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ECONOMIC GEOGRAPHY

BY

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PREFACE

TO THE FOURTH EDITION

IN addition to having been revised throughout, and advantage taken of much material published during the last few years, the present edition differs from its immediate predecessor in several respects. The first chapter has been extended by a more detailed account of minerals and soils than was formerly the case, while the sections on the European and Asiatic territories of the Soviet Union have been almost entirely re-written. Although no attempt has been made to enable the student to dispense with the aid of a good atlas a number of new maps have been introduced which, it is hoped, will prove of service to him. Moreover, the deepening of the world-wide depression in industry and trade within recent years, coupled with the fact that Great Britain has been compelled to abandon the gold standard, has made it necessary to present the figures relating to foreign trade in a different form than hitherto. Accordingly, whenever information has been available the values of exports and imports have been given in the currency of the country concerned for each of the three years 1929, 1930, and 1931, and the average rate of exchange in sterling has been added. For the latter information I am indebted to Mr. George Blatch, of the Foreign Department of the Union Bank of Scotland, Glasgow, who most readily gave me the assistance for which I asked.

A number of the maps, especially those dealing with industrial regions, have been drawn for me by a former pupil, Mr. Norman Henry, M.A.; others have been compiled by Mr. George Mackay, of the Royal Geographical Society. In preparing the book for press, and in many other ways, I have received much assistance from my wife.

J. McF.

FROM THE PREFACE TO THE FIRST EDITION

THE development of the theory of natural regions is an indication of the rapid progress which the study of Geography has made in this country within recent years. The substitution of geographical for political units has not only imparted a new interest to the subject, but has given to it a new value. On the one hand, the gain to the student has been considerable. In the words of Professor Herbertson, to whom the whole theory owes so much, "Not merely is time saved, but a more accurate knowledge of the world is gained, the memory is not burdened by such a plethora of place-names, the pupils can tell something of the shape of the lands, and of the circumstances of life in different parts of the Earth." On the other hand, the economist and the statesman may both benefit by a method which enables them to distinguish from one another regions in which the nature of the geographic control is essentially different.

Logically, no doubt, the theory of natural regions implies the treatment of the earth's surface quite independently of the political boundaries which may be traced upon it. But in Economic Geography, at least, there are certain reasons why such a course cannot be adopted. The economic development of a country is affected not only by the nature of the geographic control, but also by the political conditions which prevail. National boundaries cannot be ignored without, to some extent, losing sight of the interaction which takes place between man and his environment. In the following pages, therefore, I have endeavoured to divide the countries of the world into natural regions and to trace the influence of the geographical conditions of each upon the economic life of man within it. In some cases these regions are already well recognised; in others I have essayed a division, more or less tentative, of my own. But I have always been guided by what I conceive to be the necessity of taking all the geographical factors into consideration. The true natural region is a unit—physically, climatically, and biologically. . . . On the other hand,

the individual members of a group of units are frequently so closely allied to one another by the dominating influence of one or more of the geographical factors that in a general review of economic conditions they may be treated as together forming one natural region.

J. McF.

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ECONOMIC GEOGRAPHY

CHAPTER I

PHYSICAL CONDITIONS OF ECONOMIC ACTIVITY

ECONOMIC Geography may be defined as the study of the influence exerted upon the economic activities of man by his physical environment, and more especially by the form and structure of the surface of the land, the climatic conditions which prevail upon it, and the place relations in which its different regions stand to one another. These physical factors, it is true, do not determine absolutely the character of economic life, but they exercise a control over it which is more apparent, no doubt, in the earlier stages of human history, but which is no less real in advanced civilizations when man has learned to respond to his environment and to obtain from it an increased benefit.

In order to pursue a study of the character here indicated, it is necessary to have recourse to much information derived from other sciences. An appeal must be made to the geologist and geomorphologist for many facts regarding the structure and formation of the surface of the earth ; from the metallurgist and the mining engineer must be obtained some knowledge of the value of minerals and fuels accessible to man; the general principles determining climate must be accepted from the meteorologist; while the botanist and the agricultural chemist must supply the necessary information regarding plant life. To the economic geographer belongs the task of correlating these different facts and estimating their influence upon human activity. In the first place he has to show, among other things, how the distribution of soil and minerals is affected by the physical structure of the earth ; how climate varies with position and configuration; and how vegetation is determined by soil and by climate. Secondly, he has to consider the extent to which man in his economic aspect is controlled by these various factors, and how far he is able to free himself from their control and consciously to adapt himself to his environment.

The surface features of the land must always exercise an important control upon the economic life of man, for not only do they act indirectly through their influence upon climate and vegetation, but they determine the physical limits within which different types of economic activity are possible. The contrast between highland and lowland is of fundamental importance. In the mountain areas agriculture and settlement are, for obvious reasons, much more difficult than on the plains, and over the greater part of the world stock-raising, mining, and some lumbering are their characteristic pursuits. The obstacles which they present to communications, although now overcome to some extent by the skill of the engineer, make them barriers which, if never wholly effective, have yet profoundly modified political and economic conditions throughout the world. The highlands are, therefore, regions of isolation, often with a very characteristic social and economic development of their own. In the early periods of his history man probably preferred these open uplands to the forested or undrained lowlands, but it was in the latter regions, with their manifold opportunities for agriculture, that population ultimately became dense and industry and commerce developed.

It is also necessary to consider the rivers by which the land is drained. In the past they have frequently provided the chief means of inland transport, and even to-day their importance is by no means negligible, though the multiplication of roads and railways and the increased size of ocean-going vessels have rendered them relatively less useful than they were. In estimating their value for purposes of navigation account must be taken of the seasonal variations in their depth, and of their freedom from obstacles such as rocks, sandbanks, and ice. Within recent years the extended use of hydro-electric power has given a new importance to rivers, more especially to those of upland regions where the gradient is steep and the flow rapid. The utilization of rivers for purposes of irrigation is also more extensively practised than was formerly the case.

The surface features of the land must also be carefully studied in order to understand how different regions are related to one another. The whole economic life of the west coast of Norway is bound up with the fact that its cultivated districts lie between the sea on the one hand, and the mountain backbone of the country on the other.

it is dark brown in colour and woody in texture, and although it burns readily, it has lower heating power than the higher ranks of coal. Unlike peat, which is a surface formation, lignite is as a rule confined to sedimentary rocks of Cretaceous and Tertiary age. Coal proper may be classed as sub-bituminous, bituminous, and anthracitic. The first of these, also known as black lignite, makes good fuel and sometimes -good gas, but it disintegrates easily when exposed to the air and does not carry well. Like lignite, it occurs mainly in the younger rocks. Bituminous coal is generally of Upper Palaeozoic age, the most of it being derived from the vegetation of Carboniferous times; when it is found in the younger rocks it is usually in areas where there has been at least slight earth movement. Bituminous coals may be distinguished as coking and non-coking, the former being essential for metallurgical work, as coke which burns more brightly and intensely than coal is indispensable for blast furnaces. Anthracite has a lower percentage of volatile matter and a higher percentage of carbon than other coals. Its geological distribution is also more restricted, as it is confined mainly to regions which, as a result of dynamic disturbances, have been subject to great pressure and high temperature. As anthracite burns slowly and gives off intense heat, it is highly valued for metallurgical and naval purposes.

PETROLEUM. Crude petroleum is a liquid of complex constitution, consisting of a mixture of hydrocarbons, mainly liquid, along with some which are gaseous or solid, the last existing in solution. Geologists are now generally prepared to accept the view that petroleum is derived from the slow distillation by heat and pressure of organic matter, mainly vegetable, buried in sedimentary rocks. The rocks in which it is found are generally of Upper Palaeozoic and Tertiary age, though deposits in Mesozoic strata are by no means unimportant. Some crude petroleum is used directly as a fuel, but the greater part is first refined. The primary products of distillation include natural gas and petrol, kerosene, fuel and lubricating oils, and solid substances such as paraffin wax. The yield of different fields varies greatly in character; some give a petroleum which provides large supplies of petrol and light oils, while the distilled products of others are more suitable for fuel purposes.

GOLD in its primary form is found in quartz veins or lodes in the older and often igneous rocks, though in regions of great earth

movement and volcanic activity it may occur in more recent formations. When gold occurs in this way the ore in which it is contained has to be crushed in stamp mills before the gold itself can be extracted. On the other hand, much gold is still obtained from alluvial deposits or "placers," which are due to rivers bringing down, and depositing in sandbanks and elsewhere, gold which has been liberated by weathering from veins and lodes along their courses. The Rand goldfield in the Transvaal is perhaps a much altered placer deposit of early geological times.

SILVER, COPPER, LEAD, AND ZINC. Part of the world's silver is obtained from the same ores as gold, but much of it comes from ores which contain copper or lead, cobalt or nickel. Copper ores are found in various formations ranging in age from pre-Cambrian to Tertiary, but the most important are those which occur in igneous and metamorphic rocks. Gold and silver are almost always present in copper ores, and are recovered during the electrolytic refining of the copper. As it is a good conductor of electricity, copper is much used in electrical engineering; it is also the main constituent in bronze and brass. Lead commonly occurs with silver and zinc, the principal ore from which it is obtained being galena. When it is found in sedimentary beds independent of igneous intrusion, it is usually associated with zinc, but is free from silver and copper; when it is associated with igneous intrusions, the latter minerals may also be present.

PLATINUM is originally derived from basic igneous rocks which have been raised to the surface by mountain-forming uplifts, but the greater part of the world's production comes from placer deposits—more especially those in the Ural mountains. Platinum, which is now much more valuable than gold, is largely used in the chemical and electrical industries, in jewel-setting, and in dentistry.

ALUMINIUM is widely distributed in nature, but for commercial purposes is mainly obtained from bauxite, a mixed mineral believed to be the result of weathering and chemical action. As an abundance of electrical energy is required for the reduction of the ore, the smelters are frequently situated where hydro-electric power can be cheaply generated. Important deposits of bauxite occur in Arkansas (U.S.A.), French Morocco, and British and Dutch Guiana.

TIN has its chief source in the oxide *cassiterite* which is found in veins closely related to granitic rocks. In actual fact, however,

the greater part of the cassiterite used at present comes from placer deposits, mainly in south-east Asia. In Bolivia are the largest lode deposits at present worked.

IRON occurs in various forms, but the most important ores are hematite (Fe_2O_3), magnetite (Fe_3O_4), limonite ($2Fe_2O_3 \cdot nH_2O$), and siderite ($FeCO_3$). These ores are geologically widely distributed. Hematite is found in the pre-Cambrian rocks of the Lake Superior region, the Carboniferous limestone of Cumberland, and the Lower Cretaceous rocks of north-west Spain. Large quantities of magnetite are mined in pre-Cambrian metamorphic rocks in the north of Sweden; it also occurs in the Urals and around Lake Superior. Limonite occurs in great quantities in the Jurassic rocks of Lorraine and the English Midlands, though in the latter region siderite is also present. The Lake Superior deposits, the Spanish hematites, the Swedish magnetites, and the South Russian ores contain 50 to 65 per cent of metallic iron, while the Jurassic ores contain 35 per cent or less. The latter ores contain phosphorus, and it was not until the discovery of the basic process that they could be used in the manufacture of steel.

MINOR MINERALS. *Chromite*, from which chromium is obtained, occurs in pre-Cambrian igneous rocks, Rhodesia being at present the chief source of supply. Used as an alloy, chromium renders steel very hard and tough, and it is also an important constituent in the manufacture of stainless steel. *Manganese*, which occurs in various forms, is mainly of value as an alloy of iron, which it hardens and strengthens. India and Brazil are the chief sources of supply. Most of the world's *tungsten* is obtained from wolframite, an ore found in quartz veins in granitic rocks. Tungsten itself is employed in the manufacture of steel required for high-speed tools, and tungsten filaments are used in electric lamps. *Nickel* occurs in igneous rocks, the chief deposits worked at present being at Sudbury in Ontario and in New Caledonia. Nickel when added to steel gives it great strength, and it is used in the manufacture of armour plate and all other good steels except high-speed tool steels.

SOIL. It is impossible to give here, however briefly, any systematic account of soils; all that can be attempted is an indication of the general trend of modern theories on the subject. Research has shown that the character and constitution of the soil are not, as was formerly believed, almost entirely dependent upon the nature of the

rock from which it has been derived, but that they are largely determined by climatic agents; different rocks within the same climatic regions may give soils which approximate to one another, while the same rocks under different climatic conditions may give rise to very different types of soil.

Climatic agents may act directly upon the soil by altering its physical and climatic composition, or indirectly by controlling the vegetation which grows upon it and ultimately affects its constitution. In the first case, if precipitation exceeds evaporation the soil moisture tends to move downward, and the soil is subject to a leaching process whereby certain chemical substances may either be carried to a lower level or removed altogether. In the second case the character of the soil is affected by the organic matter derived from the vegetation growing upon it. The leaf-fall of the deciduous forests, with the accompanying ground vegetation, provides more organic matter than the coniferous forest, but it is under grassland and steppe conditions that the organic content of the soil reaches its maximum. Based upon these climatic differences, but qualified to some extent by geological conditions where the soils are immature and still contain chemically unweathered material derived from the underlying rock, a certain number of major soil regions have been determined, of which those mentioned in the following paragraph are among the more important.¹

Podsol soils cover considerable areas in northern and western Europe, and as they belong to regions where precipitation exceeds evaporation, they are completely leached. On light sandstones, poor in the elements of fertility, podsol soils develop rapidly, and their natural vegetation is heath and coniferous forest; on loams and clays their development is much slower. The brown earths of Central Europe and Eastern United States have developed under the deciduous forest. They are less intensely leached than the podsols, and the return of leaf-fall and ground vegetation combine to maintain these soils in their virgin states. Black soils (tschernozem) are characteristic of regions with a moderate rainfall (less than 24 inches in Russia), occurring mostly in early summer, and with a marked range of temperature between summer and winter.

¹ For a study of soils the reader is referred to *The Soil*, by Sir A. D. Hall (Murray» 1931); *Soils : Their Origin, Constitution, and Classification*, by G. W. Robinson (Murby & Co., 1932).

These conditions result in steppe vegetation, which grows luxuriantly in spring and early summer, and is then protected from normal decay by the succeeding drought. In some parts of the world the parent material is generally loess, but loess and black soil are not necessarily coincident. The Indian black soil (regur) belongs to a region where temperature, even in winter, is higher and rainfall rather more abundant. The black soils of temperate lands are very fertile, and constitute the best wheat-producing lands of the world. Laterite, which is widely distributed in the tropical zone, appears to be best developed where there is a marked alternation of wet and dry seasons. As a result of the chemical changes which take place under these conditions, various minerals are removed in solution, and there is an increase by concentration of iron oxides and alumina. Laterite soils are often poor in the constituents of plant food, and when fully developed, which is sometimes the case, are practically worthless. Saline and alkali soils are usually confined to regions of deficient rainfall, where there is a want of surface drainage to carry away the soluble salts formed by chemical weathering. Rain-water sinks downwards and dissolves the salts below the surface, and when evaporation subsequently takes place it takes place from the surface, and the salts accumulate in the upper layers of the soil. The unproductive nature of such soils is partly due to the injury done to plant life by the presence of the salts, and partly to the fact that a hard pan is sometimes formed in the upper layers of the soil. Under irrigation they are sometimes quite fertile. Loess, which is found over wide areas in China, Central Europe, and elsewhere, is generally regarded as a wind-borne formation. The fine material of which it consists is probably, in some cases, the product of rapid weathering in arid regions with a wide range of temperature, and in others the "rock-flour" ground from the surface of the land during glacial times.

But where the soils are immature, that is, where chemical weathering has not yet completed its work, the geological factor may be of greater importance. On the whole, crystalline rocks such as gneiss do not provide a suitable environment for plant life. The soils derived from them are often thin, as they weather slowly, and they are usually wanting in lime and other constituents of fertility. Granites, also, though rich in phosphates, are often poor in lime,

and do not, as a rule, form a fertile soil. On the other hand, some eruptive rocks are very productive, as they may contain both lime and phosphates, and are at the same time retentive of moisture. Basalt, for example, often weathers freely, and responds readily to good cultivation. Of the soils formed from sedimentary rocks those derived from limestone are generally fertile, as potash is in many cases present in addition to lime. That " a limestone country is a rich country " may be illustrated by reference to the blue-grass region of Kentucky; but in some districts, more especially in upland regions, the soil is very thin and cultivation is impossible. Sandstone soils vary greatly in character. Much depends upon the nature of the cementing material which holds the grains of sandstone together. If it happens to be lime, the soil may be fertile, but, if lime is absent and the cementing material is siliceous, the sandstone will disintegrate into a poor and infertile soil. On the Bunter Sandstone of Germany a forest vegetation alone is possible, while some of the richest soils of Great Britain are upon the Old Red Sandstone. The intermixture of the debris of different kinds of rock frequently leads to a soil of great fertility. Thus the alluvial soils deposited by rivers on their flood plains, and at their deltas, are often among the most productive. Many glacial soils are fertile for the same reason, though it must not be assumed that all are so. Much depends upon the source from which the rock waste comes, and the conditions under which it is deposited.

A knowledge of the morphological processes determining the physical evolution of a region frequently throws much light upon its economic development. The folded mountain ranges of the world are generally higher than its dissected plateaus, their geological structure and river systems are different, and they exercise an influence peculiarly their own upon human progress. Plains of accumulation, again, are not the same as plains of denudation. In the one the strata are generally weak and unconsolidated, and minerals are usually, though not always, wanting ; in the other the rocks are hard and consolidated, and great mineral wealth may exist. The value of rivers to man varies with the stage of development at which they have arrived. A river in early youth, descending from a mountain range, is generally useless for navigation, though it may be productive of much water-power. On the other hand, a river which has reached maturity, such as the Lower Mississippi, is navigable,

but is without even sufficient energy to carry its load of silt to the sea. A transverse valley again tends to be narrow and to have steep sides, while a longitudinal valley is broad and suitable for settlement. Changes in the relative level of land and sea have had important economic results. When the land has sunk relatively to the sea, river mouths have often been drowned, and good harbours formed, as was the case along the coast of New England. Farther south, along the Atlantic seaboard, the land has risen, and good harbours are few and far between. The processes which led to the formation of the continental shelf, upon which the British Isles stand, account for the fishing industry of these islands, and for the high tides which have played so important a part in the development of their ports. On the other hand, the raised beaches along the west coast of Norway have provided that region with no small part of its agricultural area. In addition to its effect upon the soil the action of ice has influenced economic development in various ways. In places, river courses have been dammed by glacial debris and waterfalls formed; the great fishing banks off Newfoundland are at least partly built up of material carried from the north by icebergs ; the boulders left by the ice-sheet have sometimes made the reclamation of the land a work of considerable difficulty.

Many other instances of the importance of a knowledge of morphological structure might be adduced, but these will suffice to show that in order to understand the present it is frequently necessary to appeal to the past.

CHAPTER II

CLIMATE

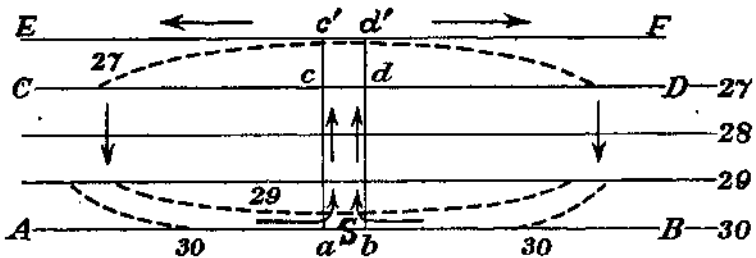
To understand correctly the geographical conditions which have controlled the economic development of different parts of the world, the factors which determine climate must be carefully studied. For climatic conditions are of the greatest importance in explaining alike the dense population of the monsoon countries and the scattered tribes of the desert, the higher civilization of temperate lands and the lower development of tropical regions.

The chief factors which control the climate of any region are its latitude, its altitude, and its position with regard to the various land and water masses of the globe. The effect of each of these may best be observed by beginning with an extremely hypothetical case, and by gradually introducing the various modifications necessary to bring it into accordance with actual facts.

If the sun were constantly above the Equator, if the surface of the earth consisted entirely of homogeneous land, and if there were no atmosphere, it is obvious that the temperature of the globe would be greatest at the Equator where the sun would be directly overhead each day throughout the year; it would gradually become less in higher latitudes, owing to the greater obliquity of the solar rays ; and it would be at a minimum at the poles where the sun would constantly appear on the horizon. In these circumstances the temperature of any place, and therefore its climate, would depend upon its latitude and upon that only. As the sun does not remain constantly above the Equator, however, but alternately " moves" each year to about $23\frac{1}{2}$ on either side of it, a disturbing element is introduced, since the increasing length of day caused thereby towards each pole in turn more than compensates, in higher latitudes, for the decreased amount of insolation caused by the sun's rays making an oblique angle with the surface of the earth. To such an extent would this be the case, indeed, that at the summer solstice the north pole would receive in twenty-four hours not only a greater amount of insolation than the Equator would receive at that time, but a greater amount than the Equator could receive in twenty-four hours at any season of the year. Under these

circumstances the distribution of temperature over the globe would be more complex, but it would still be broadly true to assume that it would diminish from a maximum at the Equator to a minimum at the poles, though that minimum is higher than in the previous case.

The introduction of the atmosphere affects the problem in several ways. In the first place, the decrease in temperature from the Equator towards the poles becomes more marked. Much of the radiant energy of the solar rays is absorbed by the atmosphere and by the water vapour and dust which it contains, and this absorption necessarily increases with latitude on account of the greater obliquity



of the sun's rays and the longer path which they have consequently to traverse through the earth's atmosphere.

The circulation of the atmosphere must next be considered. In the accompanying diagram let A B represent a portion of the surface of the earth over which the temperature is uniform and the air still. If the atmospheric pressure on the ground, as measured by the barometer, be 30 inches, at higher levels it will be 29, 28 and 27 inches respectively, and, as the air is still, these surfaces of equal pressure, or isobaric surfaces, must be horizontal, otherwise, as will be seen later, winds would blow from places of higher pressure to places of lower pressure in the same horizontal plane.

Now, suppose that the area around S receives a more intense insolation than the rest of the region. The air over it will be heated, partly by the direct rays of the sun, but to a much greater extent by the radiation from the earth of the heat obtained from the sun, and, as a result, it expands. For example, the air which formerly occupied the column a b e d now occupies the column a b c' d', and the pressure at c' d' now equals the former pressure at c d,

that is 27 inches. But the pressure towards E and F, in the same horizontal plane as c' d', is less than 27 inches, which is the pressure on the horizontal plane C D, towards C and D where conditions have not yet altered. Therefore the pressure at c d is greater than it is towards E and F. But, if in a fluid acted upon by an external force, such as gravity, the pressure is not the same in all parts of the same horizontal plane, a movement takes place from the area of high pressure to that of low pressure and continues until equilibrium is restored. Hence the air flows outwards from c' d' towards E and F, thus reducing the pressure on the surface of the ground at a b, where it now becomes less than 30 inches, and increasing it towards A and B where it now becomes more than 30 inches. Accordingly, the air moves inward along the surface of the earth from the high pressure regions around A and B to the low pressure region about S. Thus a regular system of convection currents is established, as is indicated by the arrows in the diagram, and the isobaric surfaces are no longer horizontal but inclined as shown by the broken lines. (Only the general principle is here indicated; actual conditions are much more complicated.)

When the principles in the foregoing paragraph are considered with regard to the general distribution of temperature prevailing over the earth as a whole, it is seen that there is a belt of low pressure at the Equator, where the air, being heated, expands and flows outwards towards the poles. The flow is, however, not due north and south as might be expected. On account of the rotation and shape of the earth, every free moving body tends in the northern hemisphere to turn to the right of its direction of motion, and in the southern hemisphere to the left. Thus the air which flows out aloft, from above the equatorial belt of high temperature, gradually turns towards the east both in the northern and southern hemispheres, and becomes heaped up between latitudes 30° and 35° on either side of the Equator. Two belts of high pressure thus tend to be formed round the globe, from which winds blow along the surface of the earth towards the equatorial low pressure region on the one hand, and towards the areas of lower pressure which lie poleward of the belts of high pressure on the other. Into these regions of lower pressure, also, winds appear to blow from the polar ice-caps, more especially from the southern, which is an area of great cold, and therefore of high

pressure. Thus, the ideal distribution of pressure and winds over the face of the globe is as follows: at the Equator there is a belt of low pressure, where, on account of the ascending air, calm and variable winds prevail. To the north and south of this blow the steady trade winds, beyond which are the high-pressure belts where, as the air is descending from higher altitudes, calm and variable winds are again found. In the low-pressure areas of higher latitudes are the westerly and south-westerly winds of the northern hemisphere, and the westerly and north-westerly of the southern. From the polar areas of high pressure, winds blow from the north-east in the northern hemisphere, and from the south-east in the southern.

That this distribution of pressure and winds prevails over the earth not in its ideal but in a much modified form, is due to the fact that the surface of the globe consists not of land only, but of land and water, unequally distributed. This further modification has now to be introduced into the hypothetical case with which the consideration of climate was begun. For several reasons the temperature of the ocean rises more slowly in warm weather than that of the land. The specific heat of water is greater than that of the land. The sun's rays penetrate it to a greater extent, and therefore warm it less on the surface; much heat is spent in the work of evaporation, and, as will be seen later, much is carried off by the warm currents which flow to colder regions. For somewhat similar reasons the ocean cools more slowly than the land. The water gives up its heat less rapidly, and, as that lying on the surface becomes cold and sinks, warmer water from below rises to take its place. Except in low latitudes, therefore, where the land temperature is high throughout the year, the surface of the ocean is generally colder than the land during the summer, and warmer during the winter, and the range of temperature between summer and winter is greater over the land than it is over the sea. These facts have an important bearing upon the distribution of pressure and winds. During the summer months the air over the great land masses is heated, and on the continents low-pressure conditions predominate, while over the oceans, which are heated to a less extent, the reverse is the case. In winter, on the other hand, the land is cooled more rapidly than the sea, and the pressure over it is higher. But it is important to note that, although on an isobaric chart showing the mean pressure for a given period it might

appear as if cyclonic or anticyclonic conditions, as the case might be, were continuous during the whole of that period, this is seldom the case. *Mean* conditions are shown on the chart, and not the conditions actually prevailing at any given moment. Cyclonic conditions alternate with anticyclonic both in regions of high and low mean pressure.

At the earth's surface the winds blow out from areas of high pressure, and, being diverted by the earth's rotation, blow in a clockwise direction in the northern hemisphere and in a counter-clockwise direction in the southern. The actual distribution of pressure and winds over the face of the globe is therefore very different from the ideal distribution as sketched above. In equatorial regions the belt of low pressure moves northwards and southwards with the sun. On either side of it lie the high-pressure belts which change in form and extent during the course of the year, as a result of the unequal heating of land and water. During the northern summer, the north high-pressure belt is broken up over the land and extended over the sea, while in winter it is generally extended over the land and contracted over the sea. To the north of this high-pressure belt there are, in the Atlantic and Pacific, both in summer and winter, but much farther south in winter than in summer, areas of predominating low pressure into which winds both from the high-pressure belt and the polar area of high pressure are blowing. In the southern hemisphere the normal distribution of the winds is much less affected owing to the much smaller land area which exists there in temperate latitudes. These variations in pressure modify, to a great extent, the planetary distribution of winds already discussed. In some cases the winds are strengthened, in others weakened, and in still others are entirely reversed. For example, the westerly and south-westerly winds which blow at all seasons of the year from the tropic high-pressure belt towards the west coasts of Europe are strengthened during the winter months by the presence in the North Atlantic of low pressure conditions already mentioned. In corresponding latitudes on the east coast of North America, however, the prevailing winds during the winter months are those which blow from the high-pressure area over the continent towards the low-pressure area over the Atlantic, and, being deflected to the right, appear as northerly and north-westerly winds. During the summer months, again,

the low-pressure area over the Asiatic land mass sucks in the air from over the Indian Ocean to such an extent that the north-east trade winds disappear and are replaced by the south-west monsoon.

It is obvious that the winds must exercise considerable influence upon the distribution of temperature over the globe. Those which blow from the cold continental interiors during the winter months frequently cause severe weather in comparatively low latitudes ; the trade winds which come from the sea tend to reduce the temperature of the warm lands towards which they blow ; and on the western coasts of Europe the westerly and south-westerly winds which prevail at all seasons of the year, but more particularly during the winter months, have a modifying effect, reducing the heat of summer and mitigating the cold of winter.

Ocean currents are another factor in the distribution of temperature, and their effects upon climate can most appropriately be considered in connection with the winds through which they make their influence felt. For it must be remembered that the presence of a warm current off the shores of a cold country would have little effect upon its climate, except, perhaps, to keep its ports free from ice, if winds, either warmed or prevented from cooling by the current, did not blow inland. The general circulation of the surface waters of the ocean may best be considered by describing what takes place in the Atlantic. There, the heated surface waters of equatorial regions are blown along by the trade winds and gradually acquire a momentum of their own. Two currents, the North Equatorial and the South Equatorial, are thus formed, and these flow westwards till they strike the coast of South America. Here part of the southern current is forced northward and joins the northern current, which, being likewise deflected by the land, turns to the north. Part of it enters the Caribbean Sea and passes into the Gulf of Mexico, issuing as the Gulf Stream to join the remainder, which has made its way northward to the east of the West Indies. The reunited current follows the coast of the United States to beyond the fortieth parallel, where it meets the cold Labrador current from Davis Strait. There are differences of opinion as to what happens thereafter, but apparently some of its waters are carried by the westerly winds across the Atlantic not as a definite current, but as a surface drift. This drift divides off

the coast of Spain, part turning south and rejoining the North Equatorial current, while the other part, still under the influence of the westerly winds, makes its way past the British Isles, along the coast of Norway, and into the Arctic Sea. That part of the South Equatorial current which is deflected southward flows along the coast of South America until it, too, passes under the influence of westerly winds which carry it eastwards until it bifurcates off the coast of Africa, one branch turning north to join the equatorial current, and the other continuing to follow the track of the westerly winds. In the North Pacific the circulation is, on the whole, similar to that of the North Atlantic, the main differences being accounted for by differences in the configuration of the two basins, while south of the equator the Pacific and Indian Oceans have a circulation like that of the South Atlantic, but modified somewhat by monsoon conditions. On the west coasts of continents, within the trade wind belts, there are cold currents, due in part to the upwelling of cold water to take the place of that blown westwards by the trade winds, and in part to the branches of the easterly drift which turn equatorwards to join the main current. Along the east coasts of North America and Asia there are also cold currents which move southwards until they meet with, and are diverted eastwards or lost in, the deflected equatorial currents.

Altitude is another important factor in the determination of temperature. With an increase in altitude the atmosphere becomes less dense, and also contains much less water vapour and atmospheric dust. The sun's rays therefore pass through it more easily and are absorbed to a less extent; and this is also the case with the heat rays radiated from the earth. Accordingly the atmosphere becomes cooler at an average rate of about 1° F. for every 300 feet of vertical ascent.

Inversions of temperature, however, are frequent, and are often of economic importance. On still nights, when insolation ceases and radiation begins, the air which is in immediate contact with the earth cools more rapidly than that at higher elevations. Consequently, temperature may slightly increase upwards, even to a height of 2,000 feet and more. Sometimes, also, colder air is found in valleys than on the neighbouring uplands. Valleys frequently receive less sunlight and are warmed to a less extent, while cold air from the mountain sides may slip down into them and remain there.

Certain plants which are liable to damage from frost are therefore often planted on the lower slopes of hills rather than in valleys.

The conditions affecting the distribution of rainfall over the globe have next to be considered. In the lower layers of the atmosphere water exists in a gaseous form as water vapour. This is obtained by evaporation mainly from the sea, but to some extent also from the land, and the lakes, rivers, and vegetation upon its surface. The air, however, is able to contain only a certain amount of moisture at any given time, and that amount depends upon the temperature at which it then is. When the temperature is high it can hold a much greater amount of water as vapour than it can when the temperature is low. Hence, it is of importance to distinguish between the absolute and the relative humidity of the air. The former is the actual amount of water vapour in the air at any given time, while the latter is the ratio of that amount to the amount which the air could hold at the temperature at which it then is. When the temperature continues to fall below that point (called the saturation point), at which the air is just able to retain the vapour it holds at the time, condensation and precipitation follow. This process, however, is much facilitated by the presence of atmospheric dust around the particles of which the vapour more easily condenses.

The necessary cooling to effect condensation may be brought about in one or other of several ways. Within the equatorial belt of calms, warm air, containing much moisture evaporated from the ocean, ascends at all seasons of the year, but, cooling as it ascends, is no longer able to retain that moisture, and heavy rainfall ensues. This process of cooling by the ascent of convection currents also takes place to some extent over the heated interior of continents during the summer months. Again, when winds are converging obliquely inwards as in a cyclone, some of the air is forced to rise and there is cyclonic rain. Winds blowing from the sea are frequently chilled when brought into contact with land, and their moisture is deposited. If the land is much warmer than the sea, however, this result may not follow, and in the absence of mountains there may be comparatively little precipitation. Mountains, indeed, may play an important part in the distribution of rainfall, by deflecting upwards winds from the sea and causing the moisture which they contain to condense, either by direct cooling

or by cooling consequent upon expansion under decreased pressure. In such cases there is usually a wet and a dry side to a mountain range, as the air descending on the leeward side becomes heated, and is able to retain what moisture is left.

The general principles indicated above may now be applied to a brief consideration of some of the more important types of climate distributed over the surface of the earth. These types, it must be noted, generally pass into one another by insensible gradations and no complete classification is here attempted. The equatorial belt of high temperature, low pressure, ascending air, and heavy precipitation, moves northward and southward with the sun, but certain regions on either side of the Equator constantly lie within it. In these the mean temperature of the year does not fall much below 78° F., the mean annual range between the hottest and the coldest month is less than 9° F., and the rainfall, as a rule, exceeds 60 inches. There is no dry season, but a double maximum may often be detected, corresponding to the northward and southward passage of the central part of the equatorial belt where temperature is highest and precipitation greatest. The *equatorial type* of climate occurs in the basins of the Amazon and the Congo and in the Malay Archipelago ; its general characteristics may be illustrated by the following figures for Eala (0°5' N., 18°21' E., altitude 1,181 feet)—

Temperature . . .	Jan. 75.9	Feb. 75.4	Mar. 76.5	April 76.8	May 76.8	June 76.6	July 75.4	Aug. 75.6	Sept. 75.2	Oct. 75.6	Nov. 74.8	Dec. 76.3.
Rainfall . . .	3.2	3.5	5.0	6.0	5.7	3.5	3.4	4.1	7.7	7.9	5.9	5.5

The regions in which the *sub-equatorial type* of climate prevails lie to the north and south of those with an equatorial type. As a result of their greater distance from the Equator they are within the belt of equatorial rainfall for one part of the year, and without it for another. Accordingly they have a mean temperature usually below 78° F., an annual range of at least 9° F., and a more or less well-marked dry season. But a distinction must be made between the districts with a double, and those with a single maximum. The belt of heaviest rainfall passes over the former twice each year, once when the sun is going north and once when it is going south, while the latter lie at, or beyond, the extreme limit of this belt and have only a single maximum. The figures given below for Bismarckburg in Dahomey (8° 12' N., 0° 51' E., altitude 2,330 feet) illustrate the first of these cases, and those for El Obeid in the

Anglo.Egyptian Sudan (13° 11' N., 30° 14' E., altitude 1,864 feet) the second.

BISMARCKBURG

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	77.4	79.3	78.4	76.5	75.2	72.5	70.2	70.2	71.4	73.4	76.5	76.5
Rainfall	1.4	1.9	3.3	5.4	6.7	7.0	6.1	4.4	10.7	5.	.8	1.2

EL OBeID

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	67.3	70.5	75.9	83.1	85.8	84.7	80.8	79.0	80.1	81.3	76.1	68.7
Rainfall	0.0	0.0	0.1	0.1	0.4	1.2	3.6	4.5	3.4	0.7	0.0	0.0

Sub.equatorial climates prevail over considerable areas in Africa and South America, but in some parts of the world, and more especially in south.east Asia, they are replaced by those of a *monsoon type*. The conditions which lead to the development of this type will be more fully discussed later (see especially Chapter XXIV). Its characteristics are high pressure over the land in winter which, by causing an outflow of air, strengthens the trade winds; and low pressure in summer which leads to the reversal of the trade wind system and the indraught of moist air from the sea. Hence, summer is the rainy period in contrast with winter which is relatively dry, except where special conditions prevail, as they do along the central parts of the east coast of China. Owing to the great extent of the area within which the monsoons occur, several sub.types may be recognized—the most important being the sub.equatorial, the tropical, and the sub.tropical or extra.tropical. Bombay, with its high mean temperature, low range, and heavy rainfall, may be taken as representative of the first of these. Canton, with a lower mean temperature, a greater range, and a moderate rainfall, is a good example of the second. Peking, with its hot summers and very cold winters, is typical of the third.

BOMBAY

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	75.3	75.7	79.6	83.1	85.7	83.6	81.0	80.5	80.5	82.0	80.1	77.2
Rainfall . . . .	.2	0	0	0	.4	22.1	29.2	17.4	12.6	2.5	.2	0

CANTON

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	59.0	58.0	64.0	72.0	79.0	83.0	83.0	84.0	82.0	77.0	68.0	61.0
Rainfall	1.4	3.5	7.0	8.3	10.9	9.9	11.0	9.7	5.7	3.5	1.0	1.0

PEKING

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	23.5	29.3	41.0	56.7	67.8	76.1	78.8	76.5	67.6	56.5	38.5	27.3
Rainfall	0.1	0.2	0.2	0.6	1.4	3.0	9.4	6.3	2.6	0.6	0.3	0.1

The *hot desert type* of climate, found on the poleward side of the sub.equatorial belts, is characteristic of regions which either lie within

the tropical belt of high pressure, or within the belt of trade winds, provided that, as in the Sahara, the latter have not blown over a considerable area of water after descending in the anti.cyclones of the high.pressure belt, or that they have been deprived of any moisture which they carried, as in the Kalahari. In such regions, where the relative humidity is low, the land is intensely heated during the day—especially in summer—and rapidly cooled at night. As a result the annual and diurnal ranges of temperature are considerable. The general character of the hot desert may be illustrated by the following figures for Cairo—

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	54.1	56.8	62.4	70.2	76.6	82.2	83.5	82.6	78.1	74.5	66.0	58.6
Rainfall . . .	.29	.19	.15	.08	.06	0	0	0	0	.16	.17	.25

The *Mediterranean type* of climate has warm or hot, dry summers and mild, moist winters. It occurs on the western coasts of the great land masses in regions which during the summer months are either within, or on the trade wind side of, the tropical belts of high pressure, but which in winter come within the range of the oceanic westerlies as a result of the equatorward movement of these belts. This type of climate has its greatest extension in the Mediterranean region where, however, it is partly the result of local conditions; it is also found in California, Chile, the south.west of Cape Province, and in parts of Australia. The figures for Lisbon in the following table indicate the conditions which prevail in regions bordering the open ocean; those for Athens the more special conditions within the Mediterranean area proper.

LISBON												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	50.4	52.0	54.5	57.9	61.5	66.6	70.2	70.9	67.8	62.4	56.3	51.1
Rainfall . . .	3.62	3.48	3.41	2.64	1.99	.72	.15	.30	1.28	3.19	4.18	3.78

ATHENS												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	49.0	50.0	53.0	59.0	68.0	76.0	81.0	80.0	74.0	67.0	57.0	52.0
Rainfall . . .	2.0	1.5	1.3	0.8	0.8	0.7	0.3	0.4	0.5	1.7	2.9	2.4

Temperate regions have cooler summers than the sub.tropical monsoon areas, and colder winters than the Mediterranean lands. But within the temperate type of climate many variations occur, the broad distinction being between those of a *warm temperate type with cold winters* and those of a *cold temperate type with warm summers*. To the first of these sub.types may be assigned the climates of those regions in which the mean annual temperature

does not fall far below 50° F., and in which there are not more than four months with a mean temperature below freezing point; to the second those in which the mean temperature is below 45° F. and in which there are more than four months with a mean temperature below freezing point. In both cases, however, maritime and continental climates must be distinguished from one another. Those regions which lie on the west of the great land masses are subject to oceanic influences, and have a range between summer and winter which is less than that in the interior of the continents, where the summers are hotter and the winters colder. In the former regions, also, the rainfall is more uniformly distributed throughout the year than it is in the latter, where the greater part occurs during the warm season. In the following tables the figures for Bordeaux may be taken as illustrating the maritime type of the warm temperate climate with cold winters, and those for Belgrade the continental type. The maritime and continental types of the cold temperate climate with warm summers are represented by the figures for Trondhjem and Kasan respectively.

BORDEAUX												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	40.6	43.2	46.9	53.1	58.3	64.2	68.2	68.2	63.7	55.4	46.9	41.2
Rainfall	2.8	2.3	2.5	2.6	2.9	3.2	2.4	2.7	4.5	5.6	5.7	4.2

BELGRADE												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	29.1	33.8	43.0	52.0	61.5	67.1	71.6	70.5	63.3	55.2	42.6	34.2
Rainfall	1.1	1.3	1.8	2.2	2.8	3.1	2.8	1.8	1.7	2.4	1.7	1.6

TRONDHJEM												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	27.3	26.8	30.0	37.9	45.9	53.4	57.2	56.3	50.0	41.2	32.7	27.5
Rainfall	3.3	2.3	2.5	2.2	2.3	2.5	2.6	2.6	3.3	4.3	3.5	4.3

KASAN												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	7.2	9.7	19.6	37.8	53.8	62.8	67.5	63.3	51.4	38.7	25.2	11.1
Rainfall	0.5	0.4	0.6	0.9	1.6	2.2	2.4	2.4	1.6	1.1	1.0	0.7

In the north-east of Asia and North America there is a type of climate sometimes called *boreal*. The winters of Labrador and eastern Siberia are long and cold, as these regions are far from the ameliorating influence of the oceanic winds which blow upon the west coast, and they are subject for a considerable part of the year to winds blowing from the cold continental interior. The rainfall also is low, Verkhoyansk (67° 33' N. 133° 22' E.), the coldest inhabited place on the earth's surface, is an extreme example of this type.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	58.2	48.1	23.8	9.3	36.3	56.1	60.3	51.6	36.1	5.7	34.1	51.3
Rainfall	0.2	0.1	0.1	0.2	0.3	0.9	1.0	1.0	0.5	0.4	0.3	0.1

Reference has already been made to the hot desert. The *cold desert type* of climate is found in regions where the topographical conditions of the land, and the high atmospheric pressure which prevails over it for at least part of the year, unite to exclude the rain-bearing winds. In such regions there is not only a meagre rainfall but a wide range of temperature between summer and winter. Tashkent (41° 20' N., 69° 12' E., altitude 1,610 feet) may be taken as an example of this type of climate.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	30.0	34.2	47.1	58.1	69.6	77.4	80.8	77.0	66.6	53.6	43.2	36.0
Rainfall . . .	1.8	1.4	2.6	2.6	1.1	.5	.1	.1	.2	1.1	1.4	1.7

The *sub.tropical highland type* presents some features of interest. On and near the Equator the mean annual temperature is relatively low, but the range between the hottest and the coldest month is slight and the rainfall curve shows a double maximum. Nearer the tropics the range is somewhat greater and there is a well-marked dry season. The figures for Quito illustrate the first case, and those for Mexico City the second.

QUITO

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	54.5	55.0	54.5	54.5	54.7	55.0	54.9	54.9	55.0	54.7	54.3	54.7
Rainfall . . .	4.2	4.0	5.3	7.3	5.1	1.5	0.9	1.5	2.9	37	37	3.9

MEXICO CITY

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature . . .	54.0	56.8	60.4	64.2	64.9	63.9	62.4	62.1	61.2	58.6	56.5	53.4
Rainfall . . .	.2	.2	.6	.6	1.9	3.9	4.1	4.7	4.1	1.8	.5	.2

CHAPTER III

VEGETATION

THE distribution of vegetation over the surface of the earth is primarily determined by the nature of the climate and the character of the soil. The climatic factors—especially humidity and temperature—are the more important. The amount of water in the soil and in the atmosphere, the periods of the year in which precipitation takes place, and the conditions under which moisture is absorbed by plants, affect their structure in a marked degree. Those which grow in a region where the humidity is high differ in many respects from those which grow where it is low. But an important distinction between physical and physiological humidity must at once be made. Certain conditions may prevent the absorption of moisture by plants even when it is present in abundance. For example, when the temperature is low, water cannot be so easily absorbed by vegetation as when it is high, and for the purposes of plant life, therefore, the colder parts of the world are relatively dry. Again, the presence of humus acids renders the absorption of water by plants difficult, and districts where these acids occur in the soil are physiologically dry. Those plants which flourish in regions physiologically humid are known as hygrophytes, and they are fitted both by their internal structure and their external parts, such as their leaves, which are broad and relatively thin, to get rid of excess moisture. Xerophytes, on the other hand, grow in regions which are physiologically dry, and their structure is such as to retain what moisture there is. Their transpiring surface is generally limited, and their leaves are, in some cases, thick and leathery, in others, needle-shaped, and in yet others, so adjusted as to lie parallel to the rays of the sun. Certain plants known as tropophytes are alternately hygrophilous and xerophilous. At the beginning of the physiologically dry season they drop their hygrophilous parts, such as their leaves, to assume them later when climatic conditions become more favourable.

If humidity is the most important factor in determining the structure of plants it is heat to which they owe their growth. Every plant lives between two temperatures, above the upper of

which or below the lower, it cannot continue to exist for long. Each function of the plant, moreover, such as germinating, flowering, and seeding, has its own upper and lower zero points, between which that function can alone take place.

The effect of water upon plant life is therefore very different from that of heat. Upon humidity depends the type of vegetation—whether it be woodland or grassland, or whether desert conditions prevail. The amount of moisture necessary for woodland is, as a general rule, greater than that required for grassland and the seasonal distribution is different; while the amount required for either woodland or grassland is greater in tropical than in temperate regions. According to Schimper, the essential characteristics of a good woodland climate are "a warm vegetative season, a continuously moist subsoil, and calm air, especially in winter." For grassland, on the other hand, the nature of the subsoil is of little importance, but it is absolutely necessary that there should be "frequent, even if weak atmospheric precipitation during the vegetative season, so that the superficial soil is kept in a moist condition"; and further, a moderate degree of heat during the same period. Where the best woodland conditions prevail, the trees are hygrophilous; in a less favourable environment they tend to be xerophilous.

The part played by the soil is generally of secondary importance; but, as its water-holding capacity is affected by its physical structure, that, along with its chemical composition, enables it to incline the balance towards woodland or towards grassland when the other factors are evenly matched.

These two great types of vegetation—woodland and grassland—are each capable of considerable subdivision. In those tropical regions where the rain falls at all seasons of the year the forest is evergreen, and is noted, not only for its luxuriance, but for its great wealth of shrubs, mosses, lianas, and epiphytes. When there is a well-marked dry season, as in the monsoon area, the vegetation, though dense, is tropophilous, the trees shedding the most of their leaves at the beginning of the dry period. Savanna forests, in which the trees are xerophilous and interspersed with grass, occupy considerable areas within the tropics where the rainfall is relatively low; while, under the least favourable conditions for tree growth in tropical regions, thorn-forests, such as the caatinga of Brazil, cover

the ground. In the warm temperate belts, an evergreen hygrophilous forest of considerable density is found in those regions which have rain at all seasons of the year ; when the summers are moist and the winters dry, this passes into savanna forest and thorn forest. On the other hand, when the winters are moist and the summers dry, as round the Mediterranean, a sclerophyllous woodland with thick leathery leaves prevails. In the cool temperate belts there are^k two great types of woodland, the summer green forest, which is tropophilous, and the evergreen coniferous forest, the structure of which is xerophilous. In tropical regions and in the warm temperature belts, grassland is generally of the savanna type ; the grasses are tall and grow in tufts, while the landscape is broken by trees and shrubs. Under unfavourable conditions savanna passes into steppe. In the cool temperate belts grassland varies from meadow to steppe. In meadow the grasses are hygrophilous and grow in close formation; in steppe they are xerophilous and the formation is open. In all these cases local conditions of soil and climate may cause variations in the prevailing type of vegetation.

It is difficult to correlate the distribution of economic plants with natural types of vegetation because the former have frequently been introduced into, and acclimatized in, regions to which they are not indigenous. Frequently, also, their original character has undergone great change as a result of their new environment and their long cultivation by man. But the climate and soil which suit certain natural types of vegetation are likewise adapted to the growth of certain plants of great economic value, though it must not be supposed that their limits are coterminous. Some of the most important rubber-producing plants, cacao, and the oil-palm belong to the equatorial forest, while the date palm is characteristic of the desert. On lands which have been cleared of monsoon forest are now grown such products as tea, rice, sugar-cane, and jute. Millet is the most important food plant of the savannas. Maize and cotton are extensively cultivated in, but not confined to, the belt of warm temperate forests. In the regions formerly occupied by deciduous forests and temperate grasslands, wheat, barley, and oats, sugar-beet and flax are all grown.

RUBBER. Rubber is obtained by coagulating the latex of certain trees, shrubs, and woody climbers belonging to the natural orders

Euphorbiaceae, Urticaceae, and Apocynaceae. Among the Euphorbiaceae the genus *Hevea* is the most important, one species, *Hevea brasiliensis*, yielding fine, hard Para, which is the highest quality of rubber exposed on the world's markets. Although it is an inhabitant of the Amazonian lowlands *Hevea brasiliensis* is at present cultivated successfully under very varied conditions of climate, soil, and elevation. Even on poor soils it will thrive if there is a mean annual temperature of about 80° F., and a rainfall of at least 75 inches, but it grows most quickly and gives the heaviest yield in the moist lowlands, on rich alluvial soils from which the virgin forest has but recently been cleared. Contrary to the opinion formerly held, it is unnecessary that the land should be inundated each year, and good drainage is essential. Within recent years many plantations have been established in Ceylon, the Malay States, the Dutch East Indies, and elsewhere, and it is from these that the greater part of the world's supply of rubber is now obtained.

Manihot Glaziovii, the source of Ceara rubber, is found over a wide area in the north-east of Brazil, where it flourishes on dry soils up to a height of about 4,000 feet. Attempts to cultivate it in other parts of the world were not at first successful; owing to its bushy nature the tree is difficult to tap, and in the tropical forest it seems to suffer from cryptogamic growths. More recently it has been found to thrive in regions too dry for other rubber trees, and it is now grown in East Africa, southern India, and elsewhere. Although it will stand a heavy rainfall if the drainage is good it does not, as a rule, require more than 40 inches; the mean temperature need not be as high as for *Hevea*, and the annual and diurnal range may be greater.

The principal rubber-producing plants of Africa belong to the natural order Apocynaceae. *Funtumia elastica* is, like *Hevea*, a large tree, sometimes attaining a height of 100 feet, and thrives not only in the equatorial forest, but also in the savanna forest where there is a more or less well marked dry season. In its indigenous condition it does not contribute much to the output of rubber in Africa, and in most places its cultivation on plantations appears to have been abandoned in favour of *Hevea*. The bulk of indigenous rubber is at present obtained from various vines belonging to the genus *Landolphia*. Of these the most important is *Landolphia owariensis*, a climbing plant which frequently attains a length of

over 300 feet. Although it belongs to the tropical forests, it grows best either upon its outskirts, or in the more open spaces of the interior, where it has access to light and air. *L. owariensis* is widely distributed in tropical Africa, and the rubber which it yields is of excellent quality. Two other species of *Landolphia* may be mentioned, *Landolphia Klainei*, which is common in West Africa, and *Landolphia Kirkii*, which is the most important rubber vine of East Africa. *Landolphia Thollonii* is a dwarf shrub from 6 to 12 feet high with a central tap-like root, which enables it to grow in regions with a long dry season ; it is found on the savanna, and is one of the principal sources of root rubber which is obtained from the bark of its underground stems or rhizomes.

Of the rubber-producing trees which belong to the Urticaceae the most important are *Ficus elastica* and *Castilloa elastica*. The former is indigenous to south.east Asia where it thrives under varied conditions, provided that the soil is well.drained and the atmosphere humid. As a cultivated plant in the Malay States and elsewhere, it has been replaced by *Hevea* which gives a larger yield. *Castilloa elastica*, of which there are several varieties, is a native of Mexico and Central America. It frequently occurs on the banks of rivers and on moist plains, and it prefers the open to the dense forest. It is now cultivated in plantations, particularly in Mexico.

OIL.PALM. The oil.palm, *Elaeis guineensis*, belongs to the natural order of the Palmae. In West Africa, from which practically all the palm.oil and kernels of commerce are derived, it is indigenous between the parallels of 16° N. and 12° S., but the trees are most productive in the equable and constantly moist climate of the equatorial zone. The oil.palm requires a mean annual temperature between 71° F. and 86° F., the thermometer rarely rising above 95° F. or falling below 59° F., and the optimum mean being probably about 77° F. A rainfall of 70 to 100 inches, well distributed throughout the year, gives the best results from the economic point of view. Although the oil.palm is essentially a tree of the equatorial forests, it is seldom found where the vegetation is dense, and it thrives best on the margins of the forests, in clearings around native villages, or where they have once existed, and in the gallery forests which fringe the rivers. It grows well on soils of a very varying type, but is most productive on a rich but not too heavy alluvium. Efforts are now being made to grow the oil.palm in plantations as

well as to encourage the natives to take more care of the wild trees. Palm.oil can be converted into an edible fat, but it has hitherto been used in Europe mainly in the manufacture of soap and candles, and the demand for it is likely to increase, as various oils formerly used for making soap are now employed in the manufacture of margarine. Palm.kernel oil is almost exclusively used in the margarine industry.

CACAO. The world's supply of cocoa is obtained from *Theobroma Cacao*, a tree which belongs to the natural order Sterculiaceae. It finds its natural conditions of growth in countries which possess a hot, equable, and moist climate, and a well.distributed rainfall. It requires a mean temperature of at least 75° F., and thrives best where the thermometer very rarely falls more than two or three degrees below 68° F., or rises more than two or three degrees above 90° F. The amount of rainfall necessary for cacao varies with the depth and nature of the soil and the humidity of the air, but in the regions in which it is grown, except in those where irrigation is practised, there appears to be a precipitation of at least 80 inches. A moist atmosphere is specially favourable to cacao, which is very sensitive to sudden or great changes in the amount of water vapour in the air. To protect it against the effects of desiccation wind.belts are planted where there is no natural shelter from the prevailing winds. As a general rule it is necessary to shade the young plant, and, except where the soil conditions are exceptional, even the mature tree. In practice, the most favourable soils are those which are rich in humus, and combine good drainage with a high water.capacity. In many cases these conditions are satisfied on land which has been reclaimed from the tropical forest.

THE DATE PALM (*Phoenix dactylifera*) is the most valuable food plant of the tropical desert, and the chief source of its timber supply. No degree of dryness in the atmosphere and no amount of heat will injure its growth. Atmospheric humidity, indeed, is positively detrimental to it. On the other hand, it requires a continuous supply of moisture about its roots, but it is able to resist large quantities of alkali, which is often present both in the soil and water of arid regions. Although the date palm is at certain seasons of the year able to exist with the thermometer below freezing point, it requires a very high temperature for the development of its fruit,

and the lower zero point for flowering is believed to be $65\pm 5^{\circ}$ F. A mean temperature of 70° F. during the fruiting season (May to October) with one month at least above 80° F. will enable early varieties of dates to ripen; for later varieties the temperatures must be above 75° F. and 85° F. respectively, and for the best and latest varieties 84° F. and 94° F.

JUTE. Jute is a bast fibre derived from two species of plants, *Corchorus olitorius* and *Corchorus capsularis*, which belong to the natural order Tiliaceae. Both are cultivated in India, where practically the whole of the world's crop is produced. Jute requires a hot, damp climate with a precipitation of at least 50 inches, but it is desirable that there should not be too much heavy rain, especially at the time of sowing and during the early period of growth. Later on the plant is not injured by being submerged; as a matter of fact, much jute is grown on ground which can be flooded, and as the crop is an exhausting one the land profits greatly by the silt which is deposited by the flood water. Jute will grow on all kinds of soil, but the most productive are loams or light clays mixed with sand, while laterites and gravels are least favourable to it. *C. capsularis*, which is said to produce the finer fibre, is grown on higher lands, while *C. olitorius* flourishes on alluvial deposits, on lands subject to inundation, and even in the Sunderbans.

SUGAR.CANE. All varieties of cultivated sugar.cane are generally regarded as belonging to one species, *Saccharum officinarum*, of the natural order Gramineae. Although it is cultivated in certain subtropical areas such as Madeira and Natal, sugar.cane finds its most favourable environment in humid regions within the tropics. The best results are said to be obtained where there is a mean annual temperature of 70° F. to 75° F., as the canes are then longest and thickest; on the other hand, where there is a low winter temperature the vegetative season is short, and the immature canes yield an impure juice with a low sugar content. For this reason sugar is not cultivated where the mean temperature falls for long below 50° F., although on occasion it will stand a few degrees of frost. If the rainfall is much below 60 inches a humid atmosphere is necessary for the growth of the plant, whereas, if it is much above 60 inches, a dry season is required in which the canes may ripen. In dry districts, however, the production of sugar has been facilitated by irrigation and the development of drought-resisting varieties of

cane. Very different types of soil appear to be suitable for the cultivation of sugar. The best are undoubtedly well-drained clays, but loams with a considerable amount of humus, and even calcareous soils, yield good results. The position of the chief producing regions near the coast is probably due less to climatic conditions than to the facilities which they offer for the export of the raw sugar.

RICE. Of rice, which forms one of the chief foods of the human race, there are many varieties, most of which belong to one or other of two species, *Oryza sativa* and *Oryza montana*, of the natural order Gramineae. The first of these is the grain of regions with hot, moist summers, where wheat and other cereals do not thrive. It grows best on clays and clay loams where the water is able to percolate freely, but it may also be successfully cultivated on soils which are almost impervious. As the paddy fields in which the rice is planted have to be carefully embanked in order to impound the water necessary for its growth, it is frequently cultivated on the level alluvial lands found along the lower courses and on the deltas of the rivers. Such localities have the further advantage that, if the rainfall be insufficient, water can usually be obtained by regulating the overflow of the rivers during the flood season, a process which leads to a good deal of fertilizing silt being distributed over the land. Rice may also be grown on unflooded lands, as, for example, on the terraced slopes of a hillside if irrigation by other means is possible. Although it may be sown broadcast, rice is generally cultivated in a seed-bed, from which the young plants are transferred when they are about four or five weeks old. While the crop is growing the paddy field ought to be kept under water, the depth varying from one or two inches to about fifteen inches according to the height of the plants. *Oryza montana*, or upland rice, which requires much less moisture, can be raised at a considerable height above sea-level. In the United States, where a large quantity of rice is now grown, the methods of cultivation are somewhat different and will be described later.

COFFEE. The coffee plant belongs to the genus *Coffea* of the natural order Rubiaceae. The two most important species of commercial value are *Coffea arabica*, which in one or other of its many varieties is by far the most widely cultivated, and *Coffea liberica*, which grows better at low elevations and is more robust,

but is generally regarded as yielding a coffee inferior to that obtained from *Coffea arabica*. Although it is a tropical plant, *Coffea*, and more especially *Coffea arabica*, requires an open and bracing climate, and for that reason it thrives best at fairly high altitudes. In Brazil the chief producing districts are situated on plateaus seldom less than 1,800 feet high, whilst in Arabia they lie as a rule between 4,000 and 6,000 feet above sea level. A temperature varying from about 55° F. to 80° F. around a mean of about 70° F. appears to be most suitable to the plant, which suffers severely if the thermometer stands for long below 41° F. or above 95° F. The rainfall should be fairly high, probably between 60 and 70 inches, and should be well distributed throughout the year, although it is an advantage if there is a dry season during the winter. In Yemen, where precipitation is irregular, irrigation is necessary. Strong winds are detrimental, and it is often necessary to plant wind belts. As a general rule shade is necessary for the young bushes, and sometimes for the mature plants, and, in order to provide it, various leguminous trees, bananas, and rubber-producing trees are grown on the same ground. *Coffea* is an exhausting crop and requires a rich, deep and well-drained soil with plenty of humus. Hence it usually finds its most favourable environment on land from which virgin forest has recently been cleared. Fertilizers are necessary as the plant, especially when it begins to bear fruit, makes heavy demands on the nitrogen, potash, and phosphoric acid in the soil. For this reason the diabase soils of Sao Paulo, which are rich in potash, are particularly suited to the cultivation of the coffee plant.

TEA. The tea plant, *Camellia Thea*, is a variety of the genus *Camellia* of the natural order Theaceae. Being able to stand a greater range of temperature, it has a wider extension than either coffee or cocoa, and is cultivated as far north as latitude 45° in the Russian Caucasus, and as far south as latitude 30° in Natal. It is chiefly grown, however, in certain favoured localities of the wet evergreen and warm temperate forest areas, and the most important producing regions lie between the parallels of 32° N. and 8° S., and between the meridians of 80° E. and 140° E. The conditions most favourable to tea are a temperature not falling for long below 54° F., and not rising, except for short periods, above 80° F. A rainfall of at least 60 inches is essential, and the best results are obtained when there are nearly 100 inches, a considerable part of

which falls during the vegetative season. At the same time the land must be well drained, and for this reason it was long thought that the tea plant would flourish only upon the lower slopes of hills ; but within recent years many gardens have been established in level country where the land is not liable to be waterlogged. On the other hand, it seems to be the case, both in India and Ceylon, that the teas produced in higher and cooler altitudes are superior in flavour to those grown on the lowlands, though the yield of leaf per acre is less. Tea will grow on many kinds of soil, but it thrives best on deep, sandy loams with a free subsoil. Organic matter, nitrogen, phosphoric acid, and potash ought all to be present. Upon the first two depends the luxuriance of the plant, but if they are in excess the quality of the tea is poor. Well-flavoured teas are apparently produced only where phosphoric acid and potash are found in sufficient quantities in the soil.

MILLET. The two most important varieties of millet are *juar* or Great Millet (*Sorghum vulgare*) and *bdjra* or Spiked Millet (*Pennisetum typhoideum*). *Juar* is cultivated in many countries between latitudes 45° N. and 35° S., but it is of most value in comparatively dry regions, some of which, indeed, would be almost uninhabitable without it. It grows well on most soils, even on those which are poor, provided that they are dense and deep enough to retain moisture. Too much rainfall is injurious, and in some places *juar* will grow with a precipitation as low as 20 inches. *Bajra* has a somewhat similar distribution to *juar*, but is often cultivated on soils which are too little retentive of moisture for the latter plant.

COTTON. The cotton plant belongs to the Malvaceae or mallow family, those varieties which are most cultivated for commercial purposes being derived from *Gossypium hirsutum*, *Gossypium herbaceum*, *Gossypium barbadense* and *Gossypium arboreum*. The first of these is believed by some to be identical with *G. herbaceum*, and in one or other of its many forms is largely grown in the United States. Sea Island cotton is generally considered to be *G. barbadense*, and it is probable that most Egyptian cottons are hybrid forms of the same species. The bulk of the world's supply is at present cultivated on lands which have been cleared of lighter tropical and warm temperate forests, on warm temperate savannas, and even on desert and semi-desert areas when irrigation is practicable. Conditions of soil and climate restrict the growth of the plant

even within these regions. Its lower zero points are relatively high, and six or seven months free from frost are necessary for its development. During the time that the plant is growing an increase in temperature is advantageous, but, after full vegetative growth has been attained, a decrease in temperature and an increasing diurnal range prevent the plant from running to wood, and cause it to devote the food supply which it has accumulated to the nourishment of its seed. According to Heuze, the most favourable daily temperature from germination to flowering is from 60° F. to 68° F., and from flowering to maturity, 68° F. to 78° F. In the United States the northern margin of the cotton belt has a mean temperature of 77° F. for the months of June, July, and August, and in Egypt the greater part of the cotton crop is grown where the mean temperature for the same three months is between 80° and 85° F.

The moisture required for the development of the plant is supplied, as will be seen later, under conditions which vary so much in different parts of the world, that no absolute statement regarding the amount necessary can be made. In the earlier stages of its growth frequent showers, increasing in volume with the progress of the plant, yield the most satisfactory results. The absence of a sufficient supply of moisture at this period leads to stunted growth and premature ripening, while too great an abundance of it gives rich vegetation with little fruit. In the United States little cotton is grown where the mean rainfall for June, July, and August is less than 8 inches or more than 20 inches. Later on a decreasing rainfall is favourable to the seed maturing.

The nature and composition of the soil play an important part in determining whether cotton can be grown upon it in sufficient quantities to make it a profitable crop for commercial purposes. The agricultural chemistry of cotton is yet in its infancy and much has still to be learned on the subject ; but it would appear that those soils which are most favourable contain nitrogen, phosphoric acid, potash, lime, and magnesia, in sufficient quantities to satisfy the demands of the plant. Nevertheless, some of these may be present in very small quantities on good cotton land, while other lands, seeming to possess all the necessary constituents, fail to yield a crop. The texture of the soil is of importance, chiefly from its influence on the water supply. If the rainfall is considerable,

a heavy soil may become waterlogged; on the other hand, a sandy soil, unable to retain moisture, will yield only a poor crop if the rainfall is low. Thus, although no particular soil is typical of the cotton-growing regions, it may be concluded that a deep loam which is continuously moist, but not wet, is the most suitable.

VINE. The different varieties of vine cultivated in the Old World are derived from *Vitis vinifera* of the natural order Ampelidaceae; in the New World other species are also cultivated, such as *V. Labrusca* and *V. aestivalis*. For the production of wine of commercial value the vine requires a hot summer, and a warm and prolonged autumn in which to ripen its fruit. In France, the chief wine-producing region in the world, it is confined to the country lying south of a line drawn from a point on the French coast a little to the north of the mouth of the Loire, through Paris, to Mezieres. In this region the climate is essentially moderate with a September mean of about 60° F., the winters are not exceedingly cold, which is an advantage, although low temperatures for a time are not necessarily fatal to the plant, and the dangers of spring frosts can be mitigated by planting only on sunny slopes and on easily warmed soils. In the growing season the vine demands a considerable amount of moisture, but its deep roots enable it to draw water from below, and to flourish in countries where there is little or no summer rainfall; after the fruit has begun to approach the ripening stage dry weather and abundant sunshine are necessary. Although even slight differences in the soil may affect the quality of the wine produced, the vine will, in a general way, grow well on soils of very varying character. One which is rich does not give the best results, and the most suitable are those which, though retentive of moisture, can be easily drained, and do not contain more than a sufficiency of the nutriment required by the plant. For these reasons the vine thrives on soils which consist of limestone or chalk mixed with sand or clay, and it will even grow on gravel with a moist subsoil. The small, seedless grapes, which, when dried, are known as currants, grow in Greece and in the adjacent islands. To get large crops and fine fruit a good rich loam is desirable. Sultana raisins are the product of a yellow grape which is extensively grown in the neighbourhood of Smyrna, where the soil consists of a decomposed shell limestone.

OLIVE, The olive tree (*Olea europaea*) is able to resist summer

drought, and finds its most favourable environment in those countries in which a Mediterranean type of climate prevails. But, in Europe, at least, it also requires protection from cold northerly winds, and even within the Mediterranean area it is not found where such protection is wanting. On the other hand, a rainless summer does not appear to be absolutely essential, and the tree bears fruit in many districts which lie somewhat beyond the limits of the true Mediterranean climate. Although the olive grows well on all kinds of soil, those of a calcareous nature are probably best adapted to its requirements. For the best results, careful culture is necessary, but it is often wanting in those countries in which the olive is chiefly found.

MAIZE OR INDIAN CORN. The botanical name of this plant, which is one of the Gramineae, is *Zea Mays*. According to the Tenth Census Report of the United States, in which country over three-fourths of the world's supply is grown, "the ideal climate is one with a summer from four and a half to seven months long, without frost, the middle portion hot both day and night, sunny skies, sufficient rain to supply the demand of a rapidly growing and luxuriant crop, falling at such intervals as to best provide moisture without ever making the land actually wet." According to the same authority the mean temperature of the warmest month of the year is of great importance, and maize flourishes when that ranges from 70° F., or preferably 75° F. to 80° F. During the growing season, also, there should be a precipitation of from 15 to 30 inches. In the United States the best conditions prevail where there is a series of comparatively heavy rains during the growing season, separated by considerable intervals of clear weather with abundant sunshine, and followed by a warm, dry, ripening period. Maize requires a moist but well-drained soil, and for that reason loams with an admixture of sand are amongst the most suitable.

WHEAT. Although bread can be made from various species of wheat it is from *Triticum vulgare* that the world's supply is mainly produced. Owing to its great adaptability this species is widely distributed, and is cultivated under very varied conditions of soil and climate. The most suitable soil appears to be a light clay or a heavy loam, but many others are very productive when the climate is favourable. According to the Census Report already referred to, the seed, in order that there may be a good crop, "must

germinate and the young plants grow during the cool and moist parts of the year, which season determines the ultimate density of growth on the ground, and consequently mostly determines the yield. . . . Wheat branches only at the ground and produces no more heads than stalks. It only sends out these branches early in its growth or during cool weather, and unless the growth is comparatively slow the branching of wheat (called 'tillering') must take place before the plant attains any considerable height or it does not occur at all." On the other hand, "wheat ripens in the warmer and drier parts of the year, which season more largely determines the quality, plumpness, and colour of the grain. . . . More sun is needed and less rain. Too much rain, particularly if accompanied with heat, induces rust, mildew, and other diseases, and too dry winds shrink the grain." Percival, in his monograph on *The Wheat Plant*, says that the best conditions are afforded when the cool, moist growing season is followed by a bright, dry, and warm ripening period of six or eight weeks with a mean temperature of about 66° F.

With regard to rainfall a mean annual precipitation of about 15 inches may generally be regarded as a minimum, except under special conditions, as, for example, when all the rain falls during the growing season, or when irrigation or dry farming is practised. But the best results are obtained when there is an annual rainfall of between 20 and 30 inches, a considerable part of which falls during the growing season.

Many investigations have been made as to the exact amount of heat required by wheat, but no precise result has as yet been obtained, though it is believed that a temperature of at least 41° F. is necessary before vegetative growth can begin. The temperature, measured by day degrees,¹ which must accumulate before wheat will ripen, appears to vary in different parts of the world not only with the variety of the plant, but according to the length of the day, the amount of precipitation, and the nature of the soil. It has been calculated that at St. Paul in the United States wheat ripens as a rule when the accumulated temperature amounts to 2,716 day degrees (F.), but in some parts of Alaska, where the days

¹ Day degrees are reckoned by taking the excess of the mean temperature of the day over zero point, in this case 41° F. If the mean temperature of any day is 50° F., nine day degrees are accumulated.

are long, only 1,320 day degrees (F.) are necessary.¹ In England 1,960 day degrees over an initial temperature of 42° F. appear to be requisite.

Of the other species of the wheat plant the only one which need be mentioned is *Triticum durum*, from which the so-called macaroni wheats are obtained. It requires a hot climate and is easily damaged by frost, but it gives a fair yield even with 10 inches of rain, provided that a considerable proportion falls during the early part of the growing season. For these reasons it is extensively cultivated in warm and semi-arid regions. The most suitable soil is one which is deep and rich, with an abundance of humus and an adequate supply of lime, potash, and phosphates.

The quality of wheat varies, not only with the variety which is grown, but with the conditions of soil and climate under which it is cultivated. The soft winter wheats of mild, moist districts, such as Western Europe, are relatively rich in starch, while hard wheats—whether winter or spring—which grow in regions where the summers are hot and precipitation is light, are poor in starch but rich in gluten, and are particularly adapted for mixing with the softer wheats in order to produce a flour suitable for baking purposes. In various parts of the world attempts—more or less successful—have been made to adapt the grain more closely to its environment, and to render it more suitable for the purpose for which it is required.

OATS. The oat (*Avena sativa*) is a hardy and robust cereal which stands cold, and ripens at a lower temperature than wheat; in Europe it grows as far north as the 69th parallel. It does well on clay loams and on soils rich in organic matter, such as reclaimed moorland, but it will also thrive on poorer soils than any other cereal. An abundance of moisture is necessary almost to the close of the ripening period; if it is contained in the soil the oat will do well even in a dry climate, but if not frequent rains are necessary.

BARLEY. Although barley (*Hordeum sativum*) will grow in the tropical uplands, a cool climate suits it better than a hot one. It is the most hardy of all the cereals, and can be cultivated as far north as the 70th parallel. On the other hand, it does not require much moisture, and will flourish in regions where there is little

¹ Dr. J. F. Unstead, *Geographical Journal*, Vol. xxxix (1912).

precipitation during the summer months, as is the case in countries along the Mediterranean seaboard. On rich soils the plant is liable to grow too rapidly, and the best crops are obtained from light, open, and, preferably, calcareous soils. Although barley has been the chief food grain of various peoples in the past it cannot, owing to its low gluten content, be baked into vesiculated bread, and for that reason is now used mainly for malting purposes.

RYE (*Secale cereale*). As rye grows well in regions which are too cold for wheat and on poor soils it is extensively cultivated in Scandinavia, in Northern Germany, and in Central Russia, where it is the principal cereal crop. In gluten content it ranks next to wheat, and it is therefore the most important food grain of the countries in which it is extensively grown.

SUGAR BEET. The sugar beet, *Beta vulgaris*, belongs to the natural order Chenopodiaceae. It is now extensively cultivated for the manufacture of sugar in Europe and in North America. In Europe the chief producing districts have a mean temperature between 62° F. and 65° F. for the three warmest months of the year ; in America the largest crops are produced where the July temperature is about 70° F. A rainfall of 2 to 4 inches per month appears to give the best results, but it is essential that there should also be abundant sunshine and a warm and dry ripening period about September. For these reasons the plant often does well on irrigated lands. It is important that the soil should be deep, porous, easily worked, and well-drained, but within these limits various types can be adapted to the cultivation of beet. A deep loam containing a fair amount of clay and lime is perhaps the most suitable ; heavy clays are, as a rule, less satisfactory, and sandy soils still less so.

FLAX. Flax is a fibre obtained from the stems of *Linum usitatissimum*, which belongs to the natural order Linaceae. It grows under very diverse climatic conditions in different parts of the world. In warm countries the seed (used in the manufacture of linseed oil and linseed cake) is abundant but the fibre is poor, whereas in temperate regions the fibre is developed at the expense of the seed. So far all attempts to combine the two crops seem to have met with little success, the usual result being an inferior crop of both flax and seed. In India, where the plant is grown as a winter crop, it is cultivated on clay soils in the Gangetic plain and on the black soils of the Deccan, and, if there is sufficient moisture

for germination, it will reach maturity with little rainfall. Indeed, precipitation during the flowering season is injurious. In Europe, where it is chiefly grown for fibre, the flax plant thrives best in cool regions with a sky often clouded and a humid atmosphere. Well-drained loamy or sandy soils with a large proportion of organic matter are the most suitable.

HEMP. Common or true hemp is derived from the stems of *Cannabis sativa* of the natural order Moraceae. When grown for fibre it requires climatic conditions similar to those under which flax is cultivated, but as its growing season is shorter it makes its way farther north. In hot countries the stalk, leaves, and flowers produce a resinous juice which possesses the properties of a narcotic, and it is for this purpose that it is chiefly grown.

PULSES, including peas, beans, and soya beans, all flourish in temperate, and to some extent in tropical countries. Peas find their most congenial environment in cool temperate, and beans in warm temperate regions. Soya beans (*Dolichos soja*), which have within recent years become of considerable importance, can adapt themselves to varying climatic conditions. " They are very resistant to drought, can endure slight frosts, and are capable of withstanding an excess of moisture. . . . They thrive equally well in regions occasionally subjected to periods of semi-aridity, in regions where the valley soils are flooded for a few weeks during the rainy season, and in northern latitudes having a growing season like that in Minnesota." In the United States soya beans grow best between latitudes 37° and 43°, but in Manchuria, where they are chiefly cultivated at present, they make their way as far north as latitude 47°, and the farther north they extend the better they become. " They grow best in soils of medium texture containing fair quantities of potash, lime, and phosphoric acid. Good results have sometimes been obtained in comparatively light soils, and an abundant crop is sometimes obtained on land too poor for clover." (" The Soya Bean of Manchuria "—Imperial Maritime Customs, Special Series, No. 31.)

EUROPE

CHAPTER IV

EUROPE

EUROPE forms the western part of the great continental land mass of Eurasia, and on physical grounds alone can hardly be considered a separate continent. But its peninsular character and greatly indented coast line, its climate, and above all the political and economic development of the majority of its inhabitants, mark it off from Asia, and justify the usual custom of according it treatment by itself. In the circumstances, however, it is obvious that the boundary between Europe and Asia must be more or less conventional, and it is sometimes taken as following the Ural mountains, the Ural river, and the Manych depression to the north of the Caucasus. The area of the continent as thus defined is about 3,850,000 square miles, or about one-fourteenth of the total land surface of the globe.

Several great physical regions may be distinguished. In the north of Ireland and in the north of Scotland, in Scandinavia and in Finland, are the remains of an ancient Archaean land which has been much worn down, and of which, as the result of extensive fracturing, many parts have sunk beneath the level of the sea. This region, which has been glaciated within recent times, is bordered in places by a peripheral zone of low land, built up in part by the debris brought down by the northern glaciers, and in part by the alluvium deposited by Alpine rivers. To this peripheral zone belong the Low Countries and the North German Plain.

Farther to the south, there lie a number of ancient massifs, the remains of mountain ranges raised during later Carboniferous times. They include the fragments of the Armorican mountains, which at one time extended from the south of Ireland, through the south-west of England and through Brittany, to the Central Plateau of France, the Iberian Meseta, and such remnants of the Variscan ranges as the Ardennes and Rhine massif, the Vosges and Black Forest, the Harz, and the mountains of Bohemia. Within the barriers formed by these ancient massifs there are great areas in which Secondary and Tertiary rocks have been deposited. Some of these

areas are adjacent to the lowlands already mentioned, and along with them form the great European Plain, which extends from eastern England, through France, Belgium, Holland, and Germany into Russia.

In the south of Europe lies the most conspicuous feature in its geography—the Alpine ranges which form part of the great mid. world mountain system. The Alpine curve begins in the west with the Pyrenees and includes the Hy&res of Southern France, the Alps, the Carpathians, the Balkans, the mountains of the Crimea, and the Caucasus. One branch of the main curve passes from the south of France through the Balearic Islands and is continued by the Sierra Nevada of southern Spain, the Atlas of northern Africa, Sicily, and the Apennines to rejoin the Alps; while another follows the Dinaric Alps, runs through Greece, reappears in Crete and Cyprus, and is connected with the Caucasus by the Taurus Mountains of Asia Minor and the highlands of Mesopotamia.

East of the regions already mentioned, and in a sense apart from them, is the Russian massif, consisting of older sedimentary rocks, which lie horizontally, and which have been little affected by those great tectonic movements that influenced so profoundly the geography of the remainder of the continent. As a result there is over the whole area little topographical variety, and the general monotony of the surface is accentuated by the fact that Russia is not indented by the sea to anything like the same extent as Western Europe.

Off the north.west coast of Europe the continental shelf has a wide extension, its seaward limit running from the Norwegian coast, by the west of Scotland and Ireland, to the south.east corner of the Bay of Biscay. Within this area the floor of the sea has nowhere a greater depth than one hundred fathoms. In the Mediterranean region, on the other hand, the mountain ranges border a sea whose floor, except in the Adriatic, sinks rapidly to a depth of 1,000 fathoms and more.

CLIMATE. The climate of Europe is determined mainly by its latitude, and its position on the western side of a great land mass. In winter, the vicinity of the Atlantic coast is warmed by westerly and south.westerly winds from the ocean, and the isotherms run N.N.W. to S.S.E., being turned eastwards in the Mediterranean region, along the northern borders of which they are somewhat

closely crowded together. In the interior of the continent the trend is rather N, W. to S.E., but the general rule holds good that temperature decreases from west to east at this season of the year, except in the Mediterranean region, where the more southerly latitude and the modifying influence of the sea together tend to prevent a marked decrease. In summer the conditions are reversed, the coastal districts, under the influence of oceanic winds, remaining cool, while the interior becomes rapidly heated. In July, the isotherms, outside of the Mediterranean region, run W.S.W. to E.N.E., and temperature thus increases from west to east, in which direction also, as is obvious, there is an increase in the range between the temperature of winter and that of summer.

The following figures illustrate these variations—

Place.	January mean.	July mean.	Range.
Cambridge	37.6°F.	61.5°F.	23.9°F.
Utrecht	34.1	62.6	28.5
Hanover	32.7	63.1	30.4
Berlin	31.3	64.5	33.2
Poznan	29.3	65.5	36.2
Warsaw	25.9	65.8	39.9

(These places all lie within half a degree of the 52nd parallel, and the altitude in no case exceeds 400 feet.)

The following figures indicate the more equable character of the Mediterranean region—

Place.	January mean.	July mean.	Range.
Murcia	50.2°F.	78.8°F.	28.6°F.
Catania	51.4	79.5	28.1
Athens	48.7	80.6	31.9
Smyrna	45.6	80.2	34.6

In January, the coldest month of the year, practically the whole continent lies between the isotherms of 50° F. in the south and 0° F. in the north; in July, the warmest month, the range of the

isotherms is from 80° F. in the south to about 50° F. in the north. The summers are therefore cool in the north, warm in the centre, and hot in the south.east and in the Mediterranean region, while the winters are cold all over the continent, except in the countries along the central part of the Atlantic seaboard, where they are cool, and on the Mediterranean, where they are, as a rule, somewhat milder.

Three regions may be recognized in respect to the period of the year in which the greatest amount of precipitation takes place. In the interior of the continent the rainfall occurs chiefly during the summer months, when moisture.bearing winds from the ocean are sucked into the low.pressure area, which at that season of the year lies over the Eurasiatic land mass. On the Atlantic coast lands, however, the heaviest precipitation is in autumn when the sea has lost little of its heat and evaporation is proceeding almost as in summer, but when the land is cooling rapidly and causing condensation to take place. The Mediterranean region, again, has its rainfall in the winter half of the year, when it is influenced by cyclonic conditions; in the summer months the north.east trade wind system gradually extends over it, and the winds, blowing off the land and towards lower, and so warmer, latitudes, are dry.

The regions of heaviest precipitation in Europe are either in the countries which border upon the Atlantic or on the slopes of mountains which face the rain.bearing winds. Over considerable areas in these regions there is a mean annual precipitation of 40 inches and more, which decreases in the less exposed districts to between 30 and 40 inches. The greater part of Central Europe has between 20 and 30 inches, but in the north.east and south.east of the continent there is less than 20 inches.

VEGETATION. The natural vegetative regions of Europe need only be mentioned here, as they have been so greatly altered by the hand of man. In the extreme north there is tundra which soon passes into the poor coniferous forest of high latitudes. About the 60th parallel this coniferous forest begins to merge into the deciduous summer green forest of Central Europe. In the Mediterranean region evergreen trees of a sclerophyllous type grow on the lowlands, and deciduous trees on the uplands. The south.east of Russia is steppe land.

Of economic plants barley makes its way farthest north and finds

its extreme limit along a line running south.eastwards from about the North Cape to the intersection of the 60th parallel with the European frontier. It is closely followed by oats, but wheat cannot grow beyond the 65th parallel in Norway and Sweden, after which its limit bends to the south.east and enters Russia about the 60th parallel. Rye has a somewhat greater extension, and in Sweden can be grown as far north as the Arctic Circle. The northern limit of maize enters France in the south of Brittany and runs in a north.easterly direction as far as the Polish province of Poznan (Posen), where it bends to the east, runs through Poland by way of Lemberg,¹ and includes Romania and Southern Russia. The vine has a limit practically the same as that of maize as far as Poznan. East of that point the increasing length and severity of winter pushes it to the south of the Carpathians. The area within which the olive is grown is practically coterminous with the region of Mediterranean rainfall.

¹ Now Lwow.

CHAPTER V

THE BRITISH ISLES¹

THE British Isles, comprising the two large islands of Great Britain and Ireland, along with about five thousand smaller islands lying off their shores, stand upon the continental platform, off the north-west coast of Europe. As indicated in the previous chapter, the geographical and geological characteristics of the region are exceedingly varied and complex. The north and west of Great Britain consist in the main of mountainous land built up of older rocks, while the south and east are generally lowlands in which the younger formations prevail. As these differences in physical structure have had a great influence upon the economic development of the whole country, a more detailed examination of them is necessary.

Scotland may be divided into three great physical regions—the Northern Highlands, the Central Lowlands, and the Southern Uplands. The Central Lowlands, which separate the first of these regions from the last, consist of a great rift-valley, caused by two lines of fracture, one running from Stonehaven in the east to the mouth of the Clyde in the west, and the other from Dunbar in the east to Girvan in the west. The Northern Highlands, which have an average elevation of about 1,500 feet, are in the main a great dissected tableland, formed of ancient sedimentary rocks, which have been completely altered by metamorphic action. In the Outer Hebrides and on the west coast, Archaean rocks and pre-Cambrian sandstones appear; in the central part of the Highlands there are considerable areas of intrusive granite, and in the Inner Hebrides extensive volcanic outpourings of Tertiary age. In Caithness in the extreme north, and along the eastern margin of the Highlands as far as the mouth of the Moray Firth, there is a low-lying coastal sill of varying width, formed mainly of Old Red Sandstone. This lowland area broadens out in north-east Scotland, but is there composed in the main of rocks similar to those of the Highlands. The Southern Uplands consist of Ordovician and Silurian rocks, and, like the Northern Highlands, their structure is

¹ In his revision of this chapter the author received much help from *Great Britain, Essays in Regional Geography*, Cambridge University Press, 1928.

that of a dissected tableland, but their average height is less, and probably does not exceed 1,000 feet. The Central Lowlands, which have been let down between these two ancient masses, and folded in the process, are generally covered with Old Red Sandstone and Carboniferous rocks, except in the upland districts, which owe their formation to volcanic matter ejected in Carboniferous times.

England is divided into two very different physical regions by a height of land known as the oolitic escarpment, which extends from Portland Island, by the Cotswolds, to the North Yorkshire Moors. To the north and west of this escarpment lie the great Palaeozoic areas of the country, while to the south and east of it are the Secondary and Tertiary formations. The Palaeozoic areas—the Pennine Range, the Lake District, the Welsh Upland, and the peninsula of Devon and Cornwall—are united by the Central Plain, which lies between them and the oolitic escarpment. The Pennine range was built up of folded and faulted Carboniferous rocks,—Mountain Limestone, Millstone Grit, and Coal Measures,—but denudation has removed the Coal Measures, and in many places the Millstone Grit, from the upper parts of the range. The Coal Measures, however, appear on both flanks, in Lancashire on the west, and in Northumberland and Durham, Yorkshire, Derbyshire, and Nottinghamshire on the east. The Lake District is a dome-shaped uplift, formed of Ordovician, Silurian, and igneous rocks, with a band of Coal Measures along the north-west coast. The Welsh Upland is a dissected plateau consisting in the main of Ordovician and Silurian rocks, strengthened in places by intrusive igneous material. In the south, in a synclinal trough in the Silurian rock, there are areas of Old Red Sandstone and Carboniferous rocks within the last of which lies the coal basin of South Wales. The peninsula of Devon and Cornwall consists of a synclinal trough in the Devonian rocks which appear in the north along the Bristol Channel, and in the south along the English Channel where there are also considerable areas of intrusive granite. The country between these outcrops of Devonian rocks is covered with Carboniferous deposits, which do not contain coal. The Central Plain, which connects these various upland regions, is composed in the main of Permian and Triassic rocks, though in some parts of the south the Coal Measures come to the surface. Beyond the Lias belt, which borders the Central Plain and from some points of view

might be regarded as forming part of it, the land rises to the oolitic escarpment and then slopes gently away eastwards and southwards across the Jurassic belt to the foot of the Cretaceous escarpment, which runs from the Dorset Downs, by the Marlborough Downs, the Chilterns, the East Anglian Heights, and the Lincolnshire and Yorkshire Wolds, to Flamborough Head. This escarpment bounds the chalk country which extends eastward and southward until it is overlaid by the Tertiary gravels and clays of the London and Hampshire basins.

Ireland may be described as basin-shaped, since it consists of a central plain, more or less surrounded by a rim of mountains. In the north and south these mountains cover wide areas, but in the east and west they are more restricted and less continuous. In the north-west, where they follow the fold lines of the Scottish Highlands, they consist of crystalline and granitic rocks, while in the south-east of Ulster, where they were once continuous with the Southern Uplands, and in Leinster, where they formed part of the same mountain area as Wales, they are of Ordovician and Silurian rocks which have been pierced, however, by the large granitic masses that now give them their most characteristic features. The Antrim Plateau, in the north-east, is built up of layers of basalt. In the south and south-west, where the mountains have been folded along the same lines as those of south-western England, the ridges consist of Old Red Sandstone, while in the intervening valleys Carboniferous Limestone appears. The low-lying Central Plain, formed by the denudation of the upper layers of the Carboniferous rocks which once covered the greater part of Ireland, is underlain by a floor of Carboniferous Limestone which, in fact, only comes to the surface in a few places, as it is generally concealed beneath a covering of glacial drift. Over the whole of Ireland, indeed, the drift is widespread, and, by obstructing the watercourses, has done much to aid in the formation of the bogs which are so characteristic a feature of Irish scenery.

CLIMATE. The British Isles fall within the climatic area of North-Western Europe, and lie in the belt of westerly and south-westerly winds, which modify alike the heat of summer and the cold of winter. In summer, the land is heated by the direct insolation of the sun, which is then north of the Equator, and temperature decreases in a northerly direction. Owing to the cooling influence

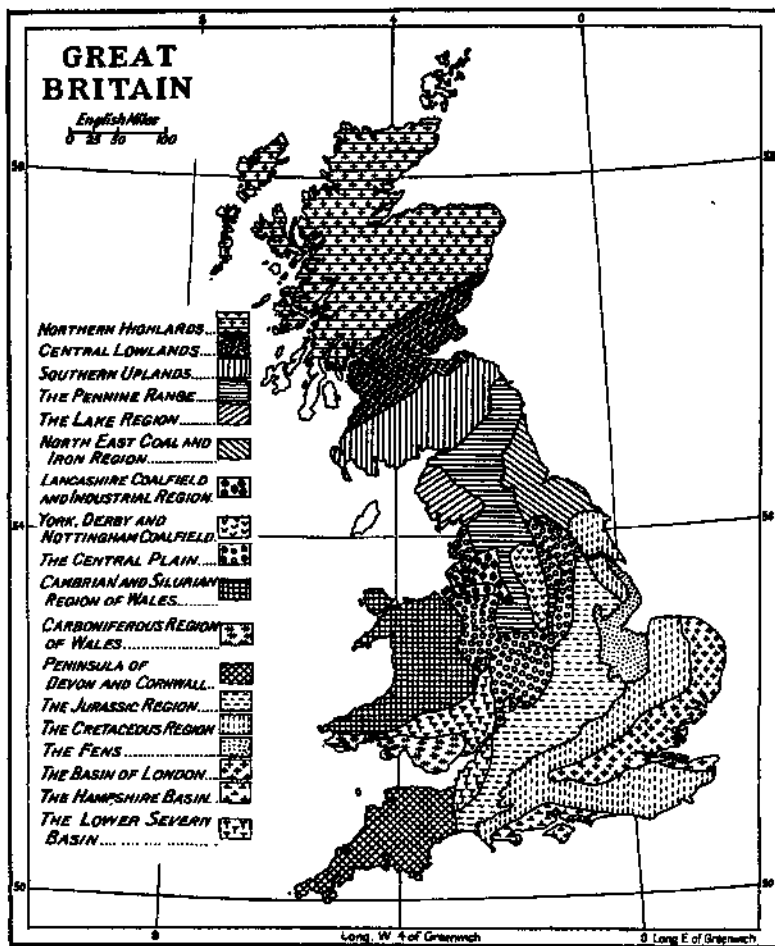
of the westerly winds blowing from the ocean, however, Ireland has at this season of the year a temperature about 2° F. lower than that part of Great Britain which lies within the same parallels of latitude; while places on the west coast of Great Britain have a somewhat lower temperature than corresponding places on the east coast. In July, the warmest month of the year, the isotherms range from 63° F. in south.eastern England to 55° F. in the north of Scotland. In winter, on the other hand, when the sun is south of the Equator, the British Isles receive the greater part of their warmth not from it directly, but from the westerly and south.westerly winds, which reach them from the Atlantic. Accordingly, the western coasts, which are most exposed to these winds, receive the greatest benefit from them, and temperature decreases, not from south to north, but from west to east. At this season of the year, therefore, Ireland has a mean temperature several degrees higher than that of corresponding parts of Great Britain, and the west coasts of both islands are warmer than the east coasts. In January, the coldest month of the year, the mean sea.level temperature ranges from 44° F. in the south.west of Ireland to 38° F. in the south.east of England, while the isotherm of 40° F. runs from Cape Wrath to the Isle of Wight. The upland regions are, of course, colder at all seasons of the year than the sea.level temperatures indicate. On the whole, however, it may be said that in the British Isles the summers are warm and the winters cool.

The western parts of the British Isles have generally a heavier precipitation than the eastern parts. This is due in the first place to their more exposed position in relation to the winds blowing from the Atlantic, which is the great source of moisture; and in the second place to the presence of mountain masses, which force the winds upwards, so that they are cooled, and the moisture, which they carry, condensed. The eastern parts of the country, on the other hand, lie in the rain shadow cast by the mountains, and have, therefore, a much lower rainfall. Generally speaking, it may be said that on the mountainous districts of Ireland and of the west of Great Britain there is a mean annual rainfall of at least 40 inches, while on the lowlands, in both countries, there is less than that amount. But parts of the Western Highlands, of the Lake District, and of Wales, have as much as 60, 80, and

even 100 inches. The greater part of the Irish plain, and the Scottish Lowlands, have between 30 and 40 inches; the Central Plain of England, and much of the east coast of Great Britain, have between 25 and 30 inches, while the eastern counties of England have less than 25 inches.

GENERAL CONSIDERATIONS. In order to realize the extent to which geographical conditions have contributed to establish the British Isles in the pre. eminent position which they occupy in the economic world of the present day, certain considerations of a general nature must be taken into account. In the first place, the position of the British Isles upon the continental platform has been of importance in several ways. The islands were, at one time, connected with the Continent, and even after land connection ceased they were easily accessible from it. European flora and fauna entered during the earlier period, and European civilization during the latter. But along with accessibility there was detachment, and even a certain amount of isolation, which allowed the island people to develop along lines of their own, free to a greater extent than most continental countries from the danger of foreign invasion. Again, the insular and indented character of Britain would, in any case, have made communication by sea relatively easy, but the high water in nearly every river estuary around the coast, caused by the heaping up of the tidal wave upon the continental platform, rendered many comparatively inland places, seaports of some importance in early times. With the increased size of ships, a number of these inland ports have decayed as such. On the other hand, some of the principal seaports of the country, which have grown up near the mouths of rivers, are only accessible to the larger vessels of the present day at times of high water. Finally, it may be noted, the position of Great Britain on the continental shelf has been the main factor in the development of the great fishing industry of the country.

In the second place, although the British Isles cover but a small area, geological structure and land form are exceedingly varied and climatic contrasts are well marked. The number of natural regions is, therefore, large, and as many of them are well endowed with regard to soil and climate, or mineral wealth, the geographical conditions for a wide range of economic activities are present. Moreover, the actual distribution of natural regions has proved favourable to economic development. Those regions which



NATURAL REGIONS OF GREAT BRITAIN

are most suitable for agriculture, and, therefore, best fitted for man in the earlier stages of civilization, lie nearest to the Continent, and are most accessible from it. Those, on the other hand, whose economic resources could only be utilized by a fairly advanced people, and whose topography would in some cases have actually retarded progress in its earlier stages, lie distant from the Continent, and were for long but scantily populated.

Lastly, account must be taken of the international position of Great Britain. Before the geographical renaissance of the fifteenth century the country practically lay upon the outer circumference of the known world. But, after the discovery of the Cape route to India, and of America, its position became central rather than peripheral. By taking advantage of this relative change in position, especially during the critical period of the eighteenth century, Britain became a trading and colonial power. This not only gave it the profits of a great entrepot trade, but aided the development of manufactures by facilitating the importation of raw material from, and the exportation of manufactured goods to, all parts of the globe.

A consideration of these factors helps to explain the economic activities of the British people. Agriculture was, and still is, the most important single industry of the country, but, though much of the land is highly cultivated, it does not provide employment for more than about one-tenth of the working population. Manufactures have gradually developed and their development has been based partly on the mineral resources of the country—mainly coal and iron—partly on the facilities, geographical and otherwise, for trade with other lands, and partly on the skill and industry of the people. The manufacture of textile goods, and the manufacture of iron and steel, including machinery and engineering products, are of special importance, as, along with coal, the profits of shipping, and the interest on foreign loans, they constituted in pre-war days the chief means by which the country was able to purchase the food and other commodities required by its inhabitants.

The geographical advantages of a country are, however, relative not only to the stage of civilization reached by its inhabitants, but to the progress which has been made by the world at large. As other peoples have developed their own geographical advantages, those possessed by Great Britain have declined in relative importance, with serious consequences for British industry and commerce.

NATURAL REGIONS. Geological structure, land form, and climatic conditions all serve to mark off fairly well the major natural regions of the British Isles. The areas of ancient rocks are generally uplands, and being uplands have a higher rainfall and a lower temperature than the neighbouring lowlands, with the result that their vegetation and, to a certain extent, their economic development, are different. But each upland region may be considered separately, as no two of them are exactly alike. The Northern Highlands are of older rock than the Southern Uplands, their elevation is greater, and their climate more inclement. The Central Lowlands may be distinguished from both, not only by their physical character and climatic conditions, but by their mineral wealth and economic potentialities. The Pennine Chain differs entirely in structure from the other Palaeozoic areas of Great Britain, while each of the great coalfields which lie upon its flanks, has, as a result of differences in geological environment, climate, or place relations, a well-marked individuality of its own. The Lake District, the Welsh Upland, and the peninsula of Devon and Cornwall present contrasts to one another in respect to structure, mineral wealth, and climate. The Central Plain, which unites these upland regions, is itself a lowland which must be subdivided in order that due attention may be given to the Carboniferous districts within it. The south and east of England, though generally lowland, do not form one natural region.

The soils of the Jurassic area differ from those of the Cretaceous area, and the economic development of the two regions differs likewise. In the Cretaceous area, moreover, the agricultural conditions of different districts have been much affected by the distribution of the glacial drift. Lastly, the Tertiary basins of London and Hampshire, and the lands adjoining the estuary of the Severn, have had their past history and present conditions so profoundly modified by their position and place relations that each must be considered apart from the others. In Ireland, the Central Plain and each of the mountain masses by which it is surrounded may be considered as separate natural regions, but it is perhaps better to recognize three belts, a northern upland, a central lowland, and a southern upland; and to subdivide each of these into two parts, an eastern and a western, the division being based partly upon physical structure and partly upon climatic conditions.

SCOTLAND

THE NORTHERN HIGHLANDS. The whole of the country which lies north of the line connecting Stonehaven with the mouth of the Clyde may be divided into two parts: the Highlands proper, and the north.east lowland. The mountainous character of the first of these, the acidity of its peaty soils, the heavy rainfall to which it is exposed, and the comparatively low temperature to which its altitude subjects it, combine to render it one in which little cultivation is possible. In the more favoured localities, such as the sheltered valleys, oats and potatoes are the main crops, but the yield per acre is generally below the average. Even for pastoral purposes the land is not altogether suited, and the density of both cattle and sheep is, and has apparently always been, below the average for Great Britain. The counties of Sutherland, Ross and Cromarty, Inverness, and Argyll, may be taken as typical of the region. With 14 per cent of the area of Great Britain, they have less than 2 per cent of the arable land and permanent grass, about 2 per cent of the cattle, and 7 per cent of the sheep. During the last half.century the arable land decreased from 288,000 acres to 262,000 acres, which is considerably less than the average rate of decrease for the whole of Great Britain; while permanent grass increased from 126,000 acres to 175,000 acres, which is above the average rate of increase for the same area. On the other hand, cattle have decreased by 10 per cent and sheep by 20 per cent during the same period—a result partly due to the conversion of considerable areas of mountain grazing land into deer forests.

On the lowland region of the north.east, with its lower elevation, better soil, higher temperature in summer, and moderate rainfall, the conditions are much more favourable to agriculture. Barley is cultivated in places, but the principal crops are oats, turnips, and grass, and on this rotation large numbers of cattle are raised for the English market. Along the coast there are a number of towns which serve partly as centres for the agricultural districts and partly as bases for the fleets which frequent the fishing grounds of the Moray Firth and the North Sea. Of these the most important is Aberdeen, which is third among the trawling ports of the British Isles. It is also engaged in the granite industry, part of its material being imported from Norway, and in the neighbourhood there are paper mills.

Without coal and with only a limited amount of raw material, the Highlands appear to be unsuited for manufactures. But it is possible that the utilization of the water power of the region may in the future lead to a certain amount of industrial development. Works for the extraction of aluminium by electrical processes have within recent years been established at Foyers and Kinlochleven, the electricity being generated by a natural waterfall in the first case, and by an artificial one in the second. More important is the recently completed scheme by which the waters of Loch Treig are conveyed to a new aluminium factory at Fort William by a tunnel about 15 miles long, which passes through the Ben Nevis massif. In addition, the waters of Loch Laggan and the Spean river have been turned into Loch Treig, and when the scheme is completed by diverting the flood waters of the Spey into Loch Laggan, the hydroelectric power station will be the largest possible in Great Britain and will have an installed plant capacity of 130,000 h.p. Other important works for the electrification of parts of Central Scotland are in progress in the basin of the Tay. Scattered over the Highlands there are numerous distilleries, which are, to some extent, dependent for their raw material upon the barley grown in the vicinity, and owe at least part of their success to the flavour imparted to the whisky by the peat.

THE CENTRAL LOWLANDS are economically the most important part of Scotland, and contain over 75 per cent of the population of the whole country. The soil varies in fertility, but is generally very productive when of alluvial origin, or when derived from Old Red Sandstone or volcanic ash. The rainfall decreases from over 40 inches in the west of the region to less than 30 inches in the east. From the agricultural point of view, a distinction may be drawn between the western and eastern counties. In the former about 50 per cent of the area is either arable land or permanent grass; in the latter about 60 per cent. But of the total area under crops and grass in each case 55 per cent in the wetter west is under grass as against 30 per cent in the drier east. Two-thirds of the land under cereals is in the east, and about two-thirds of the wheat crop of Scotland is obtained from East Lothian and the neighbouring parts of Midlothian, Fife, and the lowland areas of Angus and Perth. Cattle-raising and dairying are characteristic of the west, while sheep farming is more important in the east. Fruit is cultivated in

many localities where the environment is favourable, but especially in Clydesdale and Strathmore. Roots are grown chiefly in the east.

On account of its more favourable climatic conditions, the eastern part of the Lowlands was the first to be settled; and it remained the more densely populated until the development of the great mineral districts in the west led to the growth of large industrial communities there.

The coalfields of Scotland are practically confined to the Central Lowlands, which produce about 13 per cent of the total output of the United Kingdom. The Carboniferous strata were deposited over the greater part of the rift valley, but subsequent folding in different directions led to the formation of a number of basins in which the coal was preserved at a time when it was being removed by denudation from the surrounding uplands. Of these basins the most important are the Ayrshire, the Lanarkshire (which includes the coalfields of Linlithgow and Stirling), and the Fife and Lothians. The importance of the Scottish coalfields is due in part to the fact that they contain two groups of coal seams, the lower one lying in the Carboniferous Limestone, and the upper one lying in the same geological horizon as the true Coal Measures of England. The Ayrshire basin, with an output of about 12 per cent of the whole output of Scotland (which at present averages over 31,000,000¹ tons), stretches along the Firth of Clyde from Ardrossan to Ayr, and extends inland for a distance of twelve or fifteen miles. Much of the coal produced on this field is shipped from the ports of Ardrossan, Irvine, Troon, and Ayr, to the Belfast district of Ireland. The Lanarkshire coalfields, along with which may be included those of Renfrew and Dumbarton, are at present the most important in Scotland, and account for over 30 per cent of the total output. The bulk of the coal is obtained from the Coal Measures, which extend from Glasgow eastwards to the borders of Linlithgow, and southwards as far as Stonehouse and Carluke. The seams of the Lower Carboniferous strata have not been extensively worked in Lanarkshire; and in Dumbarton and Renfrew, where the greater part of the output is obtained from them, they do not appear to be nearly as rich as those of the Coal Measures. In Lanarkshire the seams of the Coal Measures do not, as a rule, lie far below the surface, they are easily worked, and produce coal suitable for smelting,

¹ The mineral statistics in this chapter are for 1929, 1930, and 1931.

steam, and the manufacture of gas. The Linlithgow and Stirling fields, which belong to the same basin as those of Lanarkshire, have a combined output which amounts to about one.eighth that of the whole of Scotland. Formerly, the bulk of the coal was obtained from the Coal Measures, but recent developments have been chiefly directed to the exploitation of the seams in the Carboniferous Limestone. In the east of the Lowlands, the coal seams of Fife dip under the Firth of Forth and reappear along the coasts of Edinburgh and Haddington, and it is believed that the field is continuous under the Forth. The Fife coalfield has recently assumed considerable importance, and the output of coal, which is obtained from both geological horizons, now amounts to over 24 per cent of the total output of the country. Much of it is exported from Methil and Burntisland to Scandinavia and the Baltic countries. The Edinburgh and Haddington field has hitherto played a less important part than the Fife field, and accounts for not more than 15 per cent of the total production of Scotland; since the beginning of the present century a number of new pits have been sunk, and considerable quantities of coal are now exported to the Continent from Leith.

In 1913 it was estimated that the net available quantity of coal remaining in Scotland amounted to 21,000,000,000 tons. Of this, over 12,000,000,000 tons lay in Fife, under the Firth of Forth, and in Midlothian and Haddington. In Lanarkshire itself the net available quantity was 3,000,000,000 tons, which, even at the rate of consumption now prevailing, will be exhausted within three hundred years. It is very probable, therefore, that, within a comparatively short time, the chief coal-producing districts will be found in the east of the Central Lowlands, and not improbable that, within a somewhat longer period, there will be a gradual transference of manufacturing industry from the west to the east, so that the latter region will once again regain at least something of its ancient pre-eminence.

Bituminous oil shales occur in the Calciferous Sandstones underlying the Carboniferous Limestone series. These shales are worked at the present time mainly in Linlithgow and Edinburgh, and oil, wax, and ammonia are obtained by distillation. Broxburn and West Calder are the centres of the industry, but it is declining in importance.

Ironstone occurs with coal in many places, and for long was worked to supply the iron industries of the Central Lowlands. The most valuable seams, such as the blackband ironstone which could be cheaply smelted because of the large amount of carbonaceous matter which it contained, are practically exhausted, and many of the clayband ironstones have been abandoned on account of the expense of working them. The present output is inconsiderable, and the iron and steel industry now depends mainly on imported ore.

The great coalfields of the Central Lowlands, the large supplies of good iron ore which formerly existed, the proximity of coal and iron to one another, and the accessibility of the whole region by means of the Forth and Clyde estuaries, the one facing Europe and the other America, were conducive to the great industrial development of this part of Scotland. The first iron works to be established were at Falkirk, where ironstone, wood for fuel, and water-power from the Carron, were all obtainable, and for a time these works were the most important in Europe. Iron-smelting has since moved westwards, but the momentum given to Falkirk by that industry has made it at the present day the centre of a district noted for its production of various kinds of iron goods.

With the development of the use of coal for smelting iron, Lanarkshire naturally became the centre of the iron and steel industry, and among the towns which owe their importance to it are Coatbridge, Motherwell, Wishaw, and Airdrie. On the Ayrshire coalfield, where ironstone can also be obtained, Glengarnock, between Irvine and Dairy, is the centre of the industry. These two counties, and especially the first, are among the most important in the United Kingdom for the manufacture of steel, and produce about one-sixth of the total output. Since the rapid decline in the production of native ore, the accessibility of the Central Lowlands has rendered easy the importation of foreign ore.

In early times, Glasgow owed its importance to its situation on the fertile soils of the Clyde valley, and to the fact that it was at the meeting place of routes from the north, the south, and the east. Later on, its position with regard to the New World brought it much trade, which eventually rendered necessary the deepening of the river. Thus it became a great trading port, while the abundance of coal and iron in the neighbourhood facilitated the growth of shipbuilding below Glasgow. The Clyde, which is now the chief

shipbuilding river in the world, produces over one-third of the total tonnage of the United Kingdom, and its ships are to be seen on every sea. The principal yards are at Clydebank, Dalmuir, Dumbarton, Port.Glasgow, and Greenock.

The textile industries of Scotland were originally scattered over the whole country. Linen was manufactured where flax could be grown, and where water was abundant. The introduction of machinery and the necessity of importing raw material from the Baltic countries have, however, drawn the industry to the east coast, where it is established at Dundee, Dunfermline, and elsewhere. The suspension of flax supplies from Russia during the Crimean war gave an impetus to the manufacture of jute at Dundee, and this has now become its leading industry, although it has suffered somewhat in recent years from the competition of the Calcutta mills. Various branches of the woollen industry are carried on in and around Alloa, Paisley, Glasgow, and other towns ; while the manufacture of thread, which is extensively followed in Paisley, is the chief branch of the cotton industry established in the Central Lowlands.

Among other industries are engineering and the manufacture of machinery, both of which are important pursuits at Glasgow, Greenock, Paisley, Dundee, Edinburgh, and elsewhere. There are chemical works on several of the coalfields; some raw sugar is still refined at Greenock, where it is imported from the West Indies; printing is an important industry at Edinburgh, and paper is made in the neighbourhood, where clear water is abundant; oil cloth and linoleum are manufactured at Kirkcaldy; Dundee obtains from the Carse of Cowrie and from Strathmore much of the fruit required for the preserves for which it is noted.

To sum up, the Central Lowlands, on account of their moderate elevation and easy accessibility, their not unfavourable climate, and their fertile soils, the stores of coal which they still contain, and the supplies of iron which they once possessed, have become the great agricultural and industrial region of Scotland. As they contain the capital of the country and its great commercial centres, they attract people from the north and south of Scotland and, to an even greater extent, within recent years, from Ireland.

THE SOUTHERN UPLANDS. The rocks of this region are in the main Ordovician and Silurian, but in the east a belt of Old Red Sandstone runs southwards from Dunbar to the border, and much

of Berwickshire is upon the Calciferous Sandstone. In the west there are granitic areas and isolated basins of Permian rocks. The lower elevation and less rigorous climate of the Uplands cause them to compare favourably with the Highlands, even though the shales and grits of which they largely consist are not particularly fertile. The hills are generally covered with grass to their summits, and the percentage of land used for grazing purposes is high. In Peebles, Selkirk, Dumfries, and Kirkcudbright, for example, nearly 80 per cent of the land is in pasture or permanent grass, and the whole region constitutes one of the great sheep-raising districts of the British Isles, containing about one-tenth of the total number of sheep therein. Over the greater part of the Southern Uplands, indeed, there is, on an average, one sheep to each acre of pasture land. Cattle are not raised except in Dumfries, Wigtown, and Kirkcudbright, where the lower elevation of the land and the heavier rainfall lead to the growth of pasture more suitable for cattle than for sheep. Arable farming is generally restricted; oats, the chief cereal grown, is cultivated mainly in the river valleys and in the Permian basins, both of which are partly covered by drift and alluvium, and on the lower lands of the Old Red Sandstone and Calciferous Sandstone of Roxburgh and Berwick.

The woollen industry is more centralized in the Southern Uplands than in any other part of Scotland. This is due in part to the large supplies of wool at hand, and in part to the abundance of water, both for power and for cleansing purposes. The chief towns engaged are Hawick, Galashiels, Jedburgh, Selkirk, Peebles, and Innerleithen. The manufacture of tweeds of various kinds is the principal branch of the industry pursued in this region.

ENGLAND

THE PENNINE CHAIN has played an important part in the economic development of Northern England. By its influence upon the climates of Lancashire and of Yorkshire respectively, and by acting as a barrier, though not an impassable one, between the two counties, it has differentiated the occupations of the people living upon either side of it. On its moors have fed the sheep whose wool has helped to found the cotton industry on its western flank no less than the woollen industry on its eastern. The rivers which flow down its slopes have provided power for both industries

in the earlier stages of their growth, and determined the sites of many of the more important towns engaged in each of them; while from reservoirs upon it is obtained no inconsiderable part of the daily water supply of several millions of people. It is, therefore, in its influence upon neighbouring regions that the importance of the Pennine Chain consists. The limestone districts, which cover considerable areas both in the north and in the south, are in general suited for pastoral pursuits alone, though along the river valleys and in the lowlands they frequently provide good agricultural land. In the neighbourhood of intrusive volcanic rocks there are numerous lead veins, which are worked in different parts of the range. The Millstone Grit generally leads to the development of moorlands, which provide a somewhat scanty pasturage for sheep.

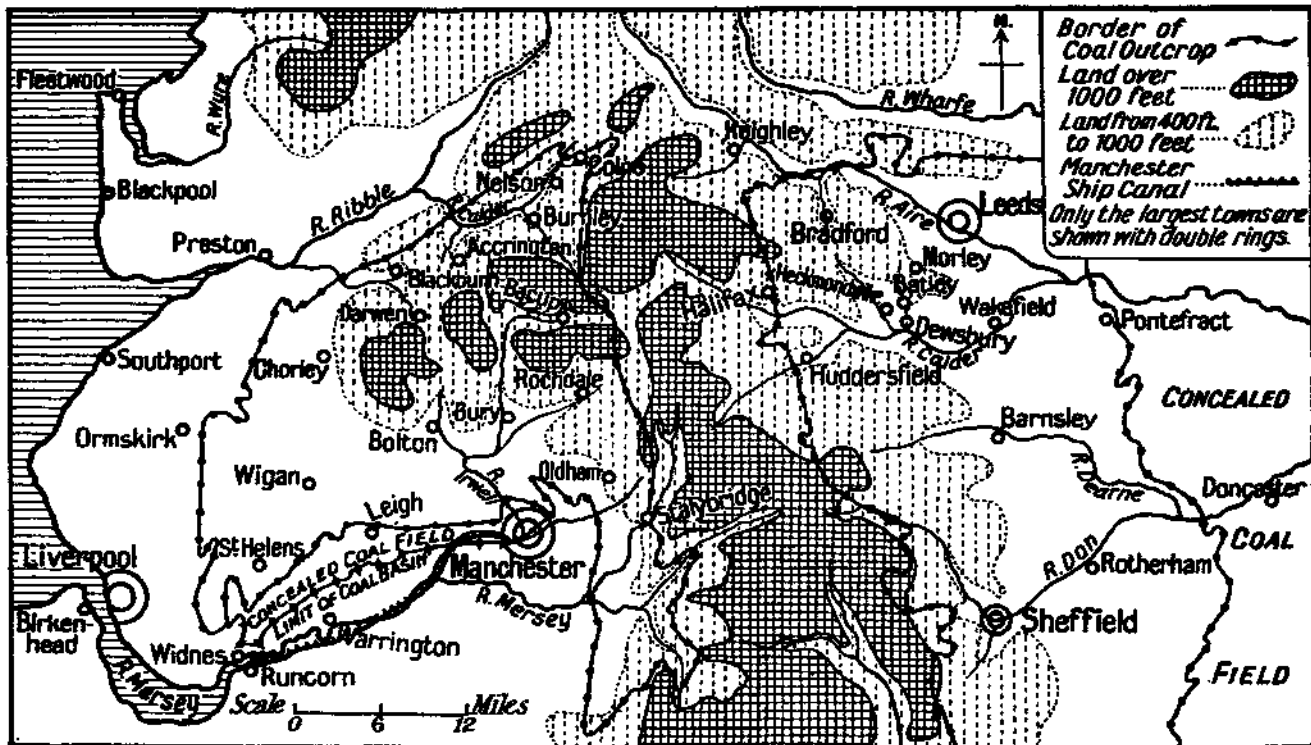
THE NORTH.EAST INDUSTRIAL REGION. The mineral resources of this region constitute the basis of its economic activities. Its coalfields fall into two distinct groups. The Coal Measures occur within an area defined by lines drawn from the mouth of the Coquet to Middleton in Teesdale, and from Middleton to a point on the coast a little to the north of Hartlepool. In the south.east part of this area they are overlaid by Magnesian Limestone, but, though the coalfield is here concealed, it has been proved and is worked at the present time. It has been estimated that the coal seams may be followed under the sea for a distance of three miles from the coast. Coal also occurs in the Mountain Limestone series in the north.east and the north.west of Northumberland, but so far not much has been produced in these districts. The actual available contents of the whole region was estimated in 1913 at 11,000,000,000 tons, while the yearly output at present is nearly 50,000,000 tons. Much of the coal is shipped to London and other seaports on the coast; consumed by the varied industries of the region itself, and exported.

The iron industry owes its origin to the fact that ironstone is found in the Coal Measures along with the coal. The greater part of the native ore used at the present time comes, however, from the Jurassic area, which produces over 85 per cent of the output of Great Britain. This ore contains phosphorus, and could not be used in the manufacture of steel until the discovery of the basic process, by which lime is added to the lining of the Bessemer converter or to the Siemens hearth to form a base with which the phosphorus may

combine. Until recently the bulk of the Jurassic ironstone was obtained from the Cleveland Hills, where, in the valley of the Esk, near Whitby, there are two seams of ore which increase in thickness towards the north, and unite to form the main Cleveland seam. Of late, the output from this region has declined, partly because the ore has now to be mined at considerable depths below the surface, and therefore at greater expense than formerly, and partly because the iron content of the Cleveland ore (28 per cent) is lower than that of some of the best Northampton ores (33 per cent). Moreover, the latter, which lie near the surface, are often worked in open quarries with steam shovels, and are thus more able to stand the cost of transport. Large quantities of foreign hematite are also imported. Middlesbrough is the centre of the iron-smelting industry, which is also carried on at Stockton, Hartlepool, Jarrow, and other places, where coal, ore, and flux can all be easily brought together. In these towns, also, steel is manufactured, and the region as a whole produces over 20 per cent of the steel made in Great Britain.

Shipbuilding is an important branch of the iron and steel industry of the region. The principal yards are situated below Newcastle on the Tyne, which has been deepened to permit of its navigation by large vessels, on the Wear at Sunderland, at Hartlepool on the coast, and at Stockton on the Tees. The tonnage of the ships built in these districts now averages nearly 40 per cent of the total tonnage built in the British Isles. Other industries of the region are also associated, to a large extent, with the manufacture of iron and steel. There are great engineering works at Newcastle, Gateshead, Stockton, and Darlington, and railway rolling stock and bridges are manufactured at the last-named town. Around Middlesbrough, salt and gypsum are obtained from the Triassic rocks, and a chemical industry seems likely to develop on the north bank of the Tees; there are also chemical works on the Tyne, which derive part of their raw material from the Magnesian Limestone in the vicinity.

THE YORKSHIRE, DERBYSHIRE, AND NOTTINGHAMSHIRE COAL FIELD. This coalfield occupies a great basin of which the western part alone is exposed, the eastern part lying concealed under an accumulation of Permian and later rocks. The exposed portion is bounded on the west by the Millstone Grit of the Pennines, and



THE LANCASHIRE-YORKSHIRE MANUFACTURING AREA

on the east by the outcrop of the Magnesian Limestone. Within these limits it extends from Leeds and Bradford in the north to Nottingham in the south. The coal varies in character, different seams having different qualities, but it includes varieties well adapted for locomotives and steamships, household purposes, and the manufacture of gas. The limits of the concealed portion of the field are only gradually being determined, but from recent investigation it would appear that the eastern margin lies not far east of the valley of the Trent. In 1913 it was estimated that the unconcealed and the proved parts of the concealed coalfield (the latter not so extensively known then as now) had an actual reserve of 40,000,000,000 tons, while the probable reserve was calculated at about 15,000,000,000 tons. Of late the production has averaged about 73,000,000 tons per year.

Upon the visible part of the coalfield numerous important industries have grown up. Partly as a result of geographical conditions, the woollen manufactures of England are established mainly in Yorkshire. The Pennine Chain was a great sheep-raising region in early times, and, as the manufacture of cotton made its way in Lancashire, that of wool was pushed over the mountains into Yorkshire, where it took firm hold. With the development of steam power the industry began to grow rapidly, and, as a result of the momentum which it thus acquired, drew to itself various branches of the woollen industry which had hitherto been settled in other parts of the country. It is mainly concentrated at the present time in the Yorkshire dales, on the eastern slope of the Pennines, between the Wharfe and the Calder. Considerable specialization prevails. Wools vary greatly in length according to the breed of sheep from which they are obtained, and the geographical environment in which the sheep are reared. Short wools are carded, long wools are carded and combed, or combed only. Carded wools are made into woollen goods "the fibres of which, in the finished article, cross and recross one another"; combed wools are made into worsteds, "the fibres of which lie parallel to one another." The former include coarse cloths, flannels, blankets, and tweeds, while the latter are generally lighter and of finer quality, and include the better kinds of dress material used by both sexes. The Bradford district, Huddersfield, and Halifax are chiefly engaged in the manufacture of worsted goods. Leeds and Morley make woollens;

Batley and Dewsbury among other articles produce large quantities of shoddy (remade woollen goods); Keighley and Dewsbury are engaged in spinning; carpets are made at Heckmondwike and Halifax; and so on. In addition to wool, it may be noted, both cotton and silk are used in the manufacture of certain fabrics. The wool is partly of domestic, but mainly of foreign origin. Of the latter, Australia, New Zealand, and South Africa are the chief sources of supply, though some comes from the Argentine, either directly, or by France or Belgium, in which two countries special methods have been devised for dealing with the very dirty wool that is produced by South America. Mohair is imported from Turkey and the Cape, and alpaca from South America. It may be noted here in passing that Leeds is one of the chief seats of the leather industry in Britain.

To the south of the wool-manufacturing region lies that in which iron and steel goods are produced. Sheffield is its centre, though the advantages of that town are shared to some extent by a number of others. The iron industry settled in this part of the country in early times, because iron ore, wood for fuel, and water power were within easy reach of one another. Coal has taken the place of wood, and, though some clay ironstone is still found in the locality, the chief supplies of native ore now come from Northampton, Lincoln, and Leicester. These ores are phosphoric, and can be made into basic steel, the Magnesian Limestone to the east being used for lining the converter or making the hearth. For the special kinds of steel in which Sheffield excels, however, hematite pig-iron has to be imported from Lancashire, Cumberland, and Spain; while, for the finest descriptions of steel goods, Swedish iron is used. Excellent ganister for the furnaces is found in the Coal Measure sandstone, some of which consists of almost pure quartz. Derbyshire limestone provides the flux, while the gangue left by the lead miners in the same county contains fluor spar which is of great value in desulphurizing the metal used in the manufacture of basic steel. In addition, moulding sands with an admixture of clay are found in the Upper Permian beds, fireclays are abundant, and excellent grindstones can be obtained from the sandstones of the Coal Measures. With all these advantages Sheffield developed a great iron and steel industry, manufacturing engineering plant and machinery, armour plate and ordnance, cutlery, tools, and a great variety of

other articles. The economic momentum derived from its favourable position has enabled it to maintain its importance, notwithstanding the general tendency of the heavy steel industries to move towards the coasts, and it still produces over one.eighth of the steel of Great Britain.

In Nottinghamshire mining operations are extending eastwards, where the Coal Measures are concealed under the Lower Triassic rocks of Sherwood Forest. Nottingham itself is engaged in the manufacture of lace and hosiery.

THE LANCASHIRE INDUSTRIAL REGION lies mainly, though not entirely, upon the Coal Measures which occupy a considerable part of the south of Lancashire, and a small area in the east of Cheshire. The country is generally hilly, but seldom rises to more than 1,300 or 1,400 feet above sea.level. The geographical factors which have most influenced the economic development of the region are the abundance of its coal, its large supplies of pure water, its climate, and its position. The coal is obtained chiefly round the lower slope of the Coal Measures, the principal mines being found in a stretch of country enclosed within lines joining St. Helens, Wigan, Bolton, Bury, Manchester, and Leigh; along a line drawn from Darwen by Blackburn to Burnley; along another line drawn from Burnley by way of Bacup, Rochdale, and Oldham to Manchester, and in the east of Cheshire. The total contents of the whole area has been estimated at 5,600,000,000 tons, and there is an annual output of about 15,000,000 tons. Along with coal, iron was formerly found, but the supplies of it are now almost entirely exhausted.

Other geographical factors may best be discussed in connection with the development of the cotton industry, which is the basis of practically all the economic activity of the region. In early times the pursuits of the people in this part of England were mainly pastoral, and the wool of the sheep raised on the Pennines was exported to the Continent. Later on, a woollen industry grew up within the region itself, and by the end of the fifteenth century a number of towns were engaged in it. As land became more valuable for agricultural purposes in the south of England, the Pennine slope became the chief sheep.raising district, and there the woollen industry was encouraged not only by the abundance of raw wool, but by the plentiful supply of water for washing it. When cotton goods came into more general use, partly, no

doubt, as a result of the discovery of the Cape route to India, it was not unnatural that Lancashire already interested in the manufacture of textiles, in which her workmen had become expert, should turn, towards the end of the sixteenth century and in the early part of the seventeenth, to the spinning and weaving of cotton. The raw material at first came from the Levant to London, and had to be sent to Lancashire at great expense. Towards the end of the eighteenth century, the inventions of Arkwright, Hargreaves, and others, which rendered possible the use of water power, led to a great extension of the industry. The Levant was no longer able to supply the raw material required, but the development of the cotton fields of North America fortunately placed the industry beyond the danger zone. At the same time, Liverpool, which is much nearer the manufacturing districts than London, became the chief receiving port for raw cotton, and this change undoubtedly gave a greater stability to the Lancashire industry. The process of localization was completed by the introduction of steam power in the first quarter of the nineteenth century. During the whole period of its growth, moreover, the cotton industry has been aided by an abundant supply of pure water from the Millstone Grit, and by the favourable climatic conditions of the region. The prevailing winds blowing from the west and south-west are heavily charged with moisture, and on approaching the Pennines are forced upwards and cooled. The relative humidity of the atmosphere is therefore high, and this is of great advantage in cotton-spinning, as it prevents the cotton, and especially the finer qualities, from snapping, as would be the case with vegetable fibres if the air were dry. These climatic conditions probably contributed also to the differentiation of processes which gradually took place in the cotton industry. The spinning towns—Oldham, Bolton, Bury, Stalybridge, and others—lie in valleys up which the winds from the ocean may easily blow. Of the weaving towns, on the other hand, Blackburn, Darwen, Accrington, Nelson, Colne, and others, lie sheltered to some extent, while Preston and Chorley have the rainfall of the Lancashire plain, which is lower than that of the Pennine slopes. Thus, the towns situated most favourably for spinning developed that branch of the industry, while others without these advantages took more naturally to weaving. The political events of the eighteenth century, which led to the growth of

the United Kingdom as a great colonial and maritime power, have also had an important influence upon the development of the cotton trade. The fact that British ships were constantly finding their way into every port on the globe facilitated the export of cotton goods, and gave Lancashire the additional advantages of cheap transport.

To estimate correctly the exact position of the Lancashire industry is a task of some complexity, which need not be attempted here; but a few figures will give some idea of its general character. On an average of the three years 1908.10, Great Britain had 40 per cent of the cotton-spinning spindles of the world, and of these over nine-tenths were in the region under consideration. On the other hand, only about 18 per cent of the raw cotton consumed in the world's mills during these years was consumed in Great Britain. This indicates that the finer qualities of cotton goods were more extensively manufactured in this country than in any other. In 1912 the average consumption of cotton per spindle in Great Britain was estimated at 35.2 Ib., in Germany at 84.4 Ib., and in the United States at 88.8 Ib. In 1929.30 Great Britain had one-third of the world's spindles and spun one-tenth of the cotton consumed by them. Although many of her spindles are idle Lancashire still concentrates on the finer counts.

In previous editions of this book attention was called to certain facts which it was suggested might ultimately affect the standing of the Lancashire industry. Among the most important of these was the progress made by other countries in the manufacture of cotton goods. It is now asserted, however, that Lancashire has not reorganized herself to meet this growing competition, which in any case would have been serious. The greater losses have been sustained in the cheaper and coarser fabrics, mostly in demand among the poorly-paid peoples of the East. For the production of these, Lancashire has always relied upon the longer-stapled but more expensive American cotton, while her competitors have substituted the short-stapled but cheaper Indian cotton, or have skillfully mixed the two varieties. The use of ring spindles, of special importance where short-stapled cotton is used, and of automatic looms for the weaving of standard cloth—a weaver can "mind" a larger number of these than of ordinary power looms—has also contributed to the growth of the foreign industry. It is further

maintained that while the foreign industry is so organized that the closest relations exist between production and marketing, Lancashire conducts her trade through merchants or shippers whose interests are not necessarily the same as those of the manufacturers, and who do not necessarily provide for the output of standard goods by mass production.¹

Around the cotton industry various others have grown up. Bleaching and calico-printing are naturally important, and the output of artificial silk is increasing. Engineering and the manufacture of textile machinery, favoured by the presence of coal, the facilities for obtaining iron, and the large market at hand are carried on in many towns of the region. Manchester itself, for example, has become a great engineering centre, and manufactures engines of all kinds, electrical apparatus, and mill machinery; while Oldham and Bolton have a large output of textile machinery. Wigan, which produces some iron ore and imports more, is the centre of the iron-smelting industry and coal export trade. The manufacture of glass and chemicals is carried on at St. Helens, Runcorn, Widnes, and other towns where coal can be obtained from Lancashire and salt from Cheshire. The presence of pure water has led to the growth of an important paper-making industry in many towns on the western slopes of the Pennines and on the edge of Rossendale Forest. Warrington has large soap works and Runcorn is an important centre of the leather industry. Liverpool is the great port of the whole region, though Manchester, connected with the Mersey by the Ship Canal, has a large and growing trade, and judged by the value of its import and export trade ranks fourth among British ports. The Canal itself has been an important factor in the industrial development of the region through which it passes.

THE LAKE DISTRICT is a dome-shaped mass formed in the main of ancient rocks. On the central uplands the cultivation of the land is impossible, but, in the valleys and on the surrounding lowlands, stock farming is an important pursuit. The mineral wealth of the region is considerable. The Cumberland coalfield extends along the coast from Whitehaven to Maryport, a distance of fourteen miles, and then runs inland in a north.easterly direction for another fifteen miles. In addition, large deposits of coal lie

¹ *Report of Committee on Cotton Industry, 1930 (Cmd. 3615)*

concealed beneath more recent formations, and under the sea, where indeed they have been worked for a distance of over four miles from the coast. The available content of the field is estimated at 2,000,000,000 tons, while the annual output is under 2,000,000, a large part of it being shipped to Ireland from Whitehaven and Maryport. Hematite deposits with an exceptionally low percentage of phosphorus occur in the Carboniferous Limestone, and are worked in the neighbourhood of Whitehaven and around Ulverston in Furness. The output, which is only about 10 per cent of the output of iron ore in Great Britain, is insufficient for the needs of the district, and it is necessary to import foreign ore for the iron industries of Barrow and Workington. In 1846 Barrow was a village with 300 inhabitants, but it began to grow when the iron mines were connected with the coast, and it is now actively engaged in shipbuilding and the manufacture of armaments. The discovery of salt deposits in Walney Island has at the same time favoured the development of chemical industries.

THE CENTRAL PLAIN, which lies between the areas of Palaeozoic rock and the Jurassic belt, is generally a flat or gently undulating country. Over the greater part of the region Triassic and Liassic rocks prevail, but in places Carboniferous strata come to the surface. The Bunter sandstone yields a soil which, as in Cannock Chase in Staffordshire, is often poor and infertile, and suitable only for sheep runs. On the other hand, the soils derived from the Keuper sandstones, while light and sandy, are usually more fertile and are well adapted to arable farming. The Keuper marls weather down into a stiff clay which provides some of the best soils of the Central Plain, but, being heavy and difficult to work, is generally kept under grass. This is also true of the Lias region, though a highly intensive system of cultivation has converted the Vale of Evesham into an important fruit-producing area. Considerable areas are also covered with Boulder Clay and alluvium, and are generally fertile. But, taking the Central Plain as a whole, it is not surprising to find that over one-half of its area is in permanent pasture, and that only one-tenth is under cereals, wheat and oats being the principal crops. On the other hand, cattle-raising and dairy farming are extensively carried on, and the best cheese-making districts in England are those which are situated upon the Keuper marl.

Owing mainly to the presence of various minerals in different

parts of the Central Plain, a number of industrial regions have grown up within it and require to be treated separately.

The Cheshire Salt District centres round the towns of Northwich and Winsford, the salt itself lying in the red marls of the Upper Trias. A small quantity is mined, but the bulk is obtained by pumping up and evaporating water which has been allowed to enter the mines and dissolve the salt. An important chemical industry based upon the production of salt has grown up at Northwich and at other points upon the saltfield, as well as at the neighbouring towns of Runcorn and Widnes, already mentioned.

The North Staffordshire Coalfield is a valuable one, and its annual output is about 5,500,000 tons. The coals vary in quality, but they are chiefly used for domestic, steam, and manufacturing purposes, though in some cases good coking and gas coals are found. A considerable quantity of iron ore is also obtained from the Coal Measures. Mining and the manufacture of pottery are the chief occupations of the region. The latter industry, which is carried on in and around the "Five Towns" (now united in the county borough of Stoke-upon-Trent) owed its origin to the presence of large deposits of suitable clay in the neighbourhood. The finer clays are now exhausted, and it is necessary to import kaolin from Devonshire, as well as other raw materials from various sources, for the manufacture of porcelain and china; local clays are still used for the coarser kinds of earthenware, and for making the "saggars" in which the finer kinds are baked. Iron-smelting and engineering are also important pursuits.

The Black Country. The coalfields of this region extend from Rugeley in South Staffordshire as far as the Clent Hills. The coals are of much the same character as in the previous region, except that gas and coking coals are generally absent. The total available content of the Staffordshire coalfields is estimated at 7,000,000,000 tons, but in the Black Country proper, that is to the south of Walsall, the annual output of coal has fallen to little over 1,000,000 tons, and the bulk of that which is used comes either from Cannock Chase, with an annual output of nearly 5,000,000 tons, or from Warwickshire. The region is one of great industrial activity. The iron ore which occurs in the Coal Measures was for long worked with charcoal from the Forest of Arden, which lies to the south, and, when coal replaced charcoal as the fuel required, the industry

naturally remained where it was. But a certain amount of readjustment has from time to time taken place. Birmingham, several miles distant from the coalfield, engaged in the manufacture of hardware, producing a great variety of articles for all of which there was a widespread demand, but none of which was of great bulk in proportion to its value. On the other hand, Wolverhampton, Dudley, and other towns actually on the coalfield had blast furnaces and manufactured heavy goods until competition, either from abroad or from towns more favourably situated near the coast, led to their decline as iron smelting and steel-producing centres, and forced them to concentrate on industries requiring relatively small amounts of raw material. Within recent years further changes have taken place. The iron and steel industry has become still less important, while the manufacture of jewellery, small arms, glass, nails, cast hollow-ware, and other articles in and around Birmingham, of chains at Dudley and Cradley, of needles at Redditch, and of saddlery at Walsall, have all declined. Instead of these, new industries have grown up connected with the manufacture of motor-cars, cycles, electrical apparatus, artificial silk, food, and drink. In and around Birmingham, engineering, partly constructional and partly connected with the motor and cycle industries, is now more important than the manufacture of hardware; and if the non-ferrous trades, including brassfoundry, have more than held their own, it is largely because they have become complementary to the local engineering industries. The saddlery of Walsall has given place to motor furnishings and light leather goods. Instead of needles, Redditch makes springs for motors and hosiery hooks. Dudley and Wolverhampton have turned to the manufacture of artificial silk and ready-made clothing.¹

Several other industries which obtain their fuel partly from the South Staffordshire coalfield, and partly from the much less important coalfields of Shropshire, may be mentioned here, although, strictly speaking, they do not belong to the Black Country. Droitwich is the centre of a large glass-making industry. It is not far from coal, and receives salt from the Keuper marls upon which it stands, while the fireclay, which is found in the valley of the Lye, near Stourbridge, is of great value for moulding the pots

¹ *The Industrial Development of Birmingham and the Black Country*, by G. C. Allen. (George Allen & Unwin.)

in which the glass is melted. Kidderminster is noted for the manufacture of carpets, and is said to owe its success to a popular belief in the peculiar properties of the waters of the River Stour for fixing dyes. Worcester, without any special advantages, took up the manufacture of china after the decline of its woollen industry.

The Warwickshire Coalfield lies in the north.east part of the county of Warwick, between the towns of Nuneaton, Coventry, and Tamworth, and extends under Permian and Triassic rocks to the south and south.east. The coal is of the ordinary bituminous character, and, besides satisfying local needs, is exported in considerable quantities to other parts of the country. The content of the field is estimated at 1,400,000,000 tons, and the annual output is under 5,000,000 tons. Coventry, a few miles south of this coalfield, has had a varied history, but it is now chiefly engaged in the manufacture of cycles, motor.cars, and artificial silk.

The Leicester Coalfield lies in the north of the county of that name, and extends into south Derbyshire. The coals are bituminous, and are used for manufacturing and domestic purposes. The net available content of the field was estimated in 1913 at 2,400,000,000 tons, and the annual output at the present time is slightly over 2,500,000 tons. Burton has a great brewing industry, due partly to the fact that its water has, dissolved in it, a considerable quantity of gypsum from the Keuper marls. Leicester, which is some distance from the coalfield, is engaged in the manufacture of boots, shoes, and hosiery.

THE WELSH PLATEAU, which lies in the west and north.west, may be broadly described as a dissected tableland, the uplands of which are generally grass.covered except in their highest parts, while the lowlands are broad valleys capable of cultivation. The arable area is small and just exceeds one.third of that in permanent grass, oats and rotation grasses being the principal crops. There are also large areas of rough grazing. Sheep are well distributed throughout the region, but cattle are most numerous on the lowlands of Anglesey, Pembroke, and Carmarthen, which contain one.third of all the cattle in Wales.

Mineral wealth is of some importance. Slates are extensively quarried near Bangor, in the north.west, while along the eastern rim are the coalfields of Flint and Denbigh, with an annual output of about 3,000,000 tons, and an available content which has been

estimated at 2,500,000,000 tons. Artificial silk and chemicals are made at Flint, and there are ironworks at Mostyn.

The South Wales Coalfield covers part of the counties of Pembroke and Carmarthen, nearly the whole of Glamorgan, and part of Brecknock and Monmouth. The Coal Measures come to the surface over the greater part of this region, while the productive coalfield has an area of about 1,000 square miles. The land, which has a plateau-like formation, and slopes from north to south, is cut up by a number of deep transverse valleys, including those of the Nedd, Rhondda, Taff, Rhymney, and Ebbw. These valleys, by exposing many of the coal seams, facilitated in the past the economical working of the coal, which could be obtained by driving adits and galleries from the outcrops along the hillsides; and, as a result, deep mining was rare in this region until within comparatively recent years. At the same time, the eastern part of the shallow syncline which constitutes the coalfield is traversed for many miles by an important anticlinal fold, which converts it into two troughs, and in this way brings within reach of the miner much coal which would otherwise have lain at too great a depth to be worked. The character of the coal varies from bituminous in the east to pure anthracite found in the west, the steam coal used in the Navy and on all fast boats occurring chiefly in the central part of the field between Llanelly and Neath. The whole coalfield is estimated to have an available content of about 35,000,000,000 tons, of which about 14 per cent is classed as first-class steam, 22 per cent as anthracitic, 30 per cent as bituminous, and 33 per cent as second-class steam. The annual output of the field, formerly over 52,000,000 tons, of which a considerable part, consisting largely of steam coal, was sent abroad, has averaged less than 45,000,000 tons during the three years 1929,31, largely as a result of reduced demand from the Continent. The export of coal from South Wales, like the mining of it, is greatly aided by the transverse valleys, which open up easy railway routes across the field, and have at their mouths the chief exporting towns: Llanelly, Swansea, Cardiff, and Newport. Barry Dock, situated a few miles west of Cardiff, though not at a river mouth, is also engaged in the coal trade.

In addition to the mining and exportation of coal, metallurgical industries of considerable importance are established on the coal field. These industries, although they owe their origin to the

proximity of raw materials, are now mainly dependent on ores imported from abroad. Iron is brought from Spain for the iron and steel works now mainly concentrated at Cardiff, Port Talbot, and Newport, and the region produces nearly one-fourth of the steel of Great Britain. For the tin-plate industry which has grown up in the west, raw material was formerly obtained from Cornwall, but is now imported from the Malay Peninsula for the works at Llanely and Swansea. In and around Swansea, also, there are smelting works for the treatment of copper, lead, and zinc, and Swansea itself is an importing and distributing centre for mineral oil.

THE PENINSULA OF DEVON AND CORNWALL forms a synclinal trough. Old Red Sandstone appears in the upland districts in the north and south, while Carboniferous rocks occupy the hollow between. In the south, also, there are considerable upland areas of granitic formation. Much of the country consists of moorland and grassland; and cattle-raising and dairy farming are important industries in this region, which contains nearly one-tenth of all the cattle in England. Arable farming is most important in the river valleys, and oats is the chief cereal grown. The northern part of the Old Red Sandstone is, in the east, suitable for apple-growing, while the mildness of the climate along the south coast favours the cultivation of early flowers and vegetables. In those districts in the west of the peninsula, where granitic masses have come into contact with contorted slaty rocks of pre-Devonian age there are mineral veins, the output of which, however, is not now of great value. Tin is still worked in Cornwall, and some copper is produced, but the amount of each is insignificant when compared with that which is imported from abroad. Kaolin is obtained from districts in which the granitic rocks are decomposing, and is sent not only to the Potteries, but to the United States and other countries; it is also used in the manufacture of paper and cotton goods. Fishing for pilchards, mackerel, and flat fish is carried on from various points along the coast. Devonport is a naval station, and Plymouth a port and place of call for mail steamers.

THE SCARPLANDS AND TERTIARY FORMATIONS. The economic development of England to the south and east of the Central Plain is in striking contrast with that of the regions which have already been discussed. The Scarplands and Tertiary formations cover less than two-fifths of the total area of England and Wales,

but they include over three-fifths of the arable land. On the other hand, until recently, manufacturing industry on an extensive scale has been in the main confined to London and the larger ports. Agriculture is the chief occupation of the inhabitants, but its character varies from one place to another with changes in the geographical environment. Differences in soil and climate over the whole region would permit of its division into a considerable number of sub-regions, but in what follows only the more general characteristics are considered.

THE JURASSIC AREA. The soils of the Jurassic belt vary greatly in agricultural value. For reasons already stated, the Lias with its fertile but heavy soils has been included in the Central Plain. On some of the higher parts of the oolitic escarpment the land is only suitable for pastoral purposes, as in the Cotswolds; but, as a general rule, the soils, though often light and sandy, have been converted into farm land, where sheep rearing is associated with the cultivation of roots and grasses. In places, also, as on the Lincoln edge, barley is an important crop.

From the oolitic escarpment the land slopes gently down towards the foot of the chalk escarpment. In the lowlands are the Oxford and Kimmeridge clays, which, though productive, are heavy and difficult to work. Consequently, they have in many places been converted into grassland, and, except in the drier east where cereals are important, as in Huntingdon and the west of Lincoln, the area under permanent grass is generally greater than that under crops. Cattle and sheep, wheat, barley, and roots are the chief agricultural products of the region.

In various places iron is obtained from the Jurassic belt. Apart from the Cleveland Hills, which have been included in the North-East Industrial Region, the chief deposits are in Lincoln, Northampton, and Oxford, where they occur in the Lower and Middle Lias and Lower Oolite. Part of the ore produced by this region, which has an average annual output of about 7,000,000 tons, is sent to Sheffield and other iron-manufacturing areas, but an increasing quantity is smelted in the vicinity of the mines, at Frodingham, Scunthorpe, Kettering, Wellingborough, and elsewhere. Frodingham with Scunthorpe has become an important steel-manufacturing centre, but in the other districts the industry is not so highly developed, and such products of the furnaces as forge and

foundry iron are largely utilized in the workshops of Sheffield and the Black Country.

Manufactures are of secondary importance. The West of England woollen industry is situated mainly, but not entirely, upon the western part of the Jurassic area, where the proximity of sheep-runs and the abundance of water favoured its early growth. The industry is declining but some of the woollen cloths manufactured at Stroud are still held in high repute. Witney, in Oxfordshire, is famous for its blankets. Northamptonshire, where nearly two-thirds of the agricultural land is under grass, has for long been a great cattle-grazing country. The presence of oak-woods encouraged the tanning industry, which in turn led to the manufacture of boots and shoes. This industry is now extensively carried on in Northampton itself, and in the towns and villages of the central and southern districts of the county. Agricultural machinery is made at Lincoln and Grantham, and motor-cars at Oxford.

THE CRETACEOUS REGION must be divided. The greater part of the eastern section is overlaid by Boulder Clay, and along with it may be considered those parts of the London Basin (north of a line from Romford to Colchester) which are also covered with the deposits of the glacial ice-sheet, and even the Fens, where both Jurassic and Cretaceous rocks lie under a covering of surface deposits, such as silt and peat. The fertile soils, the low rainfall, and the warm summers of the whole of this area render it well suited for arable farming; and in the East Riding of York, the eastern part of Lincoln, and Norfolk, Suffolk, Essex, Cambridge, and Hertford, the area under arable land is twice that which is in permanent grass. Wheat and barley are the most important crops of these counties, which contain over two-fifths of the land under wheat in Great Britain and one-half of that under barley. The heavy soils of the Fens and of the Boulder Clay districts of East Anglia are most suitable for wheat, while the wolds of Lincoln, where glacial deposits are often wanting, and the greater part of East Anglia, but more particularly the sandy soils of north-west Norfolk, grow large quantities of barley. Lincolnshire and the Fens are noted for potatoes. Turnips are most extensively cultivated in the Wolds, where sheep-farming is combined with the cultivation of roots and grasses; also in Norfolk, especially in the loam lands of the east, where they are grown for cattle, and in the sandy soils of the north-west,

where they provide food for sheep. The cultivation of sugar-beet is increasing in the Fens and in East Anglia, but, although climate and soil appear to be favourable, improved methods of growing the crop, together with an increased use of its by-products, would appear to be necessary if the industry is to become self-supporting.

Over the greater part of the Cretaceous area in the south and west of the country, the chalk comes to the surface. As there is little soil on the uplands, and the rainfall is quickly absorbed, these districts are often devoted to sheep, which thrive on the good, if somewhat thin grass with which the chalk is covered. In many places, more especially in the valleys where the soil has accumulated, arable farming is possible.

In the Weald economic conditions are more varied. To the north and the south lie the chalk downs, but, in the country between, the lower members of the Cretaceous system are exposed. Of these the most fertile are the Hythe beds and the Upper Green sand. The former constitute the typical soil of Kent, on which some of its best hop gardens and fruit orchards are to be found, while the latter, which is one of the best light soils in the country, grows hops and wheat.

Manufacturing industry is developed only to a relatively slight extent within the Cretaceous area. In the north it is concentrated mainly at the ports; Hull is engaged in seed crushing, in the preparation of vegetable oils, and in the manufacture of paints and varnishes, pursuits which originated in the refining of whale oil in earlier times. Flour-milling, engineering, and the manufacture of other articles, such as cement and soap, are also of importance. At Grimsby there are flour mills, and large quantities of timber are imported and sawn. (For the fisheries of these towns, see pages 88.9.) The industries of East Anglia are to some extent based upon the agricultural products of that region. Malting depends in part at least upon local supplies of barley, and is carried on at Norwich, Ipswich, and Woodbridge; while mustard is made at Norwich. Agricultural machinery is manufactured at Ipswich and elsewhere, and boot-making and engineering have to some extent replaced the silk and woollen industries of Norwich. With the development of industry in the south of England, many small towns in other parts of the Cretaceous area, such as Bedford, St. Albans, and Letchworth, have become minor industrial centres. A small amount of coal is

obtained from the recently developed East Kent coalfield, which lies round Dover. As the Secondary rocks by which it is covered yield iron ore, it is not improbable that this region will eventually become industrial.

THE LONDON AND HAMPSHIRE BASINS lie in depressions in the chalk occupied by various Tertiary formations, the most important of which are the London Clay and the Bagshot Sands. The latter are dry and pebbly, and are chiefly covered with heath; while the former constitutes a stiff clay, which, although difficult to work, is of considerable fertility. In the *London Basin* much of this clay is under grass and is divided up into dairy farms; on some of the lighter soils market gardening is an important pursuit, and the Lea valley is famed for the number and extent of its glasshouses. But the economic importance of the London Basin lies in the great city of London. Situated near the head of the estuary of the Thames, which offers an easy means of access into the country, and at a convenient crossing point of that river, whence goods routes diverge to all parts of the British Isles, London also lies opposite the mouths of several large rivers, which drain some of the most productive regions of the Continent. To these conditions are due its rise and early importance, but its later development is the result of that change in geographical values which led to the colonial and imperial pre-eminence of the United Kingdom. It was then that London became not only a great port, but the international market and financial centre for the most important part of the economic world. With the progress of other nations it has lost some of its earlier advantages; many of its markets have moved away from it; its port is affected by the competition of rivals both at home and abroad; some of its manufactures are carried on with increasing difficulty. Nevertheless it remains the greatest port of the Kingdom, the centre of its entrepot trade, the point upon which all its most important railways converge, and the seat of an extensive and varied industrial activity. Of late the manufacture of lighter goods and articles of luxury have increased in its neighbourhood as proximity to a great port and a great market, and facilities for transport, have more than counterbalanced the distance from coal.¹ Industries

¹ It is estimated that the number of factory operatives between Acton and Slough increased from 60,000 to 150,000 between 1922 and 1928. (Factory Inspector's Report, 1928.)

have also developed on the south bank of the Thames, especially along the lower Medway, where cement-making, engineering, and the manufacture of paper are carried on.

The Hampshire Basin. Dairy farming, fruit-growing, and market gardening are the chief agricultural pursuits of this region. Southampton, favoured by position and docking facilities, has become the first passenger port of the British Isles and, being in a sense an outpost of London, carries on an extensive trade, mainly with the Atlantic ports of Europe, with Africa and the East, and with South America.

THE LOWER SEVERN BASIN. The lands on either side of the lower Severn include the plain of Hereford, the east of Monmouth, the vale of Gloucester, and the plain of Somerset. In the plain of Hereford the Old Red Sandstone yields a soil of exceptional fertility, and the apples grown upon it have given it a famous cider industry. The soil of Monmouth is less productive and much of it is under permanent grass. Dairy farming, with orchards on the higher ground, is the chief pursuit of the vale of Gloucester, and in the plain of Somerset there is also much dairy farming, the well-known Cheddar cheese being one of the chief products. The geological structure of the region is varied, but it contains two coalfields—the Forest of Dean and the Bristol and Somerset. Its position, also, with regard to the south-east of England, on the one hand, and the New World on the other, has given to its trade and industry certain distinctive features. The Forest of Dean coalfield, with an estimated net content of 200,000,000 tons, and an annual output of more than 1,000,000 tons, produces good house and gas coal. A small iron-smelting industry, which formerly obtained the necessary fuel from the forests in the locality, is still carried on upon this coalfield. The Bristol and Somerset coalfield is more important, and it is estimated that it contains 4,000,000,000 tons. The output, which averages 1,000,000 tons annually, consists of house, gas, and good steam coal. Bristol, the chief town of the region and the nearest western port to London, has always been interested in the American trade, and was, formerly, one of the principal ports engaged in it, but it is handicapped, both by the unsuitability of the Avon for navigation by large ships, and by the great rise and fall of the river. With a view to overcoming these obstacles, docks have been constructed at Avonmouth. The chief imports include cereals and colonial produce

generally of a tropical or sub.tropical nature. A great drawback to the growth of the port has been the want of a return cargo, and attempts to tap the Birmingham area have not been very successful. Bristol itself is engaged in the manufacture of tobacco and cocoa.

IRELAND

Ireland is now divided into two parts—Northern Ireland and the Irish Free State. The boundary between them is so drawn that Northern Ireland includes the six counties of Londonderry, Antrim, Down, Armagh, Fermanagh, and Tyrone; while the Irish Free State consists of the remainder of the country.

The Irish Free State (Saorstát Éireann) may for present purposes be divided into three regions—a northern, a central, and a southern. To the north of the Central Plain lies a belt of broken country which includes the mountains of Donegal, Mayo, and Connemara. Much of the soil is poor, and one-half of the farmed land is in holdings, which do not exceed 30 acres. Less than 10 per cent of the total area is under crops, while about one-half of it is used for pastoral purposes. As in the south of Ireland, dairy farming is important, and except in the overpopulated counties of Donegal and Mayo, much of the milk is sent to creameries. Oats and potatoes are the main crops, the latter especially being cultivated on the smaller farms.

The Central Plain covers about one-sixth of the country. The soil derived from the underlying limestone, mixed to some extent with the debris of other rocks, is often fertile, but the drainage is defective, and in many places there are great bogs. In the region as a whole, the land under crops does not exceed 10 per cent of the total area, while that under hay and pasture amounts to about 70 per cent. The rainfall increases from east to west, and as a result the cropped area tends to decrease. Moreover, while the acreage under cereals exceeds that under green crops in the east, the reverse is the case in the west. These tendencies would be even more marked were it not for the fact that in the east much of the land is in large farms (over 200 acres) on which store cattle are fattened for market. Oats, potatoes, and turnips are grown throughout the region, and barley is an important crop in some of the eastern counties.

Dublin, which is situated where a break in the mountain rim

and a deep bay permit of easy access from England to all parts of Ireland, is the chief industrial town of the region. Brewing and distilling, the manufacture of poplin (a fabric consisting of a mixture of wool and silk, noted for its soft texture, delicate colouring, and extreme durability), and biscuit-making are all carried on.

THE SOUTHERN REGION is, on the whole, mountainous, but contains considerable lowland areas along the coasts and in the valleys of the larger rivers. The soil varies greatly from one place to another. On the Old Red Sandstone of the south-west it is well adapted to dairying, while in the Silurian districts in the south-east much of it produces good herbage. In the Golden Valley, between the Slievefelim and the Galty Mountains, an intermixture of the debris of limestone and Old Red Sandstone produces a soil of great fertility; and elsewhere, also, the limestone soils are generally fertile. In this region, where climatic conditions are favourable to the cultivation of cereals in the east and to dairying in the west, the medium-sized farm (50-100 acres) is most common. Barley is grown mainly in the east, and has given rise to brewing at Waterford, Kilkenny, and elsewhere. Oats are largely grown in the southern as well as in the eastern counties, but potatoes are not so extensively cultivated as farther north. Dairying is an important pursuit throughout the region, which contains about three-fifths of the cows in the Saorstát—Cork, Kerry, Limerick, and Tipperary alone having over two-fifths of the total. Dense dairy herds, numerous creameries, many pigs (fed on skimmed milk), and large bacon factories are the characteristic features of the live-stock industry in these south-western counties.

NORTHERN IRELAND has a land area of 5,237 square miles and a population which numbers 1,256,000. The debris from the basaltic rocks which constitute the Antrim plateau furnishes considerable areas with a fertile soil, and the plains around Lough Neagh and in the valley of the Bann are very productive. The Old Red Sandstone which occurs in parts of Tyrone has also weathered down into good arable land; and the valley of the Lagan, with its mixed soils of alluvium, basalt, and Red Sandstone, is unrivalled for pasture. The valley of the river Foyle and the shores of Lough Foyle, the low grounds of Down, and the valley of Newry also contain good arable land. The uplands above 500 feet, with their poorer soils and heavier rainfall (40 inches and over), are fit only

for pasture. Rather less than one-sixth of the land is ploughed, the principal crops being oats, potatoes, turnips, and flax. The first three of these are widely distributed throughout the lowland area, but flax is most abundant in the rich basaltic soils of the lower Bann and round Lough Neagh, where the temperate climate is peculiarly favourable to it. Unfortunately, in the after-treatment of the plant the Ulster fanner appears to be careless and unscientific, and Irish flax does not hold its own with that imported from abroad. Dairy farming has developed mainly in the vicinity of the industrial areas, as in the valley of the Lagan and around Belfast Lough; other cattle are widely distributed, except in the highlands where their place is taken by sheep.

The industrial life of Northern Ireland is concentrated, to a great extent, in the north-east. The mineral wealth of the region, it is true, is of little importance, as there is practically no coal, and the aluminous iron ores which occur in the basalt of the Antrim plateau are sent to England to be used as a flux in smelting the red hematite of Cumberland and Lancashire, while the aluminium which is found in the associated bauxite is manufactured in Scotland. On the other hand, Northern Ireland is easily able to obtain coal from Ayrshire and South Lancashire, and iron and steel from Cumberland and other parts of Great Britain, for the shipbuilding yards at Belfast. There, a certain amount of compensation for the want of raw material is found in the relative cheapness of land and labour, and the excellent facilities for launching vessels. Belfast builds some of the largest ships in the world and, according to tonnage, has an output of nearly 12 per cent that of the United Kingdom. Londonderry is also engaged in shipbuilding, but on a much less extensive scale.

The manufacture of linen in Ireland was a natural result of the cultivation of flax in that country, but at the present time much of the raw material is imported from abroad, especially from Belgium and Latvia. The facilities for bleaching afforded by climatic conditions and the nature of the water supply, as well as the large reserve of female labour, have done much to concentrate the industry in Belfast, though it is also carried on to a greater or less extent in many of the surrounding towns and villages. Shirt-making, which gives employment to a large number of people in the west of the province, probably owes its origin to the presence of the

linen industry. The cutting and finishing processes are performed in large workshops in Londonderry, but the actual sewing of the shirts is a domestic industry throughout Londonderry, and Tyrone. Other industries in Belfast and Londonderry include rope-making, engineering, brewing, and tanning.

In conclusion, it may be noted that the economic development of Ireland is affected by a variety of circumstances. Her comparative poverty in mineral wealth has retarded the growth of manufactures (though the Shannon hydroelectric affords a certain amount of compensation); topographic and climatic conditions limit the possibilities of agriculture; the proximity of Great Britain prevents her growth as a trading nation. She has suffered alike by the protectionist policy of her more powerful neighbour in the eighteenth century, and by the free-trade policy of the nineteenth: in the former period by the suppression of her woollen industry, and in the latter by the loss of special privileges for the sale of her agricultural produce.

FISHERIES. That the fishing industry of the British Isles is of considerable importance may be gauged from the fact that over 100,000 men and women are directly engaged in it, and that the annual value of the fish caught in 1930 and 1931 averaged £17,000,000. The trawl, the drift net, and the line are all employed, but as far as England and Wales are concerned the fish are mainly obtained by trawling; in Scotland, on the other hand, drift net and line fishing are of greater importance than in England. For the years 1930 and 1931 the average catch for Great Britain was over 20,000,000 cwt., of which about 60 per cent was landed by trawlers. In addition, foreign vessels landed 2,800,000 cwt. in 1931. The great trawling ports are, in order, Hull, Grimsby, and Aberdeen.

Trawling is confined in the main to the shallower parts of the continental shelf, as those edible fish which live on the floor of the sea, such as soles, plaice, turbot, halibut, and cod, are not usually found in quantity in deeper waters, and for practical purposes the 100 foot fathom line is generally taken as the limit of successful steam trawling. The principal fishing grounds were, until recently, found in the North Sea, where the Dogger Bank, sixty miles east of the Yorkshire coast, the Silver Pits and the Lemon Bank farther to the south, and the Dutch coast, are among the best known. Plaice and soles are chiefly caught in the shallower, southern parts of this

area, and cod and haddock in the deeper, northern portions. But in 1931 larger supplies were obtained from important trawling grounds which lie off the north and west coasts of Scotland, where cod, haddock, and coalfish are found; off Iceland and between Iceland and the Faroes, where the principal fish are cod, halibut, haddock, and coalfish; and near the mouth of the White Sea, where plaice forms an important part of the catch. In the Irish Sea there are soles, plaice, and whiting; and in the English Channel soles, brill, turbot, skate, and whiting are obtained. The importance of these fishing grounds is not to be explained solely by the fact that they offer a great extent of shallow water; it is also in part due to the great abundance in temperate seas of those minute vegetable organisms upon which the food supply of the ocean ultimately depends. Steam liners fish in much the same area as trawlers, but they extend their operations into the deeper water on the edge of the continental shelf, where much halibut is found. Line fishing from small boats is carried on from various ports along the coast, more especially in Scotland, where it is still an industry of some importance.

The drift net fishery is mainly confined to the east coast, where herring are caught during the summer and autumn months. Within recent years, however, steam trawlers have begun to participate in the industry, and, it is maintained, have done considerable damage to the fishing grounds. A large proportion of the herring caught from Scottish ports is cured and a considerable export trade is done.

FOREIGN TRADE. The main factors in British trade have already been indicated, but it is necessary to note its extent and character somewhat more closely. The imports consist partly of goods intended for consumption within the country itself, and partly of commodities which are imported in order to be exported again. The relative importance of each of these classes is shown in the following tables which give the average figures for the years 1929-31 (inclusive) compiled from the "Annual Statement of the Trade of the United Kingdom."

IMPORTS IN £ MILLION

	Food, drink, and tobacco	Raw materials and articles mainly unmanufactured	Articles wholly or mainly manufactured	Others	Total
1929	535.5	339.6	334.4	11.3	1220.7
1930	475.1	250.5	307.4	11.0	1043.9
1931	416.7	173.0	261.7	9.8	861.2

EXPORTS OF PRODUCE AND MANUFACTURE OF THE UNITED KINGDOM
IN £ MILLION

	Food, drink, and tobacco	Raw materials and articles mainly unmanufactured in £ million	Articles wholly or mainly manufactured	Others	Total
1929	55.6	78.9	573.8	21.0	729.3
1930	48.2	63.8	440.0	18.7	570.7
1931	35.6	47.0	292.0	16.0	390.6

EXPORTS OF IMPORTED MERCHANDISE
IN £ MILLION

1929	26.0	54.3	28.9	•5	109.7
1930	23.8	38.4	24.0	•6	86.8
1931	20.1	25.7	17.4	•6	63.8

The following table shows the average value of the imports and exports (of domestic origin) of the more important commodities for the years 1929.31—

Imports	Percentage of total imports	Exports	Percentage of total exports of domestic origin
Meat	10.2	Cotton yarn and manufactures .	16.5
Raw cotton ..	4.8	Iron and steel and manufactures	
Wheat and wheat flour	4.7	thereof ..	8.8
Butter	4.7	Machinery ..	7.9
Wool	4.5	Coal	7.6
Wood and timber	3.7	Woollen goods ..	6.7
Fruit	3.4	Chemicals, drugs, etc.	3.8
Tea	3.2	Apparel	3.5
Petroleum ..	3.2	Road vehicles ..	3.2
Oilseeds ..	3.2	Pottery, glass, etc.	2.0
Iron and steel ..	2.1	Paper and card. board	1.4
		Electrical appar. atus	1.3

The principal importing and exporting countries are as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports of domestic origin
United States ..	14.5	British India ..	9.6
Germany ..	6.3	Australia ..	5.9
Argentina ..	6.1	Irish Free State ..	5.9
Denmark ..	5.0	United States ..	5.4
Australia ..	4.7	Union of South Africa ..	5.3
France ..	4.6	Canada	5.0
New Zealand ..	4.1	France	4.9
Irish Free State .	3.9	Germany ..	4.8
Canada	3.7	Argentina ..	4.0
Netherlands ..	3.7	Netherlands ..	3.2
Belgium	3.6	New Zealand ..	2.9
Russia	2.9	Belgium ..	2.6

The sources even of the principal imports are widely distributed, and it is impossible to do more than indicate the more important. Much of the food is imported from those countries which contain the great grasslands of the world; for example, chilled meat comes from the Argentine, frozen meat from Australia and New Zealand, wheat from Canada, the Argentine, the United States, and Russia. But Denmark, a closely settled, small farming country, provides most of the bacon and much of the butter (part of the latter coming from Australia and New Zealand), while the Irish Free State, another small farming country, sends live cattle. Tea and coffee on the other hand, come from tropical and sub-tropical regions, tea from India and Ceylon, and coffee from Central America and East Africa.

The raw materials imported also have very diverse origins. While wool comes from the grasslands of Australia, New Zealand, South Africa, and the Argentine, cotton is largely a product of the sub-tropical forest land in the United States and of the irrigated desert in Egypt. Hard woods are brought from the eastern slope of the United States, and soft woods from the northern forests of Europe. Oilseeds include cotton seed from Egypt, linseed from Argentina, and palm-kernels and ground-nuts from Nigeria. Manufactured goods of a very miscellaneous character come mainly from the industrialized regions of western Europe and eastern United States.

The exports of the produce and manufacture of the United Kingdom are also widely distributed. Coal finds its chief market on the Continent where France, Italy, and Germany are the largest purchasers at present, but it also makes its way across the Atlantic to Canada and the Argentine. Cotton goods are still, however, the most important export of the country. The principal market for yarn is in Germany, but for piece goods there is still an important but rapidly decreasing demand in monsoon Asia—more particularly in India; Australia, the Argentine, and Egypt are also large buyers. Woollen goods on the whole go to colder regions, and European countries, Canada, and the United States take in the aggregate a considerable quantity. Iron and steel goods are sent to various parts of the world, but India and the East, Australia, and South Africa are among the more important customers. European countries and British India take the greater part of the machinery exported.

The exports of imported merchandise include tea sent to Russia, Ireland, other European countries, and Canada; wool exported to Germany, France, and Belgium; hides and skins, bought by various European countries; and rubber sold to Russia, Germany, and France.

The following table shows the quantities of some of the more important articles of British origin exported in 1913, 1924, and 1931.

	1913	1924	1931
Coal (in million tons)	73.4	61.6	42.7
Iron and steel goods (except machinery) in million tons	4.97	3.8	1.97
Cotton yarn (in million lbs.)	210	163	133
Cotton piece goods (in million sq. yds.)	6780	4443.9	1716
Woollen yarns (in million lbs.)	80.4	45.5	45.4
Machinery (in thousand tons)	689	463	329

The following table indicates the relative position of the chief ports engaged in the foreign trade of the United Kingdom (1929.31).

Port	Imports (in £ million)	Exports of the produce of the United Kingdom (in £ million)	Exports of Foreign and Colonial produce (in £ million)
London	424.8	125.4	50.2
Liverpool	178.1	167.2	11.9
Hull	62.2	26.1	1.2
Manchester	54.8	21.5	•6
Southampton	35.7	31.8	9.2
Glasgow	25.7	39.7	•8
Harwich	43.2	4.7	1.7
Newcastle	19.2	17.0	•1
Grimsby	20.2	10.0	•1
Bristol	27.1	2.4	•3
Goole	11.0	11.3	•1
Leith	16.0	4.8	•2
Swansea	5.4	15.3	•0
Cardiff	7.7	12.8	•0
Dover	11.5	5.6	3.0
Middlesbrough	3.3	10.5	•0
Newhaven	7.9	3.3	1.3
Folkestone	5.5	1.2	1.1

TRADE OF THE IRISH FREE STATE. The principal imports include wheat and wheat flour, coal, tea, maize, iron and steel goods, machinery, and articles of clothing; cattle, porter, beer, and ales, butter, eggs, and other dairy produce make up the bulk of the exports. Great Britain and, to a much less extent, Northern Ireland and the United States are the chief importing and exporting countries.

For the three years 1929.31 the value of exports and imports was as follows—

	Imports	Exports
	(in £ million)	
1929	61.3	46.8
1930	56.7	44.5
1931	50.5	36.2

CHAPTER VI

SCANDINAVIA

THE Scandinavian peninsula consists of a plateau with a gentle slope to the east and an abrupt slope to the west. This plateau, which has an average elevation of about 3,000 feet, and to which the names Kjolen and Fjeld have been applied, is not continuous from north to south, but is broken up by transverse valleys along which communication between the east and west coasts is possible, while isolated summits rise to a height of several thousand feet above its general level. The rocks of which it is composed belong mainly to the early Palaeozoic period, though Archaean rocks are characteristic of the remainder of the peninsula. Those on the west coast have been much glaciated, and great fjords have been formed, while on the east coast a strip of land, which broadens out in the south of Sweden, was covered with the deposits of glacial rivers at a time when it lay below the level of the sea. The gradual upheaval of the land which brought it above the waters is also apparent in the raised beaches on the west coast and along the fjords. Only in the south of Sweden, in Skane, do rocks of Triassic and Cretaceous age appear, and these are covered by deposits of the glacial period.

Three of the climatic regions of Europe are represented in Scandinavia. In January, the isotherm of 32° F. runs along the southern half of the Norwegian coast, and even as far north as the North Cape the temperature on the coast does not fall more than 7° or 8° below freezing point. In Sweden, on the other hand, the range of temperature is much greater, varying from 32° F. in the extreme south to 4° F. in the north. In July, the west coast lies between the isotherms of 53° F. and 57° F., but in Sweden the range is from about 62° F. in the south to about 57° F. in the same northern districts as before. The rainfall varies from over 60 inches in south-western Norway to less than 20 inches in north-eastern Sweden.

The flora of Scandinavia reflects the physical and climatic environment. In Skane the forest vegetation of Central Europe is found, but over the remainder of southern Sweden and south-eastern

Norway deciduous and coniferous trees are intermingled. The coniferous forest, in which Scots pine and spruce are the dominant species, and the birch forest, before which it gives way at higher altitudes and in colder latitudes, occupy the remainder of the country, except in the north and on the plateau, where an Arctic vegetation prevails. Both below and above the upper limits of tree growth there are many regions suitable for pasturage during the summer months.

NORWAY¹

The greater part of the Norwegian population is found in the agricultural region, that is, on the raised beaches along the coast, on the delta lands of the fjords and lakes, in the valleys of the rivers which penetrate the plateau, and in the Oslo (Christiania) region where the soils, derived from Palaeozoic limestone, possess considerable fertility. These districts only amount to about three per cent of the whole area, but, lying between the forest region on the one hand and the sea on the other, the whole industrial activity of the country is centred upon them. Cereals such as barley and rye can be grown as far north as the 70th parallel, but oats is the chief crop. The production of grain is not sufficient to meet the home demand, and large quantities have to be imported. Dairying is becoming an important industry, and there are over 1,000,000 cattle in the country. During the summer months many of these are fed on the upland pastures. As the farms are small, co-operative dairies have been established and have proved very successful. Butter and condensed milk are exported.

The most valuable forests lie in the south and east, and their products—timber, wooden goods (such as doors and window frames), wood pulp, and paper—constitute over one-third of the country's exports. The manufacture of wood pulp and paper is greatly facilitated by the presence of enormous supplies of water power, obtained from the rivers which rush down from the highlands. The population of the Forest zone is largely migratory, the various processes in preparing the timber for export being carried on chiefly in the small towns of the previous region.

Norwegian fisheries are of first-class importance. The greatly indented coast, with its long line of protecting islands (the

¹ Area = 124,533 sq. miles. Population, 1930—2,809,564.

Skjaergaard), provides numberless harbours for the fisherman, and good spawning grounds for the fish. The proximity of the Arctic leads to the predominance of northern species, and these find their home on the ocean banks, more especially in the vicinity of the Lofoten Islands which are the centre of the cod-fishing industry. Herring are obtained all along the coast from Bergen northwards, but the relative productivity of different districts varies greatly from year to year. The cod, when salted and dried, are exported to the Catholic countries of Europe (chiefly to Spain), while the herring are sent to Germany, Sweden, and Russia. Whale-fishing is carried on from various ports, ships going to the seas round the north and west of Britain and more especially to the South Atlantic round South Georgia, the South Orkneys, and the South Shetlands.

With the development of hydro-electric methods of treating ore it has become possible to develop the iron industry, as the poverty of the country in coal is at least partially compensated by the abundance of its water-power. Iron ores are abundant, those with the highest iron content lying in the south, where they are mined near Kragero and Arendal and smelted in electric furnaces not far off. A low-grade ore is found along the coast from the vicinity of the Arctic Circle northwards and is worked at various places but more especially in Sydvaranger. Owing to the low iron content this ore is subjected to magnetic concentration before it is exported. Among other minerals, silver is worked at Kongsberg, and copper, which is widely distributed, in Nordland and elsewhere.

Of the industries other than those already mentioned, the most important are shipbuilding, the manufacture of paper, wood pulp, and matches, and the production of various chemical substances by the fixation of atmospheric nitrogen. Within recent years the last mentioned group of industries has become firmly established in Norway, which is specially favoured by its large supplies of water-power. At Odde, on an arm of the Hardanger Fjord, there are large works for the manufacture of calcium carbide, which is used in the production of acetylene. Calcium cyanamide, which is also made at Odde, is obtained by the combination of calcium carbide with nitrogen, and may either be applied to the soil directly, or indirectly after it has been converted into ammonium salts. At Notodden, on Lake Hitredal in Telemark, nitrate of lime known as Norwegian saltpetre, and the still more valuable ammonium nitrate

are manufactured for use as fertilizers. Sodium nitrite, which is obtained in the process, is exported in large quantities for the manufacture of dyes. At the Rjukan Fos, in the north of Telemark, where large supplies of water-power have recently been made available, the production of nitrates is now conducted on an extensive scale.

The geographical position of Norway, its numerous good harbours, the facilities for building wooden ships, the ease by water and the difficulty by land with which communication is carried on, the exportation of timber and fish, and the importation of coal, cereals, and manufactured goods, have all contributed to the growth of Norwegian shipping, which has nearly 5 per cent of the world's tonnage, and ranks in importance after Great Britain, the United States, Japan, Germany, France, and Italy. Oslo, Bergen, and Trondhjem are the chief ports.

For the three years 1929-31 the value of the foreign trade was as indicated below—

	Imports	Exports	Average rate of exchange (At par Kr. 18.16 = £1)
	(in million kroner)		
1929	1,072	742	18.20
1930	1,065	674	18.17
1931	856	460	18.12

The principal exports include fish, paper and pulp, metals, timber, and chemical products. Among the more important imports are textiles, oil, minerals, and machinery.

Spitsbergen, an archipelago nearly 400 miles north of Scandinavia, is now recognized as Norwegian territory. The islands appear to contain valuable deposits of coal, and mining operations, on a limited scale, are now in progress.

SWEDEN¹

In Sweden, as in Norway, agriculture is the most important pursuit of the people, nearly two-fifths of the working population being engaged in it. The districts in which it is carried on are all situated within the region which has been covered by debris left by the retreating ice-sheet or washed down by glacial streams. In the north of this region, where climatic conditions

¹ Area 173,146 sq. miles. Population 1930—6,141,571.

are unfavourable, less than 10 per cent of the land is cultivated, but south of the 60th parallel the percentage of cultivated land increases in many places to between 20 and 50 per cent, while in the south of Skane it is over 80 per cent. Of the whole country about one-eleventh is cultivated, oats, wheat, rye, potatoes, sugar beet, and fodder plants being the most important crops. The production of cereals does not meet the home demand and importation is necessary.

The large natural meadows, covering over 3 per cent of the total area of the country, and the extensive forest pastures have encouraged the development of dairy farming. There are over 2,500,000 cattle in the country and large quantities of butter are exported, chiefly to Great Britain.

The forests which occur in all parts of Sweden, except on the plateau, cover half its area, and provide about 45 per cent of its exports. Timber and wood-pulp are chiefly obtained from what is known as the Forest region, that is, the eastern slope of the Scandinavian plateau between the Palaeozoic rocks of the plateau proper in the west and the belt of marine sands and clays in the east, and between the bare rocks and marshes often found in the north and the lands which are suitable for agriculture in the south. Here, climate and soil render the land unsuitable for agriculture, the snows of winter facilitate the removal of the timber from the forests, and the spring freshets float it down to the coast, along which stands a line of small towns, all engaged in the preparation and export of forest produce. As in Norway, water-power is extensively used to drive machinery in saw-mills and pulp factories. Great Britain is Sweden's chief customer for timber, but other European countries take a large share. The United States is an extensive buyer of paper and pulp.

The most important factor in the mineral wealth of Sweden is iron ore, which occurs in the central parts of the country and in Lapland. In the first of these regions, the chief ore fields lie to the north of the lakes, and include the Grangesberg, the Dannemora, and the Norberg, the first having by far the largest output. The most important fields in Lapland are those of Gallivare and Kierunavaara, both of which lie within the Arctic circle. The mines, which have only been opened up within recent years, now produce about three-fourths of the Swedish output. They are connected by rail with

Lulea, near the head of the Gulf of Bothnia, and with the Norwegian ice-free port of Narvik, which ships a large part of the total output. Both magnetite and hematite are obtained in Central Sweden, but in Lapland magnetite predominates. In the former district the ores, as a rule, contain but a low percentage of phosphorus, though this is not true of those from the Grangesberg field, while in the latter the percentage is generally but not invariably high. The iron content of the Swedish ores is above the average; for the country as a whole it is estimated at 60 per cent and for Lapland 65 per cent. The production of iron ore in Sweden in 1927-28-29 averaged 8,500,000 metric tons, or nearly 5 per cent of the world's production. The greater part of it is exported to Germany—chiefly to the Rhine manufacturing district—but a considerable amount is also sent to England and some goes to the United States. A third, and apparently very important, ore district has recently been discovered in the province of Vosterbotten, near the little town of Skellefteca

The manufacture of iron has long been carried on in the southern region where the population is large, the ore good, and wood for fuel and the manufacture of charcoal, abundant. The product is of excellent quality, but, with the use of coal for smelting iron, Sweden has had to take a relatively lower position among the iron-producing countries, though it is possible that the development of electrical processes may enable her to regain something of her former importance. In this region there are important steel works at Domnarvet and Eskilstuna.

Among other manufactures not already mentioned are woollen goods at Norrköping, where water-power is obtained from the River Motala; cotton goods at Göteborg and Norrköping; matches at Jonköping, where also there is water-power; paper at Kvarnsveden, near Falun; and explosives near Stockholm. Manufacturing on a large scale has hitherto been handicapped by the want of coal. Only in Skåne is a limited amount obtainable, and it is quite insufficient for the needs of the country. Much attention is now being paid to the development of hydro-electric power, and a large power station has been established at Trollhattan, on the Gota, near Lake Vener, from which it flows. Another station has been constructed at Motala, near the point at which the Motala river leaves Lake Vetter.

The development of railways in Scandinavia has naturally been impeded by the topography of the country. Stockholm and Oslo are connected, and there are also lines from the former city to Gothenburg and Malmo, two of the chief ports of Sweden. Another line runs north from Stockholm to Lulea, with a branch to Trondhjem, which is also connected with Oslo by a railway that follows the valley of the Glommen. From Kristinehamn, on Lake Vener, a line which will eventually reach Gallivare has been carried as far as Storuman. The lines from the iron ore deposits in Lapland to their ports at Narvik and Lulea have now been electrified, as has that from Stockholm to Goteborg.

For the three years 1929-31 the foreign trade of Sweden was as follows—

	Imports	Exports	Average rate of exchange (Atpär Kr. 18.16 = £1)
	(in million kroner)		
1929	1,782	1,812	18.13
1930	1,662	1,550	18.11
1931	1,439	1,127	17.95

Among the more important imports are coal from the United Kingdom—large quantities are imported from Scotland—iron and machinery from the United Kingdom and Germany, mineral oil from the United States, textiles from the same countries, wheat from various sources, and coffee from Brazil.

The principal exports are forest products—timber, wood, pulp, paper—iron ore, machinery, and electrical appliances.

CHAPTER VII

FRANCE¹

THE economic development of France has at all times been greatly influenced by the fact that it lies between the Atlantic and the Mediterranean, with easy access to both, and with good routes connecting the one with the other. The physical features of the country are comparatively simple. The Central Massif, around which the remainder of France has grown up, consists of a plateau of ancient schists, gneisses, and granites; it is overlain in places by Carboniferous deposits and later volcanic outpourings, while in the south there are considerable areas of limestone which form the Causses. The Massif is low in the north and west, but rises gently towards the south and east where the Cevennes form a steep escarpment. There are, besides, the three peripheral masses of Brittany,, known as the Armorican, the Ardennes, and the Vosges, all of which consist in the main of Primary rocks. The Alps in the east and the Pyrenees in the south are mountains folded during Tertiary times. Lastly, the lowland regions of Aquitaine, the basin of Paris, and the Rhone depression are areas of sedimentation filled up in part by rocks of Secondary age, and in part by debris from the surrounding uplands brought down during the Tertiary period.

The physical character of these different parts of France, and their relative position to one another and to the Atlantic and the Mediterranean, give to the country a somewhat varied climate, each region having its own peculiarities. In the Central Massif, which rises from a height of 1,500 to 2,000 feet in the north-west to over 5,500 feet in Mont Lozere in the Cevennes, the winter is long and cold with northerly winds, while the mean temperature of July ranges from 65° F. at Clermont.Ferrand (1,280 ft.) to 52° F. at Puy de Dome (4,820ft.). The January means are respectively 35° F. and 28° F. The rainfall is heavy, and in the more exposed districts the mean annual precipitation is over 60 inches. The Armorican region has, as a result of its proximity to the ocean, a temperate climate, and its summers are cool, while its winters are mild. The rainfall, which is greatest in autumn and winter, is not so heavy as on the

¹ Area 212,659 sq. miles. Population, 40,743,897.

Central Massif, but the atmosphere generally contains a considerable amount of moisture. In the Gironde these conditions are modified by a more southerly position, and at Bordeaux the July and August means are 68° F. (January 41° F.) as compared with an August mean of 62° F. (February 43° F.) at Roscoff. In the sub-Pyrenean region there is a heavy rainfall and temperature gradually decreasing with altitude.

The climate of the Mediterranean coast is very different from that of other parts of France. As a result of its southerly position and exposure, and the proximity of the sea, the winters are warm; on the other hand the summers are hot, as the prevailing winds blow from the land during that part of the year. At Nice the range of temperature is from 46° F. in January to 74° F. in July. The summers are relatively dry and most of the rain falls during the autumn and winter months. In the Rhone valley the temperature is much reduced by the cold wind, known as the mistral, caused by the dense air which lies over the Central Massif slipping down into the warm lowlands of the Rhone and the Mediterranean; even at Avignon the January mean falls to below 40° F. The rainfall, which occurs at all seasons of the year, is heavier than along the coast, and amounts to between 30 and 40 inches. The Jura and the French Alps have, like the Central Massif, a greater precipitation than the Rhone valley, and, of course, a lower temperature.

Eastern France, from the Ardennes to the Vosges, lies farthest from the influence of the sea, and the range between summer and winter temperature is considerable. Owing to the presence of the mountains the rainfall is high, being between 35 and 40 inches. In the Paris basin the climate is somewhat more extreme than in Brittany. January isotherms range from 35° F. in the east to 39° F. in the west, and July isotherms from 64° F. in the north to nearly 70° F. in the south. The low rainfall, less than 30 inches over nearly the whole region, is partly due to the absence of mountains.

GENERAL SURVEY. Each of the upland and lowland divisions of France has its distinctive physical and climatic characteristics, but taken together they form a complex extremely favourable to economic development.¹ The country contains large areas of cultivable land, and the diversity of climate and soil permits the growth of a variety of crops. The importance of France as an

¹ For a regional study Mrs. Ormsby's *France* is invaluable (Methuen, 1931).

agricultural country is, perhaps, best illustrated by the fact that its wheat area is only exceeded by Russia, the United States, India, Canada, and the Argentine, and its crop by Russia, the United States, Canada, and India. Unfortunately, its yield per acre is low and only averages 20 bushels as against 32 in the United Kingdom and 29 in Germany. Many of the plants grown in France have given rise to industries in which a considerable amount of labour, frequently highly skilled, is required; and, although in many cases the industry has grown to such an extent that the home supply of raw material is no longer able to meet the demand, the importance of that home supply in establishing the industry, as well as in training the labour required in allied industries, must be recognized. For the importation of raw material and for the exportation of manufactured goods the position of France is in many respects almost ideal, while the skill and taste of its inhabitants have enabled them to produce various commodities almost unrivalled on the world's markets.

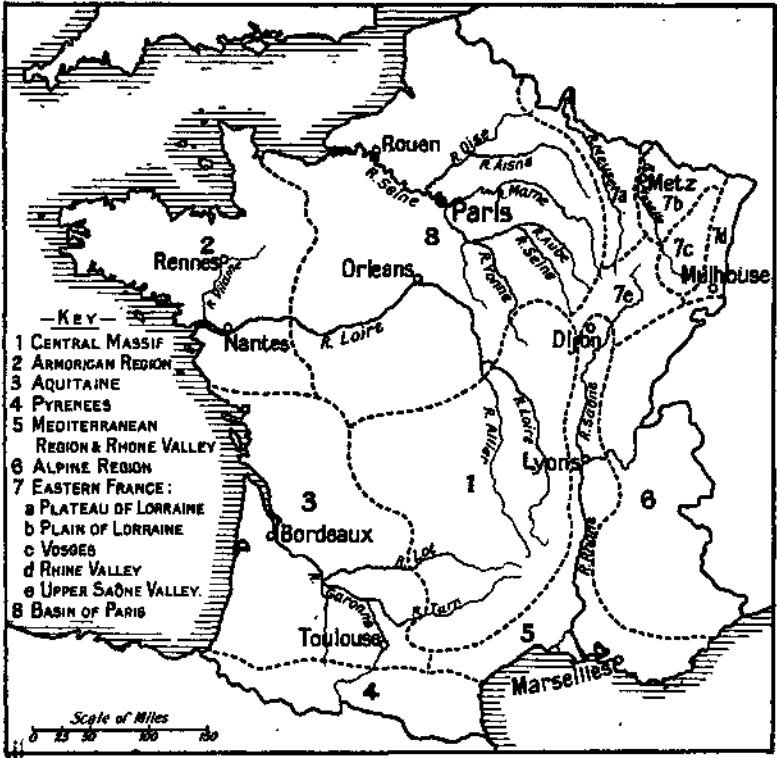
On the other hand, France has been handicapped in the past by its comparative poverty in minerals. Its coalfields only yielded about one-seventh of the amount mined in the United Kingdom, and it was compelled to import considerable quantities from abroad. The discovery of the basic process in 1878 enabled the French to work the iron ores of Lorraine, but their exploitation of them was to some extent hindered by the want of fuel for the blast furnaces. By the acquisition of German Lorraine and the discovery of large deposits in Normandy the reserves of ore have been greatly increased, but the coalfields are still inadequate for the needs of the country, while the occupation of the Saar and the obligation of Germany to supply coal for a number of years are likely, at the best, to afford but a temporary relief. In these circumstances it is not surprising that France should take careful stock of the water-power which it possesses in the Alps, the Pyrenees, and the Cevennes.

As a result of the War the productive capacity of French industry has been greatly increased. Not only have the coal mines which were then destroyed been re-equipped with the most modern machinery for the extraction of coal, but their efficiency has been improved by the provision made for the conservation or extraction of by-products of coke, such as benzol, sulphate of ammonia, and gas. The iron works within the devastated area have also been

reconstructed upon the most approved principles, while those outside it were in many cases modernized during the War in order to increase the output of material required for munitions. Engineering, chemical, and textile works have all benefited for the same reasons. The manufacturing capacity of the country has also been augmented by the restoration to France of Alsace-Lorraine with its varied industries and valuable mineral resources. There has, moreover, in many cases been a consolidation of business interests which, whatever its social drawbacks, will probably make for a more effective use of the means of production. On the other hand, it may be noted that for the utilization of its resources, France has a population below its needs, and is compelled to encourage foreign immigrants. During the three years 1928,29,30 foreign workmen entering the country exceeded those leaving by 300,000.

THE CENTRAL MASSIF. The sterility of the soil derived from the Archaean rocks of which the Massif is mainly composed, along with the rigour of the climate, renders this region unsuitable for agriculture, and arable farming is more restricted than in any other part of France, except the Alpine zone. Wheat and oats are grown on the lower land and in such favoured localities as the valley of the Allier, where the soil has been enriched by volcanic material, but the characteristic crop is rye, and nearly one-half of the rye fields of France are found on the Central Massif. Pastoral farming is also extensively carried on in the same region. The volcanic lands to the west of the Allier have decomposed into a fertile soil, and, being well-watered, provide good pasture land for cattle, while the sparsely populated Causses in the south are more suited to sheep. The Massif, as a whole, contains about one-fifth of the cattle and one-fourth of the sheep in France.

The development of the mineral wealth of the Central Massif has given it a much greater importance than hitherto in the economic life of France. Around it and within it lie a number of coal basins which, in pre-war days, produced over one-fourth of the total output of the country, the most important fields being situated round St. Etienne in the basin of the Loire, at Le Creusot, Blanzy, and Fipinac, all in the south of Burgundy, at Commeny in the basin of the Cher, and at Alais in the south-east. The coal from these fields is extensively used in the metallurgical and textile industries of the surrounding districts.



NATURAL REGIONS OF FRANCE

Iron ore is also found in this region, but it frequently occurs apart from coal, and the present output is inconsiderable. Nevertheless, its existence has facilitated upon the coalfields the development of an important metallurgical industry, much of the ore for which has now to be brought from a distance. Le Creusot, St. Etienne, St. diamond, and other towns are all engaged in the production of iron and steel, and some of the best French steel comes from this region. Le Creusot is the centre of large ordnance manufactures.

Textile industries are situated in a few more or less scattered localities. St. Etienne is the commercial centre of the silk ribbon industry; electric power is extensively used and the ribbons are manufactured in small workshops, scattered over hill and valley within a radius of twenty or thirty miles; Roanne, on the Loire, is engaged in the production of cotton and woollen goods. Limoges is noted for the manufacture of china, Clermont.Ferrand and Montlucon for pneumatic tyres, Thiers for cutlery, and Vichy for mineral waters.

THE ARMORICAN MASSIF is in its general character a region of Primary rocks, its most striking feature being its tendency to rise towards the ocean as the two belts of ancient schists and granites, which run through the country from the east towards the west, converge upon one another. These uplands separate three lowland districts, one of which lies along the north coast, one in the centre, and one along the south coast. The uplands are generally infertile and unproductive, while in the lowlands good and bad lands alternate. The coastal plains, where marine deposits provide excellent fertilizers, are carefully cultivated, and, in the northern one, much attention is paid to market.gardening. In the basin of Rennes and around the lower Loire considerable quantities of wheat are grown, but buckwheat is the principal cereal of Brit. tany. In the north, in the "bocage normand" of north.west Nor. mandy, and in the south, in the "bocage vendeen" of north.west Poitou, softer schists provide good grazing grounds intermingled with woodlands. The humidity of these districts makes them especially suitable for cattle, and it is instructive to note that the Armorican region as a whole has over one.fourth of the cattle, but only about one.twenty.fifth of the sheep, of the whole of France.

In Normandy, on the borders of the Massif, there is being opened

up the most important ore-field in France after that of Lorraine. The ores consist partly of hematite but mainly of carbonates similar to those produced in the Jurassic area of England, though apparently with a higher content of iron. Smelting works have been established near Caen, but the bulk of the ore is exported from that port to Germany and Great Britain. Farther south, to the north-west of St. Nazaire, iron ore is also worked but to a much less extent. The development of both regions has been handicapped by the want of labour and of coal.

The conditions favourable to the growth of towns and industrial development are generally wanting, and there are few manufactures. Nantes has important shipbuilding yards and metallurgical industries, while Laval is engaged in textile pursuits. On the other hand, the sea, which has always been an attractive force, has drawn many people to fishing and seafaring, and Breton fishermen still go to the Banks of Newfoundland. Some of the principal naval stations of France, Cherbourg, Brest, and Lorient, are situated on the coast; but, owing to their remoteness from the industrial parts of the country, the ports of the Armorican region do but a small trade, with the exception of Nantes and its outpost, St. Nazaire, which owe their importance to being at the outlet of the basin of the Loire. St. Nazaire is an important shipbuilding centre in France, and Cherbourg is now a port of call for many foreign liners.

AQUITAINE is the lowland region surrounded by the Central Massif, the Armorican Massif, and the Pyrenees. It is composed partly of Secondary and partly of later formations, but the character of the soil is very variable. In parts of the sub-Pyrenean districts, covered to a large extent with glacial debris, in the Landes where Quaternary sands stretch over wide areas, and on some of the limestone rocks of the north and east, it is infertile; elsewhere, and more especially on the Tertiary lands of the valley of the Garonne, it is well adapted to cultivation. Agricultural pursuits predominate, wheat is the chief cereal grown, while the French maize crop is almost exclusively obtained here, as temperature and humidity are alike favourable to it. Cattle are reared on the richer pasture lands, and sheep are fed on the Landes, in the sub-Pyrenean districts, and elsewhere.

Nearly one-third of the French vineyards are situated in this

region, the most important being in the country round Bordeaux, from which come such well-known wines as Medoc, St. Julien, and Sauterne. Farther north, in the basin of the Charente, are grown the vines from which brandy is made, and Cognac, situated on that river, is the centre of the brandy-distilling industry. Plums and walnuts are also important products of Aquitaine.

The industries of Aquitaine are chiefly concerned with the preparation for the markets of its various agricultural products, and it is only at the ports, where coal and raw material can easily be obtained by sea, that manufactures assume a more varied character. At Bordeaux, there are chemical works and sugar and petroleum refineries; at Pauillac, the outport of Bordeaux, and at Bayonne, ironworks. In order to prevent damage being done by moving sand dunes, the Landes have in many places been planted with forests of pine and cork, and these have given rise to various pursuits, such as the preparation of pit-props and cork and the extraction of resinous products.

THE MEDITERRANEAN REGION AND THE RHONE VALLEY. The Mediterranean region differs in several respects from the rest of France. Along the coast much of the soil is infertile, but farther inland it improves and is capable of producing valuable crops. The climate, hot and dry in summer, mild and moist in winter, gives the region its characteristic vegetation, the vine, the olive, and the mulberry being its typical products. Of the area under vines in France over one-third is included within the Mediterranean region, which also contains practically all the olive-yards and about one-third of the mulberry trees of the country. Arable farming is not of much account, but sheep are reared on the upper slopes of the hills and on some parts of the lowlands.

With the Mediterranean region may be also considered the Rhone valley, where the soil is generally more favourable even if the climate is less beneficent. The olive does not make its way far beyond the Mediterranean region, but the vine and the mulberry flourish, over one-half of the mulberry trees and nearly one-tenth of the vineyards of France being found in this part of the country.

The olive grows well in many parts of the Mediterranean coast where the soil is too dry or stony for other crops. Elsewhere, however, it is not in exclusive possession of the land it occupies, but is cultivated along with cereals or vegetables.

The industrial development of the Mediterranean coast and the Rhone valley is based partly on the cultivation of the above-mentioned plants, partly on the position of the Rhone valley in relation to Africa and the East, and partly on proximity to the coal resources of the Central Massif. The manufacture of silk settled naturally in a region favourable to the growth of the mulberry tree, but the domestic supply of raw material is now far short of the demand, and large quantities are annually imported from Italy, the Levant, China, and Japan, with all of which there is easy communication. The growing dependence of the industry upon electric power has encouraged its distribution over a wide area, and silk goods are manufactured not only in the suburbs of Lyons and in the small towns of the neighbourhood, but in the valleys of the southern Jura, in the French Alps, where the valley of the Isere is said to contain one-third of the silk factories of the Lyons region, and on the slopes of the Central Massif, where St. Etienne is in a sense tributary to Lyons. While handloom weaving has declined in importance and is now reserved for special materials, the development of hydroelectric power has made possible a large increase in the number of home-weaving power looms. Lyons itself remains the commercial centre of the industry, and is also engaged in the dyeing and finishing processes. One of the great inconveniences of the silk industry is its entire dependence upon the fashions of the hour, and the adaptability of the Lyons industry has been a potent factor in its success. In this connection it may be noted that a large part of the rapidly-growing output of artificial silk in France comes from the region under consideration.

The cultivation of olives has played an important part in the trade and industry of Marseilles. The manufacture of olive oil encouraged the growth of pursuits of a similar character, and the facilities with which such articles as linseed, gingelly, sesamum, groundnuts, and copra could be imported from the East contributed to the establishment of oil, candle, and soap factories on an extensive scale.

The presence of coal in the Central Massif and the demand for silk-weaving machinery have favoured the development of a large engineering industry at Lyons, which is also noted for the construction of automobiles, a result partly of the fact that early experiments in this mode of locomotion were made there. The

position of Marseilles as a great port, and its facilities for the importation of coal and iron, have naturally made it a centre of smelting works, engineering establishments, and shipbuilding yards. Toulon, farther east, is an important naval dockyard.

THE ALPINE ZONE plays but a relatively small part in the economic life of France. The soil is generally poor and difficult to cultivate outside of the valleys, where it is rich, and with increasing altitude the climate becomes unfit for the growth of cereals. Much of the region consists of poor pasturage, which in the north is devoted to cattle, in the south to sheep and goats; while in the sheltered valleys, more especially in that of the Isere, the vine is grown. Anthracite and iron occur in places, and there are numerous hot springs. The earlier manufactures were chiefly such as could be carried on in the homes of the people, and included glove-making in the country around Grenoble, wood-turning, and employments of a similar nature. Within recent years, however, the development of hydro-electric power has led to the growth of chemical and metallurgical works in the region, while the silk industry has become more widely distributed. In the limestone Jura, dairy farming is important in the uplands where the soil is poor, but in the valleys the vine is extensively cultivated. In the small towns, various industries requiring little raw material but a high degree of skill on the part of the workmen have been established. These include watch-making, the construction of motor-cars, and the manufacture of textiles and optical instruments at Montbeliard, Besancon, and elsewhere.

THE BASIN OF PARIS is the name given to that great area of sedimentary deposits which lies between the Central Massif, the Ardennes, and the Armorican region. For present purposes the Meuse may be taken as its eastern limit. The outer rim of the basin consists of rocks of Jurassic age; within that there is a belt, not fully developed in places, of Cretaceous rocks, and the centre of the basin is covered over with deposits of Tertiary times. Although the soil of this region is generally fertile, its character varies considerably from one place to another. In the Tertiary lands the greater part of it is suitable for cultivation, but on the Cretaceous area it is less certain. Champagne, for example, consists in part of a great plain where the chalk comes to the surface and is suitable only for grazing purposes, and in part of a region of wet

clays naturally opposed to cultivation. In the Jurassic lands the valleys are generally fertile, but the limestone uplands are more often forested.

Taking the Basin of Paris as a whole, however, it is the most important agricultural region of France. It produces about two-fifths of the wheat and over one-half of the oats grown in the country, and it also contains the best grasslands. In many places, and more especially in the vicinity of the great towns, market-gardening is an important pursuit; and in the north-east there is grown practically the whole of the French sugar-beet crop. Cattle are raised mainly in the moister regions of the west and north-west, and sheep in the drier districts of the centre and east. There are two separate and important vine-growing areas—that of the Middle Loire, which produces light wines, and that of the eastern part of the Seine basin, more especially on the chalk and limestone slopes round Reims and Epernay, at the foot of the Tertiary escarpment, where are grown the vines from which champagne is made.

Industrially, this region is also the most noteworthy in France. It contains part of the great coalfield which extends from western Germany through Belgium into the departments of the Nord and the Pas-de-Calais. Unfortunately, in the French portion of the field the coals lie at a greater depth than in Belgium, and are worked at greater cost. The chief centres of production include Lens and Anzin, and the total output in pre-War days was nearly three-fourths that of the whole country; in the two years 1912-13 it averaged 29,000,000 out of 41,000,000 metric tons. The restoration of the mines after the damage done, intentionally and otherwise, by the German forces has been remarkably rapid, and the region now produces more than in 1913. The average production of France for the two years 1929 and 1930 was 55,000,000 metric tons, and of that 35,000,000 came from the Nord and the Pas de Calais. Gas coal, coking coal, and anthracite are mined.

An important iron industry is situated upon this coalfield. A certain amount of pig-iron is made on the spot; but large quantities are bought from Lorraine for the manufacture of steel, an industry carried on round Anzin and Douai. At Lille, Valenciennes, Roubaix, and other towns either on or in the neighbourhood of the coal field, the manufacture of textile machinery and general engineering are important industries.

Within the Basin of Paris there are two cotton-manufacturing districts. That of Normandy owes its origin to the fact that woollen and linen goods had for long been made in the vicinity of Rouen through which port raw cotton was first imported into France, and, though it is handicapped by the absence of coal, the momentum it acquired by its early start, the ease with which raw material can still be imported, and the traditional skill of its workmen, have all contributed to enable it to retain its position. It had, in 1914, about 1,670,000 out of the 7,560,000¹ spindles in the country. Rouen is the centre of this district, and among other towns belonging to it are Darneal, Maromme, Sotteville, and Oissel (all in the vicinity of Rouen), Evreux and Gisors, Havre, and Yvetot. In proximity to the coalfield of the north is situated the other cotton district of this region; prior to the outbreak of war it contained over one-third of the French spindles. Among the towns engaged in the spinning industry are Lille, Roubaix, and Turcoing; weaving is less important, much of the yarn being employed in the manufacture of lace, embroidery, and mixed tissues. Farther south, in St. Quentin and Amiens, the manufacture of various kinds of cotton goods is carried on.

The woollen industry also finds its principal home near the coal field, where it has the further advantage of being able to import raw wool from abroad through Dunkirk, and where the chief manufacturing towns are Roubaix, Tourcoing, and Fourmies. The industry is also followed at Reims, where wool is obtained from the sheep of Champagne, in the middle Loire at Orleans, and elsewhere, and in Normandy at Elbeuf. The manufacture of woollen goods in France has been carried to a high state of perfection, and the country is specially noted for its output of fine dress materials, large quantities of which are exported.

Artificial silk is already made at several towns in this region, one of the largest works being situated near Calais. Lace is manufactured at Caudry, not far from Cambrai, and in the neighbourhood of Calais. The chemical industries are widely distributed, some of the most important being in the coal-producing districts, and there are glass-works at St. Gobain and Chauny, south of St. Quentin. Another industry which may be noted is the manufacture of sugar, carried on in the beet-growing districts, where coal is easily obtainable.

¹ 10,000,000 in 1931, but these include about 2,000,000 in Alsace.

EASTERN FRANCE. The Treaty of Versailles restored to France the region of Alsace-Lorraine and handed over to her for fifteen years the administration of the Saar coalfield, together with the ownership of the coal which it contains, subject to the right of Germany to re-purchase what is left if she finally regains possession of the coalfield. Various problems arising out of this settlement can best be considered by regarding the east of France as consisting of a group of natural regions more or less closely related to one another.

(1) *The Plateaus of Lorraine.* The scarp-lands of the Paris basin are continued eastward as far as the plain of Lorraine, and the surface of the land consists of a series of plateaus, each of which rises gently from the west and falls steeply to the east. The escarpments thus formed are known as cotes, and the Cotes de Moselle are of special economic importance on account of the large supplies of ore which are mined, not only along the Moselle on the edge of the plateau, but also on the plateau of which the cotes are the edge. Previous to the war this ore-field was divided between France, Germany, and Luxembourg. The French deposits were situated round Longwy, Crusnes, and Briey in the north, the last named being the most important, and round Nancy in the south; while the German deposits extended from Luxembourg, the output of which went to Germany, along the west bank of the Moselle as far south as Metz. The ores from these districts are known as "minette," and as they contain a high proportion of phosphorus they could not be used in the manufacture of steel until the discovery of the basic process. Some are calcareous while others are argillaceous, the importance of the distinction being that the former are self-fluxing while the latter are not. The iron-content of both is low and appears to average between 35 and 40 per cent, but the fact that they occur in large and continuous deposits and are easily mined compensates for the relatively low percentage of iron.

Previous to the War an important metallurgical industry had developed on the ore-fields both in French and in German Lorraine. In the former the chief iron and steel centres were situated in the valleys of the Meurthe and Moselle around Nancy, and in the neighbourhood of Longwy, farther to the north; in the latter they lay between Metz and Thionville, in the valleys of the Moselle and its tributaries. The French industry was favoured by the facilities

for water transport to the coalfield of northern France, and to some extent by the proximity of the German coalfield of the Saar. The Saar, however, did not produce a good coking coal, and much of the coke required was imported from Westphalia. On the other hand, as German Lorraine contained comparatively small quantities of calcareous ore, a large amount was imported from the Briey plateau. The German output, moreover, was considerably larger than the French, and what was not smelted in the vicinity of the mines was sent either to the Ruhr or to the Saar.

The whole region has now passed under French control, and it is interesting, if unsafe, to speculate upon its future development. In order to provide for a supply of coke, without which many of the blast furnaces in Lorraine would have had to be closed down, the Peace Treaty stipulated that for 15 years Germany should supply France with large quantities of coke and coal. But even with these supplies the future of the industry is uncertain. Prior to the war German Lorraine not only exported to Westphalia iron ore, but also considerable quantities of pig iron and mild steel for use in the steel and engineering works of the latter region. To some extent, at least, this policy has been continued, and the Lorraine works still specialize in rolling mill products of moderate value, as labour for the manufacture of more highly finished goods cannot be obtained.

The present position is somewhat as follows: France produces about one-fourth of the world output of iron ore, and of that about one-third is exported. On the other hand, the production of steel in the France of to-day is more than twice as great as in the France of 1909.13, and that country now finds it necessary to seek a foreign market for about one half of its output. A considerable quantity of semi-manufactured steel still goes to the Ruhr, and Britain and Belgium are also in normal times large purchasers of it. But it remains to be seen whether the Lorraine industry will be content, when the present depression is over, to continue on its present lines, or whether it will seek to emulate its neighbours by engaging in the manufacture of wholly finished goods.¹

(2) *The Saar Coalfield.* This coalfield, to which reference has already been made, will remain under French control until 1935

¹ *La Lorraine Metallurgique* by Axel Somme (Editions Berger-Levrault, Paris, 1930).



LORRAINE, THE SAAR, AND THE RUHR

at least, and accordingly it may best be described here. It lies in the basin of the river Saar (a tributary of the Moselle) from which it takes its name, and is situated mainly in Prussia, whence it extends into Lorraine and the Bavarian Palatinate. The coal appears to be of somewhat inferior quality, and it is only recently that means have been devised by which it can be rendered useful for metallurgical purposes. In 1929,30 the output from the Saar averaged over 13,000,000 tons and from Lorraine 6,000,000 tons. Of the former nearly one-third was used in the blast furnaces, machine shops, and glass and porcelain works which had grown up on, or in the vicinity of, the coalfield. The remainder was exported mainly to Alsace-Lorraine, the south-west of Germany, Switzerland, and the north-east of France. The most important centres of the iron and steel industry are in the valley of the Saar, between Saarbrücken and Dillingen.

(3) *The Plain of Lorraine.* The Plain of Lorraine extends from the Cotes de Moselle to the northern Vosges. In the east the Bunter sandstone is covered with forests which formerly provided fuel for numerous glass works, but these are now partly dependent upon the Saar coalfield. Farther west, salt is obtained in large quantities from the Keuper marls at Chateau Salins, Sarralbe, and Dieuze, where chemical works have been established. On the whole the soil is poor, but on the Liassic slopes in the valley of the Moselle the vine is grown, although climatic conditions are not altogether favourable.

(4) *Alsace and the Vosges.* Beyond the Plain of Lorraine rise the Vosges Mountains, which are separated from the Black Forest by the rift-valley of the Rhine. In the vicinity of the Rhine itself the land is poor and often either water-logged or too porous to retain water, but farther to the west, more especially where the plain and the lower slopes of the hills are covered by a thick layer of loess, the soil is exceptionally fertile. The climate is also favourable, as the valley is sheltered from cold winds, and spring comes early and is warm. Agriculture, accordingly, assumes considerable importance; the vine flourishes, tobacco and hops are widely cultivated, and sugar beet is grown. As a result, wine, cigars, beer, and sugar are all manufactured throughout the region.

France now possesses in the country round the Vosges the largest cotton industry on the continent of Europe. Prior to 1870 this

industry was mainly carried on in Alsace, and after the cession of Alsace-Lorraine to Germany, was developed under German auspices. The towns which are engaged in it are, as a rule, situated upon the plain, but owe part of their prosperity to the rivers which flow from the Vosges, and provide not only power but pure water for finishing and bleaching purposes. Mulhouse is the centre of the Alsatian industry, and Guebwiller, Colmar, and Thann are among the other towns mainly dependent upon it. In 1914 the region possessed about 1,900,000 spindles, or over 15 per cent of all the spindles in Germany. After the loss of Alsace in 1870, a number of French manufacturers withdrew from that province, and, taking advantage of the water-power on the west of the Vosges, built up there a new cotton industry, with Epinal as its centre. This region, which includes the manufacturing towns of St. Die, Remircmont, and Senones, along with Belfort farther to the south, made rapid progress, and in 1914 had about 3,000,000 spindles, or 40 per cent of the total number in France. The districts round the Vosges have not the same advantages as other cotton manufacturing areas in respect to atmospheric conditions and facilities for obtaining raw material, but they are well organized and are able to draw upon a steady supply of labour from the agricultural districts.

In 1904 deposits of potash were accidentally discovered in the Rhine plain to the north-west of Mulhouse, and mining operations were begun in 1910. The field, which has an area of about 65 square miles, is believed to be sufficient for the needs of the world at its present rate of consumption for many years to come. Its discovery and the restoration of Alsace to France have broken the German monopoly in soluble potash salts, which arose from the fact that in Alsace and the Stassfurt region were the only really large deposits of such salts known to exist.

COMMUNICATIONS. The distribution of ways of communication in France is determined to a considerable extent by the physical features of the country, and the same geographical conditions which have made Paris the capital have made it the centre of the railway system. There are seven important French railways, and the lines of five of these radiate from Paris. Each serves a separate sector of France, and, consequently, there is little competition for local traffic, though for long-distance traffic there is considerable rivalry.

The *Chemin defer du Nord* serves the busiest and most industrial

part of France. The main lines, which have few physical difficulties to overcome, are those which connect Paris by way of Amiens with Calais, Dunkirk, and Lille, and that which follows the valley of the Oise for Maubeuge on the Belgian frontier, and forms part of the railway route to Cologne. The Nord, therefore, performs three important functions: it connects Paris with the ports for Britain; it serves the industrial region on the coalfield of the North; and it connects France with the plain of Northern Europe.

The *Chemin de fer de VEtat* now includes the lines formerly owned by the *Chemin de fer de l'Quest*. These run from Paris to Dieppe and Havre, following the valley of the Seine to Rouen; from Paris to Caen and Cherbourg; and from Paris by Laval to Rennes, and along the northern coastal plain of Brittany to Brest. The chief lines of the old State railway connected Paris with Bordeaux by Chartres, Saumur, Niort, and Saintes; and Nantes with Bordeaux by La Rochelle and Rochefort. The most important part of the whole system is that between Paris and Havre, a great port of France.

The *Chemin de fer Paris.Orleans* connects these two towns. The main line then follows the Loire as far as Tours, where it divides, one branch continuing along the river to Nantes and St. Nazaire, and the other striking south by Poitiers to Bordeaux. Another line over difficult country connects Orleans with Toulouse. The Paris.Orleans railway brings the basin of Paris into communication with the Atlantic ports, and by means of the *Chemin de fer du Midi* offers a choice of routes to Spain. The railway begins at Bordeaux. One line runs by Bayonne to the Spanish frontier, while another goes by Toulouse and the depression of Naurouse to Narbonne, whence there are lines to Cette and by Perpignan into Spain.

The *Chemin de fer Paris.Lyon.Mediterranee* has the greatest mileage of any of the French systems. Its most important line runs from Paris by Lyons to Marseilles, following the valleys of the Seine, the Yonne, the Saone, and the Rhone. From this line there breaks off at Dijon a branch which strikes across the Jura to Vallorbe by the Mont d'Or tunnel and connects with the Swiss railways. At Macon another important line diverges, and after following the valleys of the Isere and the Arc passes through the Mont Cenis tunnel into Italy. From Marseilles there is a line along the coast into Italy. The traffic on the main line of the P.L.M.

is very important, for not only does it bring the Paris basin into communication with the Mediterranean, but along it there also passes much of the traffic with Switzerland and Italy. Another branch of this railway runs from Paris to Nimes and Cette by the valleys of the Loire and the Allier, but the route is a difficult one, and there are many obstacles to overcome.

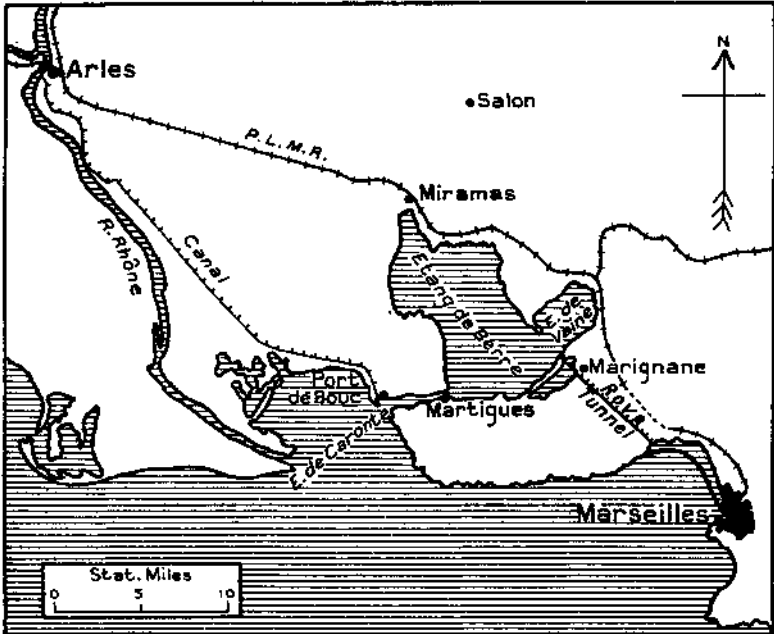
One line of the *Chemin de fer de l'Est* follows the Marne to Epernay, crosses by Reims to the valley of the Meuse, and follows it to the Belgian frontier on the way to Namur; a second line leaves the first at Epernay, continues up the Marne to Vitry, and then goes by Nancy to the borders of Alsace at the Gap of Saverne, while a third, going from Paris by Troyes and Chaumont, turns the southern extremity of the Vosges at the Gap of Belfort and likewise arrives on the borders of Alsace. These two lines are linked up with Strasbourg and Mulhouse respectively by branches of the *Alsace Lorraine* railway, the main line of which connects the two towns and is continued to the north. In Lorraine a line runs from Sarrebourg, on the Nancy-Strasbourg route, by Metz into Luxembourg; with this line the Saar coalfield is connected at various points. The *Est*, therefore, serves the mineral region of France and has important connections with Germany, the Paris-Strasbourg line forming part of the Orient route.

Within recent years the scarcity of coal in France has induced engineers to consider the possibility of using hydroelectric power on the French railways. At the present time a considerable part of the Midi system is worked by electric power derived from the Pyrenees and Cevennes, and the waters of the Dordogne and other rivers have been used for the electrification of a small part of the Paris-Orleans line. It has also been proposed to convert the P.L.M. system, the power to be supplied by the Rhone and the rivers of the Alps and Central Massif.

INLAND WATERWAYS play an important part in the movement of goods from one part of France to another. They belong to three classes—free, rivers, canalized rivers, and canals—and they are connected with one another so as to form an extensive and fairly complete system.

The Seine stands by itself. As far as Rouen it is navigable by ocean-going steamers of small size, and even to Paris it is ascended by vessels from abroad. Of waterways navigated by specially

constructed boats, the most important are those which connect the north and east of France with one another and with Paris. A network of canals and canalized rivers extends from Calais and Dunkirk over the coal-producing and industrial area, connected on the one hand with the Belgian waterways of the Lys and the Scheldt,



MARSEILLES

and, on the other, by the Canal de St. Quentin with the Oise, which is in turn connected by canal with the Sambre. The Oise with its canal extensions is one of the most important inland waterways in France and carries large quantities of coal to Paris. It is connected by canals with the lateral canals of the Aisne and the Marne; the latter is joined at Vitry-le-François by the Marne-Saone and the Rhin-Marne canals. The Canal de l'Est, which runs from north to south, brings into touch with one another the Meuse, the Aisne, the Marne, the Moselle, and the Saone. These different waterways enable coal and even cotton to be imported into Eastern France, and iron and iron ore to be exported.

The Seine is connected with the lateral canal of the Loire, which

extends from Briare to Roanne, by the Canals du Loing and de Briare, while the Canal du Centre joins the Loire with the Saone near Chalon. The Seine is also connected with the Saone by its tributary the Yonne and the Burgundy canal. The Rhine.Rhone canal connects these two rivers by the Gap of Belfort.

With the restoration of Alsace.Lorraine, France once more obtained a frontage on the Rhine, where its chief port is Strasbourg. Since the deepening of the channel between Mannheim and Strasbourg, the latter port has been accessible to large barges unless the river happened to be exceptionally low. Above Strasbourg navigation is much more difficult on account of the velocity of the river and the low level of the water during the greater part of the year. To remedy this state of affairs various schemes have been suggested. That favoured by the French is a lateral canal in Alsace which would enable large barges to make their way upstream as far as Basel, and at the same time provide a large amount of water.power for industrial purposes. A barrage recently constructed across the Rhine at Kembs makes navigation easier above that point, and will enable the water of the Rhine to be turned into the Alsace canal when it is constructed.

On the Rhone and the Saone, traffic is much impeded by the character of the river, and the movement of goods is largely downstream. A canal from Aries joins the Rhone to the Mediterranean at Port de Bouc. The 600.ton barges which pass along it may then go by the Etang de Caronte and the Etang de Berre to the four.mile long Rove tunnel whose southern entrance opens into the sheltered harbour of Marseilles. There is also a proposal to improve the Rhone by a system of barrages and canals so that it will be navigable as far as Lake Geneva. The plans at present under consideration make provision for water.power and irrigation on an extensive scale. The Canal du Midi, which carries only a small amount of traffic, places the Mediterranean in communication with the lateral canal of the Garonne and so with the Atlantic.

Bulky materials constitute the greater part of the traffic on all these canals. In 1913, for example, 80 per cent, and in 1928 70 per cent of water.borne goods consisted of coal and coke, building materials, and agricultural produce. But, notwithstanding the fact that water transport is cheaper than transport by rail, the amount even of bulky goods carried by rail is much greater than

that carried by water. Among the disadvantages with which French waterways have to contend are the slowness of transit, the greater length of the journey (60 per cent on the average), the want of good inland ports, and the inadequate facilities on some of the canals for the transference of goods to or from the railways.

COMMERCE. France, facing alike the North Sea and the Channel, the Atlantic and the Mediterranean, with good internal communications, and with easy access to Central Europe, occupies a position very favourable to commerce. Its position, its varied agricultural resources, its comparative poverty in minerals, and the skill and aptitude of its people, determine the nature of its trade, the general features of which are indicated by the tables given below.

The following table shows the value of the imports for home consumption and the exports of domestic produce for the years 1929.31—

	Imports	Exports	Average rate of exchange (At par 124.2 francs = £1)
	(in million francs)		
1929	58,220	50,139	124.02
1930	52,510	42,835	123.88
1931	42,199	30,421	115.63

The following table shows the average imports and exports of the more important commodities for the years 1929.31—

Imports	Percentage of total imports	Exports	Percentage of total exports
Coal and coke ..	8	Silk	7.4
Wool	6.6	Woollen goods ..	6.2
Raw cotton ..	6	Machinery ..	4.7
Machinery ..	5.7	Cotton goods ..	4.6
Cereals	5.1	Iron and steel ..	4.5
Wines	4.6	Metals	3.9
Oilseeds and fruits	3.9	Raw wool ..	3.3

The principal importing and exporting States are as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
Germany ..	13.6	United Kingdom	15.8
United States ..	11.2	Belgium ..	13.2
United Kingdom	7.7	Algeria	10.6
Belgium ..	7.7	Germany ..	9.4
Algeria	6.3	Switzerland ..	7.1
Argentine ..	3.3	United States ..	5.9

Among the principal food-stuffs imported are wheat and wine from Algeria, cereals from United States and the Argentine, wines from Spain, coffee from Brazil, and sugar and rice from the French colonial possessions. Of raw materials, cotton comes from the United States, Egypt, and India, wool from the Argentine and Australia, and silk from Italy, China, and Japan, oils and oilseeds from Italy, India, and the West Coast of Africa, and hides from India. Coal and coke to the extent of about 28,000,000 tons are imported mainly from Germany, Great Britain, and the Saar. Manufactured goods consist largely of machinery and textiles from Great Britain and machinery from Germany. The food-stuffs exported include wine, sugar, and dairy produce; the raw materials are chiefly iron ore from Lorraine and wool; while the manufactured goods consist of textile materials, furniture, clothing, leather, chemical products, and automobiles. Great Britain and Belgium are the chief customers, but many of the articles sent to the former in the first instance are for transmission abroad.

The chief ports of France in order of importance, according to tonnage of goods imported and exported, are Rouen, which received a great impetus during the War; Marseilles, through which the bulk of the trade with the Mediterranean and the East passes; Havre, which has an extensive trade with North and South America, and imports cotton, wool, and copper; Dunkirk, which is equal with Havre, is growing as the port of the industrial region of North France; it imports wool from South America; and Bordeaux, which trades with the West Coast of Africa and with South America, and is the chief town in France for the exportation of wine,

CHAPTER VIII

BELGIUM

BELGIUM, with an area of 11,752 square miles, is one of the smallest countries in Europe. In 1930 it had a population of over 8,092,000. The south.eastern region, which varies in height from 500 to over 2,000 feet, belongs to the plateau of the Ardennes, and consists in the main of Devonian slates, though Cambrian rocks appear in some of the more elevated districts. Along its northern border, partly within the Devonian area, but partly without it, lies a belt of Carboniferous rock which is traversed by the valleys of the Sambre and the Meuse. Beyond this are the Tertiary sands and loams, which cover the greater part of Belgium, and of which the most fertile is the loess.like formation known as the "loam of Hesbaye"; it extends over the greater part of the district of Hesbaye and of the provinces of Brabant and Hainaut, but its agricultural value varies considerably from one place to another. In the north.east, in Antwerp and Limburg, there is a great sandy tract known as the Campine. The remainder of the country is almost entirely covered by Quaternary formations: in Flanders, in the north.west, between the loam.lands and the sea, there is first a belt of country covered with sand, but underlaid in the south by clay; then a stretch of low.lying land which has been drained and formed into polders, and lastly a line of sand.dunes which, along with artificial walls, prevents the encroachment of the sea.

The climate is somewhat warmer in summer and colder in winter than the south.eastern part of England. The mean temperature for July is about 63° F. and for January about 35° F., except in the Ardennes, where the summers are cooler and the winters more severe. The rainfall, which occurs chiefly in the summer and autumn months, ranges from 20 to 40 inches.

THE ARDENNES PLATEAU, with its bleak climate and infertile soil, is of relatively little economic importance. Much of the region is still forested, but deciduous trees are being replaced by coniferous. Oats and rye are grown, and on the improved pasture lands cattle are raised. Butter.making is an important industry, pigs are fed

on skimmed milk, and store cattle are reared for export to the more fertile lowlands. In the deep valleys, which are entrenched in the plateau, climatic conditions are more favourable, and various fruits, including the vine in the valley of the Meuse, are cultivated. The population is scattered, and in the province of Luxembourg averages only 130 per square mile as against 635 per square mile for the whole of Belgium.

THE CARBONIFEROUS AREA is one of great importance. The chief coal deposits lie in a long narrow trough, which extends from Liege through Namur into Hainaut, and which is separated from the Ardennes by a great fault. In the west the Belgian coalfields are continuous with those of the north of France, while in the east they are connected with the German coalfield of Aachen. The principal mines are situated around Liege, Namur, Charleroi, and to the south-west of Mons, the most productive being those around Charleroi, which produce over one-fourth of the Belgian output of 27,000,000 tons per year. Many of the coal seams lie at a great depth and, owing to folding, faulting, and overthrust, are frequently worked only with considerable difficulty. The total available resources of this region have been estimated at between 15,000 and 16,000 million tons, but this includes many seams of which little is as yet known.

Many important industries have grown up in this region where coal is so abundant, and among these the manufacture of iron and steel holds a foremost place. Iron-ore was formerly obtained from the Ardennes, but the amount produced there is rapidly decreasing, and France and Luxembourg now supply the bulk of the raw material. In and around Liege and Charleroi there are many blast furnaces, and all kinds of iron and steel goods, locomotives, and machinery are made. Liege, in addition, has long been noted for the manufacture of ordnance and firearms. Belgium is able to export large quantities of cheap iron and steel goods, partly on account of the relatively low cost of labour, and partly because transport to the coast is rendered easy by the magnificent system of waterways which the country possesses.

Glass is manufactured in the vicinity of the coal mines, Charleroi being the chief centre of production. In addition to coal, which is at hand, large quantities of excellent sand are found in the Campine, and limestone appears along the northern border of the Ardennes;

but the industry, which is an old-established one, undoubtedly owes much at the present time to the inherited skill of those who are engaged in it. Chemical products and ceramic wares are also extensively, but not exclusively, produced upon the coalfields. Sulphuric acid is manufactured near Liege, in the vicinity of the zinc works which formerly obtained their raw material from the Vieille Montagne in the neutral territory of Moresnet, but are now compelled to import the most of it from abroad. Superphosphate of lime is manufactured in the same locality with phosphates obtained partly at home and partly abroad, while carbonate of soda is largely produced in the neighbourhood of the glass-works, where it is in great demand. The earthenware and brick-works situated in this region obtain the coarser material which they require from the clays underlying the loam of Hesbaye, while finer clays are found near Mons, to the south of Charleroi, and elsewhere. Venders, situated on the dividing line between the Ardennes and the Carboniferous region, is, with its neighbourhood, the great centre of the woollen industry in Belgium, and owes much of its prosperity to the excellent facilities for washing wool provided by the pure waters of the Gileppe dam. Large quantities of foreign wool imported by way of Antwerp are washed at Venders before being dispatched for manufacture in Central Europe.

CENTRAL BELGIUM AND FLANDERS. The loam lands of Central Belgium constitute the most fertile part of the whole country. Wheat is the principal cereal crop, and the yield per acre is high; sugar beet is cultivated on an extensive scale, and flax, chicory, and other industrial crops are grown. In Flanders the districts covered by sand have been greatly improved by the cultivators raising the underlying clay, where it is at no great depth, and mixing it with the sand. In this and in other ways a region, which would have been, if left to itself, as barren as the greater part of the Campine, has been rendered most productive. Rye, potatoes, and flax are the principal crops. In the rich soil of the polders wheat and barley, flax, sugar-beet, and other crops are grown; large numbers of cattle are raised, and dairying is an important pursuit of the inhabitants.

The industrial activity of the whole of this region is of considerable antiquity. In the Middle Ages the towns situated within it were able, largely on account of their central position on the

plain of Northern Europe, to engage both in commerce and manufactures; and in the thirteenth and fourteenth centuries they were noted especially for their production of woollen goods. As a result of various political and economic changes they fell for a time into a state of decadence, but succeeded during the nineteenth century in regaining something of their old importance. The manufacture of linen is carried on mainly at Ghent, Courtrai, and other towns in or near the flax-growing districts, but the supply of home-grown flax is unable to meet the demand, and large quantities are imported from Russia and elsewhere. Much of the flax which is grown in Belgium itself is retted at Courtrai, where the waters of the Lys are particularly adapted to giving the fibre a soft and silky appearance and great tenacity; and large quantities of it are exported to the United Kingdom where it is much in demand. On the other hand, Belgium imports from Ireland a considerable amount of the finer kinds of yarn which the climatic conditions of the latter country enable it to produce. The cotton industry of Belgium, with over 2,000,000 spindles in operation, has its chief centres at Ghent and Alost in East Flanders, in the district round Nivelles, and in Brabant. The first of these is the most important town engaged in the industry, and contains about one-half of the spindles in the country, and, though it is somewhat more remote from coal than the districts in the south, it is able to import its raw cotton more easily by means of the Terneuzen Canal. Ghent is also the chief centre of the weaving industry. Other textile pursuits include the manufacture of jute and hemp.

Other industries include shipbuilding at Antwerp, the production of chemicals in the neighbourhood of the textile centres, and the manufacture of bricks, earthenware, and porcelain in the large towns with clay obtained partly from the valley of the Rupel, especially in the vicinity of Boom, and partly from abroad. At the ports a great variety of articles are made for which the raw material has to be imported. In diamond cutting Antwerp has now become a serious rival to Amsterdam, partly as a result of the increased output of diamonds from the Kasai district in the Belgian Congo.

THE CAMPINE. Although there are still great stretches of sand and heath in this region, parts of it, especially in the west, have been developed by afforestation, by irrigation, where that is possible,

and by the improvement of the soil. Rye, oats, and potatoes are the chief crops, but they are grown mainly to provide food for milch cows, dairying and the fattening of calves being important pursuits. The Campine may, indeed, be the seat of considerable economic activity in the future. About 1900 coal was discovered under more recent formations, and various soundings which have since been taken encourage the belief that the resources of the region are very considerable. But there are great difficulties in the way of exploiting the coal owing to the depth at which it lies and the water-logged nature of the covering ground; in some cases freezing is necessary before the pits can be lined. The field is, however, proving of considerable value, as it produces bituminous and gas coal, in which Belgium is deficient. The output, which is steadily increasing, is now over 3,000,000 tons.

COMMUNICATIONS. Over the greater part of Belgium geographical conditions favour the free movement of railways, and it is only in the south that their distribution is affected, except in a minor degree, by the physical features of the land. Brussels, upon which many of the most important lines converge, may be regarded as the centre of the whole system. It is connected with the French Northern Railway by two lines, one of which goes to Calais by Tournai and Lille, and the other to Paris by Mons and Maubeuge. From Maubeuge another line, connecting Paris and Berlin, runs by the Sambre and the Meuse past Charleroi and Namur to Liege, whence it goes by Verviers to Aachen, and then on to Cologne. Namur, which has direct communication with Brussels, is connected with Paris by a line which follows the Meuse and its tributary the Virouin, and joins the Northern Railway at Hirson. From this railway there breaks off a branch, which, after running along the valley of the Lesse, joins a line which has come by the valley of the Ourthe from Liege (like Namur in direct communication with Brussels) and then continues its course southwards by Luxembourg to Metz. North of Brussels the most important railway is that which runs by Mechlin and Antwerp towards Amsterdam. From Mechlin one line going by Ghent, which is connected with Antwerp, joins the railway from Brussels to that town, and proceeds by Courtrai to Lille or by Bruges to Ostend, a packet station for the United Kingdom; while another meets the Brussels-Liege line at Louvain.

There are over 1,000 miles of good waterway in Belgium, 900 miles of which are owned by the State. The lower Scheldt and the Rupel are tidal rivers, but it has been necessary to canalize the Lys, the upper Scheldt and the Dendre, the Sambre and the Meuse, in order to render them navigable. The Lys and the Scheldt are connected with the canal system of north.eastern France, while the Sambre has been linked up with the Oise, and the Meuse with the Aisne and the Marne. The Meuse and the Scheldt also connect the waterways of Belgium with those of Germany and Holland. Of the canals the most important are the Canal de Jonction, which connects the Meuse and the Scheldt; the Charleroi.Brussels canal and its continuation from Brussels to the Rupel; the Ghent.Bruges canal, which connects these two towns and is continued to Ostend; and the Terneuzen canal which, by opening up a route from Ghent to the Scheldt, has converted that town into a seaport. The waterways in the west and south.west of Belgium connect that country with the coalfields of the north of France, and the iron.ore deposits of Lorraine; and those in the centre and east bring the coal.producing areas and other industrial districts into communication with one another and with the coast. At present the traffic of the Meuse and Moselle regions can be carried on more advantageously by Rotterdam than by Antwerp. The Antwerp.Liege Canal, in course of construction, will remedy this and will aid in the development of the Campine, through which it will pass.

FOREIGN TRADE. A careful distinction must be drawn between the special and general exports and imports. In this paragraph only the special trade is discussed. The imports consist largely of food.stuffs and raw materials, while goods, wholly or partly manufactured, make up the bulk of the exports. Belgium's chief commercial relations are with the neighbouring countries of France, Germany, the Netherlands, and the United Kingdom, though large quantities of wheat are imported from the United States, the Argentine, and Canada, and wool from the Argentine and Australia. Among the other imports at the present time are iron and steel goods and machinery from Great Britain, France, and Germany, chemicals from Germany and Great Britain, raw cotton from the United States, flax from France and Holland, wood from the Baltic countries, and meat from the Argentine. The exports include coal which is sent to France and the Netherlands, iron and steel goods and machinery

to various parts of the world, glass ware to Great Britain and Germany, and sugar to Great Britain.

The important transit trade of Belgium is conducted mainly through the port of Antwerp, which is connected by navigable waterways with France, Germany, and Holland. Among the goods imported for distribution in Europe are grain, wool, copper and other minerals, and rubber. The wool, however, by being washed at Verviers, undergoes a process preliminary to manufacture and is now entered under special trade in the Belgian statistics. The exports from Europe by Antwerp and other ports consist largely of manufactured goods, much of which comes from Germany.

The following figures show the special trade for 1929-31—

	Imports	Exports	Average rate of exchange (At par 175 francs or 35 belgas = £1)
	(in million francs)		
1929	35,530	31,783	34.90
1930	30,927	26,060	34.92
1931	23,741	23,016	32.31

The following table shows the average imports and exports of the more important commodities for the years 1929-31—

Imports	Percentage of total imports	Exports	Percentage of total exports
Grain and flour ..	9.3	Iron and steel ..	14.2
Coal	5.1	Precious stones ..	5.0
Wool	4.2	Coal	4.0
Precious stones ..	3.5	Glass	3.9
Wood and timber	3.4	Piece goods ..	3.5
Iron and steel ..	3.3	Woollen manufac.	
Copper	2.8	tures	3.3
		Copper	2.6

The chief importing and exporting countries are as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
France	18.3	United Kingdom	19.3
Germany	15.5	France	15.0
Netherlands ..	12.9	Netherlands ..	12.7
United Kingdom	9.6	Germany	11.3

The Duchy of Luxembourg is now included with Belgium in the Belgo-Luxembourg Economic Union.

CHAPTER IX

HOLLAND

HOLLAND has an area of 12,582 square miles and a population which, in 1930, numbered 7,935,000. Although all the great geological periods are represented in the country, nearly 99 per cent of the whole area is of Quaternary age. Over two-fifths of it consists of diluvial lands formed by material either carried down from the north by the Scandinavian ice-sheet, or brought from the south—especially from the Rhine massif and the Ardennes—by the Meuse and the Rhine. This region, which includes the east of Friesland and south of Groningen, practically the whole of Drenthe and Overijssel, the most of Gelderland, the east of Utrecht, and the greater part of North Brabant and Limburg, is a dry, sandy or stony country in which water and bog alternate with stretches of land on which no vegetation can grow. The elevation varies from a few feet above sea-level to over 300 feet in the Veluwe. In the detached part of Limburg in the south-east, older rocks, including the Coal Measures, appear, and in places the land rises to a height of over 1,000 feet.

The remainder of the country is of alluvial origin; much of it lies below sea level, and, with the exception of the sand dunes along the coast, very little rises more than a few feet above sea level. Hence, this region is practically the creation of man, and, if it were not for the dikes which have been built by him, much of it would be liable to submergence by rivers or by the sea. In many places, lakes, lagoons, and marshes have been drained and formed into polders, and, along the coast, land is also being reclaimed at the expense of the sea. The west of Groningen and Friesland, North and South Holland, Zeeland, and parts of Gelderland, Utrecht, and North Brabant, all fall within this region. The reclamation of the Zuider Zee is now in progress. If the scheme is carried out as at present devised there will be added to Holland within the next twenty years an area of 800 square miles.

CLIMATE. The most important factors controlling the climate of Holland are the proximity of the sea, and the prevalence of the winds which blow from it. The winters, though somewhat colder

than in the south.east of England, do not attain the severity of the continental type, and the mean temperature for January is about 34° F. For similar reasons the heat of summer is not very great, and the mean temperature of July is about 65° F. The rainfall is not excessive, owing to the absence of hills, and only in the neighbourhood of the coast does it exceed 30 inches. On the other hand, the humidity of the atmosphere is high, especially in the west, where the proximity of the sea and the want of natural drainage contribute to this result.

NATURAL REGIONS. The great difference in fertility, which exists between the alluvial soils and the diluvial, justifies the division of the country into two main natural regions, the alluvial and the diluvial. But in explaining the development of the industry and commerce of Holland two other factors, one historical and the other geographical, must be taken into consideration. The circumstances in which the Dutch achieved their independence at the end of the sixteenth century led to a long struggle with Spain in the course of which they built up a colonial empire, part of which has remained in their hands to this day. It is to this fact that is due the large colonial trade of Amsterdam, and the manufacture of colonial products in which it is engaged. In the second place Holland is the delta of the Rhine, one of the most important commercial rivers of Europe, and much of the raw material required by German industries makes its way into the country through Dutch ports. There is thus a large transit trade in which many people are either directly or indirectly employed.

THE ALLUVIAL REGION is the most important from both the agricultural and the industrial point of view. It contains the greater part alike of the cultivated land and of the grassland of Holland. The fertility of the soil and the humidity of the climate combine to make the region an ideal one for dairying purposes, and Dutch cattle, especially those of the Friesian breed which are well adapted to the clay soils of the polders, are noted for their milk. The manufacture of butter and cheese is an important industry, and large quantities of both are exported; in Friesland and Groningen the bulk of the output comes from co-operative dairies, but in Holland the individual farm is the chief producer. On the cultivated lands, cereals (wheat, barley, and oats), roots (potatoes, sugar.beet, and chicory), grains (mustard and colza), and flax are

grown. In North and South Holland, and more especially at places like Haarlem on the margin of the alluvial soils, where clay and sand can both be obtained, many people are engaged in horticultural occupations, and large quantities of vegetables, fruits, flowers, and bulbs are exported.

The chief manufacturing districts are also situated within this region which contains most of the large towns, and over 60 per cent of the total population of the country. Amsterdam and Rotterdam, on account of their position as ports, are engaged in shipbuilding and in employments subsidiary thereto. Around Rotterdam and at Dordrecht many kinds of machinery are manufactured with raw material imported from abroad. The sugar industry is twofold. At the ports, more especially at Amsterdam, there are refineries in which is prepared for consumption cane.sugar imported from Java and other Dutch possessions in the East Indies, while in the districts where sugar.beet is grown there are numerous factories for the manufacture of sugar. Brewing and distilling are both extensively carried on, and Schiedam is noted for its gin, the excellence of which is said to be due in part to the quality of the water obtained in the vicinity. Bricks and tiles are made in many places where suitable clay can be obtained, and Delft and The Hague manufacture all kinds of pottery. Tilburg is the centre of the woollen industry. Amsterdam is engaged in the preparation of colonial produce, such as cocoa, and in diamond.cutting. Other industries depending in whole or in part on imported material are the manufacture of margarine at Rotterdam, and of tobacco in various parts of the country.

THE DILUVIAL REGION contains much land which is altogether unfit for cultivation, and much which can only be rendered fit by heavy expenditure both of labour and capital, though, with the establishment of fen colonies in various places, considerable areas have been reclaimed. Rye, buckwheat, oats, and potatoes are the principal crops of the arable districts, while in the pastoral areas cattle and sheep are raised, the former being of the Gelderland breed which thrives well on poor soils. The south of Limburg, which is much more fertile and rather resembles the neighbouring part of Belgium, produces large crops of wheat and sugar.beet, and the population is denser than in other parts of the diluvial region. Various manufactures which have been established are

aided by the coal from the only productive coalfields of Holland, those of Limburg, which have an average annual output of nearly 12,000,000 tons. Maastricht is engaged in the woollen industry, and manufactures glass and ceramic wares. In the Twenthe district of Overyssel several small towns, including Enschede, Hengelo, Almelo, and Oldenzaal, are occupied in spinning and weaving cotton, and weaving has also spread into Gelderland and North Brabant. The industry has few natural advantages, and probably owed much, in the earlier stages of its development, to the special privileges it then enjoyed for the sale of its products in the Dutch colonial possessions.

COMMUNICATIONS. The principal railways are those which place the Dutch ports in communication with Germany and Belgium. From Wesel on the Rhine one route leads by Emmerich and Arnheim to Amsterdam, another by Cleve and Dordrecht to Rotterdam and the Hook of Holland, and a third by Breda to Flushing. Amsterdam and Rotterdam are connected with Berlin by a line running eastwards by Oldenzaal to Osnabriick, and with Brussels and Paris by one which goes southwards by Dordrecht and Antwerp.

The chief waterway of the country is the Rhine, which takes in succession the names of Waal, Merwede, and Maas. Below Rotterdam it is connected with the ocean by an artificial waterway known as the "Nieuwe Waterweg." Ships going to Amsterdam avoid the voyage through the Zuider Zee by availing themselves of the North Sea Canal, which has its outlet at Ymuiden. The Merwede Canal connects Amsterdam with Utrecht and the Rhine, by way of the Lek and the Merwede; and the Zuid Willem's Kanaal replaces the Maas below Maastricht, where it becomes unsuitable for navigation. The Juliana Canal from Maastricht to the canalized Meuse will, when completed, connect the Dutch minirfg area by water with the rest of Holland. In addition there are, in the alluvial district especially, a great number of minor canals which are of much value for the conveyance of agricultural produce.

FOREIGN TRADE. The principal imports include raw cotton and grain from the United States; coal from Germany; iron and steel goods, chemicals, and clothing from Germany and Belgium; machinery from Germany and the United Kingdom; and cotton yarns from the United Kingdom. The exports, which include dairy produce,

vegetables and fruits, coal and cotton goods, find their principal markets in Great Britain, Germany, Belgium, France, and the Netherlands East Indies.

For the three years 1929.31 the value of the special trade was as indicated below—

	Imports (in thousand gulden)	Exports	Average rate of exchange (At par 12-107 gulden = £1)
1929	2,752	1,989	12-09
1930	2,418	1,718	12-08
1931	1,892	1,311	11-26

The following figures show the chief imports and exports for the years 1929.31—

Imports	Percentage of total imports	Exports	Percentage of total exports
Grain	6.6	Cotton goods ..	4.7
Coal	4.6	Vegetables ..	4.7
Oilseeds	4.2	Cheese	3.9
Iron and steel ..	3.8	Coal	3.8
Timber	2.8	Meat	3.8
Chemicals	2.7	Butter	3.7
Electrical appa- tus	2.3	Bulbs	2.3

The following are the chief importing and exporting countries during the same years—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
Germany ..	31.5	Great Britain ..	22.1
Belgium ..	10.4	Germany ..	21.2
United Kingdom	9.1	Belgium ..	11.2
United States ..	8.9	Netherlands East Indies ..	7.4

CHAPTER X

GERMANY¹

BY the Treaty of Versailles (1919) Germany lost a considerable extent of territory. Alsace-Lorraine was restored to France, and the administration of the Saar handed over to her for fifteen years. Eupen and Malmely were given to Belgium, and the northern part of Schleswig-Holstein returned to Denmark. In the east, Posen, with the exception of its western districts, and parts of West and East Prussia were ceded to Poland, while Danzig and Memel were placed under the League of Nations. At a later date the south-eastern districts of Upper Silesia were transferred to Poland by the Council of the League of Nations. As a result of these changes Germany, which at the outbreak of war had an area of 210,248 square miles, lost about 27,000 square miles of its territory. Its population in 1925 numbered, 63,180,000.

In the new German State three great physical areas may be distinguished : the Alpine Foreland, the Central Highlands, and the Northern Lowlands. The first of these regions, which slopes down towards the north, has an average elevation above sea level of about 1,300 feet, and extends from the Alps in the south to the Danube in the north, and from the Lake of Constance in the west to the Salzach-Inn in the east, while a slight extension lies to the north of the Danube between the Bavarian Forest and the Franconian Jura.

The Central Highlands have a more varied topography. In the west, the rift-valley of the Rhine, which has a length of about 200 miles, and a breadth of about 20, has been let down between the Black Forest and the Odenwald on the east, and the Vosges, Lower Vosges, and Hardt on the west. The southern parts of the Vosges and the Black Forest are both formed of ancient rocks, mainly granite and gneiss, but farther north Bunter sandstone prevails, except in the west of the Odenwald, where crystalline rocks again come to the surface. After leaving the rift-valley,

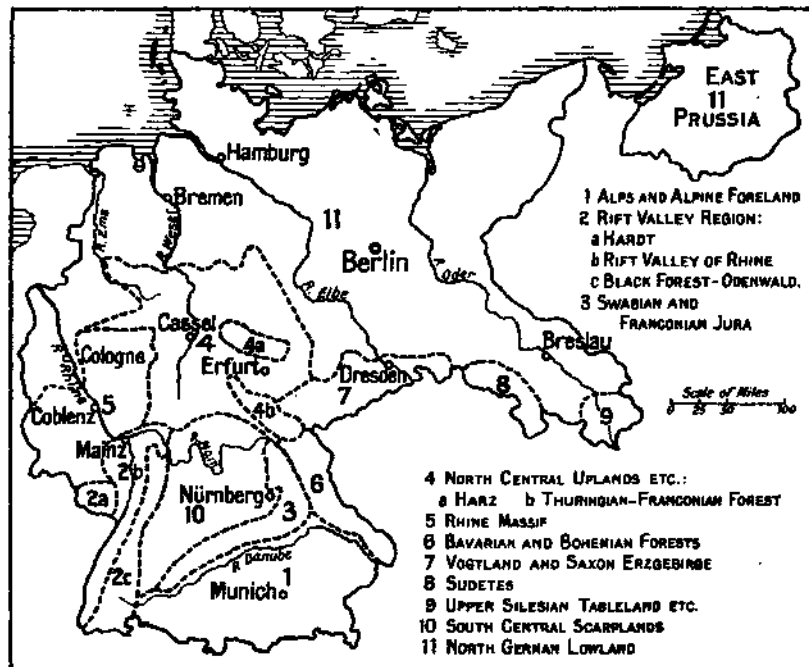
¹ For Central Europe, and especially for Germany, E. de Martonne's *Europe Centrale* is invaluable (Geographic Universelle, Armand Colin, Paris).

the Rhine makes its way in a deep gorge through the Rhine massif, which consists mainly of Devonian schists and forms an undulating plateau with an average height of about 1,600 feet. The Taunus and the Westerwald lie on the right of the river, the Hunsrück and Eifel on the left. In the north, the Westerwald passes into the Sauerland, along the northern border of which is the Ruhr coal basin. The Eifel, which connects the Rhine massif with the Ardennes, shows many traces of recent volcanic activity.

The Swabian Jura, lies north of the Danube, and forms an acute angle with the Black Forest; it consists of a broad undulating tableland of Jurassic limestone, which slopes down steeply to the Neckar, but gently to the Danube. Its average height is about 2,500 feet, and its rugged character has given to it the name of Rauhe Alp. Towards the east, the tableland formation is continued northwards under the name of the Franconian Jura, which is hilly rather than mountainous. The whole area surrounded by the uplands just described, that is, the greater part of the basins of the Neckar and the Main, is covered by Triassic rocks, which form a scarped or terraced land. In the west, Bunter sandstone is the prevailing formation; the centre is occupied by shell limestone or "muschelkalk," while in the east and south the red marls of the Keuper extend to the belt of Lias at the foot of the Jurassic escarpment.

To the north of the scarp lands, the Triassic formation extends over the uplands of Hesse, though the Vogelsberg, the Rhöngebirge, and other heights, are of volcanic origin; it also covers the Thuringian basin, which lies between the Thuringian Forest and the Harz Mountains, both fragments of the ancient Variscan Chain. Along the course of the Weser, and following the same direction as the Harz are the sub-Hercynian Hills, which include the Teutoburger, and the Wiehen Gebirge, both of Secondary formation. East of the Triassic lands lies the Bohemian massif, to be more fully described later. Belonging to it are the Bohmerwald, the Erzgebirge, and the Sudetes, all of which form part of the borderland of Germany. To the north of the Central Highlands is the North German Lowland, which stretches across the country from west to east, and lies within the plains of northern Europe. It is undulating rather than flat, but its elevation seldom exceeds 600 feet.

CLIMATE. The climate of Germany is, on the whole, transitional



NATURAL REGIONS OF GERMANY

between the relatively equable maritime type characteristic of the west coast of Europe, and the extreme continental type which prevails in Russia. From the districts which border the North Sea the general tendency is for the winters to become colder and the summers warmer towards the south and the east. In January the mean temperature in the north-west is above freezing point, and the district between the Rhine and the Weser is only a few degrees colder than East Anglia, while in July it is about the same, the range between the hottest and coldest month being about 30° F. In the eastern part of the North German Plain the temperature of January falls and that of July rises, so that the range between them is increased to 34°.40° F. In the scarplands of Central Germany the winters are a little colder than they are in the western part of the lowland, but the summers are at least as warm as in the eastern part. Farther south, the increasing altitude of the Bavarian plateau introduces a new factor, and while the January temperature falls 5° or more below freezing point, the July temperature is, on the whole, not so high as it is in the eastern part of the lowland; owing to the low winter temperatures, however, the range is as great as it is in the latter region. The rift-valley of the Rhine is specially favoured by its situation, and while the summers are hot the cold of winter is not extreme.

The following figures are typical of these regions—

	Jan. °F.	July °F.	Range °F.
Bremen	34.2	61.7	27.5
Posen (now in Poland)	29.9	64.0	34.1
Karlsruhe	32.9	66.2	33.3
Munich	27.3	61.4	34.1

There is rain at all seasons, though more falls in summer than at any other period of the year. The latter fact is more pronounced in the east than in the west; in the vicinity of the North Sea coast the rainfall of the other three seasons tends to be somewhat evenly distributed, but elsewhere more rain generally falls in autumn and less in winter. The annual precipitation over the North German Plain is between 20 and 30 inches, in the Central Highlands it varies according to position, but is generally over 25 inches; on the Bavarian plateau, except in the north, it is at least 30 inches.

NATURAL REGIONS. The physical structure of Germany, taken in conjunction with its climate, indicates the lines on which the division of the country into natural regions can best be made. In the south the Alpine Foreland is clearly marked off by structure, soil, and climate as an agricultural region, but one in which the geographical conditions are none too favourable for economic development. The Swabian and Franconian Jura, on account of their altitude and limestone formation, are more suitable for pastoral than for arable farming. The rift valley of the Rhine, and the mountains which border it, stand out in marked contrast to one another, the plain being agricultural while the highlands are forested. The south central scarplands and the north central uplands have a varied topography and the fertility of their soils is by no means uniform, but they contain considerable areas of cultivable land and are important agricultural regions. The belt of ancient uplands, the last vestiges of the Hercynian mountains in Germany, is of special interest because of the coalfields upon its borders; and on the margins of the Rhine plateau, the Erzgebirge, and the Sudetes, as well as in Upper Silesia, there are important manufacturing regions towards which the population of the country is steadily gravitating. Lastly, in the north the great lowland plain is in the main devoted to agriculture, though like the other agricultural regions which have been mentioned, it contains manufacturing centres which have frequently grown up without any obvious geographical advantages.

GENERAL CONSIDERATIONS. A survey of the natural regions of Germany and of their economic activities will show that in so far as respects the geographical endowment of the country is but moderate. It is worth while, therefore, to consider some of the causes which led to the great industrial development of the period between 1870 and 1914. The soil was often infertile, but although less than 10 per cent of the total area was actually unproductive, much of the land was devoted to crops which proved but little remunerative. On the other hand, the mineral wealth was considerable. Coal and lignite, it is true, had to be imported, but chiefly to those districts which lay remote from the German coalfields, while the total exports exceeded the imports. The deposits of iron ore in the Empire and in Luxembourg were the most extensive in Europe, and went far to make Germany the second iron and steel producing

country in the world. The great supplies of salt, including potash salts, not only stimulated the growth of the chemical industry, but played a most important part in the development of agriculture.

Certain other factors have, however, to be taken into account when considering the economic advance of Germany, and of these factors some are geographical while others are not. The position of the country in Central Europe, in touch with the chief industrial areas of the continent, gave it a high degree of nodality, which was increased by the development of the European railway system, and more especially by the construction of the Alpine tunnels, which provided for Germany an outlet upon the Mediterranean. Moreover, some of the chief rivers of the Continent flow through German territory, and, of these, two of the most important—the Rhine and the Elbe—connect the great industrial centres of the country with that part of the North Sea upon which converges a very large proportion of the world's commerce. But perhaps the most important factor in effecting the transition from an agricultural to a manufacturing regime in Germany was the increase in population which took place after 1870. In that year, it has been calculated, the country with its forty millions of inhabitants reached the limit of density beyond which it could not, at that time, go without ceasing to be self-supporting. A further increase meant either the import of food-stuffs or the emigration of the surplus population. Without colonies of their own, handicapped to some extent in North America and elsewhere by ignorance of the prevailing language, and unwilling, it may be, to cut asunder the ties which bound them to the Fatherland, the latter course presented obvious difficulties to the German people. On the other hand, their possession of coal, iron, timber, and other natural resources, rendered industrial development comparatively easy, though the existence of various manufactures in parts of the country where these resources do not exist shows that the movement was, in part, an artificial one. But to its success various circumstances contributed. Government help was not altogether wanting. The control of the railways by the different States, and the gradual evolution of working agreements between them, enabled a certain amount of indirect help to be given to the manufacturing interests of the Empire. Rates, for example, were so adjusted as to favour the exportation of goods by German ports, while in certain of the

more sterile parts of the country railways were laid which private companies would have found unprofitable to operate. Again, fiscal enactments sometimes played an important rôle in the establishment of a new industry, as in the case of beet.sugar, or in the maintenance of an old one, as in the case of agriculture. But much more pregnant of result was undoubtedly the readiness with which the Prussian people availed themselves of the results of scientific research. The utilization of the minette ores of Lorraine, the extraction of sugar from beet, the use of Stassfurt salts in agriculture, and the manufacture of aniline dyes, are all processes involving the practical application of scientific discoveries. Nowhere, indeed, was scientific and technical education carried farther than in Germany. In addition to numerous universities, and the great technical college at Charlottenburg, there were various institutions at which specialized instruction might be obtained. For example, there were agricultural colleges at Hohenheim and Berlin, as well as a great number of agricultural and farming schools scattered over the country; forest academies at Eberswalde, Aschaffenburg, and Karlsruhe; and mining schools at Berlin, Freiberg, and Clausthal; technical training in the manufacture of textiles was given at Crefeld, Barmen, Chemnitz, and elsewhere; and there were schools for those engaged in the ceramic industries in the districts where such industries are located.

By the War Germany lost some of its most valuable territory. The agricultural area of Posen, the Lorraine iron.field, the Saar coalfield, the Alsatian textile region, and part of Upper Silesia with its varied mineral wealth, have all passed from under its control. It is only gradually that Germany is adjusting herself to these new conditions, but some aspects of the question will be discussed as the natural regions which remain to it are reviewed.

THE ALPS AND THE ALPINE FORELAND. The German Alps, which attain their highest point in the Zugspitze (9,710 feet), belong to the outer limestone ranges of the Alps. The Foreland, which stretches northward from their foothills to the Danube and beyond, is of Tertiary formation, but is covered to a great extent with the debris distributed by the great glaciers which descended from the mountain zone. Morainal material is wide spread over a considerable area immediately to the north of the

foothills. The land is consequently of poor fertility, and was formerly occupied by numerous lakes, many of which have either silted up or been drained. Beyond the belt of morainal country there are great deposits of glacial gravels. West of the Lech these gravels extend to the Danube, but farther east their northern limit is, broadly speaking, the latitude of Munich. In the south of this latter region they are of considerable depth, and absorb water easily, so that the surface is left dry; but in the north, where they thin out, the water collects upon the underlying impermeable stratum, and the land becomes marshy, as in the neighbourhood of Munich. In the north and east of the Foreland the most fertile areas lie in the alluvial valleys and on the loess-covered terraces of the Danube, the Isar, and the Inn.

Climatic conditions are also unfavourable to agriculture over the greater part of the Foreland. Increase of altitude counteracts the advantages of decrease of latitude, and the summer temperatures are lower than farther north. The rainfall is heavy, the mean annual precipitation varying from over 60 inches in the south to less than 30 in the north. The mountains are forested to a height of about 5,000 feet, and elsewhere much of the original forest still stands. The grassland districts above the limit of tree growth, and the morainal districts of the Foreland, are largely devoted to cattle raising and dairy farming. Over the whole region nearly one-third of the land is pastoral, and in the southern districts, where rye and oats are the chief crops, more than one-half is under grass. On the other hand, on the alluvial soils of the Danube, especially between Regensburg and the Isar where wheat is extensively grown, only a small part of the surface is reserved for live stock. Hops, which form the basis of the great brewing industry of Munich, are an important crop in many places, particularly in the Danubian valley, and in the country between the Danube and Lake Constance. Round the lake, also, the climate is more genial, and there are many orchards and vineyards.

The Alpine Foreland is comparatively poor in other sources of economic wealth. Coal is not found, though some lignite is obtained. But much of the potential water power has been developed, and plants established on the Isar (between the Walchensee and the Kochelsee), the Inn (at Muhldorf), and other rivers, provide electrical energy for the use of railways and for the manufacture of

chemicals and aluminium. The cotton industry is carried on at various places, more especially at Ulm and Augsburg. Munich, which has grown up where the ancient salt route from Salzburg to the west crossed the Isar, has, in addition to breweries, machine shops, furniture works, and manufactories of scientific instruments. The clays and iron-free sands of the Bavarian Forest have led to the growth of porcelain and glass works at Nymphenburg and Regensburg.

THE RIFT-VALLEY AND THE ADJACENT HIGHLANDS. Germany, which formerly possessed both banks of the Rhine from Basel to Mainz, is now confined to the right bank as far north as Karlsruhe. The terraces of the rift-valley, and the lower slopes of the adjoining hills, are covered to a considerable depth with a finely comminuted wind-distributed soil, originally deposited by waters flowing from the melting glaciers of the Alps and the Jura. This loess, which is derived from a variety of rocks, is of great fertility, and has contributed much to the fruitfulness of the region. The climate is also favourable, as the valley is sheltered from cold winds, and in comparison with other parts of Germany the spring season comes early and is warm. Agriculture accordingly assumes considerable importance. The vine flourishes both on the plain and on the lower slopes of the hills, while tobacco and hops are widely cultivated, and fruit and sugar-beet are grown. As a result, wine, cigars, beer, sugar, and preserves are manufactured in different parts of the region.

The principal towns of the plain are the river ports of Frankfurt. On Main, Mannheim, and Ludwigshafen. Frankfurt has, in addition, large chemical works, breweries, and machine-shops, and is one of the most important banking centres in Germany, while Ludwigshafen is one of the chief seats of chemical industry in the country. Mannheim has flour mills, and manufactures machinery and chemicals.

The Black Forest, the Odenwald, the Spessart, and the Hardt are covered to a great extent with coniferous forests. In the Black Forest large areas are used for pastoral and agricultural purposes, but the lumber industry is still of considerable importance, and the abundance of wood has led to an extensive manufacture of clocks, toys, brooms, musical instruments, etc. Over the greater part of the Odenwald similar industries are pursued, but not to the same

extent, while on its western slopes, where crystalline rocks again appear, there are many fertile districts suitable for orchards and vineyards. Great efforts have been made within recent years to improve the economic conditions of the Spessart, and Aschaffenburg, its chief town, now has numerous timber and paper mills, breweries, ironworks, and factories for ready-made clothing. The greater part of the Hardt is forested, but in the west and centre of the Bavarian Palatinate there are considerable stretches of arable and pastoral land. Pirmasens is one of the most important boot-making towns in Germany, and there are various textile industries at Kaiserslautern and elsewhere.

THE SWABIAN AND FRANCONIAN JURA are not capable of great economic development. The limestone, which covers the upland region, provides but a scanty soil, and agriculture is confined in the main to pastoral farming, except in the valleys where fertile soil and favourable climate permit the cultivation of cereals and fruit. At Solnhofen, about forty-five miles south of Nurnberg, lithographic stones are obtained from a species of compact limestone which is found there, and, although the industry is relatively a small one, it supplies the world with all its best stones. Iron ore is worked in the Franconian Jura, notably at Hollfeld, east of Bamberg, where considerable quantities have been mined within recent years.

THE SOUTH-CENTRAL SCARPLANDS. In this region, which corresponds somewhat roughly to the basins of the Neckar and the Main, the different members of the Triassic rocks appear in succession. The Bunter sandstone of the Spessart, of the eastern slopes of the Odenwald, and of the north and east of the Black Forest, is replaced over a great part of Lower Franconia, north-east Baden, and northern Wurttemberg by the muschelkalk, which in turn disappears before the Keuper marls of Upper and Middle Franconia and central Wurttemberg. A belt of Lias separates these marls from the limestone of the Swabian and Franconian Jura.

As in other parts of Germany, the Bunter sandstone is generally forest-covered. Except in the valleys the muschelkalk does not, as a rule, weather down into a very productive soil, but its uplands provide good pasture land, and on the slopes of many of the deep valleys by which it is dissected the vine is extensively grown, as is the case around Wuirzburg. But the best soils are found upon the Keuper marls, which have given rise to the agriculture

for which Franconia is famous. Nurnberg is the centre of the hop-growing industry, and Middle Franconia and Württemberg together have one-third of the area under hops in Germany. Cereals are also extensively cultivated on the Keuper marls, while, on the alluvial soils around Bamberg and Stuttgart, vegetables are raised in large quantities. The Liassic belt on the south and east is generally fertile.

There are few minerals in the region. Salt, which is the most important, is found in the muschelkalk, and is worked near Heilbronn and elsewhere. Some lignite is also obtained. But notwithstanding the comparative poverty of its natural resources, the industrial development of this region has been considerable, and is to be explained mainly by the supply of labour provided by the growth of the population. Brewing is, as might be expected, an important pursuit in Württemberg and Middle Franconia, where hops form so abundant a crop. The toy industry of Nürnberg was originally based upon the large supplies of wood which could be obtained in the vicinity, but toys of all kinds, and not merely of wood, are now made there. The manufacture of porcelain and glass is largely localized in Upper Franconia, and in the Upper Palatinate where wood, kaolin, and quartz sand can all be easily obtained from the Bavarian Forest. Of industries without any definite geographical basis, the manufacture of cotton goods is one of the most important; it is carried on in a number of towns in the Neckar valley, including Stuttgart, Cannstatt, and Heilbronn. Esslingen and Stuttgart are noted for printing, and especially for pictorial printing. Fine metal work is characteristic of Württemberg, where it is carried on at Esslingen and elsewhere. Pforzheim is known for its jewellery and Hanau for its gold and silver ware; Stuttgart, Esslingen, and Würzburg are engaged in the manufacture of machinery; Nürnberg, which is the typical town of the whole region, has breweries, glass works, machine shops, and various establishments for the production of fine metal ware and optical instruments.

The population of this region is concentrated mainly in two districts, which are separated from one another by the Franconian Heights—an area of comparatively poor land, where the Keuper sandstones are wanting in the elements of fertility. But the valley of the Main and the valley of the Neckar, cut off as they are from

other fertile regions by the Bunter sandstone and the Jurassic limestone, which surround them, draw to themselves the surplus people of these less favoured lands, and are, therefore, areas where the density of population is high.

THE RHINE MASSIF. The economic activity of this region varies greatly from place to place. The Taunus and the Hunsrück are well wooded, and on their southern slopes vines and fruit are grown. Along the foot of the Taunus, also, are mineral springs, which have brought prosperity to Wiesbaden and Homburg. The more elevated parts of the Eifel, the Westerwald, and the Sauerland are frequently covered with dreary moors, but elsewhere much of the land is under either forest or pasture; as a result of the development of the Ruhr the Westerwald has become an important cattle country. The valleys are often fertile, and on the slopes of some of them, more especially on those of the Rhine, the Moselle, and the Aar, the vine is extensively cultivated.

The Rhenish-Westphalian industrial region, which owes its development to the Ruhr coalfield, may be subdivided. In the south, where little coal is now obtained, textile industries are established in the valley of the Wupper and west of the Rhine. On that part of the coalfield which lies between the Ruhr and the Emscher one of the great iron and steel industries of the world has grown up. North of the Emscher the coalfield is in process of development. Along the banks of the Rhine are several towns whose importance is commercial rather than industrial. The Ruhr coalfield is the most important in Germany; its southern border may be roughly defined as the lower valley of the Ruhr, while its northern lies a little to the north of the latitude of Munster. West and east it extends from the Rhine to the meridian of Soest, but the Crefeld coalfield, which lies to the west of the Rhine, is in reality a continuation of it. Some of the coals it produces are among the best in the country for heating purposes, and others are very suitable for the manufacture of gas and coke. To understand the present position it will be well to review the conditions which existed in 1913. In that year the output was over 114,000,000 tons, or about 60 per cent of the entire German production. The greater part of the coal mined on the Ruhr field was consumed in the neighbourhood, but large quantities went up the Rhine to Mannheim, down it to the Netherlands, by the Dortmund Canal to the coast, and by rail to Belgium.' For the

production of coke, Gelsenkirchen on this coalfield is the chief town in Germany, and from it large quantities of coke were sent to the ironfields of French and German Lorraine, as well as to the Saar, where it was used along with the coke made there.

The iron ore which is obtained along with the coal is limited in amount, but was in earlier times of some importance in helping to build up the great iron-smelting industry of the Ruhr district, which in 1913 produced over 50 per cent of the total German output of pig-iron and over 55 per cent of its total output of steel. The chief sources from which iron-ore was obtained were Lorraine, Luxembourg, Sweden, and Spain; but for the various industries of the region large quantities of pig-iron and mild steel were brought from Lorraine, Luxembourg, and the Saar, in which regions many modern iron and steel works had been established by the Germans, who worked them in close co-operation with the Rhenish-West-phalian group.

As a result of the war, therefore, Germany not only lost control of the districts from which it obtained a considerable amount of iron-ore, but it also lost important sources of semi-manufactured products used by the Ruhr industrial region. To meet the difficulties thus created the iron and steel industry was reorganized. Before the War, many works were engaged in the mass production of iron and steel, and large quantities of pig-iron, billets, blooms, and other semi-manufactured products were exported. But with the loss of Lorraine there has been a movement towards the formation of powerful industrial groups, embracing everything from the supply of raw material to the production of the finished article. The export of semi-manufactured goods is now relatively unimportant, and the bulk of the output consists of such articles as girders, rails, tubes, plates, and wire. For such work Germany is by no means unfavourably placed. In addition to the home supplies of ore, which are not inconsiderable, the excellent waterways of the country facilitate the import of large quantities of foreign ore at low rates; at present, Swedish ores owing to their high content of iron are most in demand, but Lorraine and Spain are also important sources of supply. Semi-manufactured products obtained from Lorraine form, as they did in pre-War days, part of the raw material of the Ruhr steel-master. The supplies of coal are also adequate; the output from the Ruhr, which for various reasons fell off during

the years immediately succeeding the War, has again increased, and in 1929 amounted to 124,000,000 tons as against 114,000,000 tons in 1913. The chief iron and steel towns include Essen, Mülheim, Oberhausen, Gelsenkirchen, Bochum, and Dortmund, all of which lie in the country between the Ruhr and the Emscher, Düsseldorf, and Duisburg. Ruhrort situated in the valley of the Rhine, and Hamborn and Recklinghausen in the more recently developed districts north of the Emscher. Industries connected with the manufacture of iron and steel goods are also carried on in these and other towns; south of the coalfield, Solingen is noted for cutlery, Remscheid for tools, and Iserlohn and Altena for fine metal work.

The mineral wealth of other districts in and around the Rhine Massif is not inconsiderable. To the west of the Rhine two coalfields have been worked, one round Aachen and the other, known as the Brügggen-Erkelenz, a little farther to the north. On account of the depth at which the coal lies these fields are expensive to work, and have not been developed to their full extent. Aachen, however, has iron and steel works, and manufactures machinery. On the west of the Rhine, also, the continuation of the Rhenish-Westphalian coal-bearing area known as the Crefeld field is as yet undeveloped, but its reserves are believed to be considerable. Lignite is found in various places, but the chief deposits lie in a low range of hills on the left bank of the Rhine between Cologne and Bonn.¹ The large power stations built during the War on the lignite quarries have provided the iron and steel industry with a good source of electricity. Iron ore (siderite) and manganese ore are obtained in the Siegerland, on the north-west slope of the Westerwald, and red hematite in the districts drained by the Lahn and the Dill. The Siegerland mines are only kept going by subsidies, and it is unlikely that any of these districts will become commercially profitable, but all are maintained as a kind of emergency reserve for the great steel concerns of the Ruhr.

In the vicinity of the Ruhr coalfield there has also grown up an important textile industry. For cotton-spinning this region occupies the first place in Germany, and has nearly 40 per cent of all the spindles in the State.² The adjoining towns of Elberfeld and

¹ The German output of lignite was 146,000,000 tons in 1930 as compared with 87,000,000 tons in 1913.

² In 1930 Germany had 11,070,000 spindles.

Barmen in the Wupperthal, and München.Gladbach and Rheydt to the west of the Rhine, are chiefly engaged in the manufacture of cotton and woollen goods. Crefeld is the principal place in Germany for the production of silks and velvets, and occupies, in this respect, a position in Europe second only to that of Lyons. Linen and artificial silk are made in various places. Round Solingen there are many handloom weavers of woollen goods. Elberfeld and Barmen are both noted for their silks, ribbons, laces, braids, and cord. Elberfeld manufactures dyes and Barmen textile machinery.

Of the towns on the Rhine, Cologne is the most important; it is a great commercial centre, and its industries include shipbuilding, flour.milling, oil.refining, and the manufacture of textiles and machinery. Düsseldorf makes rolling stock and mining machinery. Duisburg.Ruhrort is the largest inland port in Europe, and carries on much of the trade of the Ruhr region; the two towns manufacture iron and steel, paper, glass, and flour.

The Rhine Massif, with the coalfields upon its borders, had before the War become the most important industrial region in Germany. The abundance of coal, the facilities for obtaining iron.ore from Lorraine, Luxembourg, and Sweden, the progress of science which had rendered these ores of value in the manufacture of steel, the great waterway of the Rhine, which permitted the import of raw material and the export of manufactured goods, and the development of the canal system, which brought the industrial districts into communication with the German seaboard, had all contributed to the economic progress of this region, which contained about one.fifth of the total population of Germany.

THE NORTH.CENTRAL UPLANDS AND THE ADJOINING LANDS. For the sake of convenience this region may be considered to include the country between the South Central Scarplands and the North German Lowland. As usual, the Bunter sandstone provides a soil but poorly adapted to agriculture, and much of the Hessian Uplands is forested. In some districts, as, for example, in the basin of the Fulda near Cassel, where the soil is of alluvial origin, and to the west of the Vogelsberg, where volcanic debris has accumulated in the valley of the Wetter (the Wetterau), the land is of exceptional fertility. On the lower slopes of the Vogelsberg, again, and to a less extent on those of the Rhongebirge, the soil derived from the

volcanic rocks is very productive, and these districts are noted for their fruit gardens. The poverty of the Hessian Uplands in good agricultural land is not compensated for by their mineral wealth. Some iron ore found in the Vogelsberg is sent to the iron-smelting districts of the Rhine massif, and lignite is worked in various places, but all things considered, the region is of comparatively slight economic importance, the population is small, and the industries of little account. To the north of the Hessian Uplands lie the Weser Uplands. In the south these are formed of Triassic rocks, but in the north the sub-Hercynian hills are of Jurassic and Cretaceous formation. The uplands are generally wooded, while the lowlands are devoted to arable and pastoral farming. The mineral wealth of the region is of some value. Coal of Carboniferous age is mined at Ibbenbüren near the north-west extremity of the Teutoburger Range, while iron occurs in the Teutoburger Range and in the Wiehen Gebirge. The proximity of these two minerals accounts for the iron industries of Osnabrück, Minden, and Bielefeld. Osnabrück has also textile and tobacco factories, while Bielefeld is extensively engaged in the manufacture of cotton and linen. The latter industry received its early impetus from the cultivation of flax in the vicinity, but previous to the War the bulk of the raw material came from Russia.

Farther east, in the country round Stassfurt, occur those great deposits of potash salts which have played so important a part in the development of German agriculture within recent years. Their origin is accounted for by the fact, that, after the pure rock salts which underlie them had been deposited, a solution remained which contained certain chlorides and sulphates of potassium. Under the conditions prevailing at that time this solution was not drained off, as has been the case in most parts of the world, but evaporated, so that the potash salts were precipitated. "Kainit," which is obtained from the chlorides, is of especial value to the German farmer, but the sulphates are better adapted for use in arid regions.

The Thuringian Basin, which extends from the Harz to the Thuringian Forest, is of varied fertility. The alluvial soils of the Golden Vale, to the south of the Harz Mountains, are very productive, and so also is the alluvial country round Erfurt, which is noted for its market gardens and seed farms. On the Keuper

marls, which cover a considerable area, cereals are extensively raised. The muschelkalk is less fertile, but in the valley of the Saale the vine is grown, though in a latitude too far north to attain full perfection. Industry is varied. There are large deposits of salt in the Wipperthal and in the valley of the upper Unstrut, and a number of manufactures are associated therewith. The mining industries of the Harz and the Thuringian Forest are now of little importance, but a number of small towns situated upon their borders are engaged in the manufacture of metals and textiles; furniture and paper, also, come from the Harz region, and glass and porcelain from the Thuringian Forest.

THE NORTH GERMAN LOWLAND is underlaid by Tertiary rocks which have been covered in Quaternary times by material deposited in part by the glacial ice sheet from the north, and in part by the rivers from the south. Only in a few places do the Tertiary rocks come to the surface. The country to the east of the Elbe may first be considered. From the shores of the Baltic Sea the land rises to the heights of the Baltic ridge, which runs from Courland to Schleswig. Upon this line of heights, due in part to a movement of Tertiary times, the edge of the ice sheet remained for a prolonged period during its retreat from the south. The heights themselves are therefore covered with morainal debris and numberless lakes, as in East Prussia, Mecklenburg, and Schleswig, while the land intervening between the lakes is generally well wooded. On the northern slopes of the ridges there are considerable areas of fertile land, due in part, it is believed, to the debris brought down from the limestone rocks in the south of Scandinavia. On the southern slopes of the ridges, on the other hand, the waters of the melting ice sheet left large deposits of sand and gravel, which have rendered considerable areas poor and infertile. Beyond the Baltic ridge, and extending into Poland, lie the Great Valleys, which in turn mark the channels by which the water escaped at each successive stage in the retreat of the ice sheet. The valley from Thorn to Eberswalde is now occupied by the Vistula, the Netze, and part of the Oder; farther south, in the Warsaw-Berlin valley, are the Bzura, Ner, Warta, Obra, and the Spree; still farther south lies a third valley, in which the Bartsch and the Spree flow for part of their way. Over all this zone the character of the soil varies greatly from one place to another. In some districts there are considerable

areas of good boulder clay, which are fertile; in others the land had to be reclaimed from bog and swamp before it could be made productive; elsewhere, as in Brandenburg, there are wide stretches of sand, on which little cultivation is possible.

To the south of the Great Valleys lies another ridge of land, beyond which the ice-sheet did not advance. This ridge is marked by heights, rather than by hills, in the north of Silesia, in the Flaming, and in the Lüneburg Heath. The first of these upland regions contains much fertile soil; the Flaming consists of sandy wastes, marshes, and moorland; in the Lüneburg Heath vast expanses of sand and gravel are covered with heather. In parts of Saxony and Silesia there are widespread deposits of loess, and in the country south of Magdeburg this is also the case.

To the west of the Weser the country consists in the main of dreary alternations of high moors and marsh lands. The former frequently occur in sandy districts which are underlaid by an impermeable subsoil, while the latter are low-lying lands which were at one time covered by water, but are now occupied by the vegetation typical of bogs and marshes. To the east of the Weser the Lüneburg Heath is higher than the country to the west, and forms an undulating plateau covered with sand and strewn with great blocks of rock. The great inlet of the North German Plain, which lies between the Ruhr coalfield and the Teutoburger Range, and of which Münster is the centre, consists largely of sand-stones and marls of Secondary times, overlaid in many places by alluvial and generally fertile soils.

The general character of the North German Lowland as fashioned by Nature has been improved in many places by the hand of man. To the south of the Baltic Ridge, for example, much of the country has been drained, as in the Oder Swamp and in the valleys of the Warta and the Netze; and considerable areas of arable and meadow land have thus been brought under cultivation. A great part of the heaths has also been improved in various ways. Formerly, the practice was to burn the dry heath and to sow buckwheat in the ashes until the soil formed by them had been exhausted. The present method, the results of which are lasting, is to open up the moor, to drain it, to expose it to the air, and to manure it heavily. On the low moors the peat is first removed and the subsoil is then mixed with sand and manured with kainit.

Notwithstanding the comparative poverty of much of the soil of the North German Lowland, the area from which a return of some kind or other cannot be obtained is relatively small. The total extent of the region is over 75,000 square miles, and of that about 50 per cent is under crops, 15 per cent under grass, and 20 per cent under woods, while, of the remainder, parts can be used for grazing purposes. Rye is the cereal best adapted to the infertile conditions which exist, and about three-fifths of the German crop is grown in this region, Brandenburg, in the zone of Great Valleys, having the greatest output. East Prussia, Pomerania, and Mecklenburg also produce large quantities on the Baltic Ridge and on its northern slopes. To the west of the Elbe, Hanover takes the first place. Oats comes next to rye as the cereal of the North German Lowland, which accounts for over one-half of the oats grown in the country. Wheat occupies some fertile districts in the north of the plain, but it finds its most favourable environment on the loess soils of Saxony and Silesia, which together produce nearly one-fourth of the wheat grown in Germany. About one-half of the potato land of the country is also found in the Lowland, where the sandy soils of Brandenburg, Pomerania, and the less fertile districts of Silesia produce a large part of the total crop, which forms the basis of an important alcohol-distilling industry.

The cultivation of beetroot in the loess districts around Magdeburg and in Silesia finds employment for a considerable amount of labour in a region which, on the whole, is far from fertile. It also renders the land more suitable for the growth of cereals, and the pulp which remains after the sugar has been extracted forms a valuable food for cattle. The discovery of the fertilizing powers of Stassfurt salts has increased the area under beet, and at the same time improved the yield per acre, while the proximity of coal has facilitated the manufacture of sugar. Previous to the War Germany was the chief producer of beet-sugar, and provided about one-third of the world's supply of that commodity. There is no doubt that the development of the industry was greatly aided by the bounties granted by the Government on foreign exports, and for some time after the Brussels Convention came into force (1903) there was a decided decrease in the amount of sugar produced.

The mineral wealth of the region is not of great importance. Bog ores are found at Grabow in the valley of a tributary of the

Warta, and elsewhere, and sent to Silesia. Cement lime is obtained at Buxtehude, near Stettin, and supplies the large cement works of that town. Amber, a fossilized resinous product derived from a former coniferous vegetation, occurs mainly along the coast of Samland. At Sperenberg, south of Berlin, there are salt beds of exceptional thickness belonging to the younger Primary rocks.

Manufactures are in the main confined to the larger towns and seaports, which in the east are chiefly concerned with the preparation for market of raw materials, and with supplying the more immediate demands of an agricultural population. In Brandenburg, Berlin, with its suburbs, is of greater importance; manufactures of chemicals, textiles, electrical apparatus, machinery, and scientific instruments are all extensively carried on, and clothing and furniture are made in large quantities. Leipzig, which owes much of its importance to its situation on a southern inlet of the North German Lowland offering special facilities for trade, is engaged in the manufacture of textiles of all kinds, machinery, musical instruments, and scientific apparatus. Breslau, as a result of its position on the navigable Oder almost in the centre of Silesia, and with coalfields in the neighbourhood, has become one of the most important industrial and commercial towns in the east of Germany. Into the Münster "bay" also, industries are beginning to press forward, favoured by the proximity of the Ruhr coalfield, and Münster itself is becoming a manufacturing town of some importance. Of the seaports on the Baltic, Stettin is engaged in shipbuilding, and launches some of the largest German vessels, and Lübeck has chemical works and other manufactures. Of the North Sea ports, Hamburg has shipbuilding yards, jute mills, chemical works, and various factories engaged in working up raw material imported from abroad. Bremen is employed, but to a less extent, in similar occupations.

THE VOGTLAND AND THE SAXON ERZGEBIRGE. These two regions may be considered together. The first is a low highland connecting the Erzgebirge, the Fichtelgebirge, and the Franconian and Thuringian Forests, while the second, which is part of a tilted peneplane, forms the north-west slope of the Bohemian Massif. Both regions are somewhat unfavourable to agriculture. In the Vogtland, rye and potatoes are grown, but except in the valleys, where there are

orchards, the land, on account of its elevation, is unsuited for other crops, and much of it is devoted to pastoral pursuits. The slopes of the Erzgebirge are well wooded, but are even less adapted to arable farming. Farther east, beyond the picturesque but poor country of Saxon Switzerland, where the Elbe cuts its way in entrenched meanders through a sandstone plateau, the ancient rock reappears in Upper Lusatia, a region of somewhat greater fertility. The Vogtland and Saxon Switzerland are without mineral wealth; in the Erzgebirge, mines of various kinds have been worked in the past, but their present output is negligible. On the other hand, much of the prosperity of the whole region depends upon its supplies of coal and lignite. The coalfields lie near the junction of hill and plain, the larger extending from Zwickau towards Chemnitz and the smaller being situated near Dresden. The annual output of the two combined does not exceed 5,000,000 tons. The chief deposits of lignite worked at present lie on the open plain within a radius of twenty-five miles, north, south, east, and west of Leipzig. The output, which amounts to about 60,000,000 tons per year, is mainly used in the production of electric power and light, and in the chemical industries. The persistence of domestic industries in Saxony in modern times has been rendered possible by the process of electrification.

Textile industries on a small scale have long been established in the Vogtland, where they were carried on mainly in the homes of the people to satisfy local requirements, and in the Erzgebirge, where they were introduced to meet the want of employment, caused by the decreasing productivity of the mines. Among the more important industries now established in small workshops within the mountain area are embroidery and lace-making, which in many villages provide the inhabitants with their chief source of livelihood; the manufacture of clocks, watches, and musical instruments owes its origin to, and to some extent is still dependent upon, the presence of timber and the absence of more valuable sources of economic activity. A few only of the more important towns need be mentioned. Plauen is the commercial centre for embroidery in the Vogtland. In the Erzgebirge, Annaberg is the chief seat of the lace-making industry, and Glashütte is noted for its clocks and watches. In contrast with the mountain area, the zone of contact between highland and lowland along which the

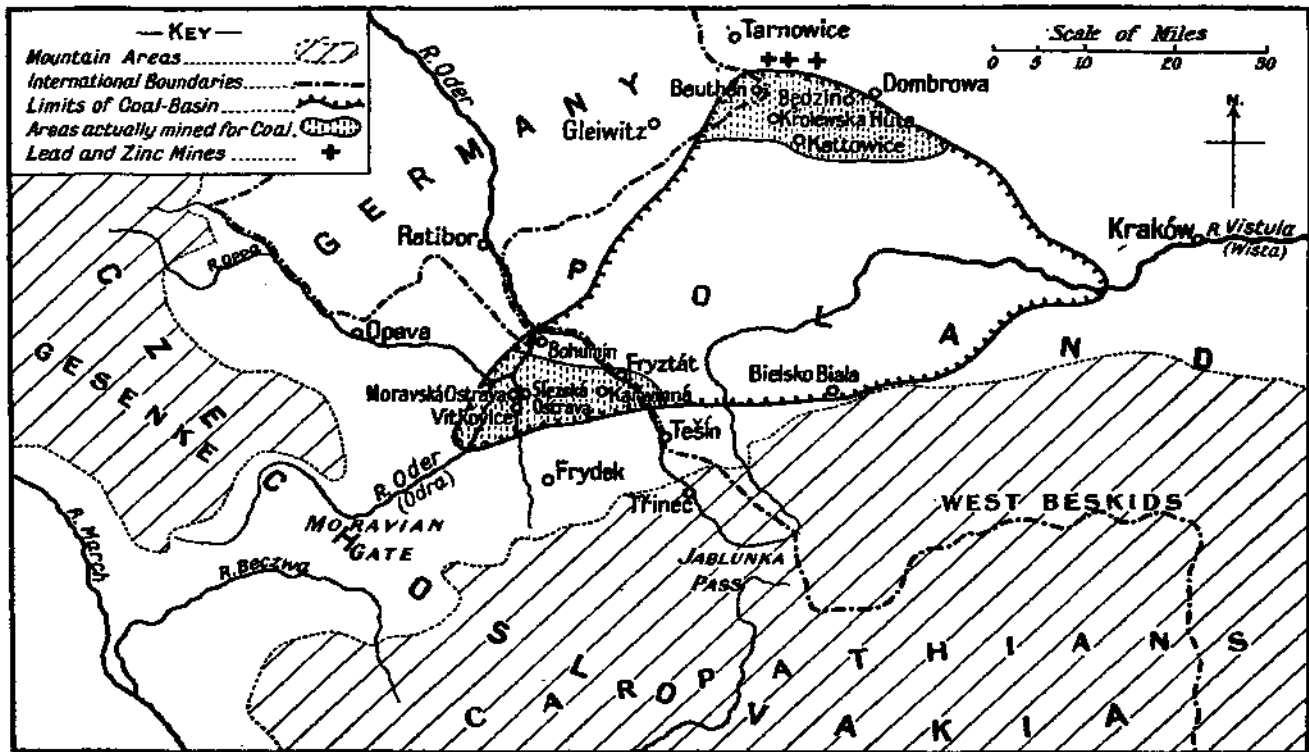
coalfields lie is a region of large-scale manufacture. The cotton industry is of considerable importance, and here is found about one-fifth of all the cotton spindles in Germany. Its centre is at Chemnitz, but a number of other towns, including Zwickau, Werdau, Crimmitschau, Glauchau, Meerane, Ölsnitz, and Lugau are also extensively engaged in it. The woollen industry, which owes part of its prosperity to the excellent wool obtained from the merino sheep of Saxony, is also carried on in most of these towns, though weaving is still to some extent a domestic pursuit, and around Glauchau and Meerane large numbers of handloom weavers are settled. Zwickau is the centre of an important iron and steel industry, its raw materials coming from the Ruhr, and both there and at Chemnitz textile and other machinery is made. Porcelain works, obtaining their kaolin from numerous granitic areas in the mountains, are established in various places, but especially at Meissen, where there is a national factory. Among other products of this belt are chemicals, furniture, leather, paper, and sugar. On the plain industrial development has taken place in the lignite region. Chemical works have been established at various towns, notably at Merseburg, where the *Badische Anilin* have large factories for the production of synthetic ammonia. Gulpa, near Bitterfeld, transmits electric power to Berlin, over 100 miles distant. Dyeing, paper-making, tanning, and other industries of various small towns in this area have all benefited by their easy access to lignite.

THE SUDETES, which form the north-east flank of the Bohemian massif, consist in the main of ancient rock, although the Coal Measures appear in the Waldenburg Hills of Lower Silesia and extend into Bohemia. The mountain slopes are forested, but a certain amount of farming, mainly pastoral, is carried on. The abundance of timber and water-power favoured the growth of various forms of industry in early times, but, until the development of the Waldenburg coalfield, little was done on an extensive scale. This coalfield extends in a semicircle from Bober and Schatzlar at the foot of the Riesengebirge, by Landeshut and Waldenburg, to Eckersdorf, near the banks of the Neisse. Its average annual output is about 6,000,000 tons.

The use of coal has effectively stimulated all the industries of the region, and, although there are no large towns, modern factories

are growing up in many places. The linen industry, which is of considerable importance, formerly depended mainly upon the presence of water-power and the large supplies of flax grown in the mountains as well as on the Silesian plain. Now it receives at least some of its power from the neighbouring coalfield, while for its raw material it relies partly on home-grown supplies and partly on imports from Russia, Poland, the Baltic States, and Belgium. Langenbielau, with its weaving factories, is the centre of the industry, which is also carried on round Reichenbach, Landeshut, and Waldenburg, and in many villages along the valleys of the Riesengebirge. Other textile pursuits include the manufacture of cotton at Langenbielau, Peilau, and Peterswaldau, and of wool at Schweidnitz, Reichenbach, and Peterswaldau. The abundance of timber for fuel, and of fine sand, has induced the glass industry to spread from Bohemia, and deposits of kaolin in the granitic areas have led to the manufacture of porcelain.

THE TABLELAND AND COAL BASIN OF UPPER SILESIA. In Upper Silesia the remnants of a Trias plateau extend eastward from the Oder into Poland, while farther south lies a great coal basin which is exposed in some places but in others is concealed by later deposits. The progress of this region was long retarded by the isolated position which it occupied in Germany, but with the growth of railways, the improvement of the Oder as a waterway, and the development of its own natural resources, it was before the war rapidly becoming one of the chief industrial areas of Germany. The coalfield which extends into what was Austrian and Russian territory is one of the most important in Europe, and from the German part of it was obtained about one-fourth of the coal mined in Germany. Though not so suitable for coking and steam raising purposes as that from Westphalia, Silesian coal is well adapted to household requirements, and its market extended from Berlin to Vienna. The muschelkalk of the Tarnowitz Plateau contains much lead and the largest deposits of zinc in Europe, while there is iron ore at Oppeln not far distant. This combination of coal, zinc, lead, and iron led to the growth of a considerable metallurgical industry at Tarnowitz, Beuthen, Königshütte, Gleiwitz, Kattowitz, and elsewhere. Here were obtained five-sixths of the zinc and over one-half of the lead produced in Germany, and here also were numerous iron works which relied largely upon imported ore. The transference to



THE COAL-FIELDS OF SILESIA

Poland by the Council of the League of Nations of the eastern and south.eastern districts of this region deprived Germany of about three.fourths of the productive coal mines of Upper Silesia, the greater part of its lead and zinc deposits, and the blast furnaces, zinc works, and silver.lead refineries situated in and about Tarnowitz, Konigshutte, and Kattowitz.¹ By more intensive working the output of the remaining coal mines had been nearly doubled by 1929, when 22,000,000 tons were raised.

COMMUNICATIONS. In Germany there are now 36,000 miles of railway, of which over 33,000 miles are owned by the State,² while the remainder are in the hands of private companies. Berlin, upon which converge many of the most important lines in the country, may be regarded as the centre of the system. One line places it in direct communication with the great port of Hamburg; and another, which runs to Cologne by way of Hanover, Hamm, and Oberhausen, has connections with Bremen and Emden at Stendal, with the Hook of Holland, Rotterdam, and Amsterdam at Lohne, with Flushing at Oberhausen, and with Ostend at Cologne. The capital is also connected with Cologne by a line which passes through Magdeburg, Soest, and Düsseldorf. From Cologne the gorge and the rift.valley of the Rhine open up a great highway to the south, and there are railroads on either side of the river from which important lines branch *off*. From Coblenz one follows the course of the Moselle by Trier and Metz to Nancy, and another utilizes the valley of the Lahn to cross the Rhine Massif on its way to Hanover or Magdeburg by Cassel. The latter line also connects with one from Mainz which strikes up the valley of the Kinzig and down that of the Fulda to arrive at Gotha, whence it runs by Erfurt and Halle to Berlin. From Mainz, too, the Nahe opens up a route to the Saar coalfield and to Metz. At Strasbourg the Orient Express route, which has crossed the Vosges from Nancy by the Gap of Saverne, joins the railway on the right bank of the Rhine, and passes north along it as far as Karlsruhe, where it branches off, turns the flank of the Black Forest, and goes by Stuttgart to Ulm on the Danube. From Ulm the main route is continued across the Alpine Foreland by Augsburg and Munich to Linz, where it rejoins

¹ See also page 240

² But under the Dawes Scheme the management of the State railways has been transferred to a private company.

the Danube, while another line of less importance does not depart from the valley of that river. These railways in the south of Germany are connected with those in the north by several routes. The line from Berlin to Halle connects with one to Leipzig, which then runs southwards between the Fichtelgebirge and the Erzgebirge, and between the Franconian Jura and the Bavarian Forest, to Regensburg, whence it continues across the Alpine Foreland by Munich to the Brenner Pass. Another line runs from Frankfurt across the Spessart and along the Main to Würzburg, where one branch goes by Nürnberg and over the Franconian Jura to join the line from Berlin to Regensburg; and the other, following for part of the way the valley of the Altmühl, runs in a south.easterly direction to Ingolstadt, and then southwards to Munich. Two important railway routes lead from the German capital towards the south.east of Europe; one goes south to Dresden and then follows the course of the Elbe and the Moldau on its way to Vienna, and the other goes by Breslau along the outer slope of the Sudetes to Kraków in Poland. In the east and north.east of Germany railways are much less numerous than in the west. Two lines, which unite at Insterburg in East Prussia, leave Berlin for the old Russian capital, the one going by Königsberg, the other by Poznan and Thorn. A railway from Schneidemühl, on the first of these, to Thorn gives Berlin an alternate route to that town, which is in direct communication with Warsaw. In addition to Königsberg, the ports on the Baltic, Danzig, Stettin, Stralsund, and Lübeck, are all connected by rail with Berlin.

The inland waterways of Germany have also played an important part in the economic development of the country. The great rivers, which even in early times were of considerable value, have, in many cases, been deepened and connected with one another by canals, so that there is a fairly complete system of water communication over the industrial parts of Germany. The Rhine is now navigable for large barges as far as Kehl (opposite Strasbourg) except when it happens to be unusually low. It is connected with the French waterways by the Rhine.Marne canal, which crosses the Vosges by the Gap of Saverne and has branches to the Saar and the Moselle; and the Rhine.Rhone canal, which leaves the Rhine valley by the Gap of Belfort. Of the tributaries of the Rhine, the Main is navigable by larger boats to Frankfurt and

by smaller ones to Würzburg, while the Neckar is navigable to Heilbronn, but by smaller boats only.

The Dortmund.Ems canal was constructed to provide the industrial region around the Ruhr coalfield with an outlet in German territory. The canal itself runs from Dortmund to Meppen, where it joins the Ems, a distance of ninety-four miles. For another fifty-five miles the Ems has been canalized, after which the waterway follows the open river as far as Emden. More recently the Dortmund.Ems canal has been connected with the Rhine by another canal running from Herne to the neighbourhood of Ruhrort. The Weser is navigable for larger boats as far as Bremen, and for smaller ones to Cassel (on the Fulda). It is connected with the Rhine by the Mittelland canal, which runs from Bevergern on the Dortmund.Ems canal, by Minden on the Weser, to Hanover and Peine. The Elbe and the Oder are both navigable by large boats, the one to Prague and the other to Kosel. Berlin, situated between these two rivers, is connected with both: with the Oder by the Finow and Oder.Spree canals, and with the Elbe by the Havel and Plauer canals. The Elbe, moreover, is brought into communication with the Baltic by two canals, the ship canal from Kiel, and the Elbe.Trave canal from Llibeck. The Oder is connected with the Vistula by the canalized courses of the Netze and the Warta. The Danube is of but minor importance within German territory, but a scheme for connecting it with the Rhine has recently been adopted. The canalized Main will be deepened between Aschaffenburg and Würzburg, and from there the canal will go by Bamberg near the confluence of the Main and the Regnitz, Nürnberg on the Regnitz, Roth on the Rednitz, and Beilngries on the Altmühl, to Kelheim on the Danube. It is hoped that this canal, which will have sufficient capacity for boats of 1,200 tons, will become a great commercial route between the agricultural regions of the south-east of Europe and the industrial regions of the north-west.

The Rhine carries a much larger amount of goods than any other German waterway. Iron.ore, scrap iron, and agricultural produce are sent upstream from the Dutch frontier as far as Ruhrort, and coal and some manufactured goods in the opposite direction. Beyond Ruhrort the chief articles going upstream are coal and agricultural produce, while building materials and manufactured

products move downstream. By the Dortmund.Ems canal, iron ore and food.stuffs are dispatched inland, and coal and coke are sent to the coast. On the Elbe, lignite and sugar are brought down from Bohemia and Saxony, the sugar going to Hamburg for export, and the lignite to many towns along the course of the river. To the downward traffic, the Saale, with chemicals from Merseburg, contributes. Of the upstream traffic, agricultural produce is the most important item. By the Mark waterways, large quantities of building material, coal, coke, and food.stuffs are brought to Berlin and its suburbs. Coal and coke are sent downstream on the Oder from the Silesian coalfield, and iron ores and food.stuffs upstream. In 1929 the inland waterways of Germany transported 110,000,000 tons of goods as against 486,000,000 tons carried by the railways. Of the former, coal and lignite, ores, earth, stones and cement, wheat, and fertilizers constituted over 80 per cent of the total.

FOREIGN TRADE. The following table indicates the value of the foreign trade of Germany during the three years 1929.31. Reparations payments are included in the exports.

	Special imports (in 1,000 marks)	Special exports	Average rate of exchange (At par 20-429 Reichmarks — £1)
1929	13,446	13,482	20.399
1931	10,393	12,035	20.382
1931	6,727	9,598	19.179

The principal countries with which Germany trades and the extent of their trade were as follows in the years 1929.31—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
United States ..	12.9	United Kingdom	10.4
United Kingdom	6.5	Netherlands ..	10.0
Netherlands ..	5.4	France	8.3
France	5.0	United States ..	6.1
Soviet Russia ..	3.8	Switzerland ..	5.1
Czechoslovakia ..	3.6	Belgium	4.7
Italy	3.6	Czechoslovakia ..	4.4
Belgium	3.3	Italy	4.0
Denmark	2.8	Sweden	3.9
Sweden	2.7	Denmark	3.5

The following table, for 1929.31, shows the percentages of the total imports and exports of the principal commodities.

Imports	Percentage of total imports	Exports	Percentage of total exports
Grain	6.6	Coal, etc. ..	6.3
Butter	3.5	Iron and steel	
Copper	3.0	goods	14.1
Fruit	2.7	Machinery ..	10.4
Eggs	2.2	Chemicals ..	5.0
Oilseeds	6.2	Electro.technical	
Cotton	5.5	goods	4.7
Wool	4.5	Cotton goods ..	2.8
Mineral oil ..	3.0	Furs	2.4
Ores	2.8	Silk	2.0
Hides	2.5	Woollen goods ..	1.4
Copper	2.2		
Tobacco	2.2		
Timber	2.0		

The principal articles imported from these countries include raw cotton, crude copper, grain, and mineral oils from the United States; cotton and woollen fabrics and textile machinery from Great Britain; butter and cheese, eggs, and vegetables from the Netherlands; textiles and iron.ore from France; raw furs and skins, mineral oils, grain, and timber from Soviet Russia; lignite, leather, yarns, and timber from Czechoslovakia; wool and silk from Italy; and wool and woollen yarns, and semi.manufactured iron goods from Belgium.

The exports mentioned above are widely distributed. Great Britain takes cotton, woollen and silk goods, paper and paper articles, iron goods, electro.technical products, leather, chemicals, glass, and furs. To the Netherlands go iron and steel, piece.goods and clothing, machinery, chemicals, and paper. France buys large quantities of machinery and metal goods; and the United States textiles, chemicals, and machinery.

The overseas trade of Germany is conducted through various ports, not all of which are within the country itself. Of those which are, the most important are situated near the mouths of the larger rivers. Hamburg on the Elbe, with its outpost at

Cuxhaven, and Bremen on the Weser, with its outports at Bremen. haven and Geestemünde, occupy the first and second places respectively, and conduct the greater part of the American trade. Emden, at the mouth of the Ems, is being developed as the port of the Ruhr industrial region. On the Baltic coast, Stettin, near the mouth of the Oder which connects it with Berlin (to which it is the nearest port) and with Upper Silesia, holds the first place. Since the loss of Danzig and Memel, East Prussia is dependent upon Königsberg, at the mouth of the Pregel, with its outport of Pillau.

CHAPTER XI

DENMARK

DENMARK consists of the peninsula of Jutland and a number of islands lying between it and the coast of Sweden, the most important of which are Zealand, Fünen, Laaland, and Falster. By the annexation of the northern districts of Slesvig in 1920, its area was increased to 17,144 square miles; its population is now over 3,500,000.

Denmark is in reality a continuation of the North German Plain. It is overlaid by Quaternary deposits, and only in a few places, as along the west coast of Jutland, do the underlying Cretaceous rocks come to the surface. The land is generally flat, and, although the extension of the Baltic Ridge into Jutland gives the eastern part of that peninsula a more undulating appearance than the western, the height is nowhere as much as 600 feet. Even at the best the soil is poor, and along the west coast considerable areas are covered by sand dunes, heath, and bog.

CLIMATE. Surrounded as it is by the sea on all sides, and exposed to the influence of westerly winds, Denmark enjoys a fairly temperate climate. The mean temperature for January does not fall far below freezing point, and that for July does not rise much above 60 °F. The atmosphere is generally humid, as might be expected, but the mean annual precipitation amounts to only about 25 inches.

AGRICULTURE is the chief industry of the country, and gives direct employment to over 30 per cent of its working population. Over 75 per cent of the land is agricultural, and of that the greater part is divided into small farms which are worked by their owners. Holdings, varying in extent from 37 to 296 acres, constitute about two-thirds of the total agricultural area, while larger farms occupy less than one-tenth. Oats, rye, and barley are the chief cereals grown, and potatoes, roots, and sugar-beet are all raised on a fairly extensive scale. Grass and pastureland cover about two-fifths of the farm land.

Climatic conditions and the sterility of the soil have combined

to render dairy farming of more importance than the cultivation of the land, and, with the development of the co-operative system, the butter industry has, within recent years, made such rapid progress that it is now the chief element in the agricultural economy of the people. Co-operative dairies, of which there are about 1,400, with a membership of over 180,000, collect the milk and convert it into butter under conditions much more favourable than the farmer, and more especially the small farmer, has at his disposal; and the milk from nearly 90 per cent of the milch cows in the country is now dealt with in these dairies. Danish butter possesses a high reputation in Great Britain, to which much of it is sent. Since skimmed milk, a by-product of the dairy industry, can be beneficially used as a food for pigs, their number has also increased rapidly; in 1881 there were 527,000, and in 1930, 4,928,000. The bulk of the bacon is prepared in co-operative factories, of which there are over fifty in the country. The export trade in eggs, which has now assumed considerable dimensions, is also controlled by co-operative societies, in whose establishments all eggs are examined before being dispatched to the consumer. In explaining the success of the co-operative movement in Denmark, it ought to be noted, in the first place, that all the articles dealt with by the co-operative societies can be easily graded; and, in the second place, that they can be held back for a time (butter may be salted and eggs preserved) if market conditions happen to be temporarily unfavourable. These facts, which have contributed greatly to the success of co-operation in Denmark, are frequently lost sight of by those who uphold the Danish system as an example to other countries. At the same time it ought to be remembered that the reputation of their dairy products is jealously guarded both by the people and the Government of Denmark.

MANUFACTURES. Denmark is practically without mineral wealth, and its manufactures have not attained more than local importance. Shipbuilding, and industries connected therewith, have grown up at several of the ports, especially Copenhagen, and agricultural machinery is made at various places. There are cement works on the west coast, where chalk and clay are both abundant; sugar is produced in the beet-growing districts; artificial manure is manufactured at many of the ports; and breweries are scattered over the country.

COMMERCE. Butter, bacon, eggs, and live stock make up the bulk of the exports. About two-thirds of the butter, nine-tenths of the eggs, and practically all the bacon go to Great Britain, while Germany is, or, at least, was the principal purchaser of live stock. The imports include large quantities of grain and feeding stuffs, oilcake being one of the most important items on the list. Coal, textile goods, timber, metals, and manufactured articles of various kinds are also imported. For the years 1929-31 the value of imports and exports was as follows—

	Special imports (in thousand kroner)	Special exports	Average rate of exchange (At par 18-159 kr. = £1)
1929	1,793,570	1,615,065	18-20
1930	1,729,138	1,523,660	18-16
1931	1,465,133	1,256,682	18-09

The chief ports are Copenhagen on the Sound, and Aarhus on the east coast of Jutland.

CHAPTER Xü

SWITZERLAND

SWITZERLAND, with an area of 15,976 square miles, may be divided into three physical regions—the Alps, the Central Plateau, and the Jura—which extend across the country from south-west to north-east. The Alps, which cover about three-fifths of the whole of Switzerland, rise in places to great heights, but are penetrated by the longitudinal valleys of the Rhine, the Rhone, the Inn, and numerous other rivers, so that their topography is very varied. The Central Plateau, whose area is about one-half that of the Alpine region, has been much dissected by the rivers which flow across it, and its height ranges from 1,000 to 3,000 feet above sea level; it consists of Tertiary sandstones generally covered by glacial deposits which frequently provide a fertile soil. The Jura, which occupies the remainder of the country, is of limestone formation, and has an average height of about 3,000 feet; it has been thrown into a great series of folds, which run nearly parallel to one another and present a serious barrier to communications.

CLIMATE. The climatic conditions of Switzerland vary greatly with altitude, with the slope of the land from, or towards, the sun, and with the direction of the prevailing winds. The mean temperature of the plateau in January ranges from about 32° F. in the lowlands to about 26° F. in the uplands, and in July from about 63° F. in the former districts to about 62° F. in the latter. The temperature on the mountains decreases with increasing elevation, and over considerable areas snow lies throughout the year, while in the Jura the climate is somewhat more severe than at similar altitudes on the Alps. Several factors which introduce local variations, frequently of considerable economic importance, may be noted. The larger lakes exercise a modifying influence upon the winter temperatures of the land in their vicinity; the difference in mean temperatures on the two slopes of a valley, one of which faces the sun while the other looks away from it, frequently corresponds to a difference of many degrees in latitude; the fohn winds hasten the spring in the valleys down which they blow. The precipitation varies greatly from one place to another, but over the

plateau it is generally between 30 and 40 inches, while on the Alps it is as a rule much greater, though some of the Alpine valleys are so sheltered from the rain-bearing winds that irrigation is necessary.

THE ALPINE REGION. The cultivated area is confined to the valleys which produce cereals, fruit, and vegetables. In the Valais, which is *the valley, par excellence*, the vine is extensively cultivated, and wine is an important item in the food of the inhabitants. Pastoral farming is, nevertheless, the main occupation of the people who dwell within the Alpine zone. In the spring the cattle are driven forth from the villages in the valley, where they have spent the winter, to the "voralp" (the lowest bit of pasture above the timber-line). As the snow melts, they are moved by successive stages to the "alp" proper (the highest pasture land immediately below the limit of perpetual snow), where they spend the summer, returning to the "voralp" for a short time in the autumn before descending into the valley again for the winter.¹ During the summer sojourn on the "alps" the cows yield rich milk from which large quantities of cheese are made for export. Other manufactures are of little importance; hydro-electric power is generated and transmitted to the central plain, and it is not impossible that its increased use may lead to some manufacturing development in this region in the near future. The large numbers of tourists who visit Switzerland each year provide a great deal of employment of one kind or another, and many of the Swiss hotels, in which, in pre-war days, £32,000,000 was said to be invested, are situated within the Alpine zone.

THE CENTRAL PLATEAU is the best cultivated and most densely populated part of Switzerland. Cereals are grown, but not in sufficient quantities to meet the home demand, and potatoes supply a considerable part of the food of the people, while the vine flourishes best round Lakes Geneva and Neuchatel. During the last twenty-five years the area under crops has decreased before that under grass, partly because of the increased demand for milk for the manufacture of cheese and chocolate and for export in a condensed form.

Several causes have contributed to the growth of industrial life in Switzerland. Its origin is probably to be found in the various manufactures carried on by the people in their own homes during

¹ The details of this seasonal migration vary greatly from one valley to another.

their spare time in the winter months. The decline of these domestic pursuits before the growth of the factory system in other countries, and the increase in the population of Switzerland itself, rendered necessary an outlet for those whom the soil was unable to support, and for whom no colonies of their own were available. The growth of industry was further fostered by the abundant supplies of water-power, of which full use has not even yet been made. The manufacture of cotton goods holds the first place in importance, the cantons principally engaged therein being Zurich, St. Gallen, Aargau, and Glarus (the last of which, indeed, belongs to the Alpine zone). Water-power is used to work most of the mills, either directly by driving turbines, or indirectly by generating electricity. Spinning is chiefly concentrated in Winterthur and the surrounding villages. Wald is noted for its muslins and the fine calico required for embroidery. Glarus manufactures bleaching and printing cloth, and is also engaged in calico printing. In St. Gallen, Appenzell, and elsewhere, embroidery is carried on both in factories and in sheds attached to the homes of the people engaged therein; it is, however, declining in importance, and the number of looms is being systematically reduced. Switzerland ranks next to the United States, France, and Germany in the manufacture of woven silk goods. This industry, which has settled in the cantons of Zurich and Basel, has declined in importance since the war; on the other hand, factories for the production of artificial silk have been established at Lucerne, in St. Gallen, and on the Rhine. Of other manufactures, the construction of various kinds of machinery is the most important. Zurich and Winterthur produce textile machines; agricultural implements are made at Frauenfeld; Geneva has a large output of dynamos; Basel is the chief centre for the manufacture of dyes and chemicals; and Neuchatel and Biel make timepieces. Other industries of the Central Plateau include brewing, chocolate-making, and the preparation of condensed milk. The general tendency of Swiss industry is to seek compensation for the want of fuel and raw material, and for inadequate or expensive means of communication, by the manufacture of commodities on which much skilled labour may be expended; of this tendency the electrical and chemical industries and some branches of the textile industry are typical,

THE JURA. On the limestone region of the Jura the soil is poor and the climate severe. Only a small area is fit for cultivation,

and pastoral farming is the main support of the agricultural population. The development of watch-making, introduced in the eighteenth century, and for long carried on as a purely domestic pursuit, has proved the salvation of the region. Within more recent times the industry has been concentrated in large factories, situated principally at Le Locle and La Chaux-de-Fonds. In 1926 Switzerland exported 15,000,000 clocks and watches, together with a large number of movements and cases ; most of these were made in the Jura.

WATER.POWER. Switzerland had always been handicapped by the want of coal, and this handicap was increased by the difficulty and cost of obtaining supplies from abroad during, and immediately after the war. As a result, even more attention than before is now paid to the development of the reserves of water.power within the country. Formerly, torrents and waterfalls alone were utilized, but plans have now been made to ensure a more regular flow by tapping mountain lakes, and by damming valleys in order to create artificial lakes. In 1930 it was estimated that the power stations in Switzerland, either in operation or in course of construction, aggregated a total capacity of about 2,700,000 horse.power.¹ Among the more important stations are those of Vernayaz and Dixence on the Rhone, the first of which supplies the Swiss Federal Railways; the Waggital serves the Zurich region; and from Rheinfelden, on the Rhine, the silk industry of Basel derives its electric power.

COMMUNICATIONS. The development of navigation on the Rhine, between Strasbourg and Basel, has, within recent years, enabled Switzerland to import considerable quantities of raw material such as iron, coal, and phosphates, by water, and to export some of her manufactured goods in the same way. It is hoped eventually to continue the navigable waterway as far as Lake Constance. Swiss railways are important largely because of their trans-Alpine connections. The line from Paris by Lausanne follows the shore of Lake Geneva and the valley of the Rhone to Brig, whence it passes by the Simplon tunnel into the valley of the Rio Toee, and thus unites the railway systems of France and Italy. The railways of western Germany meet at Basel, and from that town a line goes through Lucerne, and, by the valley of the Reuss and the St.

¹ "Recent Hydro.electric Development in Switzerland," Dr. B. Cunningham. *Nature*, vol. cxxvi, p. 689,

Gotthard tunnel, into the valley of the Ticino. With this latter way to Italy the Simplon route has now entered into competition, since the construction of the Lotschberg tunnel through the Bernese Oberland has opened up direct railway communication between Bern, which is connected with Basel, and Brig. With the East, communication is maintained by lines which go from Basel by the valley of the Rhine, and from Zurich by the shores of Lake Zurich and Wallen See and the valley of the Rhine, to Feldkirch in the Vorarlberg, whence there is a route to Innsbruck by the Arlberg tunnel. At the present time over 2,500 miles of line out of a total mileage of 3,750 are worked by electric power.

COMMERCE. The imports of Switzerland include food.stuffs, raw materials, and manufactured goods, while the exports consist principally of manufactured goods. For the years 1929,31, the value of imports and exports was as follows—

			Special imports	Special exports	Average rate of exchange (At par 25.221 fr. = £1)
			(in million francs)		
1929	..	..	2,672	2,076	25.19
1930	..	..	2,526	1,746	25.08
1931	..	..	2,214	1,334	23.36

Raw silk, cotton and wool, coal and iron, steel and copper, make up the bulk of the raw and semi.manufactured materials imported; food.stuffs include wheat and other cereals, live animals, wine, sugar, coffee, and vegetables; manufactures consist largely of cotton and woollen goods, motor.cars, and machinery. Among the most important manufactures exported are timepieces and silk (which each account for over 11 per cent of the total exports), cotton and machinery (nearly 10 per cent each), and cheese (about 5 per cent). The countries with which most trade is carried on are as follows—

Imports to	Percentage of total imports	Exports from	Percentage of total exports
Germany	26.8	Germany	16.2
France	16.9	United Kingdom	15.2
United States ..	8.5	France	10.1
Italy	7.4	United States ..	8.6
United Kingdom	6.4	Italy	7.2

CHAPTER XIü

AUSTRIA, CZECHOSLOVAKIA, AND HUNGARY

AUSTRIA

THE Republic of Austria contains slightly more than one-fourth the area of the old Empire of Austria and rather less than one-fourth of its population. It includes Upper and Lower Austria, Vorarlberg, Salzburg, and parts of Tyrol, Styria, and Carinthia, together with the district of western Hungary known as the Burgenland. Its area is, therefore, about 32,000 square miles and its population 6,500,000, of whom nearly 2,000,000 live in Vienna. The Danubian districts in the north, and the Alpine zone in the south, are the two main physical regions into which the country may be divided. In the former there are the slopes of the Bohemian massif on the left bank of the river, and on the right a flat or gently undulating land which, below Vienna, passes into the western extension of the Hungarian plain. The Alpine region includes Vorarlberg, Salzburg, and those parts of *Tyrol*, Styria, and Carinthia, which remain in the possession of Austria. The central range of the Alps becomes lower towards the east, while the limestone ranges are more fully developed both on the north and on the south. These limestone ranges are separated from the central range by the longitudinal valleys of the Inn, Salzach, and Enns in the north and the Drava in the south.

As a result of the structure of the country comparatively little land is totally unproductive, but the area available for agriculture is small and apparently does not exceed 25 per cent of the whole. Rye, oats, and hay are the main crops of the poorer uplands; while in the more fertile lowlands, such as the plain of the Danube and the low hills of Southern Styria, wheat, maize, and vines are also grown. Since the war more attention has been given to agriculture, and although Austria is not yet self-sufficing as regards cereals, it is more nearly so than formerly.

But if Austria is to recover economically it must be as a result of the reorganization and development of its industrial life. Its mineral wealth is not inconsiderable. In the Erzberg, above

Eisenerz in Styria, it possesses one of the most valuable iron mines in Europe, and there are also deposits of iron-ore, magnesite, and salt in various parts of the country. Austrian coals are, as a rule, lignitic, and, among other places, are found at Koflach and Zillingsdorf in the basin of the Mur, at Thallern and Wobbling in the valley of the Danube, and at Wolfsegg in Upper Austria. Various other deposits, hitherto unworked, are also being investigated. The output of Austrian coal in 1930 was nearly 3,300,000 tons or about 45 per cent of the total amount consumed in that year. For centuries iron ore from the Erzberg has been smelted by charcoal in the neighbouring valleys, but the modern development of the metallurgical industry at Donawitz (near Leoben), Eisenerz, and elsewhere is based upon the lignite mines in the neighbourhood. Graz, which receives its steel from this region, makes machinery and rolling stock.

In pre-War days the industrial life of the Danubian districts was centred in and around Vienna, which was the natural meeting place of lines of communication from all parts of the Empire, and was thus able to receive both the mineral products of the western regions and the agricultural products of the eastern. Among the industries which had consequently grown up in the city and in the neighbouring towns lying chiefly to the south of it, were the manufacture of different kinds of iron and steel goods, spinning and weaving, brewing, milling, furniture-making, and a host of others. There are textile industries in the Vorarlberg and in the Tyrol. In the Vorarlberg the manufacture of cotton originated in the example set by Switzerland and in the presence of abundant supplies of water-power; and as electricity is now used in many of the mills, water-power is still of importance. The centre of the industry is at Dornbirn.

The economic position of Vienna is of special interest. Before the War that city was partly dependent for its prosperity on the fact that it was the political and economic centre of a great empire, and, if it is not to decline in importance, it will require not only to maintain but to expand its industrial activities so as to be compensated for the loss of many functions which belonged to it in its former capacity. On the other hand, the geographical advantages which the city derives from its position at the meeting place of some of the most important highways in Europe will reassert themselves as political conditions become more stable, its economic

momentum will enable it to struggle against the rivalry of the capitals of the Succession States, the artistic finish which its artisans are capable of imparting to their products will continue to give a high reputation to its exports, and the development of hydro. electric power, for which there are many facilities, will compensate it to some extent for the want of coal. In some ways, indeed, these factors are already operative, and Vienna remains to some extent the intellectual, commercial, and financial capital of the greater part of the old Empire.

It is estimated that, before the War, only one.tenth of the available water.power of Austria was utilized; since 1921 that amount has been increased to nearly one.fifth. The use of electric instead of steam power on the railways is increasing, especially in the west, which is farthest from coal; and the lines from Innsbruck by the Arlberg Tunnel to Bludenz in Vorarlberg, to Salzburg, and to the head of the Brenner Pass have been electrified. The foreign trade of Austria is also being re.oriented to meet the new conditions. Excluded to a certain extent from the Succession States by high tariff walls, the Austrian manufacturer is seeking compensation in western Europe and in the overseas countries where he has not hitherto pushed his wares.. Among the chief imports are food.stuffs, coal, and the raw materials of the textile industry; while the exports include manufactured textiles, wearing apparel, paper, timber, and hardware. Among the more important customers of Austria are Germany, Czechoslovakia, Italy, and Yugoslavia. For the three years 1929.31 the value of imports and exports was as follows—

			Special exports (in millions of schillings)	Special imports	Average rate of exchange (At par 34.585 sch. = £1)
1929	..	..	3,262	2,188	34.54
1930	..	..	2,699	1,851	34.48
1931	..	..	2,160	1,304	33.16

CZECHOSLOVAKIA

The new State of Czechoslovakia was carved out of the Dual Monarchy, and is the most important of the so.called Succession States. It includes the former Austrian provinces of Bohemia, Moravia, and part of Austrian Silesia, together with the Carpathian

lands lying in the north-west of the old kingdom of Hungary. The total area is estimated at about 54,000 square miles, or somewhat less than half that of the United Kingdom. The basis of the new State is ethnological rather than geographical, and the majority of the population are Northern Slavs who are separated from their kinsfolk, the Southern Slavs, by the Germans of Austria and the Magyars of Hungary. In Bohemia and Moravia these Northern Slavs are Czechs, and the census of 1910 showed that out of a total population of over 9,000,000 they numbered over 6,000,000 or about two-thirds of the whole. The remaining third consisted of Germans, who formed an almost homogeneous block in the north-west of Bohemia, more especially in the basin of the Eger, and were also numerous in the north of Moravia. In Slovakia, as the Carpathian part of the State is called, about half of the total population of 3,500,000 was returned as Slovak, but in the valleys, and in the plain on which the valleys open out, the Magyars are more numerous, and in the region as a whole were said to number over 1,000,000. According to the census of 1921, however, the population consisted of 8,760,000 Czechoslovaks, 3,120,000 Germans, 745,000 Magyars, 462,000 Ruthenians, and 520,000 others. In 1930 the country had 14,723,000 inhabitants.

PHYSICAL FEATURES. Physically, Czechoslovakia falls into several distinct regions. In the west there is the Bohemian massif, which includes Bohemia and the north-west of Moravia, and in the east that part of the Carpathian system which lies within the political frontiers of the State. These two regions are separated from one another by the Moravian lowland, which opens up a route from the basin of the Danube to that of the Oder.

The Bohemian massif consists in the main of an ancient block of Archaean age, but Palaeozoic rocks cover a wide extent of country between Pilsen and Prague. To the west and north of these Palaeozoic rocks is a district in which the Coal Measures were deposited in a great inland lake; and in the north and north-east of Bohemia, where the ancient massif lies at a lower level, there is a large area of Cretaceous rock, in which many of the river valleys are covered with Tertiary and Quaternary material. The *Mittelgebirge* in the north are of volcanic origin. The mountains surrounding Bohemia, though they frequently form a serious barrier to communications, do not rise to any great height, the average elevation

of the Bohmerwald, on the south.west, being about 4,000 feet, and of the Erzgebirge, on the north.west, about 2,500 feet. On the north.east are the Sudetes, the northern part of which is known as the Riesengebirge. To the south of these latter mountains lies the coal basin of Žacler-Svatoriovice, which is continuous with that of Waldenburg in Lower Silesia. On the south.east towards Moravia there is no mountain range, and the two countries are separated by a line of uplands which form the divide between the waters flowing to the Elbe and to the Danube respectively. The west and north.west of Moravia, therefore, belong to the south.eastern slope of the Bohemian massif, though they are covered in many places by recent alluvium. Towards the north and north.east there are areas of Palaeozoic rock, some of which contain iron and others coal. In the south.east Moravia has a lower elevation and consists in the main of Tertiary and Quaternary formations.

Slovakia belongs, in the main, to the Carpathians, which begin at the Danube, opposite the eastern extremity of the Alps, and run first to the north.east and then to the east. In some respects these mountains may be regarded as a continuation of the Alps, but it is only the outer sandstone ranges of the latter which are continuously developed throughout, and these do not rise to anything like the same height as the Central Alps. The crystalline zone of the latter is here represented only by isolated massifs, of which the Tatra is the most important. On the inner side of the Carpathian curve, also, the line of contact between highland and plain is marked by the appearance of volcanic outpourings. The lower valleys of the rivers, and that part of the Hungarian plain which lies between the foothills of the Carpathians and the southern frontier of the State, are generally covered with fertile soils of recent formation.

CLIMATE. The climate of Czechoslovakia is continental in type, and is, on the whole, favourable to agriculture. In the north of Bohemia mean temperatures are somewhat higher than in the south where the land rises to a greater height. Prague, which occupies a central position, has a January mean of 29.5° F. and a July mean of 67° F. On the uplands of Moravia conditions are similar to those in the south of Bohemia, but in the south.east, where the land is lower, they are more favourable. In Slovakia the mountainous elevation is the controlling factor, and the winters are long and cold, while the summers are cool. Even in the plains

near the Danube, the mean temperature remains below freezing point for several months in the year, but the July mean approaches 70° F. The rainfall varies greatly; in Bohemia it ranges from 20 inches, or even less, in some parts of the interior to 40 inches or more on the mountains of the north.west and south.west. In Slovakia it is about 25 inches in the plains and about 40 inches in the mountains. Throughout the region precipitation is heaviest during the summer months.

NATURAL REGIONS. The western and eastern wings of Czecho.slovakia differ so markedly from one another that the natural regions into which each may be divided appear to be of much less importance than the general distinction which has just been made. This, however, is far from being the case, and several important regions may be recognized. The Bohemian plateau, including not only the south of Bohemia but the west and north.west of Moravia, with its Archaean rocks, its somewhat infertile soil, and its less favourable climate, stands in marked contrast with the remainder of the country. The second region, which is sometimes called Central Bohemia, occupies the south.eastern part of the basin of the Beraun, and consists of old Palaeozoic rock on the borders of which there are considerable deposits of coal. To the north, drained by the upper and middle Elbe, the lower Moldau, and the Eger, lies the Bohemian lowland, fitted for agriculture by its fertile soil and favourable climate, and for manufactures by its deposits of lignite and the water.power from the streams which flow from the highlands on the north.west and on the north.east. The Moravian lowlands are also fertile, and along with them may be included that part of the Danubian plain which borders Czecho.slovakia on the south. The north of Moravia and the neighbouring part of Silesia (Těšfn),¹ where coal and iron are found in and around the old Palaeozoic rocks, form an important mining and industrial area, and the mountains of Slovakia may from many points of view be distinguished from the other regions which have been mentioned.

To weld these different regions together into an economic unity with common interests, although not an easy task, will be less difficult than the corresponding one in Poland or Yugoslavia, as the Bohemian and Slovakian wings of the State are in a sense complementary to one another. Bohemia and Moravia were the

¹ Teschen.

chief industrial regions in the Austro-Hungarian empire, but, although they were also important agricultural areas, their production of food-stuffs was insufficient to meet the home demand. Slovakia, on the other hand, has few manufactures, but in addition to much good agricultural land it has considerable stores of iron and lignite. In order that these varied resources may be more fully developed it is necessary that the present system of internal communications should be remodelled. Before the war the north of Bohemia found its natural outlet both by rail and water through German ports; the south-east of Bohemia and Moravia looked towards Vienna; in Slovakia the railways, with only one important exception, converged upon Budapest. Various proposals to unite these different parts of the country more closely together and to facilitate its foreign trade are under consideration.

THE BOHEMIAN LOWLAND, along with which may be considered the slopes of the Erzgebirge and the Riesengebirge, is one of the most important regions in the country. It contains much fertile soil, and produces large quantities of sugar-beet, hops, and wheat. Czechoslovakia is, next to Germany, the chief producer of sugar-beet in Europe; more than half of the output comes from Bohemia, and in Bohemia it grows best in the valley of the Elbe, where the deep alluvial soils are rich in humus and lime. A considerable amount of sugar is exported, the chief collecting centre being Ústí,¹ on the Elbe, whence the sugar can be sent by water to Hamburg. The red alluvial soils in the valley of the Eger round Žatec² are retentive of heat, and are thus specially adapted to the cultivation of hops, which thrive best with a low diurnal range of temperature. Here are produced over three-fourths of the hops grown in Czechoslovakia; they have a high reputation, and quantities are exported to Germany and the United States. Wheat is cultivated chiefly on the soils of the Cretaceous area, and gives place on the more fertile alluvial lands to barley and sugar beet; the yield per acre is high, averaging for winter wheat from 27 to 30 bushels. Potatoes, which form a staple food of the inhabitants, are widely grown, but mainly on the poorer soils.

The industrial development of the Bohemian lowland has been aided by the proximity of the region to the coal deposits of Central Bohemia, the supplies of lignite which it itself contains, and the

¹ Aussig.

² Saaz.

large reserves of water.power in the neighbouring valleys. The lignite is found along the site of ancient swamps which lay at the foot of the Erzgebirge, the chief centres of production being at Most¹ and Falknov. Prior to the war over 40 per cent of the lignite mined was exported, but with the development of the Saxon fields the demand for it in Germany is now declining. The textile industries are found chiefly in the basin of the Upper Elbe, in the north-east of the country, where water.power can be obtained from the Sudetic mountains. Liberec² and Warnsdorf are engaged in spinning and weaving cotton goods; woollens are also manufactured at Liberec, and linens at Trutnov and Rumburk. Glass is made in the north of the country, where quartz can be obtained from the sandstone and fuel from the forest, though with the increased use of chemicals, coal is now frequently used in place of wood. Bor,³ Steinschonau, and Jablonec⁴ are among the principal seats of the industry. Karlovy Vary,⁵ besides being a famous spa, is the centre of the porcelain industry, as kaolin is found in the granitic hills in the neighbourhood. Paper mills are mostly situated near the mountains, where water.power is available.

CENTRAL BOHEMIA. The soils of this region are not so fertile as they are in the Bohemian lowland, but in places the land is well cultivated and cereals are grown. The coalfields which lie on the margins of the older Palaeozoic rocks are the most important in Bohemia, and coal is mined at Kladno and Slaný, to the north-west, and at Rakovnik to the west of Prague, and in the country about Pilsen. Iron ore occurs between Prague and Pilsen, and is worked at Nucice and Krasnahora. The proximity of coal and iron has led to the development of iron and steel industries at Kladno, Prague, and Pilsen; but local supplies of both minerals have now to be supplemented from elsewhere. Pilsen, which obtains its barley from the valley of the Elbe and from the Hana in Moravia, and its hops from Žatec, has world.famous breweries. Prague, the capital of the country, is an important industrial centre, and manufactures textiles, glass, beer, and other articles.

THE BOHEMIAN PLATEAU. In this region, which covers the south of Bohemia and extends into Moravia, the soils upon the Archaean rocks are generally poor and infertile, and it is interesting to note

¹ Brüx. ² Reichenberg. ³ Haid. ⁴ Gabionz.
⁵ Carlsbad.

that Budejovice,¹ the only large town of the region, besides being at the meeting-place of several important lines of communication is situated where Tertiary materials have been deposited in a basin on the older rock. Except in such favoured localities, rye and potatoes are the prevailing crops, grazing is an important pursuit, and much of the land is still forested. In the Moravian parts of the plateau, where many of the river valleys are overlaid by alluvium, cereals are cultivated. But the region, as a whole, is relatively infertile, no special industries have developed, and there are few towns of importance.

THE MORAVIAN LOWLANDS. The Moravian lowlands are more important, and consist in the main of the more recent formations drained by the Morava and its tributaries. An extension towards the north-east leads to the valley of the Oder at the Moravian Gate. The soil, consisting of loess and alluvium, is generally fertile, especially in that part of the Morava valley south of Olomouc known as the Hana, and among the more important crops are barley and sugar-beet ; maize, vines, and fruit are cultivated in the south.

The mineral wealth of the region has contributed greatly to its industrial development. Coal is found in a narrow strip of country running north and south to the west of Brno,² and is mined at Rosice. To the south-east of Brno, Hodonin, on the Morava, is the centre of a district from which lignite is obtained. The chief coal-producing region is, however, in the north-east, where the Ostrava-Karvinna-Krakov field extends into Moravia. In pre-war days the principal mining centres were around Moravska Ostrava and Vitkovice, but the resources of Czechoslovakia in this region have been greatly increased by the cession to her of part of the Těsin district of Austrian Silesia, where coal is mined at Slezska-Ostrava,³ Karvinna, and elsewhere. The total output of the Moravian and Silesian districts combined was over 10,000,000 tons in 1924 ; as the coal obtained makes good coke, a considerable amount is sent in that form to neighbouring regions for the iron-industries there. Iron ore occurs in various places both in Moravia and Silesia, but the output is small, and the iron and steel industries, to which it has given rise, now depend for their raw material on Spain, Hungary, and Sweden. Among the chief centres of production are Vitkovice in Moravia, and Trinec and Frystat in Silesia.

¹ Budweis.

² Brunn.

³ Polnisch Ostrau.

Machinery of various kinds is manufactured at Brno and Moravska Ostrava.

Textile industries are widely distributed, but the more important are found in the vicinity of the coalfields. Brno was the most important woollen-manufacturing town of the Austrian Empire, and owes at least part of its importance to the proximity of the Rosice mines. Svitavy and Sternberk in the north, with easy access to Moravska Ostrava, are extensively engaged in the cotton industry. Linen goods are made at Krasnahora¹ and Svitavy.

THE CARPATHIANS AND THE DANUBIAN PLAIN. The Carpathians are of considerable economic importance. The outer sandstone ridges are peculiarly favourable to the growth of trees, and, as scientific methods of forestry have in the past been encouraged by the Hungarian State, the income derived from their forests is considerable. Those of the Tatra region have, however, been exploited to a less extent. Agriculture is an important pursuit in the river valleys. Barley is the chief cereal grown, and sugar-beet and potatoes are also cultivated. On the Danubian plain, where the conditions of soil and climate are more favourable, wheat is an important crop, and the vine is grown in various districts on the left bank of the Danube. Pastoral farming is of importance, more especially in the mountain districts.

Minerals are widely distributed throughout the region. Before 1914 lignite has been worked mainly at Salgotarjan in Nograd and at Drog in Esztergom, but, as both of these are situated on the Hungarian side of the new frontier, other deposits are now worked. In the county of Nitra, in the basin of the Upper Nitra, there are known to be large quantities of lignite of fairly good quality. Iron ore is abundant, and is worked at the present time in Abauj-Turna, Gemer, and Spis. There are iron and steel works at Krompachy in Kosice and near Brezova, Zvolen, and elsewhere, but the output is small, and a considerable part of the ore mined has hitherto been sent to the Moravian works at Vitkovice or to the Hungarian works at Salgotarjan. Other minerals include manganese, antimony, and zinc. Textiles, machinery, and chemicals are manufactured in various small towns scattered throughout the region.

FOREIGN TRADE. Nearly one-half of the imports into Czechoslovakia consists of raw materials and nearly one-third of

¹ SchSnberg (Moravia).

manufactured goods; of the exports, about three-fourths consists of manufactured goods and only about one-sixth of raw materials. The following table shows the principal imports and exports (1929-31).

Imports	Percentage of total imports	Exports	Percentage of total exports
Raw cotton ..	8.8	Cotton goods ..	10.3
Raw wool ..	6.9	Iron and steel manufactures .	9.9
Cereals	6.8	Leather	7.5
Machinery ..	3.8	Sugar	4.9
Iron and steel ..	34	Coal	4.5
Hides	2.8	Glass	4.1
Mineral oil ..	2.1	Machinery ..	2.7
		Timber	2.4

Germany supplies just over one-fourth of the imports, while about one-half of that amount comes from overseas by way of the German ports of Hamburg and Bremen. The chief customers of Czechoslovakia are Germany, Austria, and Great Britain; but other central European States form in the aggregate an important market for Czechoslovakia!! goods. For the three years 1929-31 the value of the imports and exports was as follows—

	Special imports (in million korune)	Special exports	Average rate of exchange (At par 164.25 kr. = £\)
1929	19,941	20,485	168 ³⁰ / ₃₂
1930	15,678	17,460	164 ³ / ₃₂
1931	11,720	13,097	153 ⁷ / ₈

HUNGARY

The Hungarian plains, to which the State of Hungary is now entirely confined, represent an area of subsidence occupied in late geological times by an arm of the sea to which the inflowing rivers brought great deposits of sands and clays. In later times, when the sea had disappeared and when arid conditions prevailed,

these deposits were concealed over wide areas beneath a covering of loess; elsewhere, as, for example, between the Danube and the Tisza, there are long rows of sand-dunes which, although they have been fixed by vegetation, prevent the free run-off of the surface water and lead to the formation of salt lakes. In the river valleys the soil has been altered in character since the time of its deposition; it has been mixed with alluvium, and the marsh vegetation resulting from frequent inundations has given it a large supply of organic matter; it is consequently more fertile than the loess in the inter-riverain areas. The Little Plain is cut off from the Alföld or Great Plain by the Bakony Forest and the spurs of the Carpathians, which are the only upland areas now left to Hungary. The climate is essentially continental in its main characteristics, even although the country is protected to some extent by the Carpathians from cold northerly winds. At Budapest the mean temperature ranges from 28-2°F. in January to 70-3°F. in July, and the mean precipitation over the whole region is between 20 and 30 inches. The heaviest rainfall occurs during the early summer, but its irregularity is a source of much trouble to the agriculturist. In some years the drought is so great that all vegetation is burned up, and in others large areas are inundated by floods. With a steppe climate the Hungarian plains have also a steppe vegetation. Grasses cover the land in the early summer, but wither before its close, and away from the hills there are few trees except in places where their growth has been patiently fostered by man.

Since the war the inhabitants of that part of the Hungarian plains still called Hungary are more than ever dependent upon agriculture. Three main areas may be distinguished. In the north of the region between the Danube and the Tisza, where much of the soil is sandy and where there are many sand-dunes, barley, oats, and rye are the chief crops, but farther south, where conditions are more favourable, wheat and maize predominate, though the Backa, where the largest yield of those cereals was obtained, is now lost to Hungary. To the south and west of the Danube there are considerable areas of upland in the Bakony Forest, but on the whole the land is well cultivated, wheat and maize again being the principal crops. This region comes next to that between the Danube and the Tisza in respect to the area under vines, the hill country being particularly well adapted to them. The third region lies to

the east of the Tisza, and is the least developed part of the plain as it contains great areas of sandy soil. Wheat and maize are extensively grown, but the yield per acre is below the average. Tobacco is a crop of some importance.

As a result of the climatic conditions under which it is grown, Hungarian wheat is of high quality, but the average yield is little more than 18 bushels per acre. Maize is not so extensively grown as wheat and is mainly used for feeding stock. Rye, barley, and oats together cover over one-fourth of the cultivated area. Other crops include sugar-beet, flax, hemp, and hops.

In early times cattle-breeding was probably the chief pursuit of the Hungarian people, and it still holds an important place in the agricultural economy of the country, though its character has almost entirely changed. The natural pasture lands, over which the cattle formerly roamed, are rapidly decreasing in extent, while the area under fodder plants is largely on the increase. At the same time, scientific methods of breeding stock have been introduced, and the dairying industry is of growing importance.

In the years which preceded the war agriculture had made considerable progress in Hungary, and in this progress the State had played a prominent part. Agricultural schools and experimental farms had been established in many parts of the country. Government help had been given to co-operative societies, more especially to those connected with the sale of agricultural produce. Colonies, in regions hitherto uncultivated, had been established, and the margin of cultivation had been steadily pushed forward. The practice of husbandry had also advanced. The rotation of crops had become common over a great part of the country instead of the old three-field system, which still, it is true, survived in places; and the proportion of land which lay fallow every year had been gradually reduced. An agrarian law passed in 1920 to facilitate the breaking up of large estates has not yet had much effect. On these the yield per acre has, as a result of more modern methods, been higher than on the small farms which constitute the greater part of the agricultural domain.

Manufacturing industry in Hungary was for long confined to supplying the more immediate wants of the people, but, with the industrial development of Austria after 1866, it became evident that if Hungary were not to become economically dependent upon her

more powerful neighbour to a greater extent than was politically expedient, it would be necessary for the State to encourage the development of manufactures within its borders. This encouragement took various forms and was not without success. But it had as one result the establishment within the Magyar area of numerous industries dependent for their markets, no less than for their raw material, upon the non-Magyar parts of the kingdom, and, with the loss of these, the industries in question have been totally-disorganized. Practically the only mineral left to the new Hungary is coal. Hard coal is mined in the south-west at Pecs, and lignite at Salgotarjan on the frontier north-east of Budapest, and elsewhere. From these sources sufficient is at present obtained to meet more than four-fifths of the country's requirements. Flour-milling, which has its centre at Budapest, is less important than in 1913, as wheat is no longer received from Backa and the Banat. The iron and steel industry, on the whole, has also declined, though for certain classes of goods, such as textile and electrical machinery, the growing demand from the highly protected home market has led to an increased output. The chief centres of production include Budapest, Szeged, and Pecs. The textile industry at Budapest has grown rapidly since the war; it provides to an increasing extent the cheap standard goods required by the home market, which is unable to purchase the more expensive foreign products. But the present position is transitional, and it is evident that the future of Hungarian industry will depend upon the extent to which it is possible to enter into commercial agreements with the neighbouring States.

At present the bulk of the exports consists of various kinds of agricultural produce, which are sent to Austria, Germany, Italy, and Britain; while the imports are mainly manufactured goods from Germany, Austria, and Czechoslovakia. For the three years 1929-31 the value of imports and exports was as follows—

			Special imports	Special exports	Average rate of exchange (At par 27·82 pengos = £1)
			(in million pengos)		
1929	..	..	1,063	1,038	27·84
1930	..	..	823	911	27·79
1931	..	..	549	567	27·58

COMMUNICATIONS

The waterways of those countries treated in this chapter belong mainly to the Danubian system. The Danube itself, since its course has been regularized and the obstructions at the Iron Gate removed, is the most frequented of these, but its importance is lessened by the fact that it leads, not directly to the open ocean, but to a sea of relatively little commercial importance. As far as that part of its course at present under consideration is concerned, it was chiefly used in pre-war days for the interchange of goods between the industrial regions of Austria and the agricultural regions of Hungary. Of its tributaries, the rivers of the Alpine region are floatable rather than navigable, but considerable quantities of wood are brought to the lowlands by them. In Hungary, the Tisza, which has been canalized in places and brought under a certain amount of control, is navigable for the greater part of its course. The Moldau-Elbe is the great waterway of Bohemia, and is of special value for trade with Germany; it is now navigable for steamboats as far as Prague. Czechoslovakia hopes eventually to construct a waterway from Bratislava on the Danube to the Oder. From it another would break off at Přerov and run to Pardubice on the Elbe, below which that river is being improved as far as its confluence with the Moldau. Heavy goods, such as iron ore for industrial Vitkovice, are brought up the Oder by barge from Stettin to Gleiwitz, whence they go by canal to Kosel.

In the Dual Monarchy, Vienna and Budapest were the chief railway centres. The Orient Express route enters Austria near Salzburg, and passes through Vienna, Bratislava, and Budapest on its way to Belgrade. From Vienna a line runs to Prague, which is the meeting-place of routes from southern Germany by the Gate of Furth, from central Germany by the passes round the Fichtelgebirge, and from northern Germany by the valley of the Elbe through the hills of "Saxon Switzerland." Another line from Vienna follows the course of the March, and, after entering the valley of the Oder, passes through the Moravian Gate between the Sudetes and the Carpathians on its way to Kraków. The most important route from Vienna to the Adriatic runs south-west from the Austrian capital, crosses the Semmering pass, follows the Mürz-thal to Bruck, and the Mur-thal to Unzmarkt, passes into the valley of the Drava near Villach, and, after tunnelling through

the Karawanken and Julian Alps, descends the Isonzo on the way to Trieste. Two important railways follow the longitudinal valleys of the Alps—one, branching off near Brack from the Semmering route, utilizes the valleys of the Enns, the Salzach, and the Inn, and some of their tributaries to reach Innsbruck, and, after passing through the Arlberg in a tunnel over six miles in length, arrives in Switzerland; the other runs from Villach along the valleys of the Drava and Puster, and joins the route from Innsbruck to Verona by way of the Wipp-thal, the Brenner pass, and the valleys of the Eisak and the Adige. These two longitudinal lines have now been joined by a railway which passes by a tunnel over five miles long through the Hohe Tauern, and forms part of the shortest route from Salzburg and south-west Germany to Trieste.

The development of Hungarian railways was largely the result of the national policy pursued by the Hungarian Government, and the country had, on the whole, a fairly good network of communications. The zone system was, however, in operation, and was for political purposes worked in favour of direct communication with Budapest, so that, while radial movement was easy, cross-country traffic frequently found many obstacles placed in its way. Among the more important lines from Budapest are those which cross the Carpathians to Krakow, Lwow, and Bucharest, and the Karst to Fiume.

CHAPTER XIV

ROMANIA

ROMANIA, as it existed in 1914, consisted of the principalities of Walachia and Moldavia lying on the outer slopes of the great Carpathian curve, and the Dobruja, a tract of country between the northern course of the Danube and the Black Sea. To these have since been added, as a result of the war, Bessarabia and Bukovina to the east and north-west of Moldavia respectively, the hill country of Transylvania within the Carpathian curve, and part of the Hungarian plain. The area of the country has thereby been increased from 56,458 to 122,282 square miles; in 1930 its population was 18,025,000.

As the political and economic conditions which prevailed in the old kingdom differed in various respects from those in the Austrian, Hungarian, and Russian sections of the new territories, it seems advisable to begin by considering them apart. Thereafter it will be possible to estimate the value of the factors which will contribute to the economic growth of the new Romania.

THE OLD KINGDOM

In Walachia and Moldavia several distinct physical regions may be recognized. The outer slopes of the Carpathians are bordered by a hill country which, in Moldavia, extends as far as the Prut, but, in Walachia, passes into the plain which lies between it and the Danube. In appearance, the hill country resembles an immense plateau much dissected by the rivers which traverse it. On the slopes of the Walachian valleys there are terraces which have been formed by the rivers at an earlier stage of their existence, and these terraces are of considerable economic importance, as they are covered with fertile soil and frequently provide the only cultivable land in the region.

The Walachian plain rises somewhat steeply above the valley of the Danube, but merges almost insensibly into the hill country in the north. Although it varies somewhat in height, it everywhere presents the appearance of a monotonous plain overlaid by alluvial

soils in the west, and by loess in the east. On the slopes of the somewhat deeply incised valleys, the water which has sunk through the loess flows out in springs, which fix the sites of human settlements throughout the region. The Dobruja, to the east of the Walachian plain, is hilly in the north, marshy in the east, and a plateau in the south.

The climate of Romania is, on the whole, continental in character, and the summers, in the plains at least, are very hot, while the-winters are cold. At Bucharest the mean monthly temperature ranges from 25°F. in January to 73°F. in July. Precipitation is heaviest on the mountains and least on the plains, the amount varying from over 30 inches in the former region to less than 15 in the latter.

The best division into natural regions is that afforded by physical structure. The Carpathians, the hill country in Moldavia and Walachia, the Walachian plain, and the Dobruja have each their distinctive economic development determined by physical and climatic conditions.

THE CARPATHIANS are forest clad to a height of about 5,000 feet. On the lower slopes the beech is the characteristic tree, but higher up it is replaced by the spruce. Above the tree line come the Alpine pastures, on which sheep which have wintered in the Walachian plain are grazed during the summer months. A little agriculture and much lumbering, more especially in the "wooded Carpathians" of Moldavia, are the chief pursuits of the region.

THE HILL COUNTRY. On the uplands between the river valleys much of the land is still forested, the characteristic trees including the oak, the beech, the maple, and, in Moldavia, the black poplar. Agriculture is mainly confined to the river terraces in Walachia and to the valley slopes in Moldavia. In these regions maize is the most important crop, although other cereals, sugar-beet, and various industrial plants are cultivated. As an agricultural country Moldavia takes a high place; its loess soils are very fertile, and there is abundant sunshine during the summer months.

In the Tertiary rocks of the region, especially in the south-east, there are large deposits of petroleum and salt. The area within which petroleum has up to the present been found lies between the Ialomița and the Bistrita, and there the most productive wells are in the districts of Prahova and Dambovită. There are refineries at Cămpina, Ploesti, and elsewhere, and much of the oil exported is

conveyed to Constanta, on the Black Sea, by a pipe-line which crosses the Danube by the great bridge at Cernavoda. The Romanian oil industry developed rapidly during the earlier years of the present century, and in 1914 the annual output amounted to 3-5 per cent of the world's production. To prevent the wells falling into German hands they were destroyed by a British mission in 1916, but they have since been restored or replaced ; the present output, although somewhat larger than before the war, amounts to less than 3 per cent of the world's production.

The industries of the hill country are almost entirely concerned with working up raw materials such as timber and agricultural produce for consumption at home or for export abroad. In Moldavia they include flour-milling, the manufacture of sugar, and distilling; in Walachia, apart from those connected with the exploitation of the oil fields, they are of a similar nature, but have shown a tendency to settle in the towns along the southern margin of the hills rather than within the hills themselves.

THE WALACHIAN PLAIN, except in the north where oak-woods are found, is a true steppe land. Much of it is now devoted to agriculture and it is the chief wheat-producing region in the country, more than half the total acreage under that cereal in the old kingdom being found within it. Maize covers a somewhat larger area, and various other cereals, the mulberry, tobacco, and the vine are also cultivated. The growth of Rumania as a wheat-exporting country was due in the main to the development of the Walachian plain by capitalist farming. Owing to variation in the annual rainfall the crop varies greatly from year to year, and it was the large farmer who was able not only to balance the failure of one year against the success of the next, but to invest in modern machinery and to cultivate by modern methods. By him it was that the Baragan, which for long was almost entirely uninhabited except by wandering herdsmen, was transformed into a productive land.

At Bucharest, the capital, and at Braila and Galatz, the chief ports on the Danube, various industries, conducted on modern lines, have been established. Bucharest and Braila manufacture textiles and have large flour-mills. Galatz is engaged in saw-milling and in the export of timber. Among other industries in these and other towns of the Walachian plain are the manufacture of sugar, beer, chemicals, and cement.

THE DOBRUJA. In the south around Constanta, and more especially in the districts taken from Bulgaria after the second Balkan War (1913), there are considerable areas of good corn-growing land. In the north copper has been worked to some extent in the district of Tulcea. Constanta is the chief town, and is of special importance as the one ice-free port in the possession of Romania.

THE NEW TERRITORIES

TRANSYLVANIA AND THE EASTERN BANAT consists of a high plateau of Tertiary formation surrounded by three groups of primitive rocks—the Transylvanian Alps in the south and south-east, the Rodna Mountains in the north between the Maros and the Tisza, and the Bihar Mountains and other ranges in the south-west between the Maros and the Koros. The central plateau has a much eroded and very irregular surface, it slopes from east to west, and varies in height from 1,300 to 2,000 feet. In the valleys of the rivers which drain the region there are alluvial river flats of considerable size.

The climate is continental in type, modified to some extent by the elevation of the land. On the plateau the rainfall is generally between 20 and 30 inches, but on the slopes of the encircling mountains it is, as a rule, somewhat greater. Owing to the character of the surface less than one-fifth of the land is under cultivation. Maize is the principal cereal, but wheat, oats, and barley are also grown, and other crops include sugar-beet, vines, and tobacco. Pastoral pursuits are of considerable importance, and there are large numbers of both cattle and sheep. Various parts of the country, and more especially the Carpathians, are wooded, and forestry is of some importance.

But it is on account of its mineral wealth that this region was of value to Hungary and will be of value to Romania. Gold, silver, copper, and lead are found in various parts of the region. Of these gold is the most important; it is mined in the Bihar group of mountains, in the Transylvanian Alps, and elsewhere. Within recent years the coal and iron resources of the country have also been developed. There is little true coal in Transylvania, but at Anina and Recita in the Banat, where there are also deposits of lignite, about one-third of the coal of Hungary was formerly obtained. In Transylvania lignite is found in the south of Hunedoara

and in various other districts, and it is there that over 70 per cent of the total output of coal in Romania is produced. Iron ore is mined in the Banat in the same districts as coal, and it is also obtained in Hunedoara and Tarnava-Mare¹ in Transylvania. Among the metallurgical works, which owe their existence to their proximity to iron and fuel, some of the most important are those of Hunedoara in the county of the same name, where charcoal is partly used, and of Anina and Recita in the Banat, where both coal and charcoal are used for smelting purposes. In addition, Anina produces cast and puddled iron, and Regita steel. Of the other industries of the region the most noteworthy is the manufacture of wool, carried out mainly in the south of Transylvania where sheep are most numerous.

THE WESTERN BANAT AND ARAB belong to the Alfold, and like it are devoted to agriculture, wheat and maize being the chief crops. Sericulture appears to have made considerable progress within recent years. Flour-milling and the manufacture of tobacco and silk are among the chief industries, and are carried on at Timișoara and elsewhere.

BUKOVINA. The physical features of Moldavia are continued in Bukovina, and there is a belt of Carpathian country in the south-west, and of hill country in the north-east. In the latter region the climate is markedly continental in type. Agriculture is the main pursuit of the people, maize, oats, barley, and potatoes being the principal crops, but the standard of cultivation is not high. Forests cover a considerable area and large quantities of timber are floated down the Moldavian rivers. There are some minerals but they do not appear to be of much value.

BESSARABIA is traversed in the north by spurs of the Carpathians, but there is much good agricultural land on which wheat and maize are extensively grown. The central parts of the region are also hilly and are heavily forested. In the south is the Bundjak steppe on which large numbers of cattle, sheep, and horses are raised.

GENERAL CONSIDERATIONS. Romania is essentially an agricultural country²; in the old kingdom 80 per cent of the population are engaged in the cultivation of the land, and in the new territories

¹ Magyar: Nagy-Kukullo.

² *L'Agriculture en Roumanie*, Album Statistique (Ministere de l'Agriculture, Bucharest, 1929).

the percentage is also high. But a considerable change has taken place in the conditions under which agriculture is carried on. In the old kingdom, in pre-war days, nearly one-half of the cultivated area consisted of large estates, and it was from these that most of the grain exported was obtained. In accordance with a decree issued in 1918, the owners of these estates have been expropriated and their lands converted into small holdings, but what the final result will be is not yet clear. There has been so far a reduced output as a result of the extension of peasant methods of cultivation, the decreased use of machinery, and the difficulty of obtaining labour for the larger farms. This decreased output appears to have been accompanied by an increased consumption of grain within the country itself. Under the old regime many of the holdings were too small to maintain their owners in comfort, while the workmen on the large estates were inadequately remunerated. The indications are that in the future farming will tend to be for sustenance rather than for profit, and that the export of grain will probably remain much below its pre-war figure.

The principal imports of Romania are food-stuffs, cotton, and woollen goods, iron and steel, machinery and hardware; while the exports are live stock, grain, timber, and petroleum. For the three years 1929-31 the imports were said to average 22,932,000,000 lei, and the exports 26,507,000,000 lei. (In 1929 the lei was stabilized at 813-59 to the £, but in 1931 the exchange rate averaged 763-58 to £1.)

CHAPTER XV
THE BALKAN COUNTRIES

YUGOSLAVIA

YUGOSLAVIA (no longer officially termed the Kingdom of the Serbs, Croats, and Slovenes) was formed by the union with Serbia of various communities of Southern Slavs. To the former Kingdom of Serbia has been added Montenegro, likewise an independent State; Croatia, Slavonia, the Backa, and the western part of the Banat taken from Hungary; Bosnia, Hercegovina, Dalmatia, and Slovenia (the greater part of Carniola, and the southernmost portions of Carinthia and Styria), which belonged to Austria; and some of the western districts of Bulgaria. The new State is therefore founded on an ethnic basis, but the ethnic consciousness to which it owes its existence is of recent date and has yet to stand the test of time.

Physically, Yugoslavia belongs to several very different regions. The Backa, the Banat, and the greater part of Croatia and Slavonia fall within the Hungarian plain. Slovenia forms part of the Alpine zone. Dalmatia, Hercegovina, and Montenegro, together with the western parts of Croatia and Bosnia, are traversed by the Dinaric ranges and have a karst topography. Serbia and the eastern parts of Bosnia belong, in the main, to the mountainous region of the Thracio-Macedonian massif. In the north the climate is typically Central European in type, but in the south it is somewhat modified by the proximity of the sea, while along the Adriatic coast some of the characteristics of the Mediterranean type are to be noted.

The physical structure and climate of the country afford the best basis upon which to divide it into natural regions. But it must be remembered, that, previous to the Balkan wars (1912.13), the region which now forms Yugoslavia was divided up among no less than six different states, and that the present economic development of its different parts has been much affected by their past history and cultural relations. The geographical factor is, therefore, not the only one to be considered in estimating the economic position of the various natural regions into which Yugoslavia may be divided.

NORTHERN SERBIA, which includes the basins of the Morava and the Timok as far south as the Kopaonik range, falls in a series of terraces from a height of about 2,500 feet in the south to one of about 300 feet in the neighbourhood of the Danube. The sands and clays upon these terraces are covered with a thick layer of humus, and the soil, especially in the west, is very fertile. Formerly wooded, the land is now cleared, and is dotted with farmsteads, vineyards, and orchards. Maize and wheat are extensively grown and other cereals are cultivated, while the prolonged autumns, characteristic of the region, enable various fruits to ripen to perfection. Of these the most important is the plum; part of the crop is used in the manufacture of *slivovitsa*, a brandy, which forms the national beverage of the Serbians, and part is exported in the form of prunes. The industrial crops include sugar-beet, hemp, and tobacco. Within this region may be included northern Bosnia, which is similar to it in relief, climate, and economic vegetation. To the east of the Morava pastoral pursuits predominate.

Nearly one-fourth of the forested area of Yugoslavia lies in Bosnia and northern Serbia, the principal trees being the beech, the oak, and (in Bosnia) the fir. These forests are an important source of wealth, producing, in addition to timber, wood-pulp and cellulose.

The mineral wealth of these regions is not great. Coal is worked in various parts of Northern Serbia, but the greater part of the output at present consists of brown coal and lignite obtained from the State mines at Senjski Rudnik, not far from Cuprija on the Belgrade-Nish railway. Of greater importance are the copper mines at Majdanpek and Bor about 75 and 85 miles respectively south-east of Belgrade. The ore from these mines, which appear to have been extensively worked by the Central Powers during the war, is smelted on the spot. In Bosnia Tertiary coal is found to the north and west of Sarajevo, at Tuzla in the north-east of the country, and elsewhere. In the latter region, also, deposits of salt, the most important in Yugoslavia, have given rise to a chemical industry. There are large deposits of iron ore at Ljubija, north-west of Banjaluka; and at Vares, north of Sarajevo, where iron ore is also found, there are blast furnaces.

As a result of the importation of foreign goods domestic industries have decayed, and, except in a few cases, modern manufactures have advanced but little beyond the stage of working up for local

consumption the agricultural produce of the country. Flour mills and breweries are somewhat widely distributed, and there are a few factories for the manufacture of textiles, especially cotton and hemp. Of the domestic industries, carpet-making at Pirot alone has more than local importance.

CENTRAL SERBIA includes the elevated country from which rivers flow to the Mediterranean, the Adriatic, and the Black Sea. In the tectonic basins of the regions there is much fertile soil, and cereals and fruit are extensively grown. On the lower slopes of the surrounding mountains cattle and sheep are raised in considerable numbers, and above the tree line there are important summer pastures. The mineral resources of the region include iron ore in the Kopaonik Mountains, and silver-lead at Kratovo about thirty miles east of Kumanovo, but whether the deposits are of more than local importance does not yet appear to have been determined. The manufactures are somewhat similar to those of Northern Serbia.

SOUTHERN SERBIA includes the greater part of Macedonia which became Serbian territory after the Balkan wars, and may be divided into two regions, a western highland and an eastern lowland. In the former there are a number of lake basins such as those of Monastir, Okhrida, and Presba. On the fertile soil around the lakes cereals are grown, while above the tree line on the surrounding mountains there are summer pastures frequented by shepherds from the Aegean and the Adriatic. In the eastern region, the valley of the Vardar lies at a lower level and experiences a modified form of the Mediterranean climate. The mountain slopes are unforested, and in the lowlands, where irrigation is practised, mulberries, vines, tobacco, and rice are grown. Iron ore occurs in various places, and appears to have been somewhat extensively worked by the Central Powers between Veles and Prilep. Lead, lignite, chromium, and other minerals are also found. Linen and leather are manufactured in places.

THE NORTHERN PLAINS include that part of the Banat ceded to Yugoslavia, the Backa, and the eastern part of Croatia-Slavonia. In the Banat and the Backa the soil is fertile, and the region was one of the most noted in Hungary for the production of wheat. The eastern part of the country lying between the Drava and the Sava is a lowland covered with loess, but farther west there are

sands and clays from which various isolated hills emerge. As a result of its varied topography the economic activities of this part of Croatia-Slavonia are somewhat more diversified than those of the Backa and Banat. In the lowlands, where climatic conditions are similar to those of the plains of Hungary, cereals, especially maize and wheat, tobacco, and sugar-beet are grown. The vineyards on the low hills in the west suffered severely from the phylloxera, but appear to have recovered. Plums are grown in the upland country to the north of Zagreb, and are either distilled for brandy or dried for prunes. Horse-breeding, pig-raising, and bee-keeping are all important pursuits. These varied occupations give employment to the mass of the people, but agricultural methods, although they have made considerable progress within recent years, are still somewhat backward, and the land does not yield what it might under more favourable conditions.

The region is without much mineral wealth, and apart from cotton mills the manufactures which exist are chiefly concerned with working up the agricultural produce of the country; distilleries and breweries, flour mills, and silk and tobacco factories are widely distributed. As forests are abundant, more especially in the west, there is a considerable output of wooden goods of various kinds. Zagreb, Osijek, and Zemun¹ are among the more important industrial towns.

THE ALPINE REGION. Slovenia, the country of the Slovenes, includes the greater part of Carniola and the most southerly districts of Carinthia and Styria. It falls within the Alpine zone, except in the south-west (which will be treated along with the Karst to which it belongs), and in the east, where it descends to the plains at Maribor and elsewhere. The most fertile districts include the basin of Ljubljana,² which forms the heart of the vSlovene country, and the basin of Celje to the north-east. These depressions, as well as the main valleys, are bordered by soft Tertiary strata and alluvial soil, which produces good crops of cereals, while the vine and other fruits are cultivated on the sunny slopes of the surrounding hills.

The mineral wealth of the region is not unimportant. Coal of Oligocene age is found in the valley of the Sava at Trbovlje (Trifail), about twenty-five miles east of Ljubljana, and at Sagor and

¹ Semlin.

² Laibach.

Hrastnigg in the immediate vicinity. Lead is mined and smelted near Prevalje, about forty miles west of Maribor, and at Litija, fifteen miles east of Ljubljana. Celje smelts zinc ore obtained in Slovenia and abroad. For the blast furnaces in the Ljubljana area imported iron-ore is used. Manufactures are but little developed and, apart from the light iron and textile industries of Ljubljana and the numerous saw-mills scattered throughout the forested areas, are of local importance only.

THE DINARIC REGION. The southern folds of the Eastern Alps curve round towards the south-east and form a region to which the title of Karst, originally applied to a more limited area, has been extended. This region includes part of Carniola, the west of Croatia and Bosnia, Dalmatia, Hercegovina, and Montenegro. Its distinguishing feature is the limestone, of which it is almost entirely composed. This limestone has been much affected by water and a great part of the drainage is now underground, so that notwithstanding its heavy precipitation—frequently over 60 inches—the country suffers severely from drought. In certain valley-like depressions, to which the name of *polje* is given, the water comes to the surface, and it is in these depressions accordingly that the best agricultural land is to be found.

Cereals are cultivated, while tobacco is one of the chief crops of Hercegovina. Much of the mountain area is barren or covered, at best, with scattered scrub and thorn, but in places where limestone soils have accumulated, or where the flysch is found, there are deciduous and coniferous forests. Interspersed among the latter, and spreading out into an Alpine zone, there are meadows to which shepherds from the lowlands bring their flocks during the summer months. Along the coast, between the sea and the mountains, lies a narrow belt of country in which the Mediterranean type of climate prevails. In places which have sufficient water and are sheltered from the bora, a cold wind blowing down from the mountains, the vine, the olive, and various fruits are grown. The total area capable of cultivation, however, is limited, and many of the inhabitants seek employment in fishing, in navigation, and in commerce. Within recent years, also, manufactures have developed. Calcium carbide is made at Sebenico and Omis by hydro-electric power obtained from the Kerka and Cetina respectively. Split is the centre of an important cement industry. (Zara, which has long

been noted for its maraschino, a liquor manufactured from sun-dried cherries, is now included within Italian territory.)

CONCLUSION. From the foregoing survey it is evident that the economic future of Yugoslavia is bound up with the development of its agricultural resources. The output of the country could be greatly increased by improved methods of husbandry, and by the cultivation of much fertile land which, as in Serbian Macedonia, is at present lying waste. Manufactures will always be handicapped by the want of coal and other minerals on an extensive scale, but, with the utilization of the large supplies of water-power which exist, it should be possible to develop many local industries in which such products of the land as timber, hemp, and sugar-beet would be prepared for the consumer. Even now it is proposed to establish stations on the Bosna and the Drina to provide power for a wide stretch of country lying on either side of the Sava. One of the main difficulties with which the country has to contend is the totally inadequate system of communication, and the obstacles which the physical structure of the country puts in the way of its improvement. This is the more serious because it tends to retard the consolidation of the various South Slav peoples, who at present stand on very different cultural levels. The very existence of Yugoslavia as a separate state depends upon wise government at home, in order that a common nationality may be created, and peace abroad, in order that time may be given for the development of the resources of the country.

The present outlets of Yugoslavia are by way of Salonika, Gru2, and Susak. Part of the harbour at Salonika with land and buildings has been constituted a Free Zone for the benefit of Yugoslavia. Gruž (Gravosa) on the Adriatic is the port of Dubrovnik (Ragusa), and the centre of a large transit trade. Since the settlement of the Fiume question, Baros, the port of Susak, has also developed a considerable trade.

The principal exports of Yugoslavia are timber, wheat and maize, live stock, meat, and copper; the imports include textiles, iron and steel goods and machinery, sugar and coffee, coal and coke.

In the years 1929-31 imports averaged 6,451 million dinars and exports 6,501 million. At par 25-2215 dinars = £1, but in 1931 the rate was 257 to the £.

For railways, see pages 209-10.

ALBANIA

Albania, which lies along the Adriatic between the Greek frontier and the former Kingdom of Montenegro, has an area of about 11,000 square miles, and a population of 1,400,000. The greater part of the country is mountainous, and is only fit for pastoral pursuits. The coastal districts are said to be unhealthy, but in the valleys of some of the rivers there are not inconsiderable areas of land which might be rendered more productive than they are at present. Partly on account of its mountainous character, and partly because of Turkish misrule in the past, the country is entirely undeveloped. A few roads constructed during the war have apparently been allowed to fall into a state of disrepair, and there are no railways. Small quantities of cereals, fruit, and dairy produce are exported to neighbouring lands, but the climatic conditions seem well adapted to the cultivation of both cotton and tobacco. The ports of the country, Valona, Durazzo, and San Giovanni di Medua, are merely open roadsteads. For economic development foreign capital is necessary, but until orderly government is assured that is unlikely to be forthcoming.

BULGARIA

From the Danube the Balkans strike southwards and then curve towards the east, where for a considerable distance they run with an average height of 5,000 to 6,000 feet, gradually descending as they approach the Black Sea. In the first part of their course they consist of crystalline rock, but towards the east they appear to be mainly of sedimentary origin. To the north of them lies the Balkan Foreland, which is built up of sandstone and limestone overlaid in places by loess, and is deeply dissected by the rivers which flow northwards to the Danube ; while to the south of the main range and separated from it by rich alluvial valleys, such as that of the Tunja, are the mountain masses of Sredna Gora and Karaja Dagh. The Roumelian plains, which lie to the south of these and contain much fertile soil, are bordered on the south-west by the Rhodope Mountains, which belong to the Thraco-Macedonian massif, and on the west by a hilly country in which there are fertile depressions such as those of Sofia and Kyustendil.

Climatic conditions vary in different parts of the country, but

are everywhere more or less continental. To the south of the Balkans the land is more sheltered than to the north, and the temperature is higher, especially during the winter months. At Pleven, for example, the January mean is 28°F., while at Stara Zagora it is 33°F.; the July mean for Stara Zagora is 75°F., and that for Pleven only a little less. The rainfall generally varies between 25 and 30 inches.

Bulgaria has an area of 39,814 square miles and a population estimated at 6,000,000. About 40 per cent of the land is cultivated and about 30 per cent is under forest. As the greater part of the arable area is owned by the peasantry, whose holdings seldom exceed 15 or 20 acres, a land problem does not exist, and about 80 per cent of the people are settled on the soil. The Bulgarian is a patient and hard-working agriculturist, but his methods of cultivation are still somewhat primitive, and his output could undoubtedly be increased by an improved system of tillage. The arable area, although somewhat larger than in pre-war days, could be further extended by the development of irrigation, and it has been definitely decided to irrigate parts of the Maritsa valley when the financial situation permits. Irrigation works in the valley of the Iskr are also under consideration. Apart from sufficient coal for present needs and some copper, the mineral wealth of the country is not, as far as is yet known, of much importance. The old handicrafts which were carried on in the homes of the people have declined as a result of the importation of cheap foreign goods, and although manufactures on modern lines have been introduced and encouraged by tariffs, they have on the whole proved only a qualified success.

In an agricultural country like Bulgaria the chief natural regions are determined by physical and climatic conditions, and the Balkans, the Balkan Foreland, the Roumelian Plain, the Rhodope Mountains, and the western basins are all sufficiently differentiated from one another to justify their separate treatment.

THE BALKAN FORELAND is the most important agricultural region in Bulgaria. Wheat and maize are the chief crops, the latter being grown mainly in the west where climatic conditions are more favourable. Other crops include the vine which is found everywhere, but especially in the east on the slopes overlooking the Black Sea. Sugar-beet is also grown. As the country is a natural steppe, much of the land is devoted to pastoral pursuits, and cattle,

sheep, and goats are raised in considerable numbers. Manufactures are of but slight importance. Woollen goods are woven at various places where water-power is available, and there are breweries, tanneries, and flour-mills at Ruschuk, Vidin, and elsewhere. Varna, on the Black Sea, manufactures cotton goods. Copper is mined in the country round Vratza.

THE BALKANS. The western and central parts of the Balkans are covered with forests of oak and beech, and constitute one of the chief timber reserves of the country. In the past these forests have been recklessly exploited, but various arrangements have now been made for their conservation. Agriculture is widespread in the valleys and on the lower slopes of the hills, but is carried on by more primitive methods than on the Balkan Foreland. There are deposits of coal between Gabrovo and Sliven, but they do not appear to be of much value. With the exception of the woollen mills at Gabrovo and Sliven, the industries are mainly of a domestic nature.

In the fertile valleys which separate the Balkans from the Sredna Gora and Karaja Dagħ, more especially in that of the upper Tunja, one of the most important products is the rose, from which attar of roses is distilled.

THE ROUMELIAN PLAIN has a sheltered position and a fertile soil, and, in addition to wheat and other temperate cereals, produces rice, silk, and tobacco. The mulberry is cultivated and the silkworm raised around Philippopolis and Stara Zagora. Though the bulk of the cocoons is exported, an increasing amount of silk is reeled at home. Rice is grown in the neighbourhood of Philippopolis, where a certain amount of irrigation is possible; the area cultivated has more than doubled since the war. Manufactures are mainly confined to preparing the agricultural products of the region for use or for export. Copper is mined near Burgas.

THE RHODOPE REGION. Owing to its mountainous character, its isolation, and the fact that it has been for so long under the rule of the Turk, the economic value of this region is difficult to determine. In the west, where there are large forests, much timber is cut and sent down to the lowlands. Elsewhere, agriculture and pastoral farming are the chief pursuits of the inhabitants. Various concessions have been granted for the working of minerals in the region, but so far the results have been of little importance.

THE WESTERN BASINS. In this region, which corresponds

roughly to the departments of Sofia and Kyustendil, most of the land is mountainous, but there are some fertile depressions in which the hardier cereals are cultivated. That in which Kyustendil stands is noted for its tobacco, and sugar-beet is grown in the plain of Sofia. There are deposits of lignite to the south-west of Sofia, and these are worked at Pernik, where the greater part of the mineral fuel consumed in the country is obtained. The lignite is of good quality, and is used on the railways and for other purposes. At Sofia various industries, which obtain their raw material from domestic supplies, have been established.

Exports consist almost entirely of agricultural produce, tobacco, eggs, and wheat and other cereals, accounting for about three-fourths of the total output. The chief imports are textile goods, iron and steel goods, and machinery, mineral oils, and chemical products. For the three years 1929-31 the imports averaged 5,858,000,000 leva and the exports 6,174,000,000 leva. (Par of exchange 673-569 leva equal £1.)

GREECE

From the physical point of view, Greece may be regarded as falling into three parts—continental, peninsular, and insular. In continental Greece the main range, which consists of limestone, is continued southward from the Shar Dagh in Macedonia as the Grammos, Pindus, and Tymphrestos. To the west of it, and parallel to it, are various other ranges, likewise of limestone, which are separated from one another by belts of low undulating or hilly country in which sandstones and schists are the prevailing formations. To the east, on the other hand, the mountain spine throws off various branches which either recurve and enclose low basins like that of Thessaly, or separate from one another alluvial plains such as those of Lamia and Boeotia. The territories acquired in the Balkan and European wars extend eastward to the Maritsa, and include the southern slopes of the Thraco-Macedonian massif, and the coastal plains by which they are bordered. In peninsular Greece the characteristic features are the central mountain system, and the various ranges which are more or less closely attached to it. Between the latter lie relatively small alluvial plains like Argos and Sparta. In the west the Peloponnesus slopes away across a broad plateau to a fairly wide coastal plain. The

Greek islands are the fragments of a fractured land mass. Euboea and Crete are the largest, but the Ionian Isles and some of the Cyclades and Sporades are also of importance.

The climate is typically Mediterranean. Except in the northern part of continental Greece, where it is somewhat lower, the mean temperature is generally between 45°F. and 50°F. in January, and between 75°F. and 80°F. or a little over, in July. The rainfall, the greater part of which falls during the winter half of the year, averages between 20 and 30 inches. To the west of the Pindus, however, it is much heavier, and Yannina has about 50 inches.

Although agriculture is the main pursuit of the people of Greece it is not carried on without difficulty, and only about one-fifth of the total area is cultivated. In the mountainous districts, especially where limestone is the prevailing rock, there is little fertile soil, and it is on the alluvial plains, which are of limited extent, that the bulk of the population is settled. The climatic conditions are favourable to the growth of various Mediterranean fruits, but the drought of summer and the difficulty of obtaining water for purposes of irrigation at that season tend to restrict the cultivated area. Formerly, the methods of cultivation were often of a most primitive description, but modern machinery has now been introduced, and the value of fertilizers is gradually being recognized. For manufactures Greece has few advantages; there is little coal and no large supplies of other minerals, and the industries which exist are mainly those which depend for their raw material upon the agricultural produce of the country. Maritime trade has always been important, as land transport has in many cases been rendered difficult or impossible by the nature of the surface, while the alluvial plains generally open out to the sea and are more easily connected with one another by water.

By the exchange of subjects arranged after the war, Greece is believed to have lost over 400,000 Turks and Bulgarians, and to have received about 1,500,000 Greek refugees from Asia Minor. The arrival of these led to many changes within Greece itself. Waste lands in Macedonia and elsewhere have been brought under cultivation by the refugee families, who were placed upon them, while manufactures have received an impulse from the cheap labour furnished by those who settled in the towns. In addition, certain industries, such as the manufacture of Oriental rugs, formerly

carried on in Asia Minor, were almost wholly transferred to Greece.

As a result of the annexations after the Balkan and European wars, and of the exchange of subjects, Greece has now an area of nearly 50,000 square miles, and a population estimated at 6,000,000. But its topography is so irregular that a division into natural regions would involve unnecessary detail, and it will suffice here to note some of the more important areas which lie within the country.

To the west of the Pindus, where there is a heavy rainfall, the distribution of crops is determined by the nature of the soil; and the limestone ranges are devoted to pastoral pursuits, while the intervening sandstone belts and the plains which border the rivers grow cereals, vines, tobacco, and fruit. The olive and the lemon are cultivated on the coast where the winters are mild. In the Pindus itself there is little fertile soil, and the land is mainly used for grazing purposes, large numbers of sheep which have wintered in Thessaly, Aetolia, and Boeotia being fed on the highlands during the summer months. But with the extension of cultivation these winter pastures are decreasing, and nomadic shepherds are being replaced by stock breeders who raise forage on their own land.¹ To the east of the main range lie the plains of Thessaly, which constitute the most important agricultural area within the country, and would be even more important were a better system of agricultural economy practised. The principal crops include wheat, barley, and maize. Tobacco and cotton are also cultivated, and where the climate is favourable various fruits are grown. In the river valleys and on the coastal plains farther to the south, where one of the most fertile districts is the drained basin of Lake Copais, the products are somewhat similar. Along the northern shores of the Aegean, in the recently acquired territories, agriculture is in the main confined to the lowlands. Tobacco is the chief commercial crop, and is cultivated round Drama and Kavalla, Xanthe, and Giimuljina. Cotton is also grown in Macedonia and the silk-worm reared. In the Peloponnesus all the characteristic Mediterranean fruits are found. The most productive districts are the alluvial plains, but even within the limestone hills there are many patches of carefully cultivated soil. On the north and west coasts is grown the stoneless grape which yields the currant of commerce,

¹ *Greece To-day*, E. G. Hears, p. 279.

and it is from the areas mentioned, from Zante and Cephalonia in the Ionian Isles, and from Chalcis in Euboea, that the bulk of the Greek currant crop is obtained. In these places the conditions of soil and climate are so favourable that they are more than able to meet the world's demand. Indeed, over-production has at times been so great that in 1905 a Privileged Company was empowered by the Government to purchase all currants grown for export, to fix prices, to restrict output, and to sell the surplus for the manufacture of alcohol. This company was abolished in 1924, but since then the Government has been forced to intervene and buy up surplus stocks. The agricultural products of the islands are similar to those of the peninsula. Crete, Corfu, and Mitylene export olive oil; Crete is noted for its sultanas; and Chios for its almonds, oranges, and lemons.

The mineral wealth of Greece is not great and is but partially exploited. Iron ore is mined at Laurion in Attica, in the islands of Seriphos and Siphnos, and elsewhere. In the first of these regions silver-lead ores are worked, mainly for the lead which they contain, and zinc in the form of calamine is found. In the island of Naxos there are large deposits of emery. Nickel, manganese, and copper are also obtained in the country. The mineral wealth of the Macedonian region is believed to be more extensive, but so far little has been done for its development.

As already indicated, the chief manufactures of Greece are those which depend for their raw material upon the agricultural produce of the country. Olive oil and wine are made in the districts in which the olive and the vine are grown, and in some of the olive-growing districts, such as Crete and Mitylene, soap is manufactured. Distilleries and flour-mills are widely distributed. Cotton goods are produced either at towns situated, like Levadia and Trikkala, in the cotton-growing districts, or at the Piraeus, where raw cotton can be obtained from abroad. In Macedonia and elsewhere the tobacco industry is important. Domestic industries, and more especially the manufacture of woollen goods, are found in all the rural districts. Refugees from Asia Minor have within the last ten years established an important carpet-making industry near Athens. The principal imports are cereals, cotton and woollen goods, iron and steel goods and machinery, and timber; tobacco, currants, olives and olive oil make up the bulk of the exports. For

the three years 1929-31 the value of imports and exports was as follows—

			Special imports (in million drachmae)	Special exports	Average rate of exchange (At par 375 drachmae = £1)
1929	..	..	13,275	6,985	375.05
1930	..	..	10,525	5,985	375.06
1931	..	..	8,825	4,202	352.07

COMMUNICATIONS IN THE BALKAN COUNTRIES

The development of communications has been greatly handicapped by the mountainous character of the country. There are few good roads; and with the exception of the Danube, the Drava, and the Sava, the rivers are of little use for navigation. The most important railway is that which connects Budapest with Belgrade and follows what is known as the "diagonal furrow" for the greater part of the way to Constantinople; it ascends the valley of the Morava to Nish, and then that of its tributary the Nishava, and after passing through the basin of Sofia it descends the valley of the Maritsa, in which it continues till it has passed some distance south of Adrianople, when it turns to the east and runs across the Thracian plain to Constantinople.¹ From Nish another line continues up the valley of the Morava, crosses over by Skoplje² into that of the Vardar, and descends to the coast at Salonika. Several other railways radiate from Salonika; one traverses the lowlands south of the Rhodope Mountains and joins the Constantinople line near Adrianople, a second goes by Larissa to Athens and is continued into the Peloponnesus, a third runs to Monastir. Bulgaria is placed in communication with its ports on the Black Sea by two lines; one from Sofia crosses the Balkans by the valley of the Iskr and goes eastwards to Varna, while the other connects Philippopolis with Burgas.

In the west the railway system is very defective, and various

¹ By the Treaty of Lausanne (1923) Turkey regained possession of its European lands as far west as the Maritsa. The future political position of Constantinople in the Turkish state is still obscure, but its situation "at the cross-roads of Europe and Asia" will ensure its commercial importance.

Uskub.

parts of Yugoslavia are as yet unconnected with one another. From the main line, which runs from Belgrade to Fiume, through Croatia-Slavonia, there branches off at Brod a narrow-gauge railway which ascends the valley of the Bosna to Sarajevo, and then, crossing over into the valley of the Narenta, follows that river to the Dalmatian port of Metkovic. A continuation of this line runs along the Papov polje to Grüz, and terminates at Zelenika on the Gulf of Cattaro. The difficulties of communication in this region are well illustrated by the fact that a considerable part of the line between Brod and Metkovic is built on the rack and pinion system. It is connected with the Belgrade-Nish railway by a line which breaks off at Sarajevo, utilizes the valleys of various tributaries of the Drina in order to reach Vardiste, crosses over to Uzice on the Serbian Morava, and follows that river to its confluence with the Morava. From Čacak, on this line, a narrow gauge railway runs to Obrenovac on the Sava, about twenty miles from Belgrade. If it were continued to the capital, Belgrade would be connected with the Adriatic without break of gauge. From Ogulin, between Zagreb and Fiume, a line which runs south links up various *polyen* and terminates at Split.

CHAPTER XVI

ITALY¹

A GLANCE at the map of Italy shows three great physical regions standing in marked contrast to one another. The zone of Alpine mountains surrounds the country on the north; the Apennines constitute the backbone of peninsular Italy; and the plains of the Po form a lowland area enclosed, except on the east, by the adjacent highlands.

The southern or Italian slope of the Alps differs in several respects from the northern. The descent is much more abrupt, and in the west the outer rocks are entirely wanting. Farther east the limestone appears, but nowhere is it so fully developed as on the northern slope. Many of the rivers are transverse as they issue on to the plain, but within the mountains there are numerous longitudinal valleys, of which those of the Adda and the Adige are the most important. The morainal material brought down by Alpine glaciers has built up between the mountains and the plains a belt of hills, which in some cases has dammed the river courses and caused the formation of lakes.

The plains of the Po were formerly occupied by a branch of the Adriatic, which gave place to solid land, partly as a result of the deposition in it of the debris carried down by Alpine and Apennine glaciers and streams, and partly as a result of the upheaval of its bed. The surface of the region is thus composed of Quaternary material and is generally level. Even at the present time the work of the rivers in building up the plain has not ceased, and around the mouths of the Po the land is gaining at the expense of the sea.

The Ligurian Alps are considered to end, and the Apennines to begin, at the Collo dell' Altare, west of Savona. From that pass the Apennines pursue their course throughout the whole length of the peninsula, crossing over to the east coast at Ancona, and returning to the west in Calabria. They do not form a simple

¹ Dr. Marion Newbiggin's *Southern Europe* (Methuen, 1932), throws much fresh light on various aspects of the economic geography of Italy.

anticlinal fold, but consist of a series of folded ranges. In Liguria and Emilia in the north, where they are built up of clays and other material of Tertiary age, the general trend of the ranges is to the south-east, and each fold in turn loses its height towards that direction, while its function as a watershed is taken over by the range lying immediately to the east. On the west the rivers are generally longitudinal, flowing in synclinal valleys, and thus facilitating communications, but on the east they are, as a rule, transverse. The Central Apennines of Umbria and the Marches in the north, and the Abruzzi in the south, also exhibit a folded formation, but in a less marked degree than in the north. They consist mainly of Jurassic and Cretaceous limestones, and the scenery is bolder and wilder than it is on the Tertiary clays, while in places the characteristics of a karst region prevail. The southern Apennines are distinguished rather by their broken and irregular features than by folding. They fall into two divisions: the Neapolitan and the Calabrian. The former are built up of Triassic limestone and Tertiary rocks, while in the latter, recent formations surround the mountainous regions of Sila and Aspromonte, fragments of the ancient Archaean land mass of Tyrrhenia. Of this land mass, Sardinia and parts of Sicily, Elba, Tuscany, and Calabria, are now the only remains.

On the west coast, between the Apennines and the Tyrrhenian Sea, there is a region of comparatively low elevation, built up in various ways. In Tuscany, in the north, are fragments of the Tyrrhenian block already mentioned. Farther south, along the zone of fracture, there are volcanic districts such as the Alban Hills, and the Phlegraean Fields with the active cone of Vesuvius. The plains of Rome and of the Campagna consist in the main of volcanic debris, which was originally deposited on the floor of the ocean, and subsequently raised above sea-level; but the lower basins of the Arno, the Tiber, and some smaller rivers, are covered with alluvium brought down from the Apennines.

On the east coast, there extends from the river Fortore to the Gulf of Taranto the province of Apulia, a low-lying plateau with an average height of about 600 feet. Tertiary rocks prevail except in the Murge where Cretaceous formations, frequently covered with loess, reach an elevation of over 2,000 feet.

The climate of Italy presents several features of interest. The

temperature is affected by the modifying influence of the sea, and by the protection from cold northerly winds afforded by the Alps, and in a less degree by the Apennines. In the Alps, of course, temperature decreases with altitude, but many of the sheltered valleys have mild winters, milder, indeed, than those of the plains. The latter, being cut off from the westerly winds by the surrounding mountains, have a range between summer and winter almost continental in character, the average temperature for January being about 34° F., and for July about 74° F. In peninsular Italy, where the influence of the sea is felt to a greater extent, the January temperature is higher and varies from about 42° F. on the Adriatic to about 45° F. on the Tyrrhenian coast, while the average July temperature over the whole region is from 74° F. to 76° F.

The rainfall occurs mainly in the winter half of the year. In south Italy the summer rainfall is low, but farther north the distinction between summer and winter is less marked, and in the northern parts of the plains of the Po the rainfall is fairly evenly distributed throughout the year. On the Alps and on the Alpine borderland the annual precipitation varies from 40 to 60 inches; and on the Ligurian coast, on the Northern Apennines, and over a district lying to the south of Rome, it exceeds 40 inches. Elsewhere it varies from 30 to 40 inches, except in Apulia and Sicily, where it is generally between 20 and 30 inches.

As Italy has an area of 117,982 square miles and a population of 39,000,000 it is one of the most densely populated countries in Europe. Despite the mountainous character of much of the surface, less than one-tenth of the land is believed to be wholly unproductive. But, although the cultivation of the soil assumes special importance in a country the climatic conditions of a great part of which favour the growth of Mediterranean fruits, Italy is far from being self-supporting as regards its food supply, and large quantities of cereals have to be imported. In pursuance of its policy of "ruralization," the Italian State has made vigorous efforts to improve the position of agriculture. Waste lands have been reclaimed and more modern methods of cultivation have been introduced, with the result that since 1926 the average area under wheat has increased by over 5 per cent and the average yield per acre has risen from 17 to 18 bushels. As regards manufactures, the country benefits

from the fact that some of its crops form the basis of important industries, but it is handicapped by the want of any extensive supplies of coal and iron. To some extent water-power has been substituted for coal, but for a considerable time to come it will probably do little more than check an increasing import of coal,

THE ALPINE ZONE. In the part of this region which belonged to Italy before the war, economic activity is limited mainly to the valleys and the lower slopes of the surrounding hills, where climatic conditions are generally favourable to the cultivation of the olive and the vine. The Valtellina (the valley of the Adda) especially is noted for its red wine. Mulberries grow in the more favoured localities, and figs and pomegranates are also cultivated. On the higher slopes pastoral farming alone is possible. A certain amount of industrial development has taken place within recent years. Iron ore is found in the valley of the Dora Baltea, in the Val Camonica, and elsewhere, and is smelted either by charcoal derived from the forests, or electric power derived from the rivers. Pont-Saint-Martin, in the first of these regions, has large engineering works and manufactures calcium carbide, as water-power is available. The textile industries which have developed in the valleys may best be considered along with those of the plains to which they really belong.

An important addition to Italian territory within the Alpine zone has been made by the annexation of the Trentino and Alto Adige. These districts, which lie in the basin of the Adige, are rather typical of the Eastern Alps. While the cultivable area is limited, much of the land is either forested or can be used as pasture, and that which is totally unproductive does not amount to 15 per cent of the whole. In the valleys, the vine, the mulberry, and various fruits are extensively grown. Mineral wealth—copper, lead, and iron—is believed to be abundant, though it is as yet undeveloped. The manufacture of silk goods, once an important industry, has declined, but may, perhaps, be revived under the new regime.

The eastern frontier of Italy, as modified by the war, consists in part of Alpine country, and in part of a stretch of typical karst. The latter is generally unproductive and suitable for pastoral pursuits alone, but both in Istria and farther to the north it is bordered by country the products of which are similar to those of

the Alpine zone. Quicksilver is mined at Idria, and coal near Albona on the Gulf of Quarnero.

THE PLAINS OF THE Po. This region contains over 40 per cent of the inhabitants of Italy, and is, both agriculturally and industrially, the most important in the country. The soil is generally productive, though the conditions under which it can be cultivated vary from place to place. Near the foothills of the Alps, where glacial gravels cover much of the surface, the land does not easily lend itself to arable farming, and considerable areas are kept permanently in grass. This is also the case in the districts which lie in the lee of the Apennines to the south of the Po. West of Mantua, irrigation from the Po and its tributaries is extensively practised, but to the east of that town drainage frequently becomes more important than irrigation, owing to the seepage from the rivers, whose beds are continually being raised above the level of the surrounding country.

The chief cereals grown are maize, wheat, and rice. Rice is cultivated on the irrigated lands between Alessandria and Milan, and, to a much less extent, in the swampy districts near the mouth of the Po. Italy is the only European country in which rice is grown to any extent, and there is a large home demand for it, a demand, however, which is partly met by importation from abroad, much of the Italian product, on account of its superior quality, finding a more profitable market elsewhere. Maize is one of the most important food-stuffs of Italy, and can best be grown on the irrigated lands of this region, where the necessary amount of moisture can be obtained. Much of it is made into polenta, the favourite food of the inhabitants of North Italy. Wheat is grown throughout the region, but nearly three-fourths of the wheat lands of Italy are in mountainous or hilly districts. The yield of the lowland areas is, however, higher.¹ On the grasslands large herds of cattle are pastured, and such well-known cheeses as Gorgonzola and Parmesan are manufactured.

The winters are too cold to allow the olive to flourish, but the mulberry is extensively grown, and over three-fourths of the raw silk produced in Italy comes from this region, more especially from Lombardy, Venetia, and Piedmont. The marked decline in output which began in 1915 was partly due to the abandonment of the cultivation of mulberry trees and silkworms in favour of more

¹ Italy (Overseas Trade Report), 1927.

lucrative forms of farming. The methods adopted to improve the quality of the seed and the high price obtained for cocoons have led within recent years to an output considerably above the pre-war standard.

Various circumstances combined to foster the great industrial development of the north. For the manufacture of silk there was the initial advantage of a large supply of raw material. Textile pursuits generally were encouraged, both by the example set by the neighbouring countries of France and Switzerland, and by French and Swiss operatives who emigrated to Italy, taking with them a knowledge of their craft. From the densely populated plains of the Po a large supply of cheap labour was readily obtainable. The absence of coal has, no doubt, been a serious drawback, for, although it can easily be imported, the expense is considerable.

On the other hand, the large reserves of water-power available from the Alpine rivers have been extensively utilized for the generation of electricity. For example, the Maira supplies power to the south of Piedmont, the Dora Riparia to Turin, and the Adda and the Dora Baltea to Milan, while stations at Vizzola on the Ticino and at Campocologno in the Val Poschiavo (in Switzerland) provide electric energy for an important industrial area between Gallarate and Milan. The Piave-Santa Croce installation serves Venetia and Emilia, and the power derived from the Cardano station on the Isarco, in the heart of the Dolomites, is transmitted to Milan for distribution throughout Piedmont and Lombardy.¹ Owing to seasonal variations in the flow of the rivers, these various installations are worked in conjunction with "thermic" stations, which operate when necessary.

The plain of the Po is naturally the most important region in the country for the manufacture of silk, and 90 per cent of the Italian output is produced there and in the neighbouring Alpine valleys. Lombardy accounts for 60 per cent of the total product, while Piedmont in the west and the Venetian Alps and South Tyrol in the east contribute a considerable part of the remainder. Among the chief towns engaged in the industry are Turin and its neighbourhood, Como, Milan, and Bergamo. At one time the Italians confined themselves to the reeling and throwing of

¹ Dr. B. Cunningham *Nature*, Vol. 126, p. 473.

silk, and the thread was sent abroad to be woven, but, later, large weaving establishments were set up within the country itself, especially at Como and Milan. The manufacture and export of silk textiles is increasing, especially in those classes of goods where the cost can be reduced by the mixture of silk and artificial silk. By the annexation of the Trentino, Italy has obtained possession of a district in which an important local industry has long been established. Milan is the centre for the collection and distribution of silk in Italy, and has of late years entirely surpassed Lyons as the chief silk market in Europe. Italy ranks second only to the United States as a producer of artificial silk; it is manufactured at various places in the plains of the Po and the neighbouring Alpine valleys.

While the silk industry has considerable natural facilities in the proximity of large supplies of raw material, the cotton industry, with which it may be compared, is without any such advantage, the production of raw cotton in Italy being negligible. Until 1887, Italy imported large quantities of cotton goods, but, when a highly protective tariff was imposed in that year, many of those Swiss manufacturers who had hitherto supplied the Italian market built additional mills in Italy, and thus gave a great impetus to the industry in that country. With the lapse of time the proportion of Swiss-owned to Italian-owned mills has fallen, and the cotton industry may now be regarded as naturalized. At present there are about 5,300,000 spindles in the country, and these are chiefly found in the region under consideration, more especially in Lombardy and Piedmont, where electric power is frequently used for driving the machinery. The greater part of the raw material consumed in the mills comes from the United States, the remainder being supplied by India and Egypt. The yarns which are produced tend on the whole to be coarse, but the quality is steadily improving; while woven goods, besides supplying almost entirely the home demand, find their principal outlet in South America, where the large Italian population in the Argentine prefers to have materials of a kind to which it has been accustomed. Egypt and Turkey rank next in importance as purchasers of piece goods, and Great Britain buys large quantities of hosiery.

Woollen goods are in considerable demand in north Italy, as the winters are cold; and they are manufactured in various places,

but more especially at Biella in Novara, where many people are engaged in the industry. A considerable amount of cotton is, however, used along with the wool in the manufactures of this town. Bergamo and Brescia also have wool mills.

The development of metallurgical work is due rather to the general industrial development of the country than to any direct advantages of a geographical nature which it possesses. Although a small quantity of ore is found and worked in the Alpine valleys, and a limited amount is mined in Lombardy, Tuscany, and elsewhere, the most of what is used is imported from Elba. As coal also has to be obtained from abroad, the cost of manufacture is high, more especially under present conditions, and for much of its metallurgical work Italy has been accustomed to import pig-iron and iron clippings. Accordingly, the chief establishments connected with the manufacture of iron and steel goods are situated in the larger towns and at the ports. In the region under consideration Milan and Turin are engaged in the production of pig-iron and steel; Milan turns out locomotives, wagons, and electric machinery; Turin makes railway stock, especially wagons, and motor-cars. There are large engineering works at Udine, and Venice is engaged in shipbuilding.

Among other industries which may be mentioned is the manufacture of chemical manures, mainly superphosphates, at various towns throughout the region; of glass at Murano; of lace at Venice and in the neighbouring islands; of straw hats at Marostica, near Bassano; and of arms at Bologna.

PENINSULAR ITALY. Although the general character of cultivation and economic development remain much the same throughout the whole of peninsular Italy, the differences in structure, topography, and climate, which have already been noted, make it possible to distinguish a number of regions each with its own characteristics.

The Northern Apennines contain a large area of fertile land which can be utilized, although it is frequently necessary to terrace the hillsides. The extremely favourable climate on the southern slopes of the Ligurian Apennines renders possible the cultivation not only of the olive and the vine, which are grown throughout the region, but of the orange and the lemon, the typical fruits of southern Italy. On the extensive pasty lands large numbers

of cattle are raised. Oil is found on the north-eastern slopes of the Apennines, in Emilia, and there are prospects of further development, though probably not on an extensive scale. Liguria is the most important region in Italy for the manufacture of iron and steel goods, but the industry is mainly confined to the ports. Genoa is engaged in shipbuilding, iron smelting, and cotton spinning; Savona has engineering works; and Spezia shipbuilding yards. Various small towns along the coast are similarly employed. Here, also, may be mentioned Trieste and its neighbourhood which form an important shipbuilding area.

The Central Apennines being more rugged than the northern, and presenting in places the appearance of a karst country, are frequently ill-adapted for cultivation. In Umbria, only the plains, which are of limited extent, and the lower slopes of the hills are fertile. The greater part of the Abruzzi consists of broken wooded country, cut up into isolated plateaus, but the eastern slope contains more fertile soil, and both there and in the Marches the usual products of the Apennines—olives, vines, cereals, flax, and hemp—are grown. The Marches and Umbria produce large quantities of the first of these, but the Abruzzi is less noteworthy in this respect. Of the manufactures of this region the most important are the steel works at Terni, which have electric power, generated by the Nera.

The Southern Apennines contain large areas of mountainous woodland, where, as in the Basilicata, little cultivation is possible. On the lower slopes of the hills, and in the valleys, olives, vines, fruit, and cotton are grown. The olive crop is of importance, but the cotton only amounts to a few thousand bales, and cannot be used for anything but the manufacture of coarse articles.

THE APENNINE FORELAND—WEST COAST. This includes several distinct physical regions. The greater part of Tuscany consists of an intermingling of hill and plain. In the Apuan hills in the north, limestones of Triassic and lower Jurassic times have been converted into marble, and are quarried at Carrara. The deposits of lignite, which occur to the south-east of Siena and to the west of Spoleto, are the most productive in the country, and provide Italy with the greater part of her domestic supply of fuel. In the Val d'Aspra, near Massa Marittima, there are deposits of iron ore, and pig-iron is manufactured at Piombino on the coast opposite Elba,

whence some of the ore is obtained. The chief agricultural products are olives, the oil from which is much in demand ; vines, from which the well-known Chianti wine is made ; and wheat, which forms the basis of the straw-plaiting industry of the district. Along the coast of Tuscany is the Maremma, a low-lying strip of land built up of debris brought down by the rivers, and swept in by the current. Formerly it was marshy and unhealthy, but drainage has converted much of it into rich pasture land, and it is now an important dairying district. Farther south on both sides of the lower Tiber, and occupying a considerable part of Latium, is the region to which the name Campagna is somewhat loosely given. The soil consists of volcanic debris, but, although it is fertile, it is low-lying, subject to flooding, and productive of malaria, with the result that in the past its scanty population confined itself to pastoral pursuits. Within recent years, however, the soil has been improved, and the danger of malaria lessened, by the drainage of the land and other remedial measures; for the natural pastures have been substituted artificial meadows, cornfields, and fruit trees, and the population has shown a substantial increase. On the volcanic soil of the Alban Hills, and in the plains of Campania, around Naples, are some of the richest districts in all Italy, olives, vines, figs, and other fruits being grown in great profusion. In Campania, especially, where there are many opportunities for irrigation, the methods of cultivation are intensive, and the individual holdings are small. Accordingly, there is a dense population.

Manufactures are growing up around the principal towns. Leghorn, in addition to long-established industries such as the preparation of olive oil and the plaiting of straw, has recently established copper and glass works. Florence is the centre of the straw hat industry, and makes large quantities of macaroni, both pursuits being based on the wheat production of the surrounding country. Iron ore is also smelted there ; and in the districts of which Carrara and Florence are the centres, a large part of the Italian output of steel is produced. Rome is still largely a non-manufacturing city, but, with the development of the water-power of the Aniene at Tivoli and Subiaco, it is likely to make rapid progress in the near future.

Naples has made the greatest advance within recent years. In order to encourage industrial development the municipality

offered, practically free, sites and water-power for manufacturing establishments, and remitted for two years all taxation of manufacturers who settled in the town. Accordingly, a varied selection of industrial concerns, including textile factories, sugar mills, and motor works, sprang up within the free zone. All these were under the disadvantage of being unable to draw upon a supply of skilled labour. On the other hand, what labour existed was cheap, water-power was available, and there was a good port. To what extent the disadvantages of position will be overcome remains to be seen, but the prospects appear to be fairly good.

APULIA, lying to the east of the Apennines, has a low rainfall, but is well adapted to the cultivation of wheat, which ripens during the spring months, before the hot, rainless summer begins, and is specially suitable for the manufacture of macaroni. The Murge is covered with vineyards and olive plantations, the area under olives in this region being greater than in any other part of Italy. The chief towns are Bari, Brindisi, and Taranto, but their importance is commercial rather than industrial.

SICILY may be regarded as, in the main, a continuation of the Apennine chain. In the north-east there is a fragment of the Tyrrhenian block, and around Etna much of the country is overlain with volcanic rocks. Sulphur, obtained in the latter district, is the most important mineral product of the island, and the refining of sulphur gives employment to a large number of people.

The north and east coasts have the most favourable climate, as they are exposed to the influence of warm winds from the sea. Hence, they constitute the most important agricultural districts, and grow large quantities of olives, vines, fruit, and wheat. The mulberry is raised in the province of Messina, and there is an important silk industry.

Palermo, the largest town in Sicily, is engaged in shipbuilding, the manufacture of iron and steel goods, and various other industries. Messina has recovered from the damage done by the great earthquake of 1908. Catania has large sulphur refineries.

ELBA consists of part of ancient Tyrrhenia. Olives and vines are grown, but the chief product of the island is iron ore, which is extensively worked. There are blast furnaces at Portoferraio, and Bessemer steel works have been established. Coal is imported for the manufacture of coke.

SARDINIA is likewise a fragment of the Tyrrhenian block. The interior is wild and forested, but on the lower slopes of the hills the usual products of the Mediterranean region are grown. Oranges and lemons thrive, especially on the volcanic soils of Monte Ferru. The chief economic products of the island are minerals, lead and zinc, found in the south-west, being the most important.

COMMUNICATIONS. The growth of the railway system of Italy, and more especially the construction of the Alpine tunnels, have influenced the economic development of the country in a marked degree. The Alps, although they never offered an effective barrier, either in war or commerce, yet presented a considerable obstacle to that free movement of heavy goods, which is so striking a feature of modern trade. Since the opening of the tunnels, the industrial part of Italy has been brought into easy communication with the most important industrial regions of Central Europe. The chief lines are as follows: One railway, connected with the Paris-Lyons-Mediterranean system, enters the country from France by the Mont Cenis tunnel, and descends the Dora Riparia to Turin. Of the lines from Switzerland, that from Lausanne passes through the Simplon tunnel and follows the course of the Toce on the way to Novara; while that from Basel enters the Val Leventina by the St. Gotthard tunnel and runs alongside the Ticino to the head of Lake Maggiore, whence it goes by Lugano and Como to Milan. The line from Innsbruck passes over the Brenner, and utilizes the valleys of the Eisack and the Adige, as far as Verona. Farther east, Venice is connected with Trieste and with the railways which converge upon that town. Of these the most important is the line which runs from Vienna by the Scunnering Pass, and reaches Trieste either by way of Graz and Ljubljana or by way of Klagenfurt. Venice is also connected with south-east Germany by the line which runs by Udine to Villach, up the Drava valley, and through the Hohe Tauern tunnel on the way to Salzburg and Munich. The towns which have been mentioned—Turin, Novara, Milan, Verona, and Venice—are all connected by a railway which follows the general direction of the ancient highway upon which they stand, a highway which ran from east to west sufficiently near the meeting place of mountain and plain to be free from the occasional floods along the Po and the lower courses of its tributaries. Another important line runs from

Turin by Alessandria, Piacenza, Cremona, Mantua, and Padua to Venice; while a third, breaking off at Piacenza, follows the Emilian way to Rimini, and touches those towns which have grown up where the Apennine valleys open out on to the plains of north Italy. Lines from Milan and Turin pass through tunnels in the Apennines and place Lombardy and Piedmont in communication with the port of Genoa; and Savona is also connected by rail with the North Italian lowlands. The general configuration of peninsular Italy forces many of the railways of that region to run at no great distance inland, and from Genoa to Rimini, round the south of Italy, all the towns which stand on or near the coast are linked together by lines which are seldom more, and frequently much less, than twenty miles from the sea. Notwithstanding the difficulties presented by the Apennines, a number of railways now connect the Tyrrhenian and Adriatic sides of the peninsula. One runs from Pisa to Bologna by way of Pistoja, taking advantage of the valleys of the Reno and the Ombrone. Another, recently constructed, goes from Florence to Bologna by way of Prato, crossing the Apennines by a tunnel over eleven miles long. From Rome a railway follows the route indicated by the Tiber, the Nera, and the Topino, and, after descending the eastern slope of the Apennines by the valley of the Esino, runs to Ancona. In the south of the peninsula several lines cross from Naples to the east coast. Italy has in all about 14,000 miles of railway, of which over 1,000 are electrically operated, the longest stretch of electrified line being that from Modane (within the French border), by Turin and Genoa to Leghorn, a distance of over 300 miles.

The Italian rivers are of little use for navigable purposes. Numbers of small boats are found on the Po, on some of its tributaries, and on the irrigation and other canals, but all these are alike unsuitable for larger craft. On the other hand, the great length of the peninsula has led to the development of a considerable coasting trade in which sailing ships are chiefly engaged.

COMMERCE. Silk is one of the most important elements in the foreign trade of Italy at the present time. Much of the native product is exported to Switzerland, France, Germany, and the United States, while considerable quantities of raw silk are imported from the Far East. Of importance, also, is the export of manufactured silk, which goes mainly to the countries of Central Europe,

to the United Kingdom, and to the United States. Cotton goods, as already mentioned, find their market in the Levant and in South America. Among other exports may be mentioned wine, a market for which appears to have opened up among the Italian population of the Argentine; fruits, which are sent to various countries; hemp, woollen goods, and motor cars. Of the imports, cereals come from Canada, the Argentine, and the United States; coal chiefly from Great Britain¹; raw cotton from the United States, Egypt, and India; and oil from the United States, Russia, Rumania, and elsewhere.

The following tables show the percentage values of the chief imports and exports for the three years 1929,31—

	Percentage of total imports.		Percentage of total exports.
Cereals	11.1	Silk goods ..	17.8
Cotton	8.8	Cotton goods ..	9.7
Coal	7.9	Fruits	5.9
Oils (all kinds) ..	6.6	Wool	4.9
Wool	3.5	Flax, jute, etc. ..	3.4
Oilseeds	2.5	Olive oil. . .	3.0
Meal	2.5		

The chief countries with which Italy trades are as follows—

Imports from	Percentage of total imports.	Exports to	Percentage of total exports.
United States ..	14.8	Germany ..	11.9
Germany (exclud. ing Reparations)	12.8	United States ..	11.0
United Kingdom	9.6	United Kingdom	10.4
France	8.7	France	9.9
		Switzerland ..	7.4

¹ In 1930 55 per cent of the imports were from Great Britain as against 87 per cent in 1914. The difference is in part accounted for by the importation of large quantities of "Reparations" coal from Germany.

For the three years 1929.31 the value of imports and exports was as follows—

			Special imports	Special exports	Average rate of exchange (At par 92465 lire = £1)
			(in million lire)		
1929	..	..	21,664	15,235	92.70
1930	..	..	17,346	12,119	92.80
1931	..	..	11,637	10,036	87.01

The three most important ports of Italy are Genoa, Naples, and Trieste. Others of less importance are Savona and Leghorn in the north.west, Venice in the north.east, and Palermo in Sicily.

CHAPTER XVII

THE IBERIAN PENINSULA

THE Iberian Peninsula, which includes the two countries of Spain and Portugal, has an area of 224,000 square miles.¹ Its central part, which belongs to the zone of ancient massifs and is known as the Meseta, consists of a plateau with a height of over 2,000 feet. On the north-east, the Meseta is bordered by various ranges which separate it from the basin of the Ebro ; and on the south-east by the Sierra Morena which overlooks the basin of the Guadalquivir, and is in reality only the escarpment of the plateau. The surface of the Meseta consists of great plains separated from one another by mountain ranges which have a general trend from south-west to north-east. Of these ranges the most important are the Sierra de Gredos and the Sierra de Guadarrama, which separate the plains of Old Castile from those of New Castile. In the north-west, in Galicia and in Upper Portugal, the rocks of which the mountains consist are of Archaean age; in the south-west they belong in the main to early Palaeozoic times; and in the north-east and east they were formed during the Secondary period. The plains of Old and New Castile are overlaid by Tertiary deposits, as are the basins of the Guadalquivir and the Ebro, the latter of which is cut off from the sea by the mountains of Catalonia. To the south of these mountains, the plateau withdraws from the seaboard sufficiently far to allow the formation of the narrow coastal plain of Valencia. On the west it slopes down to the plain of Lower Portugal. The basin of the Ebro is bounded on the north by the Cantabrian mountains and the Pyrenees, while to the south of the Guadalquivir is the Sierra Nevada. These ranges were folded during the Tertiary period, and consist in the main of old rocks, flanked in places by later formations.

CLIMATE. Although the Iberian Peninsula is almost entirely surrounded by water, the direct influence of the ocean upon its

¹ Spain: Area, 190,050 square miles; population, 22,000,000. Portugal: Area, 34,000 square miles; population, 6,190,000.

climate is comparatively slight, and is felt mainly upon the north and north-west coasts where the range of temperature between summer and winter is less than in any other part of the peninsula. There, the January mean (at sea level) varies from 46°F. to 50°F., while that of July lies between 68°F. and 70°F. On the plateau the range is much greater, the summers being hotter and the winters colder. At Madrid, for example, the mean temperature for January is 40°F. and for July 76°F. In Andalusia and along the Mediterranean seaboard the summers are everywhere hot, the July mean in the lowlands ranging from 75°F. to 80°F. To the south of the Meseta, however, the winters are somewhat warmer than they are along the north-east coast, the January mean in the former region being above, and in the latter below, 50°F. Except on the north and north-west coasts, which have from 30 to 60 inches, the annual precipitation is low, and only occurs during the winter half of the year. In the south-west the amount received does not exceed 30 inches, and on the plateau and along the Mediterranean coast it is generally less than 20 inches.

NATURAL REGIONS. Climate and position are the chief factors in determining the natural regions of the Iberian peninsula. In Spain, the Cantabrian mountains in the north, and the greater part of the Archæan mass of Galicia in the north-west, have a climate essentially different from that of other parts of the country. The Meseta, again, is effectively marked off from the lands to the south and east, both by its elevation and by the great range of temperature which exists between the heat of summer and the cold of winter. In the south of Spain, the lowlands in the basin of the Guadalquivir have a sub-tropical climate; and with them may be included for convenience the slopes of the Sierra Morena to the north and the folded ranges which include the Sierra Nevada to the south. Along the east coast the climate is typically Mediterranean. The lowlands in the basin of the Ebro occupy a position which is climatically intermediate between the Meseta and the Mediterranean, while the Pyrenees stand by themselves. On the west coast a broad distinction may be noted between northern Portugal, which is on the whole mountainous and possesses a climate somewhat similar to that of north and north-west Spain, and southern Portugal, which contains considerable lowland areas and has a climate approximating to that of southern Spain.

SPAIN

THE NORTH-WEST COASTAL REGION is one of the more densely populated of the natural regions of Spain. This is due in part to its favourable climate, and in part to the vast stores of minerals which it contains. Agriculture is carried on in the valleys and in other favoured localities, maize being the principal cereal grown, especially in the west. The vine is extensively cultivated, but the wine produced therefrom is somewhat inferior in quality, and little of it is exported abroad. Other plants include beet, flax, and potatoes. This region is also well adapted to cattle-raising owing to the good grasslands which it contains, and over one-half of the cattle in Spain are found within it, mainly in Galicia and Asturias. The mountains are well wooded, and from their upper slopes are obtained the pines which are made into pit-props and exported to Cardiff. The mineral wealth consists in the main of coal and iron. The most important deposits of coal in Spain occur in the province of Oviedo, and from these the greater part of the Spanish annual output of over 6,000,000 tons is obtained. The mines are in the neighbourhood of the port of Gijon, whence the coal is shipped to other parts of the country. The production of iron is still more important. The chief sources of supply are the provinces of Vizcaya and Santander, where the ore is hematite, and where about one-half of the total Spanish output of 6,500,000 tons is obtained. In Vizcaya the principal mines are near Bilbao, on the flanks of an anticlinal fold running from north-west to south-east; in Santander the largest deposits are at Cabargo and Camargo, and are mined by open cut. Although the reserves of these provinces are considerable, the richer ores with an iron content of over 50 per cent are becoming exhausted and the poorer ores are now being worked. On the other hand, large quantities of ore are known to exist in Oviedo, Lugo, and Leon farther to the west, and it is probable that in the future these will constitute more important sources of supply. The north-west region produces about three-fifths of the iron ore mined in Spain under normal conditions. Much of it is exported, especially to Great Britain, from Bilbao, Santander, and other ports along the coast. Other minerals include manganese ore from Oviedo and zinc from Santander.

Manufactures have not been developed to any great extent. Bilbao and Santander have blast furnaces, and are engaged in

the iron and steel industries, and Bilbao has also shipbuilding yards. For these, coal is imported from Gijon and from the United Kingdom. Farther west, fishing is the chief pursuit of the inhabitants of the coastal towns.

THE MESETA is of less economic importance than the preceding region. The want of sufficient moisture renders considerable areas unfit for cultivation. In Old Castile, which is more exposed to oceanic winds and has a somewhat greater rainfall than the remainder of the plateau, agricultural conditions are not altogether unfavourable, but in Estremadura and in the south and south-east of New Castile there are large tracts of infertile soil. Wheat is the principal grain crop, especially in Old and New Castile; it is noted for its whiteness and softness, and large quantities of it are milled at Valladolid, which is an important collecting centre. The area under wheat has increased considerably during the last thirty years, but, partly as a result of the persistence of old-fashioned methods—in many places, for example, grain is cut by scythes and threshed by trampling—the yield per acre does not average 14 bushels. Oats and rye are cultivated in the more mountainous districts. The vine is grown all over the region, but the olive is restricted to the more southerly parts of it. These crops are mainly grown on unirrigated land; but, as a general rule, land on which cereals are produced is only cultivated every other year. For the growth of beetroot and fruit, irrigation is necessary, but the facilities for this upon the Meseta are very limited and the area irrigated is small.

Pastoral farming is an important pursuit, and considerably more than one-half of the sheep in Spain are found upon the Meseta, Estremadura, from which come the finest merino wools, rearing the largest number. Sheep are generally moved from the plains to the more mountainous districts of Old Castile and Leon during the summer, in order that they may not suffer so much from the drought which then prevails. With the exception of Madrid, upon which lines of communication converge from all quarters, and Valladolid, the largest trading centre in Old Castile, the towns are of little importance. The most important mineral deposits of the region occur in the Sierra Menera, in the provinces of Guadalajara and Teruel, where there are large supplies of hematite.

SOUTHERN SPAIN enjoys warm winters, and a considerable variety of sub-tropical plants can be cultivated. On the other

hand, the low rainfall renders irrigation necessary, especially in eastern Andalusia and along the Mediterranean coast, where the lowlands of Murcia are supplied by a dense network of canals. Oranges and lemons, which cannot stand the cold winters of the Meseta, grow in abundance to the south of it, and the vine reaches a higher state of perfection than in any other part of the country. The wines of Jerez, Malaga and, Alicante alone have a reputation outside of Spain, while the raisins of Malaga and the fresh grapes of Almeria are well known. Sugar.cane is cultivated in places, and sugar.beet has become an important crop in the south, where it is grown especially in Granada, Malaga, and Almeria. Irrigation is, of course, necessary, but, although the yield of beet per acre is higher than on the unirrigated lands farther north, the sugar content is not so large. Cotton is grown in Seville, but not to any great extent, and among other products are rice, bananas, olives, mulberries, cork, and esparto grass.

The mineral wealth of the region is great, though it has been, as yet, only partially exploited. Iron ore is found in various forms. In Huelva province, on the slopes of the Sierra Morena, there are veins of magnetite and brown iron, while the pyrites of the Rio Tinto copper mines furnish iron ore as a by.product after smelting. In the Sierra Nevada and other folded ranges of the south, there are brown ore, hematite, and some magnetite, with an iron content of between 50 and 60 per cent and with only a small amount of phosphorus. Almeria and Murcia are the chief iron.producing provinces of this region from which rather less than one.third of the Spanish output is obtained. It is exported from Seville, Malaga, Almeria, Cartagena, and other ports along the coast. In the province of Huelva are the Rio Tinto mines, which produce the greater part of the copper obtained in Spain. Silver.lead ores are worked in Cordoba and at Linares, and zinc ore, or calamine, is obtained a few miles from Almeria. Seville, on the Guadalquivir, about 70 miles from its mouth, is the largest town of the region and conducts most of its trade. A new canal has improved the navigation of the river and made the port accessible to larger vessels than hitherto, though constant dredging is still necessary. The town itself possesses iron foundries, cork factories, and various other industries. Cadiz, which has been almost entirely superseded by Seville, is mainly engaged in the evaporation and exportation of

salt. Malaga, on the Mediterranean seaboard, has similar industries to Seville.

THE EAST COAST. This region is typically Mediterranean in its climatic characteristics and economic products. The soil is, as a rule, scanty, and in many places cultivation is only possible after the hillsides have been carefully and laboriously terraced. The rainfall is light, and without artificial irrigation the vine and olive alone would flourish, but, by means of irrigation canals, advantage is taken of whatever water the rivers contain. Valencia, which is watered by the Jucar and other rivers, though naturally among the least fertile provinces of Spain, is one of the most productive in the country. In addition to the vine and the olive, oranges, lemons, and other fruits are raised in large quantities. The mulberry, too, is cultivated, and attempts are being made by the distribution of mulberry seedlings and in other ways to restore the silk industry. Esparto grass is also grown. To the north of Barcelona, esparto, the orange, and the olive successively disappear.

The pursuits of the people are in the main agricultural, but Barcelona, besides being the chief seaport of Spain, is, and has for long been, the centre of considerable industrial activity. There, and in the neighbouring towns situated on the coasts, or in the valleys of the Llobregat and the Ter, where water-power or hydro-electric power is available, cotton and woollen materials are manufactured on an extensive scale, and linen and jute goods and electrical machinery are also made. Valencia, which ranks next in size to Madrid and Barcelona, is mainly engaged in the export of fruit.

THE EBRO BASIN. In this region the soil is in many places infertile and the rainfall is light. The winters are colder than along the Mediterranean coast, and the orange and lemon cannot be grown. The chief crops are therefore olives, vines, and cereals, but for the latter irrigation is generally necessary. Saragossa, which is the principal town, has sugar refineries and iron and steel works.

THE PYRENEAN REGION is of but little importance from the economic point of view. The inhabitants are mainly occupied in pastoral pursuits and in forest industries.

FOREIGN TRADE. The following table shows the chief imports and exports of Spain for the years 1929-31.

Imports	Percentage of total imports.	Exports	Percentage of total exports.
Cotton, raw ..	8.1	Fruit	28.2
Mineral oils ..	5.9	Ores	11.1
Chemicals ..	5.0	Wines	13.7
Motor cars ..	4.9	Olive oil. . .	9.6
Timber	4.6	Cork	5.5
Grain	4.0	Cotton goods ..	3.7
Eggs	3.5		
Machinery ..	3.3		
Coal	3.0		

For the years 1929-31 the value of imports and exports was as follows—

	Special imports (in million pesetas)	Special exports	Average rate of exchange (At par 25-22 15 pesetas = £1)
1929	2,736	2,108	33-12
1930	2,447	2,299	41-87
1931	1,177	961	47-56

As a result of commercial depression, the export of ores has declined considerably during the last few years, and fruit now occupies the first place among the exports; oranges, which are the most important fruit exported are sent to Great Britain and various European countries. Iron ore is exported to Great Britain and Germany; lead to Great Britain; and copper to Great Britain, the United States, and Germany. With the partial closing of the French market by heavy duties, the British market for wines has become relatively more important. Cotton goods are sent to South America, cork and almonds to the United States, onions and esparto grass to Great Britain. Of the imports, the bulk of the raw cotton comes from the United States. Coal and coke are supplied mainly by the United Kingdom, but to some extent by Germany. Chemicals are imported from Germany and the United Kingdom; and iron and steel manufactures and machinery from the United Kingdom, France, Germany, and Belgium. Timber comes from the United States.

In 1928, the last year for which figures are at present available, the chief importing countries were, in order, the United States, France, Great Britain, and Germany. The chief exporting countries were France, Great Britain, and the United States.

CONCLUSION. The economic development of Spain has been hindered by a variety of circumstances. The infertile nature of much of the soil, the want of sufficient moisture, and the difficulties of communication, are all serious obstacles to progress. Even more important are political and social conditions. The glamour of the past has made the Spaniard indifferent to the realities of the present, and he does little to overcome the difficulties of his environment. An improvement in the means of communication would permit the exploitation of great mineral sources hitherto untouched; irrigation might be extended, and considerable areas, at present of little value, might be rendered fertile; at the same time the methods both of agriculture and manufacture might be considerably improved. Within recent years Government assistance, it is true, has been available for the extension of the irrigated area and for the development of hydro-electric power in various parts of the country. Much, however, remains to be done.

PORTUGAL

NORTHERN PORTUGAL belongs, in the main, to the same block of Archaean granite as Galicia, and like it has a somewhat diversified topography. The soil is generally poor, and although climatic conditions are favourable to the growth of wheat, maize, and rye, much of the land is still uncultivated, and considerable areas are devoted to pastoral pursuits. The vine is extensively grown, especially in the eastern part of the Douro basin, where the wines known as port are produced. The mineral wealth of the region is not great. A little anthracite is mined, and uranium ores are found in the districts of Vizeu and Guarda to the south of the Douro. Still farther south, near Fundao, are the largest deposits of wolfram in Europe. Tin occurs in various places, a considerable amount being obtained from the wolfram deposits. Oporto, which is the chief town of Northern Portugal, is situated near the mouth of the Douro; but the approach to the town is a difficult one, and much of its trade now passes through the harbour which has been constructed on the coast at Leixoes, a little to the north-west. Oporto itself has cotton

and woollen mills, and is also engaged in trawling and in the export of wine.

SOUTHERN PORTUGAL is undulating in the south and east, but contains large areas of lowland in the west. Wheat is grown, but not in sufficient quantity to meet the home demand, and rice is cultivated, especially on the easily irrigated lands about the lower Tagus. The vine flourishes round Lisbon and in the vicinity of the Tagus, as well as in the south and south-east; and red and white wines are made, largely for exportation to Brazil and the Portuguese colonies. The cork-tree is extensively grown throughout Southern Portugal, but the chief plantations are in the lowlands about the lower Tagus. The raw cork is collected at Lisbon where it is prepared for export, much of it being sent abroad in the form of bottle corks. Olives are an important product of this region, though some of the chief producing regions are in the north of the country. Among other crops are almonds, lemons, and figs.

Copper pyrites, which is the most important mineral worked at present, is found in the south, especially at Sao Domingos and Aljustrel. Lisbon, the chief port of the region, has iron works, shipbuilding, and woollen manufactures. Setubal is actively engaged in the preservation and export of sardines, which are found in large numbers off the coast.

COMMERCE. Wine, cork, and fish, along with cocoa obtained from the Portuguese colonies, make up the bulk of the exports. The imports consist of oil from the United States; coal from the United Kingdom; raw cotton from the United States and Brazil; wheat from the Argentine and the United States; iron and steel goods from Great Britain, the United States, and Germany; and fish from Norway and the British Isles.

CONCLUSION. Portugal is still in a very backward condition. The methods of agriculture are generally of a most primitive description, and much of the land is still uncultivated. Little has been done to develop the internal resources of the country. Iron ore, for example, is plentiful, but up to the present has been worked only to a slight extent. The coastal towns alone, as a result of their long contact with the outside world, are more energetic, and there the chief manufactures of the country are settled.

COMMUNICATIONS OF THE IBERIAN PENINSULA. Madrid, which is the natural meeting-place of routes across the Meseta, may be

regarded as the centre of the railway system of the Iberian Peninsula. It is connected with the French railways by a line which crosses the Sierra de Guadarrama, and, after passing through Valladolid and Burgos, descends from the Meseta by the Pass of Pancorbo, crosses the Ebro at Miranda de Ebro, and runs to San Sebastian on the frontier. From this line there are connections with the ports of Bilbao, Santander, and Gijon, and from Leon on the last of these a branch breaks off and goes by the valleys of the Sil and the Minho to Vigo, while near the confluence of these rivers a second branch strikes off to the north-west for Corunna. Another route from the capital descends into the valley of the Ebro at Saragossa where it meets a line which follows the valley of that river for the greater part of the way from Miranda de Ebro to Tarragona on the Mediterranean seaboard. From Saragossa, also, a line follows the valley of the Gallego, passes through the tunnel of Confranc in the Pyrenees, and joins the French railway system to the south of Pau. The south-east seaboard is connected with the capital by a line which goes by Albacete, and branches to Valencia, Alicante, and Cartagena. Another line from Madrid makes its way south into the valley of the Guadalquivir and runs to Cordoba (connected with Malaga and Gibraltar) and Seville (connected with Cadiz and Huelva). From this line there is a branch to Almeria. The ports on the Mediterranean from Perpignan as far south as Aguilas are linked up by a line which keeps to the coast for the greater part of the way. To Portugal there are several lines. One runs westwards, south of the Sierra de Gredos, and bifurcates near Plasencia; one branch going northwards to Salamanca, and then crossing over into the valley of the Douro which it follows to Oporto, and the other going westwards into the valley of the Tagus which it follows to Lisbon. From Salamanca a line runs north to meet that from Leon to Vigo, and from a junction near Caceres (on the route to Lisbon) another runs south to Huelva. Lisbon is connected with Faro in the south, and through Oporto and Vigo with Santiago in the north.

CHAPTER XVIII

POLAND

To form the new State of Poland, parts of West Prussia, Poznari, and Upper Silesia were taken from Germany; Galicia and part of Austrian Silesia from Austria; and Russian Poland and some of the western districts of Russia proper from Russia. The combined area of these districts is estimated at about 149,000 square miles, and their population at 32,000,000.

The physical divisions of the country are comparatively simple. In the south the Carpathian ranges form the only good natural frontier which the State possesses; they consist of sandstone, mostly of Tertiary formation, and on their foothills there are considerable deposits of loess. To the north of them, and in the main separated from them by the Galician plains, is a zone of great plateaus which includes part of the Silesian highlands, the heights of Krakow and Kielce to the west of the Vistula, the heights of Lublin to the east of it, and the Galicio-Podolian or Black Sea plateau which extends into the Ukraine. These plateaus vary in height, but their average elevation appears to be between 800 and 1,000 feet. In the Silesian area, and in the heights of Kielce, there is much mineral wealth, while both to the east and to the west of the Vistula loess is widely distributed. To the north of these plateaus lies the continuation of the great European plain. In the west it is occupied by the zone of great valleys which have already been described, and in the east it includes the marshes in the basin of the Pripet. Generally speaking, the soil consists of sands and clays ; it is somewhat poor in Poznan, but improves in the districts to the west of the Vistula. To the east of that river it is again poor, and in the basins of the Bug and Narew there are still considerable areas of marsh. Finally, in the east, the Polesie depression consists of an unbroken series of marshes, which are bordered both north and south by great areas of sandy soil of little value. In the north of Poland the Baltic ridge crosses the so-called Polish corridor, and is continued to the north-east as the Lithuanian ridge.

The climate is transitional between that of Western Europe and

Russia, but on the whole is continental in type. As far as temperature is concerned, the July mean over the greater part of the country lies between 65° F. and 67° F.; the December mean, on the other hand, falls from 29° F. at Poznan to 26° F. at Warsaw and Krakow, and 22° F. at Wilno and Tarnopol. Over the zone of great valleys



NATURAL REGIONS OF POLAND

the rainfall ranges from 20 to 24 inches; on the plateaus it is slightly higher, except in the east, where it is about the same as in the preceding region. About two-thirds of the annual precipitation takes place during the summer half of the year, and there is no danger from drought. In the Carpathians the temperature is lower and the rainfall more abundant.

Poland is in the main an agricultural state, but it also includes important mineral and industrial areas. Its study by natural regions presents some difficulties, as, owing to its long partition among three Powers, different parts of the same region may be in very different stages of economic development. This is accentuated by the fact that the population is not everywhere predominantly Polish. The new Poland has, it is true, been constituted upon an ethnical basis, and over the greater part of the State the Poles probably number at least 75 per cent of the population. But in two regions the ethnical principle has been violated; in East Galicia, where the majority of the inhabitants are Ruthenians, and in the region lying east of the longitude of Brest-Litovsk (but apparently excluding the Wilno region), where the Poles are outnumbered by other races of whom the White Russians are the most numerous.

THE CARPATHIANS. In the Carpathians the land over 2,000 feet is unfit for cultivation, and much of the whole region is forested. On the lower slopes there are considerable areas of fertile soil, especially in the west; in the east there is less, partly, it is said, because the land is in Ruthenian hands. The timber industries are important, and paper is manufactured. Petroleum is found in a belt of country extending from the neighbourhood of Krakow eastwards through Eastern Galicia. Hitherto, the chief centre of production has been in the district round Boryslaw, but the wells there are becoming exhausted, and more attention is likely to be paid in future to the eastern and western fields of the belt. Previous to the war this region produced about 3 per cent of the world's supply of petroleum, but its output has declined, and its future will probably depend on the extent to which the Poles are able to induce foreign capital to undertake its further exploitation. Salt is found along the whole length of the Carpathian curve, the most important mines being those at Wieliczka.

THE PLATEAUS AND GREAT VALLEYS. With two exceptions, which will be treated later, agriculture is the chief pursuit of both regions, but for various reasons the conditions under which it is carried on vary considerably from one place to another. In Poznan, the poverty of the land was to some extent compensated by the scientific methods of German husbandry, and previous to the war the yield per acre was higher than in any other part of the new Polish State. Rye and oats are the principal cereals cultivated,

potatoes are extensively grown, and sugar-beet is an important crop. In what was Russian Poland, the conditions of agriculture in the lands to the west of the Vistula are somewhat similar, though the methods of cultivation are not so scientific and the yield per acre is, as a rule, not so high. Some of the best soils in central Poland are found on the terraces of the Vistula, where potatoes are an important crop. Beyond the Vistula, a distinction must be made between the plains of the centre and the plateaus of the south. In the basins of the Bug and Narew the land is poor and agriculture is primitive. Matters are still worse farther east in Polesie, where cattle and timber are the chief products, though even there something has been done to drain the land and make it fit for cultivation. On the plateaus, on the other hand, the prospects are more promising. The heights of Lublin contain some of the best agricultural land to the east of the Vistula, and on the loess-covered Galicio-Podolian plateau wheat, barley, and sugar-beet are grown. Throughout the region, industry is confined to such matters as the manufacture of alcohol from potatoes and the extraction of sugar from beet, except in two areas which will now be examined.

THE CENTRAL INDUSTRIAL REGION. In the provinces of Piotrkow and Warsaw in Russian Poland there are several important industries. The manufacture of textiles grew up without any natural advantages, beyond the fact that there was a fairly dense agricultural population from which labour could be drawn. Its origin is to be found in the inducements held out by the Russian Government to skilled settlers from abroad, and its development in the tariff system which gave it the whole of the Russian Empire as a protected market. Cotton goods are manufactured at lodz, Czestochowa, and in the vicinity of Warsaw, and in pre-war days these districts contained about one-seventh of all the spindles in Russia. At Cz[^]stochowa and elsewhere woollen goods are made, the raw material being partly of domestic and partly of foreign origin. Other industries include the spinning and weaving of flax and jute, brewing and distilling, the manufacture of iron and steel goods, flour-milling, and the preparation of timber for export, Warsaw especially being engaged in these and other industries.

THE SOUTH-WEST INDUSTRIAL REGION. In this region there is much mineral wealth. By the transference of part of Upper Silesia, Poland came into possession of about three-fourths of the

productive coal mines of that province (output in 1912, 46,000,000 tons, and in 1921, 30,000,000 tons), and has in addition those parts of the same coalfield which extend into Russian Poland round Dombrowa, and into Galicia in the district of Krakow (these had an annual output of about 9,000,000 tons before the war). The new State, therefore, has more coal than it requires; out of an average output of 41,500,000 tons for the three years 1928-31, the average export was 13,500,000 tons mainly to Scandinavia and the Succession States. Poland has also obtained the greater part of the lead and zinc deposits of Upper Silesia, and there are further supplies of both minerals in the heights of Kielce; at present Upper Silesia is one of the chief producers of zinc in Europe. For the steel works at Tarnowskie Gory,¹ Katowice,² and Krolewska Huta,³ iron ore is obtained from the Jurassic limestone of the plateau country to the east, as well as from abroad, and large quantities of scrap iron are also imported. But, although the natural advantages of the region are considerable, time will be necessary before its different parts, at very different stages of social and economic development, can be welded into an economic whole.

COMMUNICATIONS. The railway system of Poland reflects the conditions which prevailed during the period of the partition. Economic requirements frequently gave place to strategical considerations, and, in Russian Poland especially, where there was a deliberate policy on the part of the Russian Government to retard industrial progress, the railways are inadequate to the needs of the country. At present the new State has only 11,000 miles of line of which about 70 per cent is single track, and much of it has suffered more or less severely from the events of the war. In more senses than one Poland is a transition land between east and west, and some of its most important railways are those which connect Western Europe with Russia. In the north the line from Berlin to Leningrad by K6nigsberg crosses the Polish corridor and unites East Prussia to Germany. Farther south, Poznan is an important centre, whence lines diverge to Stettin, Berlin, and Breslati in the west, and to Insterburg (in East Prussia), Warsaw, and Krak6w in the east. Warsaw is connected with Leningrad by Wilno (the junction for Konigsberg), with Moscow, and with Krakow; while from Krak6w there are lines through Polish Silesia to Breslau and Berlin,

¹ Tarnowitz. ² Kattowitz. ³ Kflnigshytte.

by Warsaw to Danzig, by Lwow¹ to Odessa, and through the Moravian Gate to Vienna. To relieve the pressure upon the lines connecting the south-west industrial region with the port of Danzig,² a new route, which is in course of construction, will run from Katowice, by way of Bydgoszcz,³ to the Polish port of Gdynia. It will also be necessary to improve the navigation of the Vistula up to the limits within which improvement is possible, though it appears to be doubtful whether that river will ever become a great commercial waterway. Direct overseas trade is carried on through the ports of Danzig and Gdynia, between which there is much rivalry. In 1931 the total trade passing through Danzig was 8,000,000 tons, while that of Gdynia, opened in 1924, was 5,000,000 tons.

The principal imports and exports of Poland are as follows—

Imports	Percentage of total imports.	Exports	Percentage of total exports.
Cotton, raw ..	8-3	Coal	14-9
Wool	6-0	Wood	12-6
Machinery ..	3-3	Eggs	5-2
Electrical apparatus	3-2	Grain	5-1
Iron ore and scrap	3-0	Sugar	5-0
Leather	2-6	Zinc	4-9
Silk goods ..	2-0	Iron goods ..	3-0
		Oil	2-1

Imports came largely from Germany, the United States, and Great Britain; while the exports were sent to Germany, Great Britain, Austria, and Czechoslovakia.

For the three years 1929-31 the value of the foreign trade was as follows—

	Special imports (in million zlotys)	Special exports	Average rate of exchange (At par 43-38 zlotys = £1)
1929	3,110	2,813	43-31
1930	2,245	2,433	43-37
1931	1,462	1,878	40-61

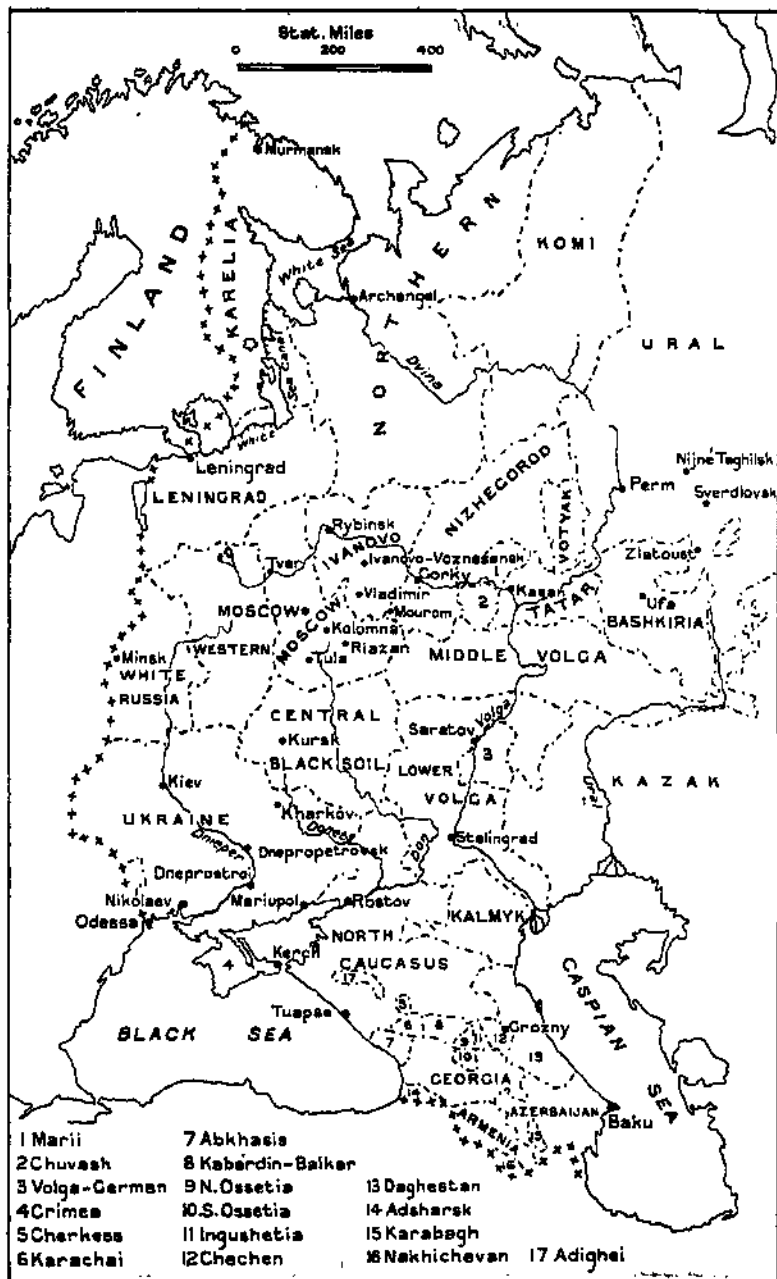
¹ Lemberg.

² Danzig, with the surrounding territory, has a population predominantly German, and was, in 1919, created a Free City under the protection of the League of Nations. It forms part of the Polish Customs administration, and provides Poland with its only real outlet to the sea. Gdynia is in Polish territory.

³ Bromberg.

CONCLUSION. Even if Poland succeed in maintaining its territorial independence many difficulties have to be overcome before its position can be regarded as assured. Alien peoples have been annexed, and must be conciliated or absorbed. Much of the land is still in the hands of large proprietors, and the agrarian problem continues. To develop further the resources of the country, capital from abroad is necessary, and the political history of the Poles is hardly such as to inspire confidence. In industrial organization the Germans played a leading part, and it appears that, without their help, some time must elapse before production again attains its former level.¹ While Poland, as a producer of raw materials such as coal, timber, and oil, and food-stuffs such as cereals, potatoes, and sugar, will be able to trade with the west, manufactured goods, such as cottons, being somewhat coarse, are more suited to the Russian market, and that market is now practically closed to them.

¹ That this is so would appear to be indicated by the following figures: For German Upper Silesia the output of pig-iron in 1929 was 47 per cent of the 1913 amount, raw steel 150 per cent, and finished rolled goods 164 per cent. The figures for Poland, which more or less correspond, are pig-iron 77 per cent, steel 82 per cent, and rolling-mill products 62 per cent.



EUROPEAN TERRITORY OF THE UNION OF SOCIALIST SOVIET REPUBLICS

CHAPTER XIX

RUSSIA, FINLAND, AND THE BALTIC STATES

WAR and revolution profoundly altered the political geography of Russia. Finland and the Baltic provinces declared their independence, while Russian Poland and a considerable part of west Russia became part of the new Polish State. Within what remained of the old empire in Europe and Asia, a number of autonomous republics, or federations of republics, and autonomous areas have been established, but, as all of them are represented in the Congress of Soviets and in the Central Executive Committee, they may be regarded as forming part of a Russian confederation. This is the Union of Socialist Soviet Republics.¹

The low depression which runs from the Black Sea to the Baltic, by the valleys of the Dnieper and the Pripet and the plains of the Vistula, separates two entirely different geographical regions; and in the contrasts between them in regard to position and configuration, structure and geology, climate and vegetation, must be sought at least part of the explanation of the differences in the economic development of Russia and Western Europe respectively.

The Archaean plateau of Scandinavia is continued in Finland, but disappears in Russia under a covering of sedimentary rocks which lie almost horizontally, as they have been but slightly subjected to the forces which cause mountain folding. These sedimentary rocks have been gradually worn down by denudation, and nowhere exceed a height of 1,320 feet. There are, nevertheless, certain broad distinctions in the topography and characteristics of the vast area covered by European Russia. The country lying to the west of a line drawn from the frontier of Poland to Archangel, by Lake Ilmen and east of Lake Onega, presents the appearance of a recently glaciated country, the land being covered with lakes of glacial origin, and the river systems being badly defined. Between this region and a wavy line which runs from Kiev to Kasan, the land

¹ Tome V. of *Geographic Universelle: Etats de la Baltique, Russie*, by P. C. D'Almeida, contains much useful information on economic conditions in Russia.

has also been glaciated, but at a more remote period, so that the river systems have become more clearly articulated, and the lakes have disappeared. To the south of this glaciated territory lies the Black Soil country, a region enriched partly by the loess derived from the melting ice-sheet, partly by the organic matter resulting from centuries of rich vegetation. The Black Soil passes gradually in the south and south-east into the true steppe, where the salinity of the soil, due to the comparatively recent disappearance of the sea, and the aridity of the climate, render the cultivation of the land impossible. In the east, Archaean rocks again appear in the Urals, while the Crimea may be regarded as a continuation of the Caucasus.

Climatic conditions, too, differentiate Russia from Western Europe. On the great lowlands, far distant from the modifying influence of the sea, and unprotected by mountains, the heat of summer and the cold of winter are alike extreme. During the latter season the isotherms run from north-west to south-east, and in January range from zero to freezing point on the Fahrenheit scale; while in the former they run from south-west to north-east, and in July range from 46° F. to 80° F. Considering the wide extent of latitude covered by European Russia (about 25°) the range of temperature between north and south is relatively low, and in some ways a better indication of climatic conditions is given by the duration of the seasons. In the north of the Crimea snow lies upon the ground for 20 days on an average, at Rostov for 66 days, at Moscow for 146 days, and at Archangel for 177 days. But the heat of summer allows cultivation of the hardier crops to be carried as far as the Arctic Circle. The rainfall, which occurs chiefly in summer, is heaviest in the west and centre, where it is from 20 to 24 inches. Outwards from this region, it decreases in all directions; in the far north and in the south-east it is less than 10 inches, but in the east an elliptical region with Perm and Ufa as its foci has from 20 to 25 inches.

The various vegetation zones of Russia are also of considerable significance to its economic development. Along the Arctic, and as far south as the 66th or 67th parallel, stretches the tundra. South of this, and coinciding in a general way with the remainder of the glaciated area, lies the now partly cleared forest region, characterized by the pine, the fir, and the birch in the north, and in the south

by deciduous trees of the Central European Forest, such as the maple, the linden, and the oak. Farther to the south, the Black Soil and fertile steppe region is generally unsuited to the growth of trees, but particularly favourable to that of cereals and grass, while in the extreme south-east the vegetation is of the scantiest description.

POLITICAL CONSIDERATIONS. In order to understand the present condition of agriculture and industry in Russia certain facts have to be borne in mind. As a result of revolution, civil strife, blockade, and the attempt to substitute communism for individualism in industrial and commercial life, Russia had in 1921 fallen to the lowest ebb. The cultivated area was only two-thirds of what it had been in 1914, horses and cattle had declined anything from 25 to 40 per cent; the output of coal had fallen from 28,000,000 to 7,000,000 tons, the production of iron was only 2 per cent of its former amount, textile industries had almost ceased to exist, and the railways were in many cases unusable as the tracks had deteriorated and more than half of the engines had broken down. As a result, the peasant finding himself unable to obtain manufactured goods in exchange for his grain, as promised, ceased to grow it.

It was in these circumstances that the New Economic Policy was introduced, by which the State permitted side by side with the State organization of industry, a wide measure of privately owned industry and the participation of private capital in State enterprises. Partly as a result of this there was a marked improvement in the economic life of Russia during the next few years, and by 1926-7¹ the aggregate production both in agriculture and industry had surpassed the pre-war level. By this time, also, the Soviet government had become convinced of the necessity of a drastic reconstruction of both, and this for several reasons. A great extension of State-controlled industry was felt to be necessary if class differentiation, which had increased under the New Economic Policy, were to be checked. It was also essential to make the country less dependent upon foreign goods, and to put it on a stronger material basis for its future progress. Moreover the growing antagonism between the peasant and the urban worker was becoming acute. The decreased return from agricultural produce and the increased cost of manufactured goods were not only alienating the peasantry as a class, but were tempting

¹ *An Economic History of Soviet Russia.* L. Lawton, Vol. II, p. 392 (Macmillan & Co., Ltd.).

the well-to-do peasants (*kulaks*) to withhold supplies. As a result not only were the towns short of food, but the State, which now controlled all foreign trade, was without grain for the purchase of goods from abroad. The Five Year Plan, which was designed to overcome these among other difficulties, aimed at developing industries connected with electrification, mining, metallurgy, and machine construction, for the ultimate benefit of all other branches of industry. It had in view the reconstruction of agriculture by the conversion of small agricultural units into either state or collective farms and the cultivation of these by the most modern machinery.

Though much that was envisaged in the original plan has not been accomplished it may be regarded as at least a partial success. The electric stations at Dnieprostroy and Volkhov, the metallurgical plants at Magnitogorsk and Kuznetsk (Siberia), the engineering works for the manufacture of tractors and agricultural machinery at Khar'kov and Stalingrad, the chemical industries of the Donetz valley, Moscow, and Leningrad, are but illustrations of the industrialization which has taken place over the whole of Russia since 1928. In many cases no doubt zeal has outrun discretion and great economic loss has been sustained through faulty organization, incompetent management, and inadequate training; nevertheless, it remains true that a great industrial advance has been made. On the agricultural side the changes have been no less important. Large State farms (*sovhozes*) such as Gigant and Verblud, near Rostov, have been established, while apparently over 60 per cent of the agricultural population have been forced into collective farms (*kolhozes*) of one kind or another—a task only achieved by the ruthless extermination of the kulaks. As a result the mechanization of agriculture has been rendered possible; indeed machinery has been introduced faster than men could be trained to handle it, and much of it has been destroyed by careless usage. On the other hand, the supply of machinery relative to the work to be done is still small; in 1931, for example, 40 per cent of the grain crop was cut by scythe and sickle. The net result so far has been an increase in the output of industrial crops rather than of grain.

In the second edition of this book (published in 1923) attention was drawn to the fact "that among those whom the Soviet leaders have called to their aid are men who are more than mere destroyers. They have investigated the resources of their country and have prepared

great schemes for its regeneration and development. If they can combine the idealism of the Slav with the practical statesmanship necessary for the execution of these schemes, it may be that Russia will not return to the individualism of the west, but will build up a new economic structure based, perhaps on that genius for co-operation which is one of the most marked characteristics of her people." Notwithstanding all that has occurred during the ten years since these words were written the Russian situation to-day still contains the same elements of uncertainty. The Soviet leaders, partly by ruthless suppression of opposition, partly by successful appeals to the enthusiasm of youth, have succeeded in carrying out, in part at least, many of their schemes, but their position has still to be consolidated. It is not yet certain that the Russians possess the administrative ability and mechanical skill required to run a great industrial system efficiently; and it is still less certain that the peasant with whom really is the key to the situation, will be able to find in the collective farm the conditions necessary for contented labour. And only time can show whether the nation as a whole can stand indefinitely the strain to which it is now subjected.

NATURAL REGIONS. The tundra, the forest, the grass lands, and the semi-arid areas of Russia obviously form great natural regions into which the country may be divided. But the lands belonging to the more recently glaciated area may be considered apart from the remainder of the forest region, partly because of their relations to the Baltic, and partly because of the effect of their recent glaciation upon their development. What is left of the forest zone falls into two regions : that north of the 60th parallel, where comparatively little agriculture is possible; and that to the south of it, where much of the land has been permanently cleared. The Black Soil and fertile steppe, the infertile steppe, and the Crimea must also, because of their geographical peculiarities, be considered as separate natural regions. Here also it is most convenient to describe the Urals and the Caucasus. The coalfields round Moscow, and the coal and iron deposits of South Russia, are the bases of industrial areas which, because of their importance, require to be treated apart from the regions in which they are found.

THE TUNDRA it is hardly necessary to mention. The only inhabitants are a few Samoyeds and Lapps who, with their reindeer, support a precarious existence.

THE LAKE REGION includes the Kola peninsula, Karelia, and the northern part of the Leningrad area. Soil and climate are unfavourable to agriculture, and fishing, hunting, and lumbering are the main pursuits except in the south where flax and the hardier cereals are grown, the latter not in sufficient quantity to supply local needs. Leningrad is the chief industrial centre; its growth was partly due to political considerations, but its position with regard to north-west Europe was undoubtedly the chief factor in its progress, and engineering and textile works naturally developed where coal and raw material could easily be obtained from abroad. Hydro-electric stations have recently been installed on the Volkhov and other rivers, and various new industries—chemical, metallurgical, and engineering—have been established in and around the city.

THE NORTHERN FOREST REGION lies between the 60th and 65th parallels, and is almost entirely covered by trees of the northern forest. Climatic conditions being severe, agriculture is carried on only in the south to a limited extent and by primitive methods. A piece of land is cleared, cultivated continuously with flax or the hardier cereals for a number of years, and then allowed to return to forest again.

Cattle-rearing in the basin of the Northern Dwina, fishing along the shores of the White Sea and along the banks of the rivers falling into it, and timber-cutting in the basin of the Pechora, are among the principal occupations of the people. Archangel, the port through which most of the trade of the White Sea is conducted, is closed by ice for five or six months each year¹ and will probably suffer in future from the competition of Murmansk, on the Kola Fjord, which is open all the year round.

THE SOUTHERN FOREST—*Western Section*. This may be taken to include the southern part of the Leningrad area along with White Russia and the remainder of the country lying west of the Moscow Industrial Region. In the main it is a partially cleared forest region, and lumbering and agriculture are the chief pursuits of the people. Owing to the damp atmosphere flax has always been an important crop, but the output has increased considerably during recent years. The production of grain, on the other hand, does not satisfy the local demand, and the density of population is low. Industries are practically confined to preparing for market the products of the

¹ It may now be kept open for two or three months longer by ice-breakers.

forest and the field, and, as at Minsk, include timber-working, distilling, brewing, and flour-milling.

The Moscow Industrial Region, which may be roughly defined by meridians through Tver¹ and Nijni Novgorod,² and parallels through Rybinsk and Tula, has developed largely as a result of its geographical position. With a varied geological structure, its situation in the centre of the country, whence great rivers flow out in all directions, gave it nodality from an early period, the relative infertility of its podsol soils rendered pursuits other than their cultivation necessary for the surplus population. The neighbouring flax-growing areas provided the raw material first in request, the forests supplied the fuel, the Black Soil region to the south secured a food supply and guaranteed one market, while the Oka and the Volga offered a route to others more distant. Later, coal from the Lower Carboniferous rocks at Ryazan and Tula was substituted for wood as fuel, but as the quality was poor much had to be imported from the Donets field. Great electric stations have recently been established within the region; they are worked by low grade local coal and by peat obtained from the many swamps of the glaciated region around. As a result new industries have been established and an impetus given to those already existing. Among the latter the manufacture of cotton goods is mainly localized in the districts around Moscow, where Ivanovo-Voznesensk and Orekhovo-Zouevo are the principal towns engaged. At Moscow itself, Yaroslavl, and Kastroma, cotton and other textile goods are made. Further south, there are metallurgical industries at Sormovo near Nijni Novgorod, and locomotives, wagons, and river steamboats are built. Kolomna has a large output of tractors and wagons and Tula makes armaments. In the Carboniferous rocks there are building stones and clays suitable for the manufacture of pottery, the Permian rocks contain salt, and the Jurassic sandstones are suitable for building purposes. The abundance of wood for fuel in the vicinity of fluvio-glacial sands has encouraged the growth of glass-making industries near Mourom and Vladimir.

THE BLACK SOIL REGION is the great agricultural area of Russia, and in it, and to the south of it, the country becomes either self-supporting as regards the production of food stuffs or more than self-supporting. Broadly speaking, the region lies south of an irregular

¹ Now Kalinin. ² Now Gorky.

line which runs north-east from Kiev to Kasan, and then east to the Urals. In the north a belt of wooded steppe gives rise to grey soils which pass southwards into the true black soils or *tchernosem*. The southern limit of the black soil may be drawn from the Caspian Sea, just north of the Caucasus, by Rostov to Saratov, and then along the westward flowing Ural river to the Ural mountains. To the south-east of the black soils lie the chestnut-brown soils of the sub-arid region, which in turn give place to the desert plains around the Caspian. The black and chestnut-brown soils cover great stretches of level land which can be easily worked by modern agricultural machinery. It is here accordingly that the opportunities for large-scale farming are greatest, and it is here that the most vigorous efforts are being made to establish it. The black soil is best adapted to the cultivation of wheat. Except along its south-eastern margin there is a mean rainfall of at least 16 inches, which under normal conditions is sufficient as the greater part falls in the spring and early summer; on the other hand, a series of years below normal may bring famine. In the region of chestnut-brown soils the mean rainfall is generally under 16 inches; wheat is the dominant and almost the only crop grown, but under conditions so unfavourable that a failure of three or four crops in ten is not considered excessive. Over the whole region the average yield barely exceeded 10 bushels per acre for the years 1927-9.

Other crops of this region include sugar-beet, fruit, tobacco, hemp, and rye. In the west, the Gosplan (State Planning Commission) has reserved the southern part of the forest zone and the northern part of the black soil area for industrial crops, such as sugar-beet, hemp, soya beans, and sunflower. As this involves a restriction of the grain-producing lands in the more humid section of the black soil proper, considerable areas in the more arid parts of the region under consideration, and elsewhere in the Soviet Union, are now being devoted to wheat cultivation, the Soviet authorities apparently being of opinion that by the cheap methods of large-scale farming over wide areas they will be able to produce an adequate supply of wheat notwithstanding the annual loss by drought of part of the crop. It is near Rostov, in a region of this type, that the great State farms known as Gigant and Verblud are situated, the former having an area of 420,000 acres.

A number of manufacturing towns are situated within this region;

they will be considered along with the Donets region with which most of them are more or less closely connected.

THE SOUTH RUSSIAN INDUSTRIAL AREA may be considered apart from the Black Soil region though it lies within it. In the Donets basin are the most important coalfields in European Russia; their proved area is about 10,000 square miles, and their available resources are estimated at 68,000 million tons. In the east of the field anthracite is found, and in the west the only good coking coal in Russia. Previous to the War the annual output of these fields had been rapidly rising; in 1898 it was less than 7,500,000 tons, but fifteen years later it exceeded 24,000,000 tons, and in 1930 it rose to 30,000,000 tons. The principal mining centres are Yuzovka (now called Stalin), Nikitovka, and Almaznaya.

An important metallurgical industry has developed on and in the vicinity of this coalfield. It depends for its iron ore mainly upon the deposits of hematite at Krivoi Rog (nearly 200 miles to the west), which contain from 50 to 70 per cent of iron. The total reserves of ore around Krivoi Rog are uncertain, the estimates varying from 87,000,000 to 200,000,000 tons and over. Farther north, in the neighbourhood of Kursk, even greater deposits of hematite have recently been discovered; they have an iron content of about 50 per cent, and the reserves are believed to be enormous. The Donets region is also in a position to obtain ore from Kerch in the east of the Crimea where there are extensive beds of oolitic ore underlaid by limestone of good fluxing quality; for the smelting of this ore on the spot large works are reported to be under construction. The metallurgical industry of South Russia as a whole is also favoured by the large supplies of manganese near Nikopol, and by the ease with which fluxes and building materials can be obtained.

Iron and steel works are situated at or near the chief coal mining towns, notably Yuzovka. Krivoi Rog, obtaining coals as a return load for the ore it sends to Donets, has become a great producer of pig-iron. Dnepropetrovsk (Ekaterinoslav), where the railway from Krivoi Rog to the Donets coalfields crosses the Dnieper, is now an important centre for the manufacture of agricultural machinery and other iron and steel goods: and Rostov at the mouth of the Don has also a large output of agricultural machinery. Stalingrad (Tsaritsyn), on the Volga, where it approaches most closely the Don, is the site of great new tractor works. Kharkov as the meeting



SOUTH RUSSIA

place of farming and mining districts has diverse industries. At Dnieprostroy below the last rapid on the Dnieper a dam nearly half a mile long has been built across the river, and a great hydro-electric station in process of construction will, when completed, supply power to a wide industrial area.

The chief ports of the agricultural and industrial regions of South Russia are on the Black Sea and the Sea of Azov. Odessa is the most important, and in favourable seasons exports large quantities of wheat. Nikolaev at the mouth of the Bug is more conveniently placed for the grain-growing districts of the south-west, and since the approach to it was improved has competed with Odessa. Of the ports on the Sea of Azov Rostov is the most important, and Mariupol is developing a trade with the Donets region.

THE REGION OF THE CAUCASUS is noted for its mineral wealth, and more especially for its stores of mineral oil, which are found chiefly around Baku in the Apsheron Peninsula on the Caspian Sea, and at Grozny in Cis-Caucasia. From the crude petroleum refined in these districts both illuminating and lubricating oils are obtained, while from the residuum is manufactured a valuable fuel used on all the steamers plying on the Caspian and lower and middle Volga. At the beginning of the present century, the Russian wells produced about 40 per cent of the world's supply of crude petroleum, practically the whole of which came from the region under consideration, but with the decline in the output of the Baku field as a result of political disturbances, and the development of oil-bearing areas in other parts of the world, this proportion gradually fell till in 1916 it did not exceed 16 per cent. Within the last few years there has been a great increase in output, which is now nearly three times as great as in 1913. At Grozny, where the oilfields appear to be less productive than at Baku, the production has steadily increased, and recently amounted to about one-third of the total Russian output, which in turn is about 10 per cent of the world's production. Grozny is connected by pipe-line, nearly 400 miles long, with Tuapse on the Black Sea, while Baku is connected with Batum by a double line 550 miles in length. The Caucasus region also contains copper, manganese ore, iron, and coal, but very little has as yet been done for their development.

THE URAL MOUNTAINS form another great mineral reserve of Russia in which are found gold, platinum, copper, iron, and coal,

as well as other substances. Important industrial centres are growing up more particularly on the eastern slope of the middle and southern parts of the range. Large deposits of iron ore are known to exist and are worked to a certain extent near Nijne Taghilsk in the valley of the upper Taghil, at Blagodad in the valley of the upper Tura, at Bakal about 50 miles from Zlatoust, and above all at Mount Magnitnai'a near Verkhne-Ouralsk in the valley of the upper Ural. At the foot of Magnitnai'a the Soviet government has built the town of Magnitogorsk where they intend to create a great metallurgical centre. For this it will be necessary to bring coal from the Kuznetsk fields in Siberia over 1,000 miles distant. Chemical industries using the by-product of the coke ovens will also be established. Other towns of the region include Sverdlovsk (Ekaterinburg) and Zlatoust, both engaged in the manufacture of iron and steel. Gold is obtained in various districts, and important deposits of platinum occurs in the valley of the Is about 59° N.

COMMUNICATIONS. Before the introduction of railways the rivers of European Russia formed the chief means of transport within the country, notwithstanding the fact that they were closed by ice for a period which varied, according to the position of their basins, from three to six months each year. Among the more important of these rivers are the Volga, the Dnieper, the Don, the Neva, and the Dwina. The basin of the Volga is connected with that of the Neva by the Mariinsk system which it is proposed to completely transform. A new waterway under construction will link up the White Sea and the Baltic by way of Lakes Onega and Ladoga. It is also proposed to link up the Volga at Stalingrad with the Don.

Soviet Russia possesses over 50,000 miles of railway. Moscow may be regarded as the geographical centre of the system, and from it lines radiate in all directions, among the most important being those which connect the capital with Warsaw, whence there are connections with Berlin; with Odessa and other ports on the Black Sea; with Leningrad, Archangel, Siberia, and Turkestan. From Leningrad there are several important lines; one runs by Viborg to Helsingfors and Abo with connections to other parts of Finland; another connects the capital with the ports on the Baltic; a third goes by Vilna where it divides, one branch going to Warsaw, and the other to Eydtkuhnen on the Prussian frontier, where it meets the line from Berlin by way of Konigsberg; and a

fourth opens up a route to warm water at Murmansk in the Kola Peninsula. Leningrad is also connected with the trans-Siberian railway at Chelyabinsk by a line which runs eastwards through Perm and Sverdlovsk. A railway from the latter town to Tyumen has been continued to Omsk, while a line from Samara by Orenburg connects the European and trans-Caspian railways of the Soviet state.

FOREIGN TRADE. During the three years 1929-31 the value of the imports and exports of Russia were as follows—

			Imports	Exports	Average rate of exchange (At par 9.46 = £1)
			(million gold roubles)		
1929	..	..	808	924	943
1930	..	..	1,059	1,036	945
1931	..	..	1,105	811	8.91

The principal exports of Russia include mineral oil, timber, furs, and agricultural produce, while among the chief imports are iron and steel goods, raw cotton and wool, machinery and tropical and sub-tropical food products. For the three years 1929-31 the chief importing and exporting countries were as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
Germany ..	28.1	United Kingdom	27.0
United States ..	22.0	Germany ..	19.8
United Kingdom	6.8	Persia	5.7
Persia ..	4.9	Latvia	5.7

FINLAND

Finland is a granitic region which everywhere bears the signs of recent glaciation. Over one-tenth of its surface is occupied by lakes, and the soil is poor and infertile. Forests cover nearly two-thirds of the total area (150,000 square miles), and less than 10 per cent of it is under crops. With the possible exception of copper deposits in East Finland, the mineral wealth of the country appears to be inconsiderable. The numerous waterfalls provide facilities for the development of electric power, and considerable progress in this direction has already been made.

The cultivation of the soil, stock-raising, and dairy farming, lumbering and fishing, are the chief occupations of the people, who number 3,600,000. Manufactures, apart from those connected with the timber industry, are of minor importance, though Tampere (Tammerfors) has important cotton mills and iron works. The chief exports are timber, wood-pulp, paper, and dairy produce. The principal ports are Vupuri (Viborg), which carries on a large part of the trade in timber; Kotka, with the largest exports of paper and pulp; Hango, the chief butter-exporting centre; Helsinki (Helsingfors), and Turka (Abo). Under normal conditions Turka and Hango alone can be kept open throughout the year.

THE BALTIC STATES

The Baltic States—Estonia, Latvia, and Lithuania—may be considered together. Physically, they belong to the recently glaciated lands of Europe and have a climate somewhat less extreme than that of the neighbouring part of Russia. Estonia consists of the old Baltic province of that name together with the northern part of Livonia; to Latvia belongs the remainder of Livonia, and the whole of Courland; Lithuania is practically confined to the former Russian Government of Kovno. The three States base their claim to independence partly on ethnical and partly on political considerations. The Ests are allied to the Finns, while the Letts and Lithuanians belong to the old Baltic race, distinct alike from the Russians and the Poles. In all three States the people were subjected to, and bitterly resented, the policy of "Russification." In all three, moreover, there was an acute agrarian problem; in Estonia and Latvia it took the form of violent opposition to the "Baltic Barons" of German descent by whom the peasantry were ruled and exploited; in Lithuania it was directed against the Polish aristocracy to whom the mass of the inhabitants were subject.

In the Baltic States less than half the land is under the plough, a considerable part of the remainder is meadow or pasture, and there are wide stretches of forest. Agriculture and stock-raising are the chief pursuits of the people, who are mainly small cultivators. Rye and oats are the principal crops, but wheat and barley are also grown. Potatoes provide the raw material of the distilling industry, and flax is again becoming an important crop in Latvia. Notwithstanding the relatively low level of cultivation in Lithuania,

where the three field system still prevails, it alone is able to produce cereals in excess of its own demands at the present time. Other exports of the region include butter and eggs, meat and bacon, linseed and timber. Live stock was everywhere depleted by the war, but measures have been taken to restore it to its former level.

There are few minerals in the Baltic States, and hitherto Latvia alone has actively engaged in manufactures. Riga, Mitau, and Libau were important industrial centres producing textiles, machinery, iron-ware, and paper, but most of their factories were destroyed during the war and, as the protected Russian market has been lost, many of them have not been restored. The oil-shales worked in Estonia are displacing timber and coal as a source of power.

The international importance of the region under consideration lies in the fact that it possesses some of the chief ports which give access to the interior of Russia. But it is uncertain whether that country will consent to the permanent alienation of the greater part of its Baltic coast-line. The port of Leningrad is frozen for five months each year, though that period may now be reduced by ice-breakers, and goods destined for that city and the region served by it have to be imported through Tallinn (Reval), in Estonia, which can, as a rule, be kept open by ice-breakers, while Baltic Port (Baltiski) a little to the west of it is practically always open. In Latvia, Riga, which provides the shortest route to Moscow, is normally blocked for less than two months, but Windau and Libau are ice-free. Since the line connecting it with the main Russian system has been converted to broad gauge, Windau has developed as a port for Moscow and Central Russia. Libau, which was formerly a Russian naval base, might also be made into a good commercial port, and plans for linking it up by a broad gauge line with the Moscow railway are under consideration. Lithuania, hitherto handicapped by the want of a port of her own, has now been put in possession of Memel.

ASIA

CHAPTER XX

ASIA

PHYSICAL STRUCTURE. The continent of Asia, which has an area generally estimated at about 17,250,000 square miles, occupies nearly one-third of the land surface of the globe. The most prominent feature in the physical structure of this vast area is the great system of mountains and plateaux which extends across it from west to east. This system is much contracted in the region of the Pamirs, which practically divide it into two parts, the eastern part, however, being much more extensive than the western. To the west of the Pamirs, the system is again contracted in the Armenian Knot where meet the Pontus and Taurus ranges, which enclose between them the plateau of Asia Minor. This plateau has a height varying from 2,000 feet in the west to about 6,000 feet in the east. The Taurus mountains, on the south of the plateau, rise in places to over 10,000 feet, but the Pontus range on the north is somewhat lower and more irregular. To the east of the Armenian Knot, where Mount Ararat is over 17,000 feet above sea-level, the fold ranges of Asia again diverge to enclose the plateau of Iran. In the north are the Elburz Mountains which curve round the southern extremity of the Caspian Sea and are continued through the highlands of north Afghanistan eastwards to the Hindu Kush, while to the south the Kurdistan Highlands, the Zagros Mountains, the south Persian ranges, and the Sulaiman Mountains extend from Armenia to the Hindu Kush and the Pamirs. These various ranges differ greatly in height. Mount Demavend, in the Elburz, is over 18,000 feet, but in the Hindu Kush some of the peaks are even higher. In the southern loop the mountains are lower, but everywhere present considerable barriers to communication. The plateau of Iran, which has an average height of about 3,000 feet, contains two basins of inland drainage, that of Iran in Persia and that of Seistan in Afghanistan. To the north of the plateaux of Asia Minor and Iran, and of the mountain ranges which border them, is a region of relative depression, occupied by the Black Sea, the valley of the Kura, and part of the Caspian. This region is bounded on

the north by the Caucasus, which are continued by the Kopet Dagh, east of the Caspian, to the highlands of north Afghanistan. The Caucasus and the Kopet Dagh form, on the west of the Pamirs, the northern boundary of the Asiatic mountain system.

East of the Pamirs, which consist of a series of high valleys separated by still loftier mountain ranges, the same distribution of land forms is continued but on a much more extensive scale. The plateau of Tibet, much of which has an elevation ranging from 14,000 to 17,000 feet, is buttressed on the south by the greatest mountain range in the world, the Himalayas, in which the passes are from 17,000 to 19,000 feet above sea-level. It is believed by some, but disputed by others, that the main Himalayan fold is continued southward in the Naga and Arakan Yoma hills of Burma and the Andaman and Nicobar Islands, and then eastwards through Sumatra and Java. To the east of the Irrawaddy fold, other highlands running southwards from the Tibetan plateau separate the various river systems of Indo-China from one another. On the north the Tibetan plateau is bordered by the Kunlun Mountains; these run eastwards into China as the Tsin-ling Mountains, but a northern branch, the Altyn Tagh, passes into the Nanshan and is continued to the north-east as the Khingan Mountains. To the north of these various ranges the area of relative depression is represented by the basin of the Tarim in the west, and by the Mongolian plateau, with the desert of Gobi, in the east. The folded Tien Shan enclose the Tarim basin on the north, and further east the Mongolian plateau is bordered by a series of ancient highlands, which include the Altai, the Sayan, and the Yablonoi Mountains. These form, to the east of the Pamirs, the northern limit of the mid-Asiatic mountain system. On the south-east the Khingan ranges overlook the lowlands of North China and Manchuria, while to the south of the Tsin-ling Mountains lies the ancient massif of South China. Both in Manchuria and in South China the hills have been formed by the fracturing of an ancient land mass.

The second great physical region of Asia is the Northern Lowland, which everywhere extends from the borders of the mid-world mountain system to the shores of the Arctic Ocean. This lowland, which is practically continuous with that of northern Europe, has

its greatest breadth in the west, and gradually becomes narrower towards the north-east. In the west of Siberia and in the trans-Caspian region it has the appearance of a true plain, in Central Siberia it is rather a low dissected plateau, and in the north-east of Siberia hills and plains are intermingled.¹ This difference in altitude is partly due to differences in geological structure, the western section being of much later date than the eastern. The Caspian and the Sea of Aral are in regions of inland drainage, and most of the land around them is covered with shifting sands. In the basins of the Ob and the Irtysh recent alluvium is the prevailing formation, though in places older rocks come to the surface. Farther east, Palaeozoic with Secondary rocks prevail over the greater part of the country.

In the south, the mid-world mountain system is separated by the great alluvial valleys of the Tigris and Euphrates, and the Indus and Ganges, from the ancient plateau lands of Arabia and southern India. These two plateaux, which seldom exceed 6,000 feet in height, are composed of ancient rocks, and seem to have remained above sea-level for the greater part of the geological period. In places they have been considerably affected by volcanic action.

CLIMATE. Only a brief account of the general conditions which determine the climate of Asia need be attempted at present, as it will be necessary later to examine in some detail the climatic characteristics of those regions which are most important from the economic point of view.

Among the factors which have to be considered are the great size of the continent, the situation of the whole of it within the northern hemisphere and of the most of it outside of the tropics, the great system of mountains and plateaux by which it is traversed, and the relation of these to the surrounding regions, and the existence of the African land mass on the south-west, and of the Indian and Pacific Oceans on the south and east.

During the winter months the greater part of Asia is an area of low temperature, and the coldest known region on earth is in north-east Siberia where, at Verkhoyansk, the mean temperature in January is -60°F . Partly as a result of the great cold, and partly because of the position of the tropic belt of high pressure,

¹ L. Dudley Stamp, *Asia*, p. 8. (Methuen, 1929.)

high pressure conditions predominate, the maximum being established over Mongolia. Hence the prevailing winds blow outwards, and, being cold, give to the districts over which they blow temperatures that are below the normal. They bring little rain except when they have crossed the sea as in north-west Japan, or where, as in Annam, they are merely reinforcing the ordinary trade winds. On the west of the continent, Asia Minor, Syria, northern Arabia, and western Persia fall within the region with a Mediterranean type of climate and receive their rainfall during the winter half of the year.

During the summer months the land surface becomes greatly heated, and an area of low pressure, which is deepest between the Red Sea and northern India, is developed over the continent. This low pressure region draws in the trade winds both of the Indian and Pacific Oceans, and so gives rain to the whole of the region backed by the mid-world mountain system from India to Korea. The mountain system itself, on account of its position and configuration, receives but little rain, except on the slopes exposed to the monsoon rains, and the interior plateaux are therefore dry at all seasons of the year. Over the lowlands, precipitation takes place mainly in the summer months. The south-west, around the Caspian Sea and the Sea of Aral, is dry at all seasons of the year, as in the summer it is sheltered by the configuration of the land, while in winter it falls within a region of high pressure. Farther north there is a gradually increasing rainfall, and a great part of Siberia has between 10 and 20 inches, the most of which falls in summer, when moisture is drawn into the northern part of the continent from various directions, but mainly from the west. This region is bounded both on the north and on the south by a belt of country in which precipitation is less than 10 inches.

Several major climatic regions, important from the economic point of view, may therefore be recognized. In the Malay Peninsula and in the Malay Archipelago, equatorial conditions prevail and there is rainfall at all seasons of the year. The proximity of this region to the densely populated monsoon lands, whence labour can be easily obtained, has led to greater economic development than is the case in similar climatic regions in other parts of the globe. The monsoon lands (taking the term monsoon in its widest sense) with their high summer temperature and alternation of wet

and dry or relatively dry seasons, have proved peculiarly favourable to man, and contain about one-half of the entire population of the globe. In the south-west of the continent, an area with a Mediterranean type of climate, and with the characteristic products and activities thereof, passes gradually into the hot deserts of Arabia and into the poor steppes and cold deserts of Central Asia. Finally, to the north of the mid-world mountain system, a great region extending across Siberia has a typically continental climate, warm summers, cold winters, and a summer rainfall; it is in parts suitable for agriculture and is gradually being developed.

CHAPTER XXI

ASIATIC RUSSIA

SIBERIA

UNDER the new territorial arrangements of the Soviet State the name Siberia only applies to a relatively small part of the region to which it was formerly attached. The Ural area (part of which is in Europe), the Siberian area, the Yakutsh, and the Mongolo-Buryat Soviet Socialist Republics, and the Far Eastern area are all included within the old Siberia. For the whole area, indeed, the name may still be usefully retained.

Except in the south-east where it is bordered by the Altai Mountains, the country west of the Yenisei consists in the main of a vast low-lying plain, less and often considerably less, than 600 feet above sea-level. To the east of the Yenisei the land under 600 feet is confined to the Arctic borderlands, and the greater part of the region as far east as the Lena consists of a plateau of ancient rock. To the south of it lie the Sayan, the Yablonoi, and other ranges belonging to the mid-Asiatic mountain system. East of the Lena, the country becomes more mountainous, among the principal ranges being the Stanovoi which continues the general direction of the Yablonoi, the Verkhoyansk which runs almost parallel to the lower Lena, and the Kolyma and Anadir ranges in the north-east.

CLIMATE. The climate is continental in character. The town of Verkhoyansk lies within a region which in January has a mean temperature of about -60° F.; but east and west of it conditions progressively become less severe. In summer, on the other hand, temperature decreases from south to north, except along the east coast where maritime conditions cause the isotherms to swing to the south. To the west of the Yenisei, the isotherms over the lowlands lying south of latitude 60° N. have a January range from about 0° F. in the west to about -13° F. in the east, and a July range from about 68° F. in the south to about 64° F. in the north. Tomsk (56° N.) for example, has a January mean of $-3-3^{\circ}$ F., and a July mean of $65-6^{\circ}$ F. These are almost the same as at Winnipeg,

but generally speaking July temperatures are somewhat higher than in the wheat-producing area of Canada. Farther east, the extreme cold of winter leads to a much greater range, and Olekminsk (60° N.) has a January mean of -32° F. and a July mean of 67° F. Conditions become less extreme as the coast is approached, and Nikolaevsk has a mean of -11° F. for the coldest month, and one of 64° F. for the warmest. The rainfall occurs mainly during the summer. Over a great part of the country it comes from the west, the mean annual precipitation being about 15 inches. Owing to the cold, the north and north-east have considerably less, not more than 8 inches, but in the extreme east where the land comes under monsoon influences, the precipitation exceeds 20 inches.

VEGETATION. Along the shores of the Arctic Ocean tundra is the prevailing type of vegetation; in the extreme east and in the west it extends well south of the Arctic Circle, but between the Yenisei and the Lena it does not advance beyond the 70th parallel, and east of the Lena its course is somewhat irregular. To the south of it lies the taiga, which covers the whole of the Siberian lowland east of the Ob as well as much of the highland. The principal trees of this great northern forest include the Siberian fir, the larch, the stone pine, the poplar, the aspen, the birch, and the spruce, but their distribution varies according to soil and climate. West of the Ob the forested area is more restricted, and, north of the 53rd parallel, a belt of wooded steppe with a maximum breadth of about four degrees extends from that river to the Urals. To the south the wooded steppe passes into true steppe.

NATURAL REGIONS. The economic development of Siberia is at present taking place mainly to the west of Lake Baikal, and here several natural regions stand out in marked contrast to one another and to the country farther to the east. West of the Yenisei, the taiga covers a marshy lowland, which has but recently emerged from the sea, and in which the watercourses are as yet but badly defined. The wooded steppe (along with which may be included the western valleys of the Altai and the more fertile parts of the steppe) has a soil and climate which render it capable of great agricultural development. The steppe-land to the south, with but a meagre precipitation, is fit only for pastoral pursuits; and the Altai and Sayan mountain districts are chiefly valuable for the mineral wealth which they contain. To the east of the Angara-Yenisei the country



ASIATIC TERRITORY OF THE UNION OF SOCIALIST SOVIET REPUBLICS

is only imperfectly known, and, as any subdivision of it would necessarily be incomplete, the region will here be treated as a whole.

THE FOREST REGION OF WESTERN SIBERIA is of little economic importance, as it is marshy, incapable of cultivation, and difficult of penetration. Fishing is the most important pursuit of the inhabitants, who catch large numbers of salmon, sturgeon, and other fish for the Russian and Siberian markets. Owing to the great decrease in the number of fur-bearing animals, trapping is now of little importance. The timber of the region varies in quality; on the more elevated districts it is often good, but in the marshes the trees are frequently rotten.

THE WOODED STEPPE is at present the most important agricultural region in Siberia. It contains large areas of good land; and the steppes of Ishim which lie between the Urals and the Irtysh, the steppe of Baraba farther to the east, and the valleys and steppes on the west of the Altai, all fall within the Asiatic extension of the Russian black soil region. This soil is usually rich in all the constituents of fertility, but it is said that in Siberia it has neither the thickness nor the continuity of similar soils in Europe. The chestnut-brown soils which lie to the south of the black soil have a lower percentage of organic matter and nitrogen; they are naturally less fertile and occur in an area with a lower rainfall. Over the whole region the land is level, and well suited to the use of modern agricultural machinery. It would also, it is believed, respond readily to modern methods of husbandry. Previous to the war wheat occupied an area of over 10,000,000 acres; but the yield was low, and did not exceed 10 bushels to the acre. For this, there were several reasons. The Siberian peasant was but a poor farmer, and he had been confirmed in his slipshod ways by the fertility of the soil, which led to extensive, rather than intensive, methods of cultivation. Formerly, the practice was to crop the land with the same cereal for a number of years in succession, only allowing an occasional year's rest, and then to let it lie fallow for a considerable time; but more recently a system of rotation had been introduced, American machinery was being used, and before the war the prospects of better cultivation were, on the whole, somewhat brighter than they had been. After the revolution there was a considerable decline in the cultivated area, but that has apparently been overcome.

Of the 75,000,000 acres believed to be available for State farms in Soviet territory, at least 25,000,000 are in Siberia.¹ But one of the obstacles to the development of this region is the absence of effective means of transport.

Cattle were formerly raised in large numbers, but, partly as a result of the rigorous winters, the breed was of an inferior type, and there has been a tendency to sacrifice quality to quantity. With the development of the butter industry, attempts were made to improve the native cattle by the importation of animals from abroad, and these attempts seem to have been at least partly successful, notwithstanding the great difficulty there was in acclimatizing foreign stock. The manufacture of butter, which had by 1914 become the most flourishing of Siberian industries, owes its origin to Danes, who first made the farming population acquainted with modern methods of dairying. The matter was then taken up by the State, and the export of butter, very largely to the United Kingdom and Germany, gradually increased until in the years immediately preceding the war it amounted to over 70,000 tons per annum. The chief centres of production were at Kurgan, Omsk, and Petropavlovsk, but considerable quantities were also obtained from the rich valleys and steppes of the Altai round Barnaul and Novo-Sibirsk (Novo-Nikolaevsk). Two reasons may be adduced for the rapid rise of the butter industry: the Siberian grasslands are said to produce milk of great richness, and the freight on butter is in proportion to its value much less than that on wheat. For some years the export of butter entirely ceased, and, though efforts are now being made to revive the industry, the export from the whole of the Soviet Union in 1929 amounted to only 27,764 tons.

Although this region is the most densely populated in Siberia, and contains over four-fifths of the total population of the country (which in 1931 was estimated at 13,306,000, including that of the Mongolo-Buryat Republic), manufactures have made but little progress. Such as exist are connected with working up agricultural, pastoral, and forest products, and include flour-milling, brewing, tanning, and match-making. The inhabitants are, as a rule, too poor to buy much, and what they actually require can be imported more cheaply by the Siberian railway than it can be manufactured

¹ C. F. Marbut, *Geographical Review*, January 1931, p. 19.

on the spot. Domestic industries, which were once of some importance, appear to be on the decline as the result of the competition of European goods.

THE KIRGHIZ STEPPES, which lie to the south of the previous region, belong to the republic of Kazakstan. The rainfall is low, and although Russian cultivators have settled in the northern parts of Akmolinsk and Semipalatinsk, the remainder of the region is generally unfit for agriculture, and it is only in a few scattered oases, where irrigation can be practised, that colonization has been attempted. The Kirghiz tribes, who are the chief inhabitants of the steppe, have large herds of horses, camels, cattle, and sheep, and practically live in the same nomadic fashion as their fathers have done for many centuries. Tallow, obtained from the fat-tailed sheep, horse-hair, and camel-hair are the chief exports; the wool of the native sheep is too coarse to find a market outside of Siberia, but since the beginning of the present century merino sheep have been introduced and are doing well.

The economic development of this region in the future will depend mainly upon the exploitation of its mineral wealth. Coal appears to be well distributed; at Ekibas-tuse to the south-west of Pavlodar on the Irtysh, and elsewhere, there are large reserves which, though of relatively inferior quality, will assist railway development. Other minerals include copper and iron, both of which appear to be abundant in the Karkaralinsk district. At present most attention is given to the copper deposits which are of considerable value.

THE ALTAI AND SAYAN REGION is noted for its mineral rather than for its agricultural wealth. There is a belt of arable land along the course of the railway, but the most fertile district is that round Minusinsk, on the Upper Yenisei, where the rich, black soil and favourable climatic conditions permit the cultivation of wheat, sugar-beet, and other crops. Gold is found in placer deposits in the valleys of various rivers in the Altai and Tomsk districts, but the output is declining and further development depends upon the discovery of paying lodes. Iron ore, although it has not yet been worked to any great extent, is known to exist in large quantities in the Kuznetsk coal basin, and there are also deposits in the neighbourhood of Minusinsk. The Kuznetsk coal basin which has a probable area of over 9,000 square miles, lies in the valley of the

Tom; in it there are at least twelve seams of coal, the average aggregate thickness of which is said to be 100 feet. Estimates of the total reserves vary from 300,000 to 400,000 million tons. The Kuznetsk basin is by far the most important coal-producing area in the Soviet Union; it is leading to the growth of a large metallurgical industry in the neighbourhood, and the coals from it are also sent to the iron and steel works of the Urals. Of the variety and quality of the Kuznetsk coal there appears to be no doubt; whether it will prove profitable to haul it to Magnitogorsk, over 1,000 miles away, is much more open to question. Other coalfields of this region are situated at Minusinsk and at Cheremkhovskoe to the north-west of Irkutsk, and among other mineral deposits may be noted copper which exists in the Altai in large quantities. In the Altai, also, there are silver-lead-zinc deposits which have hitherto been worked mainly for their silver.

EASTERN SIBERIA. The greater part of Eastern Siberia is imperfectly known, as far at least as its economic resources are concerned. Most of the land is covered with forest, and the proportion fit for agriculture is believed to be much lower than in Western Siberia. The climate also is more severe, and tends to restrict agriculture to such favoured localities as the southern part of trans-Baikalia and the more sheltered districts in the valleys of the Amur and the Ussuri and their tributaries. The amount of grain grown is not sufficient to meet the requirements of the inhabitants, who are obliged to import it from Western Siberia. Considerable areas appear to be well adapted to cattle and sheep, and steps have been taken to improve the native breeds of both. Timber will probably prove a valuable source of revenue in the future, more especially in the east, where it can easily be transported to the coast; even now it finds a market in the Far East and in Australia. Fishing is carried on in all the rivers of Siberia, but, owing to the difficulties of transport, it is only in the lower reaches of the Amur and along the east coast that it has become of more than local importance. From the Amur, salmon, sturgeon, and caviare are exported to the European market, but the fisheries of Kamchatka are mainly in the hands of Japanese. Herring are found along the coast and in Sakhalin. Trapping is of importance, though, as in other parts of Siberia, the number of fur-bearing animals is decreasing.

But it is for its mineral wealth that Eastern Siberia is chiefly important at the present time. In this region, which produces the greater part of the Siberian output of gold, the principal mining districts are situated round Bodaibo in the valley of the Vitim, Olekminsk in the valley of the Lena, and in the valleys of the Zeya and Bureya. For working the alluvial sands, which alone are exploited to any extent at present, steam dredgers have also been introduced, but the industry is still carried on under somewhat primitive conditions. Important discoveries of gold have also been reported from the basin of the Aldan, a tributary of the Lena. Coal, generally of poor quality, occurs in the Amur province, in the basin of the Ussuri, and elsewhere, but the most valuable deposits of that mineral in the Pacific region are said to lie along the west coast of Sakhalin, from the Russo-Japanese frontier northwards. It is suggested that numerous coal deposits lying between the Yenisei and the Lena must all form part of one continuous basin—the Tungusk—covering an area of nearly 400,000 square miles. But as yet very little is known of this area.

COMMUNICATIONS. The rivers of Siberia, although they are, with one or two exceptions, closed by ice for more than half the year, are of considerable value as waterways. The Ob is navigable as far as Bisk, and, along with the Tobol and the Irtysh, is used for the conveyance of grain from the agricultural regions to Tyumen on the Tura, whence it is sent by rail into European Russia. The Yenesei, notwithstanding its great volume, plays a less important part, and is used mainly for local purposes, such, for example, as forwarding the grain of Minusinsk to the mining districts farther north. These two systems are connected by a short canal, which has not proved of great value. The Lena is of some service to the mineral districts of Bodaibo and Olekminsk, while the Amur is navigable nearly to its source and carries on a considerable amount of trade. But the most important route of all is undoubtedly the trans-Siberian railway which runs from Chelyabinsk (where lines from Leningrad and Moscow meet), by Omsk and Irkutsk, round the southern end of Lake Baikal to the Manchurian frontier; it is then continued by the Eastern Chinese Railway (a joint Russian and Chinese concern) until it again enters Siberian territory not far from its terminus at Vladivostok. The all-Russian route to this port leaves the main line east of Chita and runs parallel to, but

at some distance from, the courses of the Shilka and the Amur as far as Khabarovsk, whence it follows the valley of the Ussuri on its way to Vladivostok. Various extensions of the Siberian railway have at one time or another been under consideration. One of the most important was completed in 1930; the South Siberian line, which branches off at Novo-Sibirsk, has been continued from its former terminus at Semipalatinsk to the trans-Caspian railway near Tashkent. The suggested line from the Siberian railway at some point east of Lake Baikal to Kalgan, by Kyakhta and Urga, which would reduce the journey to Peking by several days, must at present be regarded as indefinitely postponed. The completion of the trans-Siberian railway has undoubtedly been the most important factor in the economic development of the country. Between 1861 and 1895 (the year in which the line was opened to Irkutsk) less than 1,000,000 emigrants entered Siberia. Between 1895 and 1914 over 3,000,000 people moved into it from European Russia, the rate varying from 500,000 in 1909 to an average of 100,000 in 1911-13. A number of these, however, returned to Europe.

RUSSIAN CENTRAL ASIA

This region may be considered as including that part of Asia which borders upon Siberia, Chinese Turkestan, the Pamirs, Afghanistan, Persia, the Caspian Sea, and European Russia. Under Soviet rule the semi-independent Khanates of Khiva and Bukhara, along with the region somewhat vaguely known as Russian Turkestan, have been re-arranged, and the three republics, the Uzbek, the Turkoman, and the Tazhik, along with several autonomous regions, have been established in their place. The three republics have an area of over 300,000 square miles and a population of over 6,000,000. Along with them may be included, for present purposes, that part of the Kazak republic not included in Siberia.

Russian Central Asia varies greatly in its physical aspects. In the east it belongs to the region of the Pamirs and the Tien Shan, while in the west it passes into the plains of the Aralo-Caspian depression. The climate throughout is extreme, and is characterized by cold winters, hot summers, and a very low rainfall. Hence, much of the land is desert or, at best, steppe; and it is only in the vicinity of rivers, which are fed by melting snows on

the mountains, that settlement is possible. Of these rivers, the most important are the Hi, the Syr-Daria, the Zerafshan, the Murghab, and the Amu-Daria. Where the conditions are favourable, the inhabitants of the districts bordering these rivers have developed an elaborate, if primitive, system of irrigation and settled down to agriculture, but on the steppes nomadism still prevails. In the irrigated districts the soil is generally very fertile, and the crops grown include wheat (sometimes raised without irrigation), rice (where water is abundant), and other cereals, sesame, flax, and great quantities of fruit and vegetables. Most important of all, however, has been the extension within recent years of the area under cotton, which flourishes best in the basin of the Syr-Daria. Statistics are very defective, but during the three years 1911-13 the annual output probably averaged about 150,000 tons of ginned cotton. The seed used was American, and the product, the quality of which was fairly good, went exclusively to European Russia.

As a result of the economic upheaval in Russia, the decay of the irrigation works, and the substitution of wheat for cotton during the famine, the output declined, and in 1922 does not appear to have amounted to 10,000 tons. Since then there has been a remarkably rapid recovery, and the area cultivated in 1930 was reported to be over 2,500,000 acres or more than twice as much as in pre-war days. This involved the substitution of cotton for rice and wheat, but the completion of the "Turk-Sib" railway, already referred to, facilitates the imports of food-stuffs from Siberia.

Russian Central Asia is now connected with the European railway system by a line which runs from Samara through Orenburg to Tashkent. There it joins the trans-Caspian railway which connects Krasnovodsk on the Caspian with Merv (whence there is a branch to Kushk on the frontier of Afghanistan), Bukhara, Samarqand, and Andijan.

CHAPTER XXII
SOUTH-WESTERN ASIA
TURKEY¹

THE plateau of Anatolia, which is buttressed on the north and on the south by the Pontic and Taurus ranges respectively, extends from the Aegean eastwards to the Armenian knot. To the west of the Anti-Taurus the plateau forms a great central plain, of which the elevation is generally over 3,000 feet; but to the east the land, besides increasing in height, becomes more irregular in contour, and the region consists of elevated plains, separated by the numerous ranges which finally converge in the highlands of Armenia. The mountains which border the plateau approach closely to the sea and leave little room for the formation of coastal plains, the most important of which are those of the Kizil and the Kalkid in the north, and of Pamphylia and Cilicia in the south. To the west the slope of the land is more gentle, and many broad valleys open out upon the Aegean, and offer the natural routes for penetration into the interior. The area of Turkey is 294,416 square miles, of which 9,257 are in Europe.

On the coastal regions, which include both the plains and the lower slopes of the hills, the climate is typically Mediterranean. At Smyrna,² for example, the mean temperature for January is 46° F. and for July 80° F. On the plateau, the summers are hot and the winters very cold, especially in the east, where snow lies for many months in the year. The rainfall, which occurs during the winter half of the year, is heaviest in the coastal districts, and is generally between 20 and 30 inches, except along the eastern part of the Black Sea littoral, where it exceeds the latter amount. On the plateau the precipitation is almost everywhere less than 20 inches, and over a great part of western Anatolia it is less than 10 inches.

The population of Turkey is estimated at over 13,500,000.

¹ For an interesting account of present conditions in Turkey, see Stamp's *Asia*.

² Now Izmir.

The Turkish majority is believed to be derived from the fusion of the Armenoid folk, who were in possession of the land at the beginning of the historic period, with the Turkish tribes who entered the country between the eleventh and fourteenth centuries and imposed their religion and speech upon the conquered people. The Greeks, who were most numerous in the coastal districts, have now been sent to Greek territory. They consisted in part of the descendants of the Christian population of Anatolia who refused to accept the creed of Islam, and in part of the descendants of emigrants into Asia Minor from Greece and the Greek islands. In economic capacity, as in intellectual ability, the Greek was generally superior to the Anatolian Turk, and his departure is, economically at least, a loss to the country.

For the division of the country into natural regions, it is most important to distinguish between the coastal plains and the lower slopes of the plateau on the one hand, and the plateau on the other.

THE COASTAL DISTRICTS contain considerable areas of fertile soil, but their full development has been greatly retarded by the disturbed political conditions which have so long prevailed in the country. The cereals grown include wheat, maize, and barley, the last of which is exported to England, where it is esteemed for malting. The west coast is especially noted for its fruits, the most important of which are the grape, the olive, and the fig. Of these, the grape, which is exported in the form of raisins, has the widest range ; the olive seldom extends inland more than fifteen or twenty miles from the coast, except in the district round Aidin ; while the fig flourishes best in the valleys of the Cayster and the Menderes. Within recent years sericulture has become an industry of some importance in the country round Brusa. Cotton, generally of inferior quality, is grown, among other places, in the vicinity of Smyrna, at Kassaba and Aidin in the west, and on the Cilician plain in the south-east ; it is believed that the latter district, at least, if developed and irrigated, might produce large quantities of excellent material, as at present only part of it is cultivated, and that is devoted mainly to cereals. On the north coast, tobacco is extensively grown on the river deltas in the country between Trebizond and Sinope, especially around Samsun; while from the warm temperate forest, which borders the Black Sea, large quantities of hazel nuts

are exported. Tobacco is also grown in the west, round Brusa, Smyrna, and elsewhere; the immigration of large numbers of Macedonian Turks is said to have given a great impetus to its cultivation, and it is now the most valuable export of the country. Among other products of the coastal districts are sesame, valonia, and opium.

In various parts of the region carpet-weaving is an important home industry carried on by women and girls. Cotton, woollen, and linen goods, generally of inferior quality, are manufactured both in the domestic workshop and in the modern factory. Soap, in the production of which olive oil is extensively used, is made at Smyrna and elsewhere. In addition, there are cigarette factories, tanneries, and a number of other small manufacturing establishments. Many of these industries are apparently still suffering from the loss of skilled labour caused by the exodus of the Christian population.

THE PLATEAU. On the plateau the conditions of economic activity are very different. As a rule, the soil is poor and the rainfall deficient; but where conditions are more favourable, as they are around Konia, wheat and other cereals are cultivated. Hitherto agricultural methods have been somewhat primitive, but much attention is now being given by the Government to their development on more modern lines, and within recent years there has been a considerable increase of the cultivated area in all parts of Anatolia. Elsewhere the principal pursuits of the region are pastoral, and, in the west, are mainly confined to rearing sheep and the famous Angora goat from which mohair is obtained. Upon this raw material is based the carpet-making industry, which is carried on in many small villages throughout the region. In the highlands of the east of the plateau, the horse replaces the goat as the mainstay of the inhabitants, who are typical nomads.

MINERALS are believed to be abundant in both regions, and numerous concessions have been granted for their exploitation; but owing to the want of good means of communication, the lack of labour, and the disturbed condition of the country, little actual work has been done. There are various deposits of coal and lignite, but the only coalfield of importance worked at present is that near Eregli, on the Black Sea. Lead appears to be widely distributed; among other places it is worked in the Bulgar Dagh, in the vilayet

of Konia, and near Balia-Maden, in the vilayet of Brusa. The output of chromite, of which there are large deposits in the vilayets of Aidin and Brusa, has apparently declined since the development of the mines in New Caledonia. Other minerals include copper, meerschaum, antimony, and emery.

EUROPEAN TURKEY. The country east of the Maritsa alone remains to Turkey of her former European possessions. It consists in the main of an undulating steppe land upon which sheep are pastured. In the valleys and on the coasts there are woodlands which have in places been cleared to allow of the cultivation of the vine, fruit, tobacco, and the silk-worm. Constantinople, now known as Istanbul, although no longer the capital, must, on account of its position, remain a city of great importance.

COMMERCE. During 1930 and 1931 the value of imports averaged £T137,000,000 and of exports £T139,000,000.¹ Tobacco, fruit (raisins, figs, etc.), butter, and eggs accounted for over one-half of the total value of the exports. Other articles included cereals, cotton, oils, wool, and carpets. The principal imports were manufactured goods—cotton, woollens, iron and steel goods, and machinery—sugar, and mineral oils and coal. Much of the trade is carried on through Constantinople and Smyrna, as many of the ports of Anatolia are either too small for, or have not yet been developed to meet the requirements of, modern shipping. Sinope and Samsun export much of the tobacco grown on the Black Sea littoral. Panderma, on the Sea of Marmora, has increased in importance since it has been linked up with the interior by rail. Smyrna, the principal port of the country, is situated on the gulf of that name, and has a large and fertile hinterland; it is the entrepot for trade with the Greek islands and many of the Mediterranean ports of Anatolia, just as Istanbul is for trade with the ports on the Black Sea and the Sea of Marmora. Adalia and Mersina are the chief ports on the south coast; the former exports wheat and flour, and the latter the cotton grown on the Cilician plain.

SYRIA²

The coastal strip, which is narrow in the north, but broadens out in the south into the plains of Sharon and Philistia, is

¹ For these years £T1 = 2s. 6d.

² Area, 58,000 square miles; population, 3,500,000 (estimated).

bordered by a series of highlands, which include the Amanus range, Lebanon, and the hill districts of Samaria and Judaea. Beyond these lies the rift-valley of the Jordan and the Dead Sea, the eastern walls of which, when they do not rise to distinct ranges as in Anti-Lebanon, form the escarpment of a plateau that falls away gradually towards the Euphrates. The climate is of an extreme Mediterranean type and the summers are hot, especially in the rift-valley and on the eastern plateau, while the winters are warm (except in the north, where there is often heavy snow). Precipitation is heaviest on the slopes of the Lebanon, which have an average rainfall of over 40 inches; but this amount decreases slightly towards the north, and more rapidly towards the south and east.

The whole region was formerly part of the Turkish Empire, but since the war three separate political areas have been recognized. Syria, which is now administered by France under a mandate from the League of Nations, extends along the Mediterranean coast from north of Alexandretta to north of Acre, and inland as far as Feishkhabur, on the Tigris, and Abu Kemal, on the Euphrates. Palestine, which lies to the south of Syria between the sea and the rift-valley, is under the control of the British, who are pledged to make it a national home for the Jews. To the east of the rift-valley is Trans-Jordan, which has been formed into an Arab State, controlled by Britain. Throughout the whole area the Arab element predominates, but, as the land has long been exposed to invasion and conquest, the population is mixed and, in addition to the Arabs, contains many Turks, Kurds, Armenians, and others. Into Palestine there has been a considerable Jewish immigration within recent years.

Agriculture is the main industry of the people of Syria, but, though much of the soil is fertile, a great part of it is uncultivated; there is little doubt but that improved methods of husbandry, and more especially the development of irrigation, would increase to a considerable extent the productive powers of the land. The chief agricultural areas lie either upon the narrow coastal plain and the slopes of the hills facing the sea, or on the plateau beyond the rift-valley. In the first of these regions, more especially in the Lebanon and round Tripoli and Beirut, the olive is extensively grown, and the manufacture of oil, and soap therefrom, are two of

the most important industries in the country. Near Beirut, also, there are many orange plantations, and in the vicinity of Sidon large lemon groves. The rearing of the silkworm has long been practised in the Lebanon, and has spread along the coast both to the north and south, as well as inland to the Anti-Lebanon. It is reported, however, that, as a result of the competition of Chinese and Japanese silk, and of extensive emigration which has reduced the amount of labour available, there is a tendency to replace mulberries by oranges or tobacco, and that during recent years many mulberry trees have been felled. In any case, the output, though now increasing, is still much below the pre-war amount. Some of the silk is spun in the district and the product is exported, the bulk of it going to Lyons. Tobacco is cultivated in different parts of the country, but the export consists mainly of that which is grown in the country behind Latakia. Between the Lebanon and the Anti-Lebanon there are numerous vineyards, and farther north cotton is grown along the coastal plain. On the plateau region to the east of the rift-valley the products are of a somewhat different character, and cereals are grown near Aleppo, Hama, and Horns, and to the south of Damascus, in such quantities as to permit of a considerable export, especially of barley. Cotton is an important crop round Idlib in the north, where heavy dews often make artificial irrigation unnecessary. The area under cultivation is increasing and, where irrigation is possible, American and Egyptian varieties are sometimes grown. To the east of the regions mentioned, the want of rainfall condemns the country to pastoral pursuits alone, and even these disappear towards the Syrian desert.

In addition to the industries already mentioned may be noted the weaving and dyeing of silk and cotton goods at Aleppo, Horns, and Damascus, and flour-milling, tanning, and the preparation of tobacco and cigarettes which are carried on in various parts of the country. Minerals are known to exist in various places, but so far little has been done for their exploitation. Among the principal exports are fruit, silk, cereals, olive oil, and soap.

PALESTINE¹

In Palestine the most productive districts are the plains of Philistia and Sharon which border the coast, and the plain of

¹ Area, 9,000 square miles.

Esdraelon which separates the hills of Galilee from those of Samaria. With the exception of the mulberry, which is not grown to any extent, the crops are similar to those of Syria. Cereals are cultivated in the plain of Esdraelon, and in the country between Gaza and Jaffa. The olive is found all over the country, some of the largest groves being in the vicinity of Acre, Jaffa, and Nablus; Jaffa is noted for its oranges and vines, and in the same region large quantities of sesame are also grown. In the hill country there is a limited amount of arable farming and fruit growing, but much of the land is only suitable for pasture.

The various efforts which have been made during the last forty years to establish Jews upon the soil of Palestine have led to the foundation of two groups of colonies; one round Jaffa, where the conditions of soil and climate are particularly favourable for the cultivation of oranges, almonds, and the vine, and the other in the north, where arable and pastoral farming are the chief pursuits of the colonists. By 1914 the earlier difficulties had been overcome, and it was confidently maintained that all the larger and a good proportion of the smaller colonies had an assured future. Since the war there has been further immigration, and at the census of 1931 the Jews numbered 175,000 out of a total population of over 1,000,000.

'IRAQ

'Iraq, which includes Mesopotamia with a considerable stretch of desert to the west and hill country to the north-east, is an Arab kingdom. In Mesopotamia itself the land has a gradual slope from the north-west as far as an old coast-line, which runs from Hit, on the Euphrates, towards Samarra, on the Tigris, and beyond which stretches a level plain that is really the delta of these great rivers. The rainfall occurs during the winter and spring months; it is not inconsiderable in the north, where Mosul has over 16 inches, but it decreases rapidly towards the south, and between Baghdad and the Gulf does not appear to exceed 7 inches. The winters are warm and the summers hot; at Baghdad the range is from 49° F. in January to 92° F. in July and August. In the extreme north, and in the vicinity of the rivers as far south as the old coast-line already mentioned, there are large areas of good grazing land, but much of the true "Mesopotamia" is desert; farther south the greater part

of the plain is either marshland, resulting from the annual floods, or semi-desert covered with grass during the spring months, but at other times bearing little but camel-thorn.

In the delta, past civilizations have maintained themselves by the aid of great systems of irrigation which have fallen into decay, and only a small part of the cultivable area is now under crops. In the north, the most important agricultural areas are situated near the hills, where the rainfall is sufficient for wheat and barley, and where mountain streams can be utilized for the cultivation of cotton, rice, and fruit. But on the delta, where irrigation is always necessary (although the amount of rainfall has much to do with the success or failure of winter crops such as wheat and barley), the cultivated lands lie in the vicinity of the rivers, marshes, and canals.

In the neighbourhood of the Hindlya and Hilla branches of the Euphrates, where the soil is very fertile and where considerable areas can even now be irrigated, the principal crops include rice, barley, wheat, and dates. Dates are extensively grown on the banks of the Shatt al 'Arab, where the rise of the tide facilitates the distribution of river-water throughout the plantations. The cultivation of the date-palm has given to the people of these and similar districts a more settled character than is the case in other parts of the country. The nomadic and semi-nomadic tribes are mainly engaged in pastoral pursuits ; they possess large flocks of sheep, the wool from which forms one of the chief exports of 'Iraq ; they also breed camels, but cattle-rearing is, as a rule, confined to the more settled folk in the neighbourhood of the rivers.

Mineral oil has been discovered at Khanaqin on the Persian frontier, north-east of Baghdad, and near Kirkuk, about 135 miles north of Baghdad. These sources, though likely to become important, do no more at present than supply local needs, but they have led to the advent of the oil pump, which has brought large tracts of barren land under cultivation, with a consequent tendency to increase settlement at the expense of nomadism. The 'Iraq Petroleum Company which is developing a considerable stretch of country to the east of the Tigris has acquired the rights of laying its pipe-lines through Syria and Palestine. The terminal points will probably be in the Bay of Acre and in the vicinity of Tripoli.

Various schemes have been prepared for the restoration of irrigation in the delta. As the rivers are in flood from March to May, a result of the winter rains and the melting of the highland snows, and as the summers are hot and dry the water comes "too late for the winter, too early for the summer crops"; the basin system of ancient Egypt is impossible, and perennial irrigation is necessary. The late Sir William Willcocks estimated, though his figures were questioned, that the available water-supply is sufficient to irrigate about 7,500,000 acres of winter crops (wheat, barley, and beans, which require irrigation from November to May), and about 4,000,000 acres of summer crops (rice, millet, sesame, and cotton, which need water from April till at least the middle of July). To irrigate at present so large an area would, however, involve an expenditure much greater than the size of the population and its economic capacity would appear to warrant, and it is probable that the policy adopted will be that of the gradual extension of the irrigated area by means of local works. Such is the Hindiya barrage, the object of which was to regulate better the distribution of the waters of the Euphrates between the Hindiya and Hilla branches; it was constructed above the point at which the river bifurcates, and the Hilla branch, which had become silted up, together with the canals dependent upon it, was once more rendered effective for irrigation purposes. Before the war, also, the conversion of the Habbaniya depression (north-west of the barrage) into a reservoir for the storage of the surplus waters of the Euphrates had been taken in hand.

The principal towns of 'Iraq are Basra, at the head of navigation for ocean-going ships on the Shatt al 'Arab, and the chief port of the country; Baghdad, which is reached by river steamers from Basra, and carries on an important trade with Persia; and Mosul, which is the centre of the pastoral area in the north of the country. Between Baghdad and Mosul the traffic on the Tigris is mainly downstream, the craft in use being rafts on inflated skins. Small steamers can at times of high water sail up the Euphrates as far as the Hindiya barrage, but the bulk of the trade appears to be carried on by native boats. Above Hindiya the traffic is mainly downstream, and flat-bottomed boats are used. The principal exports include dates, wool, barley, and opium; while cotton goods, sugar, and timber form the greater part of the imports.

ARABIA

Arabia is a great plateau about one-third the size of Europe, with a slope from the west and south towards the east and north. Owing to the low rainfall the greater part of the region is either desert, or steppe so poor that, except at certain seasons, it almost approximates to desert. The bulk of the population, both settled and nomadic, is found upon the margins of the plateau, where the conditions are somewhat more favourable. In the centre, also, in the country known as Nejd, where the limestone is uncovered by the sands of the deserts which lie to the north and south, there are a number of scattered oases, on one of which stands Riyadh, the capital of Nejd, with a population of over 18,000 ; on the poor steppe lands which surround these oases, as in many other parts of Arabia, the Bedawis feed their flocks.

The kingdom of the Hejaz extends from near the head of the Gulf of Akaba to a point about half-way down the coast of the Red Sea. To meet the needs of the Pilgrimage, large quantities of goods of all descriptions are imported through Jidda, the port of Mecca, but its exports, apart from specie, are of little account. Yemen, which lies in the south-west of the peninsula, has a summer rainfall derived from the monsoon. With the aid of irrigation, coffee can be grown in the highlands at elevations varying from 4,000 to 8,000 feet above sea-level. Yemen has, within recent years, suffered greatly from the competition of Brazil, and Mocha coffee now holds a relatively unimportant place on the world's markets. Most of it is exported through Aden, mainly, it is said, because the routes to that port are safer than those to Hodeidah, on the Red Sea. The Aden Protectorate and Hadhramaut, on the south coast, lie within the British sphere of influence. The port of Aden, about 120 miles from the Strait of Bab-el-Mandeb, is a great coaling station and place of call for vessels on the Suez Canal route to the East. It carries on some trade with the interior, but its commercial importance is mainly due to the fact that it is a collecting and distributing centre for goods from different parts of Europe, Asia, and the east coast of Africa. Hadhramaut was once famous for its myrrh and frankincense. In the south-east of Arabia, in the mountainous country of Oman, is the independent sultanate of Muscat, from which some very fine varieties of dates are exported. Its capital, Muscat, has been displaced by Mattrah as a centre for

trade with the interior. Koweit, the capital of a sultanate of the same name, is situated on the Persian Gulf and is engaged in the pearl-fishing industry. It also carries on considerable trade with the interior and with other ports on the Gulf.

RAILWAY ROUTES IN SOUTH-WEST ASIA

In Anatolia there are now several important lines. The Anatolian railway begins at Haidar Pasha, near the entrance to the Bosphorus, and crossing the tableland by way of Eskishehr, runs to Konia, the starting-point of the Baghdad railway. Eskishehr is connected with Ankara* by another branch of the same system. The main line of the Smyrna-Kassaba railway passes through Magnesia and Kassaba, and joins the route to Konia at Afiun Qarahisar, while a branch runs north from Magnesia to Panderma, on the Sea of Marmora. The Smyrna-Aidin railway follows the valley of the Menderes for a considerable part of the way to Egerdir, on the lake of the same name. The Baghdad railway starts at Konia, and after tunnelling through the Taurus range and the Amanus range, arrives at Moslemiyeh, the junction for Aleppo. From this point the line runs eastward to Nisibin, whence, according to the plan now proposed, it will be continued by Mosul to Kirkuk. Kirkuk has already been connected with Baghdad by a metre gauge line, and Baghdad with Basra.

From Aleppo a railway runs south by Damascus to Medina, and may ultimately be continued to Mecca. It is connected with the ports of Syria and Palestine by branches from Horns to Tripoli, Rayak to Beirut, and Deraa to Haifa and Acre. From Haifa a recently constructed line goes southward along the coastal plain to Gaza and then by way of El Arish and Qantara, on the Suez Canal, to Cairo ; from it there are branches to Jaffa and to Jerusalem.

¹ Formerly Angora.

CHAPTER XXIII
PERSIA AND AFGHANISTAN

PERSIA ¹

THE area of Persia is estimated at 628,000 square miles, and the population is believed to number 10,000,000. Though the country belongs, in the main, to the Iranian plateau, its topography is somewhat varied. In the north-west, an irregular mountain system forms the connecting link between the ranges of the Elburz and the Kopet Dagh, which border the plateau on the north, and the Zagros and other ranges, which border it on the south-west. East of the latter uplands a great high plain contains many of the most fertile districts in the country. This plain is bordered on the east, as on the west, by several parallel ranges, which separate it from the deserts that extend over the greater part of Eastern Persia. In the extreme east some irregular mountain districts lie between these deserts and Afghanistan.

The climate of Persia is continental in character, the summers everywhere being hot, except in some parts of the highlands, while the winters are cold, with the exception of a strip along the Gulf coast, where they are mild. As the country lies in general between 3,000 and 5,000 feet above sea-level, altitude is an important climatic factor. Tehran (4,000 ft.), for example, has a January mean of 33-6° F. and a July mean of 84-90° F., but at Bushire (14 ft.) the range is from 57-5° F. in January to 89-4° F. in August. The precipitation occurs mainly during the winter half of the year, and is heaviest on the northern slopes of the Elburz Mountains, where it ranges from 20 to 40 inches or more. Elsewhere, on the uplands it is generally between 10 and 15 inches, but throughout a great part of Central Persia considerably less than that amount of rain falls. Tehran has less than 9 inches and Isfahan less than 4 inches.

The physical divisions already mentioned probably form the best basis for the treatment of the country by natural regions, more

¹ *The Economic Position of Persia*, by Moustafa Khan Patch (P. S. King & Co., 1926), is the best recent account of its subject.

especially as they correspond, to some extent, with the climatic differences which exist.

Of the various causes which have contributed to the backward state of Persia some, at least, are of a geographical nature. Climatic conditions have prevented the cultivation of a great part of the country, and the settled areas are often far removed from one another. The nomad peoples—Arabs, Kurds, and Turks—who inhabit the uplands are as often as not robbers as well as shepherds, and the government has seldom been sufficiently strong to maintain order over the wide and inaccessible country which they occupy. Foreign trade has been retarded, alike by the difficulty of the routes from the coast to the interior, and by the want of good means of communication within the country. Until recently the caravan, which involved great delay, was the normal method of transport, but even on the secondary roads the pack animal is now being replaced by the motor lorry.

AZERBAIJAN. The irregular mountain system of north-west Persia, which forms part of the Armenian Knot, is practically co-extensive with the province of Azerbaijan; and, owing to its position, has a somewhat greater rainfall than most other parts of the country. On the uplands, which are devoted to pastoral pursuits, the people are nomadic, and follow their herds from place to place; but in the lowlands, where soil is fertile and irrigation water abundant, the inhabitants are sedentary, and are chiefly engaged in agriculture—cereals, cotton, the vine, and various fruits all being extensively grown. Minerals are believed to be plentiful, and iron, copper, and lead have for long been worked in a somewhat haphazard fashion. Tabriz, which is the chief town of the region, lies in the fertile basin of Lake Urmia, and is a place of considerable commercial importance, as it is the centre of one of the most densely populated parts of Persia.

THE NORTHERN PROVINCES. The two provinces of Gilan and Mazanderan belong, in the main, to the northern slopes of the Elburz range, and differ in many respects from other parts of Persia, chiefly as a result of the much heavier rainfall which they receive. Along the coast, the level land consists of alluvial tracts built up of sediment carried down by mountain streams; much of it is covered with jungle, but in numerous places clearings have been made in which rice, sugar and cotton can be grown. The

cultivation of cotton is on the increase, but, like all Persian varieties, the staple is short. Above the jungle lies the forest, which consists mainly of deciduous trees. Along its lower fringes are some of the chief towns of the region, as malaria retards settlement on the coastal plains, and in their vicinity oranges, lemons, citrons, olives, and other fruits all flourish. Gilan is still noted for its silk, though the industry has never recovered from the disease by which it was devastated over fifty years ago, and the place of the mulberry has to some extent been taken by rice. On the low-lying, humid plains of Gilan and Mazanderan this cereal is extensively grown, and large quantities are exported to Russia. Owing to difficulties of transport and other causes, the timber of the region has never been exploited. Above the forest-belt there is bare pasture land, where the inhabitants are largely nomadic and depend upon their flocks for subsistence, though cereals are also grown. Manufactures are confined mainly to the towns, where cotton, woollen, and silk goods are produced. Coal and iron exist on both slopes of the Elburz, but, because of the proximity of the capital, have been mainly worked on the southern. Pahlevi,¹ which is the port of Resht, the capital of Gilan, is the principal seaport of Persia on the Caspian, and through it passes much of the trade of Central Persia with Russia. Other ports are Bandar-i-Gaz, at the south-east extremity of the Caspian, and Meshed-i-Sar, the port of Barfrush.

NORTH KHURASAN. The Kopet Dagh and other mountain ranges which occupy the northern part of the province of Khurasan, form a distinct natural region. The valleys, which have an elevation varying from 3,000 to 4,000 feet, are sometimes well watered, and when this is the case they are the centres of considerable agricultural activity. The districts along the courses of the Keshef-rud, which drains into the Hari-rud, and of the Atrek and Gurgan, which drain into the Caspian Sea, have made north Khurasan the granary of eastern Persia. On the neighbouring uplands, which are only fit for pasture, large numbers of camels are raised. The manufacture of carpets and shawls is carried on both by the sedentary peoples in the towns and villages of the lowlands, and by the nomads of the uplands. Mineral wealth is believed to be abundant, but, so far, has been little worked.

¹ Formerly Enzeli.

Meshed, in the valley of the Keshef-nid, is the chief town of the region, but is badly placed for trade except with Russia.

THE SOUTH-WESTERN MOUNTAINS. A great part of Kurdistan, Laristan, and Arabistan is occupied by parallel limestone ranges, which are separated from one another by narrow valleys and high plains. The summers are hot and dry, but the melting of the winter snows feeds the rivers and perennial springs upon which irrigation is almost wholly dependent. The inhabitants of the high valleys are nomads, but those of the plains are either semi-nomadic or sedentary. Pastoral pursuits are important; sheep and goats, horses and cattle, are reared in large numbers, and butter and cheese are important products. The crops of the plains and valleys include cereals, cotton, opium, and fruit; and gum-tragacanth is collected from the hills and mountains around. Woollen goods, and especially carpets, are the chief manufactures. There are few towns, and the patriarchal form of society prevails in many parts of the region.

There are many indications of oil in this region and along its south-western margin. The Anglo-Persian Oil Company has developed an important oil-field at Maidan-i-Naftun, east of Shushtar and about 145 miles from the island of Abadan, at the mouth of the Shatt al 'Arab, to which the oil is sent by pipe line. The output now amounts to over 5,500,000 tons, some of which is refined at Abadan and the remainder at Swansea in South Wales.

CENTRAL PERSIA. The waters which flow eastwards from the mountains in the west are used for irrigation in the arid steppes of the central plain, and account for much of the fertility of that long line of oases which extends from north to south, and includes Hamadan, Sultanabad, Isfahan, and Shiraz. Further east, beyond the mountains by which the central plain is bordered, are other oases, including Tehran, Kashan, Yezd, and Kerman. In these various oases, where most of the inhabitants of the region are settled, agriculture is an important pursuit. Cereals, cotton, and the vine are widely cultivated; the best Persian tobacco is produced round Shiraz and Kashan; among other places, opium is grown in Isfahan, Shiraz, and Yezd, and owing to the ease with which it can be exported is a valuable crop in these districts. As is generally the case among the dwellers in oases, considerable attention is paid to industry and trade. Carpets are made, by sedentary and nomadic folk alike, in many parts of the region, Sultanabad

and Kerman being considerable centres. The latter is also noted for its shawls. Yezd and Kashan are engaged in the manufacture of silk goods, Isfahan is famous for its brassware, and Hamadan is the great tannery of Persia. Tehran, Isfahan, Shiraz, and Kerman are important trading centres. The mineral wealth of the region is undeveloped, but iron, copper, and coal are known to exist.

THE EASTERN DISTRICTS. Of the great deserts of Persia it is unnecessary to speak here. Farther east, the country is mountainous, and, although a little agriculture is possible where there is sufficient rain or where irrigation is practicable, the bulk of the people are nomadic, and wander about with the cattle, sheep, goats, and camels, which constitute their worldly possessions. Wool, skins, and clarified butter are, therefore, the chief products of the region, although some opium and silk are obtained from the settled districts. The manufacture of carpets is also of some importance.

THE GULF COAST. The escarpment of the Iranian plateau runs along the entire length of the Persian Gulf, sometimes approaching close to it, but generally receding from it a distance of 15 to 30 miles. The coastal strip is sandy, and, except in places where there are clusters of date palms, is one of the least inviting parts of Persia. The valley of the Karun is an exception to this general rule, and only requires the development of an irrigation system to render it one of the most productive districts in the country. The chief towns situated upon the coast—Bushire, Bandar 'Abbas, and Lingeh—all derive their importance from the facilities which they offer for penetration into the interior.

COMMUNICATIONS. The means of communication in Persia are still very defective. A branch of the trans-Caucasian line runs from Tiflis by way of Julfa, on the frontier, to Tabriz; and Julfa and Tabriz are also connected by a good carriage way which was built by the Russians. The construction of a great north and south line has begun. From the new port of Bandar Shapur, at the inlet of Khur Musa on the Persian Gulf, it runs north 156 miles to Dizful, and from Bandar Shah, in the bay of Ashuradeh, in the Caspian, it runs 80 miles to Aliabad at the foot of the Elburz. The total length of the line will be 900 miles or more, according to the routes finally chosen. The roads are reported to meet with a fair measure of attention, more especially since the introduction of the motor lorry. One runs from Tabriz to Tehran by way of Kazvin, where

it is joined by another from Hamadan, the meeting place of important trade routes from Baghdad by Khanikin, on the frontier, and from Mohammerah near the mouth of the Karun. All these are fairly well adapted to motor traffic, as is the greater part of the road from Tehran to Meshed. The roads from Meshed to Duzdap and from Tehran by Isfahan to Shiraz and Bushire, on the one hand, and to Kerman for Bandar 'Abbas or Duzdab on the other, are only passable. There are, in addition, numerous caravan routes connecting the more important towns. External trade follows various routes. Goods destined for Tehran and the north may either be landed at Basra and forwarded by Baghdad and Hamadan, or at Mohammerah to join the previous route at Hamadan. Bushire is the main port for Isfahan and Shiraz. Duzdab, at the terminus of the line from Quetta by Nushki, is engaged in the Indian trade. Pahlevi is the chief port on the Caspian.

COMMERCE. Before the war Persia transacted the bulk of its foreign trade with Russia and the British Empire, and as far as the northern and most productive part of the country was concerned, Russia was much more advantageously situated than either Great Britain or India. As a result about one-half of the imports of Persia came from Russia, and two-thirds of its exports went there. For some years after the war this trade practically ceased, and British India and Great Britain supplied Persia with three-fourths of the commodities which it obtained from abroad. More recently, however, the Russians have improved their position and nearly one-fifth of the total trade of Persia is with that country as compared with nearly two-fifths with Great Britain and India. Cotton goods, sugar, and tea together account for over 50 per cent of the total imports. In the supply of cotton goods, Russia now comes first, with Great Britain second; sugar is obtained from Russia, the Dutch East Indies, and various European countries, and tea mainly from India. Among the exports, petroleum takes first place, and more than equals in value all other articles combined. These include carpets, fruits, opium, raw cotton and raw wool, silk, and gums. At present the United States appears to be taking the bulk of the carpets, Russia the raw cotton, silk goes mainly to Russia and Italy, opium to Great Britain (for Singapore), Russia, China, and Japan, and gums to various countries. Petroleum is exported to Great Britain and India.

AFGHANISTAN

The eastern part of the Iranian plateau belongs to Afghanistan, which has an area of about 246,000 square miles.¹ The Hindu Rush and its outliers form the northern border of the plateau, and run across the country separating the basins of the Oxus and the Hari-rud from those of the Indus and the Helmand. Except in the north, west, and south-west, the land is generally over 3,000 feet above sea-level, and the mountain-ranges rise to 15,000 or 20,000 feet. Climatic conditions are, therefore, determined by altitude rather than by latitude. The winters are generally cold, and over considerable areas snow lies for several months each year; even at Kabul the mean temperature for January is below freezing-point. On the other hand, the summers are hot and dry. The total precipitation, which does not exceed 15 inches, falls in the form of snow in winter, and of rain in spring.

The crops, which are frequently grown with the aid of irrigation, include the ordinary cereals and rice, European vegetables, temperate and sub-tropical fruits, tobacco and cotton; but, as a rule, the Afghan peoples are pastoralists rather than agriculturists, and their main wealth lies in their flocks and herds. Horses, camels, cattle and goats are reared in large numbers; but even more important are sheep, especially those of the fat-tailed breed. Manufactures are of comparatively little importance, though silk goods are woven at Herat and Kandahar, carpets are made round Herat, and coats are fashioned from sheep-skins throughout the country. Minerals, including coal, silver, copper, and lead, are known to exist, but so far little has been done to develop them.

The chief imports are textiles from Russia and British India, and tea, sugar, and hardware from the latter country. The exports include raw silk, which is produced in the districts bordering the Oxus and is sent to Persia and Turkestan, wool forwarded to Persia *en route* for Russia, France, and America, and fruits, carpets, wool, and coats exported to British India. A considerable amount of trade between Persia, Turkestan, Afghanistan, and India is still carried on by nomadic Afghans, who descend into India by the Gomal Pass, cross the Oxus to Bokhara, and go to Persia by Meshed.

¹ The population is estimated at 8,000,000.

CHAPTER XXIV

INDIA AND CEYLON¹

INDIA

THE main physical regions of India may be comprehended at a glance. On the north-west, north, and north-east, lie the great mountainous borderlands, and separating them from the plateau of peninsular India is the wide Indo-Gangetic depression. From the Pamirs, the Himalayas extend in the form of a scimitar as far as the great bend of the Brahmaputra, beyond which the mountain system of Burma runs in parallel ranges from north to south. To the south-west of the Pamirs, the borderland consists in the north of part of the Hindu Kush and its offshoots, and in the south of the parallel and concentric ridges of Baluchistan, which rise in the Sulaiman and Kirthar ranges to hills of considerable height. Between the Himalayas and the north-west borderland certain great physical differences ought to be noted. The former are higher and more continuous, and are formed of rocks of more ancient origin than are found in the latter except in the Hindu Kush. The passes across the Himalayas are few and difficult, while to the south-west of the Pamirs there are several routes by which India may be entered with comparative ease. The mountains of Burma, like those of the north-west borderland, consist in the main of rocks of recent formation.

The Indo-Gangetic plains may be considered as consisting of the basins of the Indus and the Ganges below the 1,000-foot contour line. The earth movements, which led to the upheaval of the lofty Himalayas in the north, led likewise to the formation of a great depression farther south. This depression has gradually been filled up by the alluvium carried down by rivers draining into it, a process of land building still carried on in different parts of the region.

The general character of peninsular India, which is the oldest land mass of the country, is that of a plateau with a gradual slope

¹ The statistics given in this chapter are mainly from the *Statistical Abstract of British India*, 1932, and from Census Reports.

from west to east. On the west it is buttressed by the lofty wall of the Western Ghats, between which and the sea lies a narrow coastal plain. The so-called Eastern Ghats consist mainly of the low escarpment of the plateau, which stands back some distance from the Bay of Bengal, so that the coastal plain is much wider than on the west. The surface of the plateau is generally an area of open valleys and wide plains, broken up by a number of ranges running eastwards from the Western Ghats. Over the greater part of this region the rocks are of Archaean age; but the great volcanic outbursts, which took place at the end of Cretaceous and in early Tertiary times, have covered in the north-west an area over 200,000 square miles in extent with basaltic lava, formerly known as Deccan trap. In various parts of the peninsula, but especially in the basins of the Son, the Godavari, and the Damodar, there are patches of the Gondwana series formed during Carboniferous and later times, which are of especial importance as they contain the bulk of the coal supplies of India. Much of the east and part of the west coastal plain consist of post-Tertiary deposits.

The soils of these different regions vary greatly in different parts of the country. The alluvium of the Indo-Gangetic valley and of the coastal plains is, as a general rule, the most productive, but it varies in character from drift sands, on which nothing will grow, to clays so stiff that they cannot be drained. In the region covered by the basaltic lava the soil is generally poor and infertile in the upland areas, but on the plains and along the river valleys it is deep and of a peculiar consistency, which makes it very retentive of moisture and thus renders it especially valuable in these districts where the rainfall is not great. Concerning the origin of this black cotton soil, as it is called, there has been much dispute, but while some consider that it has been derived directly from the underlying rocks, and others think that it has been transported into the region by some mechanical agency, it is probable that it owes its peculiar characteristics to chemical changes induced by the climatic regime. The soils weathered from the Archaean rocks also vary greatly in character and fertility, but, except in the valley regions, they may as a general rule, be classed as poor. On the uplands, more especially in Madras, there are considerable stretches of laterite.

CLIMATE. India falls within the monsoon region of Asia, and its climate is mainly controlled by that fact. Two seasons may be

recognized : the dry, or north-east monsoon lasts from the middle of December to the end of May, and the wet, or south-west monsoon, from the end of May to the middle of December. During the first part of the dry monsoon high pressure conditions predominate over Asia, but from the outflowing cold winds India is protected by the Himalayas. In January, its actual mean temperature ranges from over 75° F. in the south to less than 55° F. in the north-west. As pressure is therefore highest in the north-west, winds flow down the Gangetic plains in a south-easterly direction, and, veering round by north over the Bay of Bengal, blow across southern India from the north-east and east. In crossing the ocean they pick up a certain amount of moisture which they deposit on the southern part of the east coast and in Ceylon. At the same time there is a slight amount of precipitation on the Himalayas and in northern India, believed to be due to depressions moving eastward from the Mediterranean area.

During the second half of the period under consideration temperature rises, and in April the greater part of the country has an actual mean of over 80°F. India becomes relatively a low-pressure area, so that the north-east monsoon blowing over the ocean is weakened, and winds blow inland from the Bay of Bengal and the Arabian Sea. As these winds are saturated with moisture, considerable precipitation takes place, chiefly in Malabar, Tenasserim, Bengal, and Assam.

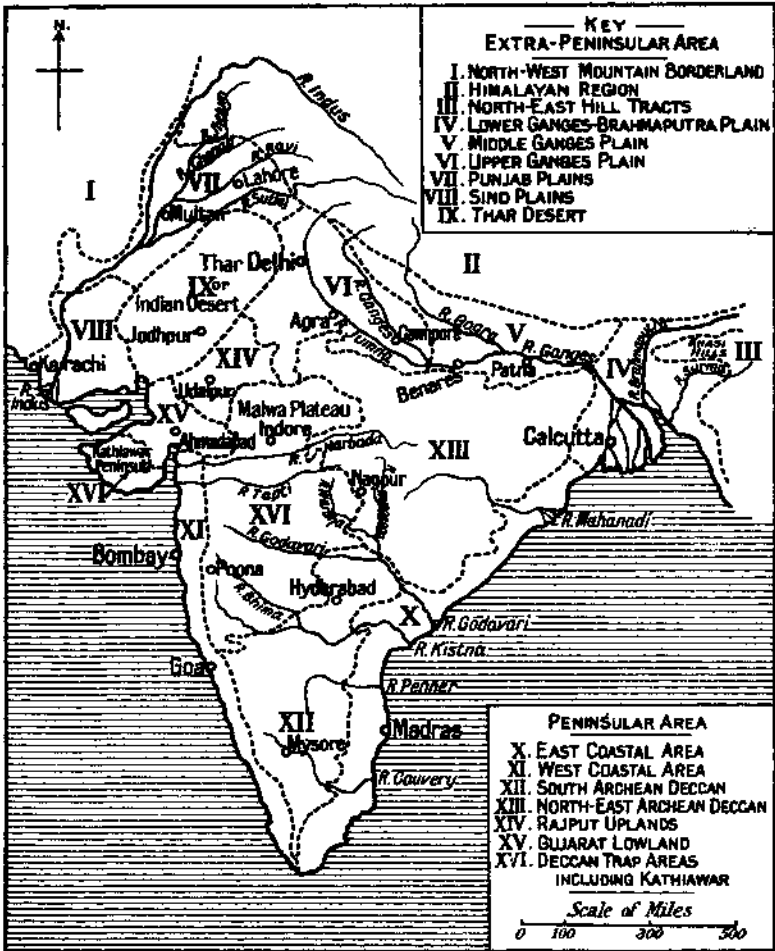
When the low-pressure area over northern India and adjacent lands closes up with the equatorial low-pressure belt during the hot season, the atmospheric conditions are entirely changed. The north-east monsoon disappears and its place is taken by the south-east trades, which are pulled across the Equator and reach India as the south-west monsoon. This is heavily charged with moisture and brings to the country about 90 per cent of its total rainfall. One branch of the current strikes the Western Ghats, upon which it deposits much rain; it then crosses the Deccan, to which, however, it only brings occasional showers; and finally it mixes with the other branch of the monsoon current which has advanced up the Bay of Bengal. This latter branch is directed in the first instance towards Burma and Tenasserim, but part of it is deflected, first by the Arakan hills, and later by the Himalayas, so that it passes in a north-westerly direction up the basin of the

Ganges, and into that of the Indus. Here it is joined by the northern part of the Arabian Sea current which, on account of the low elevation and great heat of the land, has passed over western Rajputana without depositing much moisture except in the neighbourhood of the Aravalli range.

June, and more particularly July and August, are the months of heaviest rainfall. In September, the monsoon begins to withdraw southward, as the low-pressure area over the land is gradually filled up, and a shallow depression over the Bay alone remains. This depression, which gradually moves southward, draws in the southwesterly winds so that they blow on to the east coast of peninsular India, where they deposit considerable moisture. By the middle of December the depression has passed out of the Bay, and the conditions of the north-east monsoon again prevail over the whole Indian area.

VEGETATION. A division of India into vegetation regions can best be made on the basis of the physical and climatic regions already discussed. The Himalayas may be subdivided into an eastern and a western section. The first of these—to the east of Nepal—faces the advancing monsoon current and has, therefore, a heavy rainfall. The lower slopes are covered with a dense tropical forest, in which the sac, magnolia, and various kinds of oaks, palms, and bamboos are all found. The temperate zone, which lies between 6,500 and 11,500 feet above sea-level, contains deciduous trees such as the oak, maple, and magnolia; coniferous trees, such as the silver fir; and shrubs, such as the rhododendron. The alpine zone, at a height of 12,000 feet and over, has but a few coniferous trees. The western Himalayas, with their higher latitude and drier and cooler climate, are less richly endowed, but the general character of the vegetation is the same. The tropical forest, indeed, is lower, and does not extend beyond the Indus, but, owing to the greater breadth of the mountains, the alpine zone is more fully developed. The Indus Plain, with its low rainfall, has but a scanty vegetation, which rapidly disappears as the desert is approached. Trees, such as the tamarisk and acacia, are found chiefly in the neighbourhood of rivers, and on the flanks of the Himalayas and the Aravalli hills; elsewhere the land is covered with a low, herbaceous vegetation which is burnt up during the dry season. The Gangetic Plain may be subdivided

according to the humidity of its different parts. West of the great bend of the Ganges at Rajmahal, the indigenous vegetation is that of a dry country ; in the extreme west it is continuous with that of



NATURAL REGIONS OF INDIA

the Indus plain, while farther east such trees as exist are leafless during the dry season, and the grass is burnt up. East of Rajmahal where the moisture is much greater, the mango, fig, bamboo, and different varieties of palm all flourish, while in the Simdarbans, or

lower part of the delta, the vegetation is luxuriant, and mangroves and other evergreen trees abound. The indigenous vegetation of the Gangetic plain, it ought to be noted, is only of secondary importance to that of the cultivated lands. The west coast, from southern Gujarat to Cape Comorin, has, on the whole, a heavy rainfall, and, except in the most northerly parts, is covered with a dense evergreen forest which includes valuable timber trees such as teak, ebony, and sandal-wood, and many varieties of palms and bamboos. This type of vegetation in an impoverished form is carried eastwards across the Deccan on the loftier parts of the plateau, but elsewhere the lower rainfall only permits the existence of monsoon forests in the wetter north-east, jungles of small trees and herbaceous vegetation in the drier south, and grassland on the black soil. The Coromandel coast vegetation has the same general character as the Deccan, but the presence of dry evergreen plants differentiates it to some extent. Burma is partly covered with forest of a tropical character. In the centre of the country, where the rainfall is lower, there are areas of monsoon forest which pass into grassland in the drier parts, but round the coasts and on the mountain slopes there is a wet evergreen forest.

THE PEOPLES OF INDIA. As the population of India consists of many diverse elements, and as there appears to be some connection between the different geographical regions of the country and the inhabitants of each, it may be as well to sketch briefly their distribution before proceeding to divide India into natural regions. The scheme here adopted is that suggested by Sir H. H. Risley in the Report on the Census of India (1901), which, although it has been criticized at various points, is still accepted by competent authorities as substantially correct.

It is believed that at one time the whole of India was occupied by people of Dravidian stock, who have gradually been pushed back into the most inaccessible and least fertile parts of peninsular India. These people are distinguished physically by their black skin, long head, broad nose, and low stature, and mentally by their primitive social and religious ideas. It would seem that they represent the earlier inhabitants of the country.

Invading races are supposed to have entered India by the north-west. In the Punjab and Rajputana, there is found an entirely different type from the Dravidian—a people of light brown colour,

with a relatively long head, straight, finely cut nose, a long narrow face, high stature, and well-proportioned figure. To this people the name Indo-Aryan has been given, and they are probably connected with the Mediterranean race. In the plains of the Ganges and the Jumna, from the eastern frontier of the Punjab to the southern extremity of Bihar, the prevailing type suggests an intermixture of Indo-Aryan and Dravidian blood. The upper classes approach the former in physical characteristics, the lower classes the latter. It is noteworthy, too, that it is among these Aryo-Dravidian peoples that the caste system has been most fully developed.

While many invasions took place by way of the north-west borderland, the Himalayas prevented anything but a slow infiltration of the Mongol peoples, who are found along its lower slopes. Farther east, however, where the Brahmaputra and the rivers of Burma offered easier means of access, there was a larger influx, and Burma has an essentially Mongoloid population. The delta of the Ganges, on the other hand, is occupied by a Mongolo-Dravidian people. It would appear that the Dravidians, retreating before the Aryan invaders, were driven into the swampy lands of Bengal, where they intermingled with Mongol tribes entering India by the Brahmaputra.

An area of broad-headedness extends along the west of India from the western Punjab through the Deccan southwards as far as Coorg. In many places it coincides in a remarkable degree with the more fertile districts of the Black Soil region. Here it is evident that the original Dravidian stock has been powerfully modified by the infusion of a foreign element, and it has been suggested that, after the settlement of the Indo-Aryans in the Punjab and Rajputana, various nomadic peoples, by some thought to be Scythians but by others believed to be of Alpine stock, made their way into India from the steppe-lands of Asia. Finding their progress eastwards barred by the earlier invaders, they pushed their way to the south, where they seized the best lands still left to the Dravidians, and to a certain extent intermingled with these people, forming what has been called the Scytho-Dravidian type.

Lastly, in the regions of the north-west borderland are the Turko-Iranian peoples, formed by an intermixture of Turki and Persian elements. They are broadheaded, but have a fair complexion, stature above the average, and a prominent but moderately narrow

nose. They represent the invading tribes who came last and had their further progress into India barred by the earlier settlers.

In conclusion, it must be noticed that, although the peoples of India are distributed on a geographical basis, no one type is in exclusive possession of the region to which it is referred.

THE NATURAL REGIONS OF INDIA. In dividing India into natural regions it is obvious that physical conditions must first be considered. The mountainous borderlands, the Indo-Gangetic plain, and the plateau of peninsular India form three entirely distinct areas, the economic development of each of which is quite unlike that of the others. The first of these—the mountainous borderlands—must be further divided. It has already been shown that there are considerable physical differences between the Himalayas and the frontier regions of the north-west. The position of each with regard to the monsoon current, moreover, has led to a heavy rainfall in the one, and to a very low rainfall in the other, and as a result each has its distinctive vegetation.

Physically, the Indo-Gangetic plains seem to form one natural region, but it is impossible to neglect the influence of great rivers, like the Indus and the Ganges with their tributaries, which tend to give a distinct individuality to the countries through which they flow. It is better, therefore, to recognize the Indus plain and the Ganges plain (including that of the Brahmaputra) as separate natural regions, each of which must be further subdivided according to differences in physical structure, humidity, vegetation, and potentialities for economic development.

The whole of the Ganges plain is composed of alluvium, but to the west of the great bend at Rajmahal the rivers have generally sufficient velocity to carry off their silt, whereas to the east the slope is so gentle that they are in many cases unable to do so. Flooding consequently takes place, and the surface of the land consists of recent alluvium. In the west, on the other hand, old alluvial soil prevails. A further subdivision, based chiefly upon rainfall, may be made. West of Allahabad the old alluvial soils have generally a rainfall of less than 40 inches, while to the east of Allahabad the precipitation is between 40 and 50 inches. On the recent alluvium, as far east as the Brahmaputra, between 50 and 75 inches of rain fall, but beyond that river the amount is from 75 to 100 inches.

Physically the Indus plain is not unlike that of the Ganges, but in climate and vegetation it differs to a great extent. The influence of the monsoon is slight, except in the northern plains of the Punjab, where along a comparatively narrow belt, which really forms an extension of the western division of the Ganges plain, and which stretches from the Jumna to the Jhelum, the rainfall varies from 30 inches in the east to 15 or 20 inches in the west. To the west and south-west lies a dry area with a rainfall from 5 to 15 inches, or even less. For a discussion of economic potentialities, this region may be divided. In the basins of the rivers forming the Panjnad, and in that of the Indus, a certain amount of settlement, based on irrigation from rivers or wells, is possible, but in the Thar or Indian desert a small nomadic population is all that can find subsistence.

The third great physical region is that of peninsular India. Here the east and west coastal plains may be distinguished by their topography and climate from the Deccan proper, where the region covered by the black soil, the north-eastern Archaean area with its high rainfall, and the southern Archaean area with its low rainfall, must all be treated separately.

THE HIMALAYAN REGION. Except indirectly, the Himalayan region is of little economic importance. The physical difficulties facing the cultivator are naturally great, and in many places means of communication are practically, if not entirely, wanting. Hence it is that the Mongoloid tribes, who, except in Kashmir, form the bulk of the population, add very little to the output of the country. Rice and maize are grown on the outer ranges, such as the Siwaliks, and on the lower slopes of the Himalayas; while in the hot, moist valleys, chillies, turmeric, and ginger are cultivated. On the higher hills, wheat, barley, and the poorer grains form the staple crops. In the north-west, the vale of Kashmir in the basin of the Jhelum is noted for its fertility, and silk, tea, and the fruits of temperate climates can all be successfully cultivated. There are extensive tea plantations round Darjeeling and some of less importance on the lower ranges farther to the north. The numerous hill stations, used as health resorts, make life in India bearable to the European.

THE NORTH-WEST BORDERLAND includes the mountainous districts of the North-West Frontier Province, British Baluchistan,

and the Baluchistan Agency. The region is an upland one, and, as agriculture is possible only in the river valleys, the population is scanty, and only in the Frontier Province does it exceed 100 to the square mile ; elsewhere it is very much less. The rainfall is under 10 inches per year, and irrigation from mountain streams is generally an absolute necessity. Among the more important crops are wheat, millet, and barley, but in the Makran dates provide the staple food crop of the people. Sheep and cattle are bred, and wool and hides are exported. The chief commercial importance of the region, however, lies in the fact that it is crossed by the main trade routes which connect Central Asia and Afghanistan with India. Until within recent years the inhabitants, chiefly of Turko-Iranian stock, found their greatest interest in raiding the more peaceful occupants of the neighbouring lowlands. To prevent such raids, and to keep open the passes, British influence has gradually been extended outwards to the border of Afghanistan.

THE GANGES PLAIN. Throughout the whole of the Ganges plain there is a dense population, and agriculture is the chief occupation of the people, but the conditions under which it is pursued, and the crops grown, vary from one division to another. In the western section of the old alluvium, where the rainfall is generally less than 40 inches per year, irrigation on an extensive scale has been found necessary. The Ganges Canal waters about 1,500,000 acres in the upper part of the Doab (the region lying between the Ganges and its tributary the Jumna), and the Lower Ganges Canal over 1,000,000 acres in the lower part. The Sarda Canal system will, when completed, bring over another million acres under irrigation. In addition to these and other canals, there are hundreds of thousands of wells, and the natural depressions in the alluvial plain have also been utilized for the purpose of storing water. In that part of the United Provinces which lies within the region under consideration, over 25 per cent of the total area cropped at both harvests is irrigated; and as a result, the population, amounting to about 500 per square mile, is much larger than might have been expected. The principal food grains of the region are rice, which is grown, with the aid of irrigation during the rains, on the heaviest soils; wheat and barley, which are winter crops; and bajra and juar, varieties of millet, which form the staple food of the people. Gram or chick pea and various oilseeds are also raised. Cotton is the

most important fibre and covers about 2 per cent of the cropped land, while sugar-cane occupies about 4 per cent. In the United Provinces about 70 per cent of the population are dependent upon agriculture for their livelihood.

In the eastern section of the old alluvium rice becomes the staple food of the people. The rainfall is greater than farther west, but it has to be supplemented by irrigation. Canals from the Gundak and the Son water considerable areas, and advantage has also been taken of the broken surface of the land to store water by damming the smaller streams. In Bihar, which is typical of the region, the average density of population is 600 to the square mile, the districts to the north of the Ganges, with their heavier rainfall and more abundant production of rice, being more closely settled than the drier districts in the south, where wheat is an important crop. About 80 per cent of the people look upon agriculture as their chief means of support, and industry is of relatively little importance.

Over the greater part of the recent alluvium the surface is flat, the rainfall heavy, and artificial irrigation unnecessary. Population varies in density from less than 500 in some of the western districts to over 1,200 in some of the eastern, the average being about 660. In the west, where the rivers have silted up their beds and become moribund, they have ceased to act as drainage channels, and the intervening spaces are often marshy and malarious; in the east where they are still active they not only drain the land, but fertilize it with the silt which they deposit. The long duration of a sufficiently heavy rainfall in the latter region, moreover, makes it possible to cultivate two crops of rice over considerable areas, while the well-drained soil and the clear water available for retting purposes enable a belt of country on either side of the Brahmaputra to produce the greater part of the world's jute supply. Over lowland Bengal as a whole, rice and jute together occupy 80 per cent of the cropped area, but in places this percentage rises to 90.

The Brahmaputra valley north of the delta (along with which may be taken the upper part of its tributary, the Surma, and the intervening hills) has generally a rainfall of over 75 inches, and in the hill regions of over 100 inches. Rice is still the staple food of the people, but tea is the most important commercial product of the region. Formerly, it was grown mainly on the lower slopes of the hills, which were believed to be particularly adapted to it; but many

of these situations have been abandoned in favour of reclaimed swamp lands, and it is in the Brahmaputra and Surma valleys of Assam and in the Duars of Bengal—the forest-clad plain to the south of Bhutan—that over four-fifths of the Indian tea crop is now produced. The heavy rainfall of these districts constitutes their chief advantage for the cultivation of the tea plant, which grows best with an annual precipitation approaching 100 inches. The density of population in the whole region is low, and in Assam does not exceed 115 to the square mile. In the valley of the Brahmaputra, where there are 180 people to the square mile, the growth of a dense population has been retarded partly by historical conditions, and partly by the fact that the land is not so suitable for the cultivation of rice as it is in the delta of Bengal. In the valley of the Surma, on the other hand, the soil is more fertile (owing to the rivers being more sluggish and depositing silt) and in Sylhet the density is over 500 per square mile. Agricultural operations are practically the only pursuit of the inhabitants.

The Gangetic plain is the most densely populated part of India, and contains nearly 40 per cent of its inhabitants. The majority of the people are engaged in agricultural pursuits or in domestic industries, and only a small proportion live in towns. Of these towns the most important are on the old alluvium, where the diversity of products and favourable climate made the country particularly attractive to the invaders from the north-west, and where the confluences of great rivers afforded suitable sites for the growth of urban communities. On the recent alluvium, flooded every year, and occupied by a people of a lower type of civilization, the conditions were less favourable. Hence it is that while in the United Provinces, which may be considered typical of the first region, over 10 per cent of the population live in towns, in Bengal, which is typical of the second, less than 7 per cent are town dwellers (or, excluding the Calcutta area, 4 per cent). In the Brahmaputra and Surma valleys the proportion is still lower and only amounts to 2 per cent.

The more important towns include Delhi, Agra, Cawnpore, Lucknow, Allahabad, Benares, Patna, and Calcutta. Delhi, on the Jumna, at the very apex of the triangular plateau which forms the northern part of peninsular India, is a meeting place of lines of communication from the south-east, the south-west, and the

north-west. Already important as a trading and industrial centre it became, in 1912, the capital of British India. Agra, in a fertile part of the Jumna valley, was formerly the centre of the empire of Akbar; like Delhi, it has cotton mills, and modern industry and trade are replacing marble-inlay work, gem-setting, and the preparation of mosaics, accomplishments learned by its earlier artisans during the building of the Tajmahal by the Emperor Shah Jehan. Cawnpore, on the Ganges, owes its origin to European enterprise, having been selected as the site of a factory by the East India Company in the eighteenth century. Owing to its proximity to the main cotton-growing tract of the United Provinces, it has become the centre of an important textile industry; tanneries and leather works, flour-mills and chemical industries have also been established there. Lucknow has foundries, printing establishments, and paper mills. Allahabad, at the confluence of the Ganges and Jumna, though the meeting place of railways from Calcutta, Peshawar, and Bombay, is without industries, and is said to be declining. Benares, the sacred city of the Hindus, is dependent on the pilgrims who flock thither. Patna, a few miles below the junction of the Son with the Ganges, was formerly the centre of opium manufacture; it still has considerable local trade. Calcutta on the Hooghly, a distributary of the Ganges, was, until lately, the capital of British India. Although situated at the foot of the Gangetic plain, it is in some respects not well placed, as it is 83 miles from the sea and the navigation of the Hooghly is difficult. It owes its supreme importance to its selection as the centre of British influence, but within more recent years it has become the seat of an important jute manufacturing industry, and engineering and other works have also been established.

THE INDUS PLAIN. Economically, the most important division of the Indus plain is that part of the Punjab which extends from the Jumna to the Jhelum, and receives a monsoon rainfall varying from about 30 inches in the east to 15 or 20 inches in the west. It is traversed by numerous rivers, and it has a well-developed system of irrigation by canals and wells, which enables it to maintain a relatively dense population of 300 to the square mile. The west and south-west Punjab and the plains of the North-West Frontier Province may also be considered along with the region just described, notwithstanding their lower rainfall and much

smaller population, 120 to the square mile. Naturally it is in these drier districts that irrigation is most essential, but nowhere is the rainfall alone sufficient to support extensive cultivation, and the Punjab and the North-West Frontier Province have a larger proportion of irrigated land than any other part of India except Sind. In the course of the year over 11,000,000 acres are irrigated by canals taking off from the Ravi, the Sutlej, the Chenab, the Jhelum, and other rivers; while over 3,000,000 acres receive their supply of water from wells, of which there are hundreds of thousands. The development of canal irrigation and the settlement of irrigation colonies in the south-west of the Punjab have transformed large areas of semi-desert into fertile agricultural land.

The principal crops, sown in the autumn and reaped in the spring and early summer, include wheat, gram, and barley, while such cereals as maize, millet, and rice are sown during the summer and reaped in the autumn. Of these, wheat is commercially the most important, and its rapid extension in the region under consideration, where it now covers over 17,000 square miles, or over 44 per cent of the area under wheat in British India, is largely the result of the development of the irrigation system of the Punjab. Cotton also is important; a considerable part of the crop consists of short-stapled indigenous varieties, often intermixed, but improved types of these and an acclimatized American cotton known as Punjab-American, now cover more than half of the total area under cotton.

Although agriculture is here, as in other parts of India, the chief occupation of the people, it gives employment to only 60 per cent of the labouring population, and this percentage, lower than that of the Ganges plain, reflects the less favourable conditions under which it is carried on. On the other hand, manufactures are more important. At the census of 1921 about 20 per cent of the working population were engaged in these, as against 11 per cent in the United Provinces, and about 8 per cent in Bengal. Cotton spinning has ceased to be a domestic industry in India, but hand-loom weavers were, until recently at least, as numerous as in the past. Sheep are raised largely in the south-west Punjab, and the manufacture of wool ranks next to that of cotton. Amritsar is noted for its carpets, the finest being made from the hair of the Tibetan goat. The manufacture of gold and silver ornaments, brass and copper

ware, and pottery, is carried on to an even greater extent than in other parts of India. Within recent years there has also been a considerable extension in the Punjab of the modern factory system, and several cotton mills have been established.

In the basin of the lower Indus—the region known as Sind—the conditions of economic development are much less favourable, and the density of population is about 80, or on the cultivable area 125, per square mile. As the river brings down more silt than it is able to carry to the sea, it is constantly changing its bed, and much of the cultivable area is covered with recent alluvium. The deserted beds of the river in many cases offer favourable opportunities for irrigation, without which agriculture is impossible. The most important crop is rice, but the millets, bajra, and juar, together cover a larger area, and wheat, cotton, and oilseeds are also grown. Attempts to introduce Egyptian cottons have apparently been abandoned for the present, and attention is now concentrated on the introduction of Punjab-American varieties. As these require a longer growing season than native varieties, they cannot be extensively cultivated under the existing system of flood irrigation; but the Sukkur barrage on the Indus, now nearing completion, will, it is estimated, provide for the perennial irrigation of between five and six million acres of land, and it is believed that this will eventually render possible the cultivation of 700,000 acres of long-stapled cotton in this region. It is also anticipated that wheat and oilseeds will be substituted for the less valuable millet.

In the Thar or Indian desert the scanty population is more or less nomadic. The wells—the only source of irrigation—are not permanent, and as soon as one runs dry the village community, which has settled about it, must move elsewhere.

The Indus plain to the east of the river is the home of the Indo-Aryan people, while the Turko-Iranian stock is found in the narrow plains to the west. Climatic conditions are generally favourable to the development of a more vigorous type than in the Ganges plain, although they do not conduce to so dense a population, and the region probably contains rather less than 10 per cent of the population of the whole country. The principal towns generally have their sites determined for them by physical conditions. Some, like Lahore, have grown up where the great highway from Calcutta to Peshawar crosses the rivers of the Punjab, while others, like

Amritsar, have developed in fertile doabs between the rivers. Multan, the most important town in the south-west Punjab, is at the meeting place of a number of the routes offered by its great rivers. Hyderabad stands on an eminence of Cretaceous rock at the head of the delta of the Indus, and provides a fixed crossing point in a region where, owing to the shifting of the river, such points are few. Karachi, the Indian port nearest to Europe, lies to the west of the mouth of the Indus, and owes its development largely to the railways which connect it with the Punjab and the North-West Frontier Province, and make it their port. At present it is mainly dependent on the grain trade of these regions, but as it is also connected, through Baluchistan, with the frontiers of Persia, it may eventually become important for trade with Persia and even Mesopotamia.

THE WEST COAST REGION extends from the Tapti to Cape Comorin, and consists of a narrow coastal plain backed by the Western Ghats. The plain, which is broken up by numerous ranges of foothills, varies in width from twenty to one hundred miles, being as a rule broader in the south than in the north. The rainfall averages over 100 inches per year, and the temperature is always high. The whole region may be divided into two belts, the first consisting of the plains and the foothills, and the second of the western slopes of the mountains. The first of these is agriculturally the more important, but the character of its soil varies greatly from place to place. Along the coast it is generally sandy, and suitable only for the coconut palm, which is a source of considerable wealth to the villagers. In the river valleys—more especially inland—the soil consists of rich alluvial matter, and, aided by the abundant rainfall, it produces heavy crops of rice. This is the staple food of the region and covers over 60 per cent of the cultivated area. On the lower slopes of the intervening hills there are many gardens in which plantain, mango, and pepper are grown, but on the poorer soils of the upper slopes millet and coarser grains alone thrive. Wheat, sugar-cane and cotton are also grown in favourable districts throughout the region. The western slopes of the mountains are generally covered with forest, the most important trees of which have already been mentioned. In the Nilgiris there are coffee and tea plantations, and rubber is cultivated along the coast from Mangalore to Cape Comorin.

Taking the West Coast region as a whole, the population is

fairly dense, amounting to between 300 and 400 persons to the square mile. Except in the south it consists mainly of people of so-called Scytho-Dravidian stock. Geographical conditions are, on the whole, unfavourable to the growth of large towns, and Bombay alone is of first-rate importance. The growth of this city, which at the last census had a population of over a million, has been remarkable. Ceded to England by Portugal in 1661, it became, in 1708, the headquarters of the East India Company, the silting up of the harbour at Surat making that town impossible as a base. The barrier of the Western Ghats was long a formidable obstacle to development, but, after the fall of the Maratha power, and the opening up of the railways which brought it into contact with the rest of the country, Bombay began to make rapid progress. The stoppage, during the Civil War, of the American supplies of raw cotton to the United Kingdom gave a great impetus to the export trade of Bombay, because of the demand which arose for the cotton grown on the black soils of its hinterland; it also encouraged the development of the modern factory system in the city. The manufacture of cotton has continued to increase, and Bombay, with about 30 per cent of the spindles in India and over one-half of its power-looms, is now the centre of that industry. The growth of Bombay has been handicapped to some extent in the past by distance from the coalfields, but advantage is now being taken of the facilities afforded by the rivers of the Western Ghats for the generation of hydro-electric power. The opening of the Suez Canal must also be noted, as it placed Bombay in a relatively more favourable position for trade with Europe than it had formerly occupied.

THE BLACK SOIL REGION. The greater part of the Bombay Presidency south of the Narbada, along with the detached district of Kathiawar, the Malwa plateau in Central India, the whole of Barar, the west and centre of the Central Provinces, and the west of Hyderabad are covered with the basaltic formation already mentioned. The black cotton soil characteristic of the region as a whole is deepest and most productive in a belt of country which includes the Tapti and Purna valleys, the central valley of Berar, and the plain of Nagpur. Elsewhere it is shallower and only moderately productive, except in some of the river valleys where the regur or deep, black soil is again found, and on the heights,

where the soil is poor and infertile. In this region, also, there may be included, for the sake of convenience, that part of Gujarat which is covered with a deep alluvial soil varying in character from the drift sands of Ahmadabad to the rich loam of Kaira.

The most important food grains on the black soil are millets, wheat and pulse. The millets grow best with a rainfall of less than 40 inches and are widely distributed throughout the region, jowar being the most important crop of the regur, while the lighter and poorer soils are better adapted to bajra. Wheat, a winter crop dependent upon the moisture remaining in the soil from the monsoon rainfalls, is likewise most extensively cultivated, and with the best results, upon the deep, black soil. Pulses are widely distributed, some rice is grown on the eastern slope of the western Ghats, and sugar-cane is an irrigated crop.

Cotton is now the chief commercial product of the whole region, where it covers nearly 16,000 square miles, or over three-fifths of the total area devoted to its growth in British India. But although, on the black soil, cotton has been grown for thousands of years, it is inferior both in quality and in yield. The staple is short and coarse, and the average return per acre is less than 100 lbs. It is said, indeed, that within the last century or two Indian cotton has greatly deteriorated, but, whether this be so or not, it remains true that the quality of the cotton produced might be greatly improved. Within recent years attempts have been made to do so, both by the introduction of exotics, which have thriven in their own environment, and by the endeavour to breed up native varieties to a longer staple and a higher degree of productiveness. The first of these methods seems to have been a failure, except in a few cases, and the Indian Cotton Committee (1917-1919), which made an exhaustive investigation into the conditions under which cotton is grown in India, reported, as a rule, in favour of the second, as far at least as the region under consideration was concerned. But it is difficult to forecast the extent to which such a policy will prove a success. On the Government experimental farms, both the quality and the yield have been greatly improved, and in Bombay Presidency over 30 per cent of the cotton area is sown with seed bred on these farms. On the other hand, it is difficult to induce the somewhat careless Indian cultivator to take the necessary care and trouble involved in the production of these improved varieties,

and as he is able at present to find a ready market for his inferior cotton, he is unwilling to substitute others for it, which, even if successfully cultivated, may not be profitably sold. It would appear, however, that it is in the improvement of native varieties that the best hopes of Indian cotton lie.

The opium poppy was formerly grown to a considerable extent on the black soil of the Malwa plateau, the greater part of the product being sent to China, but since the restriction of export to that country the area cultivated has greatly declined. Oilseeds, including ground-nuts, linseed, and sesamum, are also grown in many parts of the Deccan trap region. Stock-raising has not reached a high state of development. Cattle are found in all parts of the region, but, except in a few places, scientific methods of stock-raising are almost totally disregarded and the quality is poor. Buffaloes are generally found where the rainfall is heavy, and sheep and goats where it is moderate.

Throughout the whole region agriculture is the chief occupation of the people, and, outside of the industrial districts, is their only important pursuit. Besides the usual manufactures of most Indian towns, cotton mills, obtaining their raw material from the black soil, have been established in Broach at the mouth of the Narbada, at Ahmadabad in Gujarat, at Nagpur and Jubbulpore in the Central Provinces, and at Hyderabad in the state of the same name. Ahmadabad ranks next to Bombay as a cotton-manufacturing centre, and produces about one-sixth of the cotton yarn spun in Indian factories.

In that part of the Bombay Presidency which lies within the Black Soil Region the so-called Scytho-Dravidian race predominates. This race, as represented by the Marathas, extends into other parts of the region where, however, the Dravidian element generally prevails, more especially on the poorer upland soils. Indeed, in many places the line separating good and bad soils also separates Maratha and Dravidian peoples. This is especially noticeable in Hyderabad, where the trap areas are occupied by Marathas, and the granitic and calcareous tracts by Dravidians.

NORTH-EAST DECCAN. The north-east part of peninsular India, which contains the Chota Nagpur and Orissa divisions of Bengal, the eastern part of the Central Provinces, and the Madras Presidency to the west of the coastal region and to the north of the

Godavari, consists in the main of Archaean rock, but the topography is very varied. The Chota Nagpur plateau and the Eastern Ghats form wild and broken country, much of which is forested, while the Chhattisgarh plain, drained by the Mahanadi, and the Wain-ganga plain in the basin of the Godavari, contain much fertile land. The frequency of cyclonic storms over this area during the south-west monsoon period gives it a much heavier rainfall, the annual precipitation over the greater part of it exceeding 40 inches. Accordingly, it may be considered as lying outside the famine zone.

Rice is the chief crop of the region, but it cannot be grown without irrigation, and it is here, accordingly, that recourse is often had to tank irrigation. The rainfall, coming in cyclonic bursts, would quickly run off the land without doing much good, were the various channels by which it escapes not dammed, and the water retained for use as required. Cultivation is, as a result, confined chiefly to the valleys, and it is there that the bulk of the population is found. Over the whole area this averages less than 150 to the square mile, and consists in the main of various Dravidian peoples, the more civilized being found in the lowlands and the less civilized in the uplands.

In the patches of Gondwana deposits still remaining, notably in those in the basin of the Damodar, there are valuable coal beds, but, although of great importance to India as a whole, they have affected only to a slight extent the economic development of the region in which they are found. There are also important deposits of iron ore in the region. (See page 323.)

THE SOUTHERN DECCAN includes the eastern and southern parts of Hyderabad, the Deccan districts of the Madras Presidency, and the eastern parts of Mysore. Except in the river valleys, the soils derived from the Archaean rocks are often poor in quality and do not retain moisture easily. The mean temperature of much of the region is over 75° F., and the yearly range is not great, while the precipitation, which varies from about 25 to nearly 40 inches, is irregular, both in the time of its occurrence and in its distribution. Hence much of the land is covered with scrub jungle, and the area which can be cultivated is restricted. Advantage has been taken of the irregular nature of the land to construct tanks, and dams on rivers, in order to retain the rainfall which frequently falls in sudden, heavy showers as in the previous region. Rice and, in

places, sugar-cane are the principal products of the irrigated areas, but elsewhere various kinds of millet are grown for food; on detached areas of only moderately fertile black soil on the Madras Deccan, cotton is cultivated. Owing partly to the relative poverty of the soil the yield per acre of indigenous cotton is here lower than elsewhere in peninsular India; but farther south, on the hilly Archaean country below the Eastern Ghats, Cambodia, a variety of American origin, is superior both in quality and in output. The uncertainty of the rainfall brings the greater part of the region within the famine zone, though the worst evils of a shortage in the crops have been overcome to some extent by the construction of railways. Nevertheless, the density of population is low, and does not average 200 people to the square mile. These belong, as a rule, to the Dravidian stock, and with many of them the standard of living is exceedingly low.

THE EAST COAST REGION has on the whole a more fertile soil than the Deccan, its rainfall is greater, and the lower courses of such rivers as the Mahanadi, Godavari, Kistna, and Cauvery, afford facilities for the irrigation of large areas. Hence rice is the most important crop of the region, but it is replaced by millet where the rainfall is less than 40 inches, as is the case between Madras and the mouth of the Godavari. In the south, where the coastal area broadens out in the districts of Madura and Tinnevely, the rainfall is also less than 40 inches, and cotton is important, Cambodia being one of the chief varieties produced. The density of population is greater than in the Deccan; in Madras the average increases from 345 per square mile in the north to about 440 in the south.

Of the towns, Madras is the most important, but like all the ports of this region it is handicapped by its want of a good natural harbour. Among its most important articles of export are leather, hides and skins, raw cotton, and piece goods. At Vizagapatam, in the north, a large artificial harbour is under construction. The small ports of Tuticorn and Negapatam serve the southern districts.

BURMA. In the Indo-Chinese peninsula, the mountain ranges, which take their rise in the eastern extension of the Tibetan plateau, run, as a general rule, from north to south, and are separated from one another by the valleys of great rivers. Of these rivers the Irrawaddy is the most important in Burma. After leaving the confused mountainous mass in the north of the country, it flows

south to its delta through broad but not continuous plains, bordered on the west of its tributary, the Chindwin, by the Naga, Manipur, and Chin hills, and farther south by the Arakan Yoma which separates it from the Bay of Bengal; and on the east by the Kachin Hills, the Shan plateau, and the Pegu Yoma mountains, the last of which separate it from the Sittang. The Salween flows across the Shan plateau, which extends southwards, at no great distance from the coast, to the extremity of Lower Burma. Plains of varying breadth lie between the coasts and the ranges which border them.

It is to the coastal plains and ranges, and to the delta lands at the mouths of the rivers, that the south-west monsoon gives the heaviest rainfall, which is usually far in excess of 100 inches per year. In the lowlands of the Irrawaddy, on the other hand, between the 20th and 23rd parallels, the precipitation does not exceed 40 inches, and is in places much less. Farther north the plains have a heavier rainfall and there, as in the mountainous regions of Upper Burma, the annual precipitation is over 50 inches. South of the dry area, the rainfall of the plains gradually increases to 100 inches on the margin of the deltaic lands.

Five natural regions based upon physical and climatic differences may be recognized: the littoral districts with a heavy rainfall but with little space for economic development; the mountainous parts of Upper Burma, also with a heavy rainfall but generally unsuitable for settlement, although there are many fertile areas in the upper valleys of the Irrawaddy and Chindwin; the dry region of Upper Burma, consisting chiefly of plains and low hills in the valleys of the Irrawaddy and the Chindwin; the sub-deltaic and deltaic divisions, which may be taken together, although the rainfall increases greatly from north to south; and the much dissected Shan plateau in the east, with an average elevation of 3,000 feet and a rainfall of over 40 inches.

In these regions the relations between geographical environment and density of population are, as a rule, very different from those which prevail in the rest of India. Before the British occupation of the country the inhabitants had been greatly reduced in number by internecine wars, and considerable areas are still in process of re-population. Communications, moreover, are in a very backward condition ; in a country nearly twice the size of the British Isles

there are only 2,000 miles of railway, and although roads have been greatly improved and extended during the last ten years, they are not yet adequate to the needs of the country. As a result, economic progress has been retarded, and it is only in the plains, where the population is relatively dense and where the rivers can be used for transport, that the agricultural wealth of the country has been developed.

THE LITTORAL DISTRICTS are engaged chiefly in the cultivation of rice, for which the climate is specially suited, but, owing to the broken nature of the surface, the population is sparse, and does not exceed 45 to the square mile. Within recent years rubber plantations have been established in the Mergui district of Tenasserim where climate and soil are well adapted to the cultivation of Hevea, but where the absence of adequate means of transport still constitutes a serious handicap to the growth of the industry. Tin and tungsten are also mined to some extent in Tenasserim.

UPPER BURMA (WET) is the least densely populated part of the country, having on an average less than twenty, and in places less than fifteen people to the square mile. The lower slopes of the mountains are generally covered with forests, while above the limits of tree growth there are rolling grasslands. Much land suitable for cultivation in the river valleys has yet to be reclaimed. Rice is the chief food of the people and the chief agricultural product, but that which is grown in the uplands is poor in quality and unsuitable for export. Teak is found in most of the forests, except in the extreme north and north-east, and is floated down to the timber mills and ports at the mouths of the rivers. There are few towns, the chief being Myitkyina and Bhamo, both on the Irrawaddy.

UPPER BURMA (DRY) is very different in character. Instead of a dense tropical and sub-tropical forest, the land is covered with a stunted shrubby vegetation. Rice cannot be grown without the aid of irrigation, and the chief crops include millet, sesamum, beans, and cotton; while the introduction of the ground-nut has greatly increased the prosperity of the region within the last twenty years. The level nature of much of the land, and the facilities which it offers for irrigation by means of canals and tanks, have led to a denser population than in the previous regions, and there are nearly 100 people to the square mile. There are oil-fields in the valley

of the Irrawaddy, the most important being at Yenangyaung in the Magwe district, some distance south of Mandalay. From these fields the oil is conveyed by a pipe-line 260 miles long to large refineries near Rangoon. Of the towns, Mandalay is the most important.

THE SUB-DELTAIC AND DELTAIC TRACTS form the most densely populated part of the country, the average density being 136 people to the square mile. The flooding caused by the monsoon enables rice to be grown as the chief crop, and over 90 per cent of the cultivated land is devoted to it. As the population is small, compared with that in the rice-growing regions of India, there is a considerable surplus for export, and rice-mills have been established at Rangoon, Moulmein, Bassein, and elsewhere. Teak from Upper Burma, and from the hills surrounding the deltaic and sub-deltaic tracts, is also prepared for export in these towns.

THE SHAN PLATEAU has great agricultural possibilities, but development is retarded by lack of population and communications. Silver lead ores are mined at Bawdin, near Namtu, where they are smelted; the mine with its ore mills, smelter and auxiliary plant gives employment to 16,000 people, many of whom are Indians and Chinese.

AGRICULTURE¹ gives employment, directly or indirectly, to about 75 per cent of the people of India. The holdings of individual cultivators vary in size, but are generally small; over a great part of Bengal, where the population is dense, the average area is less than two and a quarter acres; in Madras it does not appear to exceed three acres for at least 75 per cent of the holdings; in Bombay, where conditions are more diversified, nearly half the holdings are less than five acres in extent, but the average size is fourteen acres. Throughout the most of Bengal the homestead system prevails, but elsewhere the rural population is generally concentrated in villages, of which there may be 500,000 in British India.

The yield of Indian crops is, as a rule, below the average, and for this various reasons have been assigned. The soils are said to be steadily deteriorating, but it is more probable that they reached their maximum impoverishment many years and perhaps centuries

¹ For agriculture in India, see *Report of the Royal Commission on Agriculture in India* and the Appendix to the Report; also *The Agricultural Geography of the Decoan Plateau* by E. Simpkins (Philip & Son).

ago, and are now at a level where natural gains balance the plant food materials removed by crops and other losses. On the other hand, little is done to improve the soil. Farmyard manure is dried and used as fuel; the export of oilseeds makes it impossible to take advantage of the large supply of combined nitrogen which they contain; and the Agricultural Departments do not yet appear to be in a position to give the cultivator definite advice regarding the economic use of fertilizers. In certain directions, it is true, great progress has been made. The development of irrigation has not only ensured and increased the crops of some regions, but has rendered possible the cultivation of others. Improved seed, produced on experimental farms, has been widely distributed, and in 1927 over one-fifth of the area under cotton in British India, and over one-tenth of the areas under wheat, jute, and ground-nuts, grew improved varieties of these crops.

There are about 150,000,000 cattle in British India, but their distribution is very uneven. In any district their number is determined by the demand for bullocks for work purposes. Where cotton and millet are the chief crops, the total number of cattle per 100 acres of net cultivated area may be from twenty to thirty, including eight to ten plough cattle; but where rice predominates, these numbers may be increased three or four times. The greater the difficulties in the way of breeding and rearing efficient cattle, the greater is the tendency for those actually kept to increase in number and to decrease in value. It is believed that much might be done to increase the efficiency of Indian cattle by scientific methods of breeding and by an improvement of the pastures.

MANUFACTURES OF INDIA. The manufactures of India fall into two entirely different categories. Some are carried on by methods which have been practised by the people from time immemorial, either in their own homes or in small workshops, while others are followed in factories planned on European lines. Even in the case of domestic industries, however, the influence of modern developments has been felt. The weaver of cotton goods uses yarn which has been spun in a mill, the blacksmith buys rolled iron imported from abroad, and the tailor invariably employs a sewing machine. But, while the modern factory usually has its situation determined by geographical and economic conditions, the village industries, growing up at a time when means of transport were almost entirely

wanting, are widely distributed over the whole country. At one time, indeed, " each village was a self-sufficient unit replete with the industries, trade, and professions necessary for its modest requirements." Under modern conditions the disintegration of this old village organization is proceeding apace, more especially in the less backward provinces. That the domestic industries still retain much of their old importance is due in the main to the fact that the imports from abroad and the products of the Indian factories have been absorbed by the largely increased demands of the country. It may also be noted that " in a country like India small-scale organization possesses certain definite advantages over large-scale organization in industries which do not demand intricate scientific co-ordination and the application of elaborate chemical or mechanical principles and methods."¹

In some cases the two systems of manufacture, the old and the new, are independent of one another, but in others they are in keen competition. The various industries connected with the preparation of food are, of course, widely distributed, and are in the main carried on under the same conditions as they have been for many centuries; but a few are of recent origin and are found where geographical conditions are favourable to their localization. Among the latter may be mentioned the preparation of tea in Assam, flour-milling in northern India, and rice-milling in Burma. Other village industries which give employment to a large number of people include those which provide dress, timber and wood-fuel, and pottery for the bulk of the population.

The manufacture of textiles ranks first with regard to the number of people employed, and there is considerable competition between the old and new systems. All over India cotton goods are made, frequently but by no means always, as a subsidiary employment of the people engaged in the industry. Domestic spinning, as already stated, is dying out, but handloom weaving still retains much of its old importance. A temporary decline in some parts of the country appears to have been at least checked by Government action in introducing and teaching people to use an improved fly-shuttle. Different parts of the country have their characteristic products, the quality of many of which is exceedingly good. But along with this ancient industry there now exists the modern cotton

¹ Anstey, *The Economic Development of India*, p. 226.

mill, whose situation is mainly determined by the facilities for obtaining raw material. These mills are engaged in the production of yarn (Egyptian cotton being imported for the higher counts, the output of which is steadily increasing) and of woven goods, grey, unbleached cotton being the most important item under this head. In all India in 1930 there were 307 mills in operation, with 173,000 looms, and about 9,000,000 spindles. These gave employment to about 610,000 people on a daily average; but at the census of 1921 the total number of operatives employed in the cotton industry of India was returned at about 3,000,000.

In the manufacture of silk there is a similar rivalry between ancient and modern methods. The raw material is obtained partly at home, different varieties of the silkworm being raised throughout the country, and partly from abroad, China being the chief source of supply. Modern steam-power mills are situated at Bombay and Calcutta, through which ports Chinese silk enters the country. The handloom factories are mainly in Bengal, which, after Mysore and the neighbouring parts of Madras, is the chief producer of the home supply of mulberry silk ; but all over India weavers, working either alone or along with their families, are engaged in the production of silk fabrics.

The manufacture of woollen goods is general throughout the country, and is followed, as a rule, in small handloom factories. The articles produced are usually of a coarse description, except in northern India where the weaving of carpets and shawls has been carried to a high pitch of perfection, the Punjab being noted for the former and Kashmir for the latter. The great demand from Europe for Indian carpets has led to the production of cheap and inferior articles, but within recent years there have been signs of improvement in this respect. In 1929 there were only fifteen woollen mills in India, and these gave employment to over 8,000 people, while in the whole country over 150,000 are probably engaged in the native industry at the present time.

Although the manufacture of jute had previously been carried on to some extent as a village industry, it was not till the Russian supplies of hemp and flax were stopped during the Crimean war that its cultivation and manufacture on a large scale began. Calcutta, with its neighbourhood, is now the centre of this important industry which gives employment to over 335,000 operatives. The jute

presses, which prepare the raw material for export, also employ a considerable number of workmen.

The tanning industry is of considerable importance in the south of India, where a good tanning material is provided by the bark of *Cassia auriculata*, known in Madras as avaram. Hitherto the bulk of the leather made in this region has either been of inferior quality for domestic consumption, or half-tanned for foreign export. At Cawnpore, a convenient centre for the collection of hides in northern India, the manufacture of leather has been carried on for a number of years on modern lines, mainly but not entirely with a view to providing for army requirements.

The native manufacture of iron, which appears to have reached a fairly high state of development, was practically ruined when the use of coal for smelting purposes in Europe, and the extension of railways in India, enabled European countries to compete with it on more favourable terms. In the present century attempts have been made to establish an Indian industry on modern lines, and the Tata Iron and Steel Company's works at Sakchi, renamed Jamshedpur, 150 miles west of Calcutta, has been rapidly developed. Coal is obtained from Jharia, ore from Mayurbhanj and Singhbhum, and limestone from the neighbourhood. The average output of pig-iron in India for the years 1929-31 was about 1,200,000 tons (of which nearly 485,000 tons were exported, mainly to Japan, the west coast of North America, and Great Britain), and of steel about 600,000 tons.

At present there seems every prospect of further development of modern industry in India. During the latter years of the war the country was unusually prosperous, and at the time of the Armistice there was a large amount of capital awaiting investment. On the other hand, the Indian Munitions Board, which had been appointed in 1917 to stimulate the local production of munitions and supplies for the Indian army, had indicated various ways in which the manufactures of the country might be extended. The conclusion of peace was, accordingly, followed by the formation of a number of companies connected mainly with cotton, jute, engineering, and chemical industries, but owing to industrial depression progress has been less rapid than was anticipated. Among other industries which have been introduced or expanded within recent years may be noted those connected with the production of

paper, matches, cement, shellac, artificial silk, and numerous articles of minor importance.

MINERALS. With a population of 319,000,000, in 1921, India had on an average only 265,000 people engaged in mining pursuits. The influence of its mineral wealth upon the economic development of any one of its natural regions is therefore very slight, and for this reason it has been deemed advisable to reserve for a separate section an account of the mineral products of the country. In the four years 1926-9 the average value of these was estimated at £22,000,000,¹ coal, oil, manganese, lead, and gold (in the order given) accounting for about 80 per cent of the total amount. The greater part of the gold produced (over £1,600,000 annually) comes from the Kolar field in Mysore, where it is worked to a depth of 3,000 feet below the surface. Alluvial deposits are washed in many parts of the country, but the output is small and is generally obtained by people mainly engaged in other pursuits. The production of coal in the years 1926-9 averaged 22,000,000 tons. Of this all but 2 per cent came from the Gondwana deposits in peninsular India, the most important being those in the basin of the Damodar, where the fields of Jharia, Raniganj, Giridih, and Bokaro are situated, the first two producing nearly four-fifths of the total output of India, while the third is noted for its steam coal. Of the other coalfields in the Gondwana deposits worked at the present time, the most important is that of Singareni, situated in Hyderabad in the valley of the Godavari. Outside of peninsular India, coal occurs in the Tertiary rocks of Sind, Rajputana, Baluchistan, Assam, and Burma, the largest output being from Assam. The development of the coal resources of India has been of great economic advantage to the country. At present, more coal is exported than imported. The bulk of the exports go to Ceylon and the Straits Settlements, while the imports are from Great Britain and South Africa.

The greater part of the salt produced in India is obtained by the evaporation of sea water along the coasts of the peninsula. Water from the Sambhar Lake, in a region of inland drainage in Rajputana, is also the source of a considerable supply. Rock salt is mined in the Punjab and in the North-West Frontier Province, the chief deposits being near Khewra in the Salt Range. Petroleum is found

¹ Converted at rate of 1 rupee = Is. 6d.

in the Tertiary strata of the Punjab and Baluchistan in the west, and of Assam and Burma in the east. Of a total average output of 293,000,000 gallons in 1926-9, Burma contributed nearly 252,000,000, but while the output of Burma is decreasing, that of Assam shows a marked increase. Although iron is now worked only to a slight extent in India, large supplies of both magnetite and hematite are known to exist in the Archaean rocks of the peninsula.

The modern iron and steel works in the country receive their ore from Singhbhum and Mayurbhanj in the province of Bihar and Orissa. Among other minerals which may be noticed are saltpetre, obtained in Bihar; lead in the Shan States; mica in Madras and Bengal; and manganese mainly in the Central Provinces and Madras. India is the chief producer of sheet mica in the world, and ranks next to Soviet Russia in the production of manganese.

COMMUNICATIONS. Much of the recent economic development of India is due to the construction of railways. Rivers had hitherto formed the chief means of transport, but, while those of the Indo-Gangetic plain are easily navigable, the remainder are of comparatively little value to commerce on account of the rapidity of their courses. Road-building, on the other hand, has always been rendered difficult, in the lowlands by the absence of suitable material, and in the uplands by the irregular topography of the country; of the roads which were made many became impassable during the rainy season. Hence it was not until the advent of railways that facilities existed for the transport of heavy goods to or from the coast.

India now has about 42,000 miles of railway. The more important systems include the East Indian, whose main line runs from Howrah, opposite Calcutta, to Saharanpur in the United Provinces, where it connects with the North-Western system and thus provides the great trunk route from Calcutta to Peshawar and the Khyber Pass by way of Allahabad, Delhi, and Lahore. The East Indian Railway serves part of the fertile Ganges plain, and at the same time provides an outlet for other systems, such as the Bengal and North-Western and Rohilkhand and Kumaon railways, whose lines cover, as with a network, the remainder of the region. The North-Western Railway, which exports the wheat of the Punjab and North-West Province, runs from Karachi by Hyderabad to Bahawalpur (south

of Multan), beyond which lines diverge to Peshawar, Lahore, and other points on the trunk line from Delhi to Peshawar. An important strategic branch of this railway follows the west bank of the Indus for a considerable distance, and is continued throughout Baluchistan by Quetta to Chaman on the borders of Afghanistan. From a point near Quetta a line runs by Nushki into Persian territory at Duzdab.

Bombay is brought into communication with the Ganges basin by several important lines. The Bombay, Baroda, and Central India Railway runs north by Baroda and across Rajputana to Delhi and Agra. The Great Indian Peninsular Railway has two routes from Bombay to the interior, the one crossing the Western Ghats by the Thalghat, and the other by the Borghat. The first of these uses the valleys of the Tapti and Narbada on the way to Allahabad, where it connects with the East Indian line and constitutes part of the mail route from Bombay to Calcutta. One branch which breaks off at Bhusawal joins the Bengal-Nagpur system at Nagpur and provides a shorter but more difficult route to Calcutta, while another which leaves at Itarsi has connections with the East Indian system at Agra and Cawnpore. The southern line by the Borghat runs south-east as far as Raichur, where it meets the Madras and South Mahratta railway. These two routes from Bombay enable the Great Indian system to tap the wheat and cotton districts of the Deccan. From Raichur the Madras and South Mahratta Railway runs to Madras by Guntakal, where one line diverges for Poona and Marmagao Harbour (the port of Goa), and another for Bezwada, near the mouth of the Kistna. From Madras a line which follows the coastal plain runs north to Bezwada and is continued as far as Waltair, near Vizagapatam. Here it joins the Bengal-Nagpur Railway, the two main lines of which run from Waltair to Calcutta, and from Calcutta to Nagpur. This railway shares with the East Indian much of the coal traffic of the country. The South Indian system, which serves the southern part of the peninsula, runs along the west coast from Mangalore to Cochin, and is connected with the east coast by a line which crosses the Palghat and goes to Negapatam, whence it follows the coastal plain to Madras. A shorter route to Madras, however, is that which breaks off at Erode and joins the Madras and South Mahratta system at Jalarpet. From Trichinopoly,

west of Negapatam, a line following a circuitous route runs to Dhanushkodi, the nearest point to Ceylon.

The Eastern Bengal system runs north from Calcutta, having as its territory the land between the Ganges and the Brahmaputra. An eastern extension touches the Brahmaputra opposite the terminal point of part of the Assam-Bengal railway, the main line of which runs from Chittagong across the Surma valley and the Khasi hills. Both lines carry jute, rice, and tea.

The chief Burmese railways start from Rangoon. One follows the valley of the Irrawaddy as far as Prome; while the other, making its way north by the Sittang, strikes the Irrawaddy at Mandalay, whence lines run north to Myitkyina, and north-east to Lashio. Teak and rice are the chief goods carried.

The difference in gauge on which, as a result of geographical and historical conditions, the chief lines in India have been constructed, is a serious drawback, which it has so far been found impossible to remedy. The East Indian, Oudh and Rohilkhand, Bengal and Nagpur, North-Western, and Great Indian Peninsular lines are constructed on a gauge of five feet six inches, while the other lines which have been mentioned are either wholly or partly on the metre gauge. Present railway policy in India is directed to connecting as far as possible the different systems which have the same gauge.

COMMERCE between Europe and India has existed from very early times, but its character has undergone various important changes. When trade was carried on by routes partly overland, and even for a considerable time after the discovery of the seaway by the Cape, the chief articles sent from or to India were, in proportion to their bulk, of high value : and spices, gems, silks, and calicoes exported were paid for by imports of the precious metals. With the improvement of communication, both by land and sea, in the eighteenth and nineteenth centuries, and with the development of the resources of India under British rule, trade became more diversified as it became possible to export and import goods of a less valuable nature. At the present time the exports are such as might be expected from a country in which the vast majority of the people are engaged in agriculture, while manufactured goods constitute the bulk of the imports.

For the three years 1928-29 to 1930-31 the value of the imports and exports of India was as follows—

	Imports (in crores of rupees)	Exports	Average rate of exchange
1928-29 ..	253	338	Is. 5'884d.
1929-30 ..	241	318	Is. 5-842d.
1930-31 ..	165	226	Is. 5-833d.

A crore is 1,00,00,000

The following table indicates the nature and average value of the chief exports and imports of merchandise by sea for the three years 1929 to 1931—

Imports	Percentage of total imports	Exports	Percentage of total exports
Cotton goods ..	20.3	Cotton, raw ..	20.7
Machinery ..	7.9	Jute manufactures	15.1
Iron and steel		Rice	10.5
goods	7.6	Tea.	9.5
Sugar	6.2	Oilseeds	8.7
Mineral oils ..	3.8	Jute, raw	7.7
Artificial silk ..	1.9	Hides	5.2
Liquors	1.7		

The greater part of the rice exported from British India is grown in Burma, and is shipped to various parts of Europe and Asia; while the wheat of the Punjab and the North-West Frontier Province finds its principal market in the United Kingdom. Even before the war Japan was the chief consumer of Indian cotton outside of India itself, and it now takes over 40 per cent of the total export. Oilseeds, which form one of the staple crops of India, are exported to Europe in large quantities, where they are used in the manufacture of soap, candles, and oil-cake. Raw jute is sent to the British Isles (mainly to Scotland), to the continent of Europe, and to the United States, but the export of raw material has to a considerable extent given place to that of manufactured goods. The United States is the principal purchaser of gunny cloth, and Australia of gunny bags. Opium formerly found its chief market in China, but the efforts made by the Chinese authorities to reduce the consumption of that drug induced the Indian Government to

put an end to the trade. Some is still exported, however, to Indo-China, the Straits Settlements, and other parts of eastern Asia. Great Britain is by far the largest purchaser of dressed hides and skins, Germany and the United States of raw hides and skins respectively. Tea is exported mainly to the British Isles, where within the last sixty years Chinese teas, which had previously held the field, have been almost superseded by those of India and Ceylon, which are also beginning to make their way in the United States and elsewhere. The better methods employed in India and Ceylon, both of growing the plant and of preparing the leaf, account in great part for the change which has taken place.

At one time India exported considerable quantities of cotton goods, but with the growth of the Lancashire industry the demand for these gradually declined. Instead, India became a large importer, and has continued to be such, though, with the recent development of the modern factory system within the country, the nature and extent of the trade have changed greatly. There is no longer the same demand for yarn as formerly, and the imports are in the main confined to the higher counts, for which Indian cotton has proved unsuitable. With an increased importation of American and Egyptian cotton, however, and an extended use of the most modern textile machinery, the demand for foreign yarn is steadily decreasing, and in 1930 less than 4 per cent of the yarn used in Indian mills came from abroad. With regard to piece goods, conditions are somewhat different, and large quantities are still imported, though even here the position is rapidly changing to the detriment of the English manufacturer. " In 1913-14 the total imports into India of cotton piece goods were 3,197 million yards, of which the United Kingdom supplied 97 per cent and Japan 0.3 per cent. In 1930-31 the total imports had fallen to 890 million yards, of which the United Kingdom shipped 58.8 per cent and Japan 36.1 per cent. Whereas in 1913-14 imports provided three-quarters and the Indian mills one-quarter of the machine-made cloth available for consumption in the country, in 1930-31 the Indian mills produced three-quarters, and imports provided only one-quarter of the available balance for consumption. Of this one-quarter, the United Kingdom, as we have seen, supplied only 58.8 per cent."¹ A number

¹ *Conditions and Prospects of United Kingdom Trade in India, 1930-31*, by Thomas M. Ainscough, C.B.E. (Department of Overseas Trade.) In this paragraph I have made free use of this valuable report.

of causes have contributed to this state of affairs. Most important of all is the fact that while the cost of cotton goods is higher than in pre-war days, the Indian agriculturist receives less for his staple products, and his increasing poverty is indicated by the reduction in *per caput* consumption from 13*3 yards in 1913-14 to 9*57 yards in 1930-31. Again, the boycott of 1930, directed against all foreign goods, affected most severely those from Great Britain.

Meanwhile the Indian millowners took advantage of the protection afforded by tariffs, of the boycott, and of their lower costs of production, to build up the home industry. Japanese competition is apparently successful, because the policy of standardization on certain types of piece goods much in demand has enabled Japanese manufacturers to sell at prices much below those of Lancashire and even below those of India itself.

Instead of exporting, as was formerly the case, almost as much sugar as was imported, India now exports little, and large quantities are imported from Java, the United Kingdom, and European countries. Iron and steel goods, railway plant, and machinery are obtained in the main from Great Britain, but also from the United States, Belgium, and Germany. Mineral oils come from the United States, Persia, and Borneo. Artificial silk is imported mainly from Japan; to a much less extent from Italy, Switzerland, and Great Britain.

In the three years 1911-12 to 1913-14 the United Kingdom supplied India with 63 per cent of its imports, while the United States provided 3 per cent, and Japan 2*5 per cent. It is of interest to note that the corresponding figures for 1929-30 were 43, 7, and 10 respectively, and for 1930-31 approximately 37, 9, and 9. In the years immediately preceding the war, about 25 per cent of the exports of India went to the United Kingdom, 8 per cent to the United States, and 8 per cent to Japan. The corresponding figures for 1929-30 were 22, 12, and 10 respectively; and for 1930-31, 24, 9, and 11.

The value of the merchandise exported from India considerably exceeds the value of that which is imported, and this is in part accounted for by the import of treasure, by the charges which the Government of India has to meet in the United Kingdom, by interest on loans, and in other ways.

CEYLON

Ceylon has an area of 25,000 square miles. Plains extend across the north of the island and along the coast, but the centre and south are occupied by a great mountainous plateau which rises at one point to a height of over 8,000 feet. The climate of the lowlands is tropical, and Colombo has a mean annual temperature of about 80° F., but on the uplands sub-tropical and even warm temperate conditions prevail. Ceylon lies in the path of both monsoons, but the heaviest rainfall takes place on the south-west slopes of the plateau, parts of which have a mean annual precipitation between 150 and 200 inches; on the plains of the north-west and south-east it varies from 25 to 50 inches.

The principal food grain cultivated by the natives is rice, but it is not grown in sufficient quantities to meet the home demand, and the agricultural wealth of the island is mainly derived from plantations under European control. Coffee was at one time the chief export of the country, but the plants were attacked by disease and the industry practically disappeared. Its place has been taken by tea, which is grown on the mountain slopes of the south-west, where, above an elevation of 2,500 feet, it forms practically the only crop. As in India, the leaf is prepared by modern methods and the average annual production now amounts to over 240,000,000 lbs.¹ The cultivation of rubber has spread rapidly within recent years; in 1890 there were only 300 acres of it in the country, but it is estimated that there are now about 475,000 acres. The plantations, which consist mainly of *Hevea brasiliensis*, lie on the lower slopes of the hills in the south-west, where the rainfall is great and the temperature high.

The coco-nut palm is grown mainly on the hot and humid plains in the west and south, and the various articles derived from it—copra, oil, fibre, etc.—when taken together, come next in value to rubber and tea among the exports of the island. Other products include areca-nut, cocoa, and cinnamon. The only mineral worked to any extent is graphite or plumbago; in quality it has long had the reputation of being superior to that found elsewhere,

Colombo is the chief port, and an important place of call for steamers.

¹ India had an output of 433,000,000 lbs. in 1929-30,

CHAPTER XXV

INDOCHINA

THE MALAY PENINSULA

THE northern part of the Malay Peninsula falls within the Kingdom of Siam, but the southern part is controlled by Great Britain, either directly or indirectly. The Straits Settlements, which include Penang, Malacca, and Singapore, as well as certain other islands and coastal districts, are administered as a Crown Colony, while the Federated Malay States (Perak, Selangor, Negri Sembilan, and Pahang), the districts of Kedah, Trengganu, and Kelantan in the north (transferred by Siam in 1909), and the State of Johor in the south, are all under British protection. The total area is about 54,000 square miles, and the population, partly Malay and partly Chinese, numbers nearly 2,700,000. The Malays are agriculturists, pure and simple, while the Chinese work in the plantations and in the mines and engage in trade.

Owing to its position just north of the Equator, the country has a tropical climate, and the mean annual temperature is about 80° F. Rain falls throughout the year, and the total precipitation is generally over 100 inches. The greater part of the country is densely forested. Rice is the staple food of the people, but it is not grown in sufficient quantity to meet the home demand, and large quantities are imported.

Since the beginning of the present century the cultivation of rubber has made great progress, and plantations of *Hevea brasiliensis* now cover an area of over 2,500,000 acres in Malaya, where 50 per cent of the world's supply of rubber is at present produced. In south-east Asia the conditions are particularly favourable, for the rubber-producing regions there not only enjoy an equatorial type of climate, but they lie in close proximity to the densely-populated monsoon lands of the continent, whence a supply of relatively cheap and efficient labour can be easily obtained. Unfortunately, there has been great over-production, the price of rubber has fallen below the cost of production, and on many plantations "tapping" has for the present ceased. Other products include

coco-nuts, palm-oil, and palm-kernels (obtained from *Elaeis guineensis*, which has recently been introduced from West Africa), and pineapples.

Tin is obtained from alluvial deposits found mainly in the Federated Malay States, the richest district being the Kinta valley in Perak. The bulk of the ore is sent to the Straits Settlements to be smelted, and the tin is exported from Penang and Singapore. The region is the most important tin-producing area in the world, and at the present time yields over one-third of the world's supply of that mineral.

Singapore, which is situated on the south coast of the island of that name, at the extreme end of the Malay Peninsula, is the chief port of the region ; it is one of the greatest trading centres in the world, as its position makes it the meeting-place of steamship lines from all parts.

SIAM

The Kingdom of Siam has an area of about 195,000 square miles, and a population which is estimated at over 8,000,000 souls. The greater part of the country lies within the basin of the Menam, and is separated from Burma by a granitic range which is continued southwards through the entire length of the Malay Peninsula. The northern part of the Menam basin is mountainous, and is traversed by numerous rivers, including the Meping and the Nampo. South of the confluence of these at Paknampo, the mountains disappear, and a great alluvial plain extends to the Gulf of Siam. To the east lies the plateau of Korat, which has an average elevation of about 600 feet. It is bordered on the north and east by the Mekong into which it drains, and on the south by a low range of hills which separates it from Cambodia. The last of the physical regions of Siam belongs to the Malay Peninsula, and extends southwards, first on the east and then on both sides of the main granitic range, to the neighbourhood of the sixth parallel of north latitude.

CLIMATIC CONDITIONS. With the exception of the last-mentioned region the climate of Siam is monsoonal in character, and there are three seasons, a cool, a hot, and a rainy. The mean temperature is high throughout the year, and in the lowlands does not fall below 70°F. even during the cool season. The rainfall

is least along the south coast and in the valley of the lower Menam, where it does not exceed 60 inches. On the more elevated lands to the north and east it ranges from 60 to 80 inches, but in the Malay Peninsula, where precipitation occurs practically at all seasons, it exceeds the latter amount.

UPPER SIAM. The mountain ranges of this region are covered with forests, while in the intervening valleys there are considerable areas of fertile soil. Teak, which is the principal product of the forests, is floated down to the coast at Bangkok by the Menam, at Moulmein by the Salween, and at Saigon by the Mekong. Other valuable timber trees are known to exist in Upper Siam, but they are too heavy to be floated down the rivers, and their exploitation must await the development of the railway system. Of the forest area, 85 per cent is held on lease by European companies, but their activities are controlled by the Government, and it is not certain how long the present output can be maintained. Other forest products include sticklac, gums, and resins. In the valleys, rice is the principal crop, but, as it is unsuitable for export, the bulk of it is consumed at home. Tobacco is also grown, mainly for domestic use, and among other crops are cotton, tea, and betel-nut. The chief commercial town of the region is Chieng-mai, which is situated on the Meping and is engaged in trade with the Shan States.

LOWER SIAM. The alluvial soil, monsoonal rainfall, and high temperature of the lowlands of Siam are peculiarly favourable to the cultivation of rice, which is the chief product of the region, and not only provides the staple food for man and beast within it, but forms the basis of the greater part of its foreign trade. Market gardening gives employment to large numbers of Chinese, especially in the vicinity of the towns. Various attempts have been made to grow cotton, but, except in the north, without much success. Other crops include maize, sugar-cane, sesamum, and coco-nuts.

The lowlands contain the greater part of the population of Siam and its chief towns. Bangkok, the capital, which is situated on the Menam about twenty-five miles from its mouth, is the great port of the country, though it has a very indifferent harbour. It is engaged in the preparation of rice and teak for export, in shipbuilding, and in engineering.

THE PLATEAU OF KORAT has considerable areas of infertile soil and swampy land, and is not well adapted to economic development.

Rice is the principal crop grown, but the amount produced is little more than sufficient to meet the demands of the somewhat scanty population. Korat is the only town of any importance.

THE MALAY STATES are as yet but slightly developed. The forests in the more mountainous parts of the country are believed to contain valuable supplies of timber. In the Monthon of Puket, to the west of the axial range, mining has hitherto been the principal occupation of the inhabitants, among whom there are large numbers of Chinese. Gold, silver, petroleum, and coal have all been located, but tin alone has been worked to any considerable extent. Agriculture has not made much progress, and food supplies have to be imported. On the east coast, on the other hand, in the Monthons of Surat, Nakawn Sritamarat, and Pattani, agriculture is the chief pursuit of the people, although a certain quantity of tin and wolfram is mined. The whole region is one in which a considerable amount of economic development is possible, but it is greatly handicapped at present by the want both of labour and of means of transport.

COMMUNICATIONS in Siam are mainly by water. In the southern part of the Menam basin, the place of roads is taken by numberless canals which penetrate in every direction, while the river itself is the great highway between north and south. From Bangkok one railway runs northward to Chieng-mai, an important town in Northern Siam, and another eastward to Aranya Pradhet on the Cambodian frontier. Near Ayutia, on the first of these, a branch breaks off for Korat; from near Korat one line runs eastward to Warin not far from the Mekong; while another, under construction, will run north to Khon Khen, which will eventually be connected with Nong Khai and Nakhon Panom, both on the Mekong. The railway from Bangkok into the Malay Peninsula has now been carried as far as the southern frontier and is linked up with Penang and Singapore.

COMMERCE. Rice is the principal export of Siam and accounts for about 80 per cent of the export trade of Bangkok. It is mainly sent in the first instance to Singapore and Hong Kong, whence it is distributed to various parts of the world. Teak and tin are also exported. Among the imports cotton goods occupy the first place, but provisions of various kinds, iron and steel goods and machinery, oil, and tobacco, are all of importance.

FRENCH INDO-CHINA

French Indo-China falls into several distinct physical regions. To the east of the Mekong and to the south of the Chinese province of Yunnan, there is the wild mountainous region of Upper Laos, from which runs southwards the crescent-shaped central range of Annam. In the south the lowlands of the Mekong lie to the west of this range; and in the north, in the angle between it and the Chinese massif, is the basin of the Song-koi or Red River of Tongking. Each of the political units into which the country is divided corresponds more or less closely to a well-defined physical region. Tongking is the basin of the Song-koi. Annam includes the greater part of the Annamese mountains, and the narrow plains between them and the sea. In the north, the western slopes of the same mountains, together with Upper Laos, constitute the territory of Laos. Cambodia and Cochin-China make up the lowlands of the Mekong, the latter belonging almost entirely to the delta of that river, while the former consists of the region between the delta in the south and the uplands in the north.

All these regions receive their rainfall during the south-west monsoon, with the exception of Annam which is sheltered from it by the mountain ranges that traverse it from north to south, and make it more dependent upon the north-east trades of winter. The average rainfall of the whole region varies from 40 to 80 inches, except in the Laos country and on the slopes of the Annamese hills, where it exceeds the latter amount.

CAMBODIA has an area of 69,800 square miles, and a population which is estimated at 2,806,000. The low-lying districts alongside of the rivers and in the vicinity of the lakes are uncultivated, and on the hills in the north and east a forest vegetation alone is possible. But the intermediate lands, which are inundated each year by the Mekong and its tributaries, are very fertile, and produce large crops of rice, which not only satisfy the home demand but afford a considerable surplus for export. Cotton is grown; it is short in fibre, but white and silky, and is said to be better than Indian; the difficulty of obtaining a sufficient supply of labour is an obstacle to the rapid extension of the area cultivated. The mulberry is also grown, and there is a small silk industry. Among other products of Cambodia are gamboge, which takes its name from the country; cardamons, which are extensively used in Chinese

medicines; pepper, cinnamon, tobacco, and sugar. Fishing is an important pursuit, both in the rivers and in the great lake Tonle-Sap, and large quantities of fish are exported. Pnompenh is the chief town of the country.

COCHIN-CHINA, which has an area slightly over one-third that of Cambodia, has a population with a density nearly five times as great, and is at present one of the most valuable of the French possessions in Indo-China. Rice is extensively cultivated and large quantities are exported, while other crops include tobacco, maize, sugar, and pepper. Various attempts have been made to introduce manufactures into the country, but apparently without much success; and rice milling at Saigon and Cholon is, apart from agriculture, the only industry of importance. Saigon, which is situated on an affluent of the Donnai, can be reached by large ocean-going ships, and is the port not only of Cochin-China but of Cambodia as well.

THE LAOS TERRITORY is as yet in a very undeveloped condition. With an area of 90,000 square miles it has a population which does not exceed 1,000,000. The only exports of importance are derived from the forest. Teak is plentiful, but its exploitation is rendered difficult by the absence of good means of communication, and more attention is at present given to such articles as cinnamon, lac, rubber, and gum benjamin (used in the manufacture of scent), the transport of which is easy. Minerals are known to exist, but the want of labour and of transport prevent their exploitation.

ANNAM, which has an area of 56,700 square miles and a population of 5,120,000, consists of a strip of land about 800 miles in length, and seldom more than 100 miles in breadth. The cultivable land is limited in extent, and occurs mainly on the coastal plain and in the valleys of the numerous small rivers which descend from the neighbouring mountains. Rice is the principal crop, but on account of the absence of summer rains it has to be planted in the early part of the year, and therefore does not receive both moisture and heat at the same time. The yield per acre is accordingly small, and there is little available for export. Attention has recently been paid to the cultivation of tea, and cotton is also grown, though not so successfully as in Cambodia. Other products include rubber, cinnamon, silk, lac, sesamum, and ground-nuts, but none of these is of great importance. Fishing is extensively carried on along the coasts, especially in the south. Minerals, including coal and gold,

have been located, but so far the output has been negligible; and the manufactures which exist do no more than meet the most pressing demands of the inhabitants. The principal towns include Hu6, the capital of the country, and Tourane, its chief port.

TONGKING has an area of 40,000 square miles. In the east are the delta lands of the Song-koi, and on them the majority of the 8,000,000 inhabitants of the country are settled. In the north the land is hilly, and in the west it is mountainous. Rice, which is the most important product, is grown both in the lowlands and in the valleys of the uplands; two crops a year are generally harvested, though, owing to the large population, the amount available for export is small. Maize has been introduced into the country and, as is also the case in Cochin-China, its cultivation has spread. Cotton is grown, and considerable attention is paid to sericulture. Other products include coffee, maize, tobacco, rubber, and cunao, a plant from which a much-used native dye is derived. Coal is at present the most important mineral obtained in Tongking, and is worked mainly in the peninsula of Hongay, north of Haiphong, where there are open mines. The coal, which is anthracitic, is used for various purposes, and large quantities of briquettes are also manufactured. Tin, zinc, iron, and other minerals, are worked on a small scale. Tongking is the chief industrial region in Indo-China. Several mills for spinning cotton yarn have been established, and there are also distilleries, soap works, and factories for the production of paper, tobacco, matches, cement, and other articles. The most important towns are Hanoi, the capital, which is situated upon the right bank of the Song-koi, sixty miles from the coast, and Haiphong, the leading port of the country, at the mouth of the Cua-cam, a canalized offshoot of the same river.

COMMUNICATIONS. Communications in Indo-China frequently present considerable difficulties. In Cambodia and in Cochin-China the obvious means of penetration into the interior is by way of the Mekong, but that river, although it is navigable by specially constructed steamers for several hundred miles, is obstructed by rapids at several parts of its course, and has never become the great route into the interior which the French hoped to make it. The principal railway in the south runs from Mytho on a distributary of the Mekong, by way of Saigon, and along the coastal plain of Annam, to Nha-trang; it is proposed to connect Nha-trang with

Tourane, to join line by Kwangtri and Vinh to Hanoi. In Tongking a line runs from Haiphong to Hanoi, whence one branch goes by Laokai to Yunnan-fu, and the other by Langson to the frontier of Kwangsi. The branch from Hanoi to Yunnan-fu has been constructed to develop French trade with China, and a reduced tariff exists for goods which are of French or Indo-Chinese origin. In the internal trade of Tongking the Song-koi and its tributaries play an important part.

COMMERCE. Rice is the most important of the exports of Indo-China and accounts for nearly two-thirds of the total value of the goods of domestic origin sent out of the country. Fish, maize, and cotton yarn are also exported in considerable quantities. Among the imports cotton goods come first, and a great variety of articles, including silk, liquor, paper, oil, iron and steel goods, and opium are all bought to a greater or less extent. The export trade is conducted very largely with Singapore and Hong Kong, while the bulk of the imports is of French or Eastern origin.

CHAPTER XXVI

THE CHINESE LANDS

CHINESE territory, consisting of China Proper and the dependent lands of Mongolia, Tibet, and Eastern Turkestan, covers an area estimated at over 4,000,000 square miles, or nearly one-fourth of the whole continent of Asia. Physically it belongs to several of the great morphological regions of Asia, and the mid-world mountain system, the Mongolian plateau, the Manchurian lowland, and the ancient massif of Southern China all fall in whole or in part within its frontiers. But, as China Proper differs in so many respects, both physically and climatically, from its outlying dependencies, while these in turn differ from one another, it is better to treat the political units separately, though along their borderlands they tend to merge into those which adjoin them.

CHINA PROPER

The physical features of China are extremely complicated and can be sketched here only in broad outline. The country is on the whole mountainous, but there are several plains of considerable importance. North China belongs in part to the mid-world mountain system, its western half being enclosed within, and traversed by, ranges from the Inshan and Tsin-ling mountains, which are folded continuations of the Kunlun. Farther east, beyond the old plateau of Ordos, the hills of the Shansi upland run from north to south, and those of Chihli from north-east to south-west. The eastern part of northern China is occupied by the Great Plain, which extends from the hills of Chihli to the delta lands of the Yangtze, and covers a considerable part of Chihli, Honan, Shantung, Anhwei, and Kiangsu. To the south of the Tsin-ling and its continuation, the Funiu-shan, lies the Chinese plateau, the mountain ranges of which were formed by fracture of the ancient land mass, and have a general trend from south-west to north-east. In the west of Szechwan and Yunnan, the mountains run from north to south.

CLIMATE. The climate of China differs considerably from that of the remainder of the monsoon region of Asia. The greater part

of the country lies outside of the tropics, and, although the summers are everywhere hot, the winters are cold in the north and mild in the south. This wider range of temperature is in the main due to the fact that China, unlike India, which is protected by the lofty wall of the Himalayas, is exposed to the cold winds which blow outward from the Asiatic land mass during the winter season. Canton, for example, has a winter temperature over 10° F. below that of Calcutta which lies less than one degree farther south, and Shanghai, practically in the same latitude as Multan, has a winter temperature which is lower by about 18° F.

In January the greater part of China, excluding Manchuria, lies between the isotherms of 10° F. and 60° F., the temperature decreasing on the whole from south to north. In the basin of the Hwang Ho, the mean temperature of the lowlands during the coldest months of the year is below freezing point, and many of the lakes and rivers are frozen at this season; in the lowlands of Central China the climate is less severe, but the mean for January falls below 40° F. in many places, and the surface of the smaller lakes in the valley of the Yangtze are sometimes covered with a sheet of ice sufficiently thick to permit skating. Even in the valley of the Si-kiang, where the January mean is over 50° F., the thermometer frequently descends at night to freezing point, and ice is sometimes found. In summer, on the other hand, when the Asiatic land mass becomes heated, China has a high temperature, and in July the greater part of it lies between the isotherms of 75° F. and 90° F. In the north of China the temperature is naturally not quite so high, nor is the period during which it is high so prolonged, as is the case in central and southern China. In the basin of the Hwang Ho the mean temperature for the warmest month of the year is generally between 75° F. and 80° F. near the coast; farther inland, where it tends to be higher, it is to some extent modified by the elevation of the land. In central China the period of greatest heat occurs in July and August, when the mean temperature is over 80° F., and in southern China from June to September, when the mean is likewise above 80° F.

The rainfall is monsoonal and occurs mainly during the summer months, when oceanic winds from the south and south-east blow towards the heated continental interior. Owing to the general configuration of the country, there is nowhere a precipitation so heavy

as that which occurs in parts of India and Indo-China, but, on the other hand, the total amount of rainfall is more evenly distributed. In winter, the winds blowing outwards from the cold continental interior bring but little moisture to any part of the country, but depressions moving down the Yangtze valley draw in oceanic winds which cause rainfall near the coasts of central China. The mean annual precipitation decreases from south to north. In the south-east of China a region which includes the basin of the lower Si-kiang and much of the southern part of the basin of the lower Yangtze has a mean annual rainfall of 60 to 70 inches or more. To the west of this region there is a decrease to 35 inches and less in south-west China. Except in the north-west, the remainder of the Yangtze basin has over 40 inches, while in the basin of the Hwang Ho there is a gradual decrease to less than 20 inches along the northern frontier. Departures from these mean figures are unfortunately both frequent and considerable, and many areas suffer alternately from drought and flood. Moreover, in a country the topography of which is so diverse as that of China local deviations from general conditions of temperature and rainfall are naturally very great.

VEGETATION. The climatic conditions of China are reflected in its vegetation, which varies from warm temperate in the north to tropical in the south. The cold winters which prevail in the basin of the Hwang Ho are fatal to tropical and sub-tropical plants at this season of the year ; on the other hand, the hot summers permit the cultivation of cotton, and rice can even be grown in some of the southern districts. The trees belong in the main to the broad-leaved, summer-green forest, and include the paulownia, the cedrela, and the sophora in the east, and oaks, poplars, hazels, and some conifers in the west. The fruits and food grains are those of the temperate zone ; among the former are apples, pears, peaches, apricots, and cherries, and among the latter wheat, maize, millet, peas, and beans.

In the Yangtze basin, with its longer summers, milder winters, and heavier rainfall, a sub-tropical vegetation appears. The bamboo, the camphor tree, the mulberry, the banyan, and a variety of the date palm are found in different parts of the region, together with trees which produce wax, tallow, and varnish. Rice, which is the chief food of the inhabitants, is extensively grown, sugar-cane and tea flourish in places, and various fibres are cultivated.

The long hot summers, the warm winters, and the heavy precipitation in the basin of the Si-kiang, permit the growth of a tropical vegetation in the lowland districts. Among the trees are the mahogany, the ebony, and the date palm; the fruits include the banana, the pine-apple, and the pomegranate; and rubber, aniseed, and several other industrial products are also obtained. In addition, the great variations in elevation throughout the basin of the Si-kiang render possible the growth of most of the plants of the preceding regions.

GENERAL CONSIDERATIONS. The present state of economic development in China is due in part to considerations of a geographical nature. As the country falls within the monsoon area it supports a large population, the size of which has been variously estimated, but which probably numbers between 400 and 500 millions. The marked climatic differences between the summer and winter seasons, which have already been noted, have probably contributed to the greater physical energy of the Chinese as compared with the inhabitants of the more tropical parts of the monsoon area. In agriculture, which is their chief occupation, they have become very proficient; nevertheless the large population has pressed heavily upon the means of subsistence, and has, in the past, been kept in check by war, famine, flood, and infanticide. But, if China is both fertile and densely populated, it is surrounded on all sides but one by barren or mountainous lands, which have retarded, though they have not prevented, communication with the rest of the world; and even the ocean was until recently a barrier to intercourse with other countries. This isolation naturally led to a deadening of intellectual life, in consequence of which education became stereotyped. At the same time, their obvious mental superiority to the nomadic races by whom they were surrounded and occasionally conquered, and to the aborigines, whom they had themselves overcome, naturally gave the settled Chinese an exaggerated belief in their own capacities, and induced a contempt for foreigners and for foreign methods. To remedy these evils the rulers of China have, on the whole, been able to do but little. The mountainous topography of the country, no less than its great extent, rendered necessary a certain amount of local autonomy, and the energy of the government has usually been absorbed, either in maintaining a balance between different parts of the

country or in readjusting the balance after it had been disturbed. After the Manchu conquests, moreover, power was long in the hands of aliens, who have cared but little for the ultimate welfare of the people. It would appear, therefore, that the great mass of the inhabitants, poor, uneducated, and ill-informed of what is happening elsewhere, presents a formidable obstacle to the spread of new ideas ; and hence it is not surprising that economic progress has only been made in those districts where foreign influences have been most felt. But the feeling of nationality is beginning to make itself manifest both in the political and in the economic life of the people; and the events of the War, during which they were forced to depend upon Japan for manufactured goods hitherto imported from western countries, emphasized in the minds of the more thoughtful Chinese not only the progress which had been made by their kinsfolk, but the possibility of similarly developing their own resources. With the large supplies of coal, iron, and other raw materials which they possess, it is not improbable that the Chinese may initiate an industrial revolution, the results of which will be of the utmost importance to the world at large.

NATURAL REGIONS. Differences in climate and vegetation justify the separate treatment of each of the three great river basins which together constitute the greater part of China, but the knowledge at present possessed regarding the geological and geographical structure, climate, and economic potentialities of the country does not permit a final division into natural regions to be made. As will be seen later, each of the river basins may be subdivided, but the available information regarding these subdivisions only allows of their treatment in a general way. Even for the larger divisions reliable statistics are usually wanting, and the relations of these regions to one another can therefore only be imperfectly discussed.

THE BASIN OF THE HWANG Ho. This region may be considered as including the six provinces grouped along the course of the Hwang Ho, viz., Kansu, Shensi (north of the Tsin-ling), Shansi, Honan, Chihli, and Shantung, though it may be noted that the greater part of Chihli is drained by the Pei-ho and tributaries of the Liao, much of Shantung by short rivers running directly to the sea, and the south-eastern parts of Honan by the affluents of the Hwai.

Kansu, Shensi, Shansi, and the west of Honan are mountainous, while the east of Honan, the greater part of Chihli, and the west of

Shantung belong to the Great Plain. In the east of Shantung is an isolated mountain mass formed largely of Archaean rock. Throughout the greater part of the mountainous area in Kansu, Shensi, Shansi, and Honan, the river basins are covered over with, and the rugged outlines of the mountains smoothed down by, large deposits of loess. The loess is, according to Richthofen, "an earth of brown-yellow colour, so soft that one can easily rub it to pieces with the fingers, and yet at the same time so firm that in places where through erosion, as by running water, large masses are broken off, it remains standing in perfectly vertical walls several hundred feet high. . . . It is so fine that one can rub most of it into the pores of the skin ; nothing then remains but some fine grains of sand, of which there are sometimes more, sometimes less. . . . By repeated washing with water one can separate this from a much greater mass of material that may be called clay, and is tinted brownish-yellow by iron. A third important element is carbonate of lime On every bit of loess, even the smallest, one may recognize a certain texture, which consists in that the earth is traversed by long-drawn-out tubes which are in part extraordinarily fine, and in part somewhat coarser ; which branch downward after the manner of fine rootlets and generally are coated with a thin crust of carbonate of lime." To discuss here the various theories held as to the origin of this loess would involve too long a digression. Richthofen himself believed that it was due to the outflowing winds of Central Asia depositing the dust obtained from prolonged denudation of the rocks in regions unprotected by vegetation, and exposed to great extremes of heat and cold, while the vertical cleavage of the loess he attributed to the pores left by the decay of grass roots as each successive layer of vegetation was covered up by fresh deposits of sand. This theory in a modified form is still accepted by some authorities, but others attribute more importance to the action of water in the transportation of loess, and believe that the vertical cleavage may be explained on a physical basis. Whatever be the true solution, the fact remains that the loess gives to northern China some of its most characteristic features. Its great fertility is, in part at least, due to the vertical pores through which by capillary action water is drawn to the surface, bringing with it lime and other fertilizing minerals derived from the underlying rocks. On the other hand, owing to its porous nature, it

requires much water in order to render it productive, and irrigation is difficult as the rivers have cut their beds downwards on to the rocks below.

The plain of the Hwang Ho, which in appearance is a wide alluvial flat, is also covered with loess to a great extent. This loess has been brought down as the alluvium of the Hwang Ho and other rivers, and has been resorted by the action of wind and water. Near the rivers, sandy soils and fine sands are found, while, in the open spaces intervening between them, loess is the prevailing formation. The poorer soils have, however, often been improved by flooding them with water from the Hwang Ho, in order that the loess which it contained might be deposited.

The loess plateaus of the west are dry and hard to irrigate, and on them the crops frequently fail. The lowlands are, as a rule, more productive, and the valleys of the Wei in Shensi, the plain of Taiyuan in Shansi, the region drained by the Lo in Honan, and the central part of the Great Plain are noted for their fertility. The staple food crops include wheat, kaoliang and other millets, maize, barley, and beans; in the valley of the Wei and elsewhere some rice is grown. Opium was, and to some extent still is, a flourishing crop in parts of northern China, especially in Kansu and Shensi, which produce much of the best native varieties. Cotton is cultivated mainly in Chihli, but also in Honan and Shantung; the output is not so great as in the Yangtze basin, where climatic conditions are more favourable. Wild silk is obtained from silkworms, which thrive upon the leaves of the oak in several provinces, but chiefly in Shantung. Ground nuts, used in the manufacture of substitutes for coffee and butter, are extensively cultivated in Shantung, which produces a great part of the Chinese crop. They thrive on sandy soils and give good results on land unfit for other purposes.

The mineral wealth of this region,¹ as indeed of the greater part of China, is very considerable, but it has as yet been exploited only to a slight extent. Coal and petroleum are known to exist in both Kansu and Shensi, and in Kansu gold is also found. Shansi is one of the great mineral storehouses of the country. In the west, between the Hwang Ho and Fen-ho, bituminous coal occurs in what

¹ On this subject, see *Coal and Iron in China*, by W. Smith (Liverpool University Press, 1926), and *Ores and Industry in Far East*, by H. Foster Bain (New York, 1927).

Richthofen described as a plateau of nearly horizontal coal-bearing strata, although later research has shown that dips in the strata frequently occur, and that the coalfields are probably more restricted than Richthofen supposed. In the east and south-east of Shansi there are large deposits of anthracite, while along the foot of the Tai-hang-shan, on its border, anthracite and bituminous coal are both found. The mineral wealth of Shansi may yet make it one of the great industrial provinces, but the present output is not large. There are modern mines under Chinese control at Ping 'ting 'chou and elsewhere along the railway which leads to Tai-yuan-fu, and native mines of some importance at Tsechou in the south-east of the province. Along the foot of the Tai-hang-shan in Shansi, and in the neighbouring parts of Chihli and Honan, there are various mines, including those at Liuhokou and Chiaotso, the latter of which is worked by the Peking Syndicate. As a result of political disturbances the output of these has greatly declined during the last few years.

More important are the mines owned by the Kailan Mining Administration at Kaiping and Lwanchow, in Chihli, about eighty miles from Tientsin. The output, consisting of bituminous coal suitable for steam and coking purposes, was over 5,000,000 tons in 1928-30, or about one-fifth the total output of China (including Manchuria) in that year. In Shantung the coalfields lie along the margins of the western half of the mountain region where the rocks are of later formation than farther east. A German company, the Schantung Bergbau Gesellschaft, had mines at Fangtze in the Weihsien district, and at Hungshan in Poshan, and these together produced 700,000 tons in 1913. Since 1922 they have been worked by a Sino-Japanese concern. The Chinese-owned mines at Chung-sing are both valuable and productive. In 1926 the total output of Shantung amounted to over 2,000,000 tons, but by 1930 civil war had brought about a reduction of 65 per cent. For the whole region under consideration, the total production was 10,500,000 tons in both years. In addition to coal, Shantung has deposits of iron, copper, gold, and other minerals, and iron is also found in Shensi, Shansi, and elsewhere.

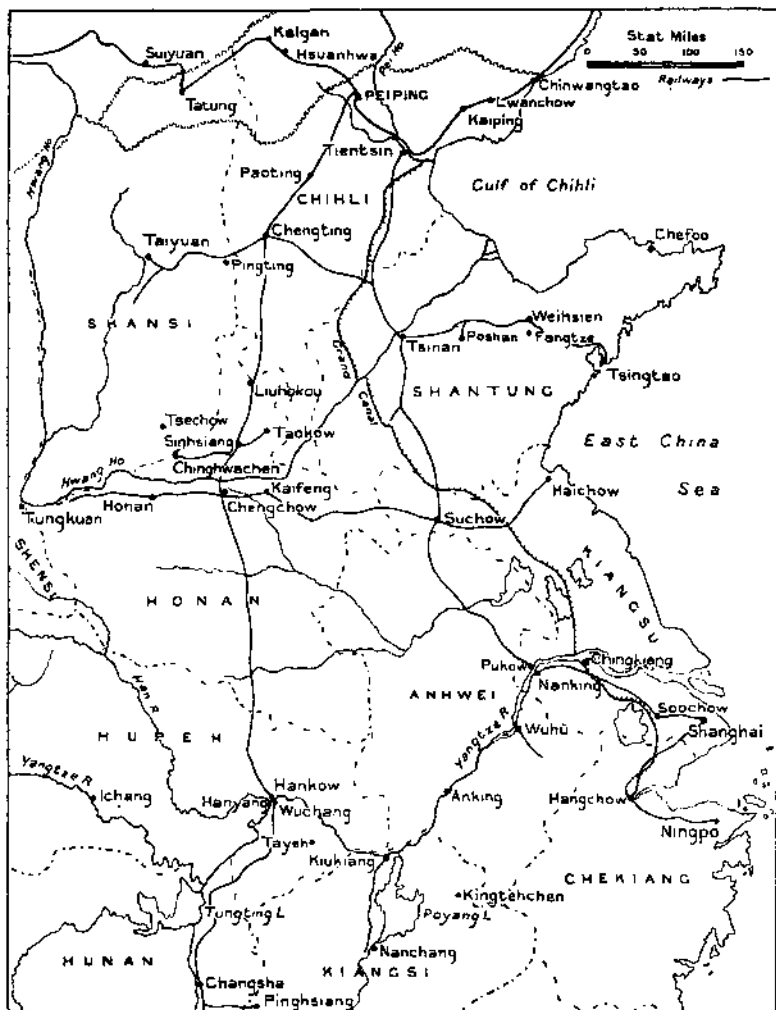
The manufactures of the Hwang Ho basin are, with a few important exceptions, confined to the supply of local necessities and are produced by primitive methods. Owing to the cold winters which

prevail, woollen goods are in much demand, and are manufactured at Lanchow in Kansu, at Tatung in Shansi, and elsewhere, with wool grown in these provinces or imported from Mongolia. Native looms for the weaving of cotton are found everywhere, and modern cotton factories have been established at Tientsin, at Tsingtao in Shantung, and at Chengchow in Honan. At Tientsin there are also dyeworks and distilleries. Shantung and Honan are both extensively engaged in the silk trade, but Chefoo, where there are steam and hand filatures for the treatment of Manchurian cocoons, is suffering from the competition of the more favourably situated Japanese industry at Antung. Both provinces, but especially Shantung, are also noted for their manufacture of pongees from the tussah, or wild silk, which they produce. The manufacture of straw plait is an important industry in the west of Shantung and in the south of Chihli, where a wheat with a long straw is grown. Japanese straw is also imported for the same purpose. With the introduction of foreign iron the native industry declined, but modern works have been established in several places. Iron ore from the vicinity of Hsuanhwa, south-east of Kalgan, is smelted near Peking, with coal from Liuhokou; and in Shantung there is a small industry of a similar nature not far from Poshan.

COMMUNICATIONS AND TOWNS. Tientsin, situated on the Pei-ho, a little below the place where the river is joined by its principal tributaries, is the great collecting and distributing centre of the Hwang Ho basin and the most important seaport of North China. Owing to the rocky bed in the upper part of its course, the frequent shallows in the lower part, and the rapid flow throughout, the Hwang Ho itself is on the whole of little value as a waterway and is only navigable in places by junks. Accordingly, no great commercial city has grown up near its mouth, and Tientsin, situated on the navigable Pei-ho and serving as the port of Peking, has become the entrepdt of the whole region. Unfortunately its harbour is bad, but by constant dredging a depth of 19 feet at ordinary high water can generally be maintained. It is also possible, except on rare occasions, to keep the port open throughout the year by means of ice-breakers. From Tientsin great trading routes lead to different parts of Asia. One goes north-east by Shanhaikwan, and between the hills of north Chihli and the sea, to Mukden in Manchuria; another runs north-west by way of Peking and the Nankou pass to

Kalgan, almost on the edge of the Mongolian plateau, and formerly the great centre of the Russian tea trade. From Kalgan several routes diverge: one strikes across Mongolia by Urga to Kyakhta; another makes its way round the plateau of Ordos by way of Kweihwacheng (situated in the north of Shansi, and a great collecting centre for skins and camel-hair ropes from all parts of Mongolia) to Lanchow in Kansu; a third goes to Tai-yuan, the capital of Shansi, where it meets a more direct route from Peking by Chengting-fu, and then proceeds by Sian-fu, the capital of Shensi, to Lanchow. Lanchow is the point of convergence of routes from Lhasa and Kashgar; while from Sian-fu there are roads to Chengtu in Szechwan and Hankow on the Yangtze, the first across the western and the second across the eastern end of the Tsin-ling mountains.

From Peking, the most important route to the south crosses the Hwai-yang-shan, a continuation of the Funiu-shan, on the way to Hankow; it is followed by the railway which connects these two towns. Two other railways run from Peking; one goes by Tientsin and Shanhaikwan to Mukden, with a branch to Newchwang, while the other goes by the great route centres of Kalgan and Sui-yuan to Pao-tow on the Hwang Ho. It is proposed to connect the latter line with Urga, and eventually to link it up with the trans-Siberian railway. If this be done it will probably lead to a great increase in the trade which Tientsin at present carries on with Mongolia. A little to the south of Chengting, on the Peking-Hankow line, a narrow-gauge railway breaks off from the main line and runs to Tai-yuan across a very difficult piece of country; it taps the coal and iron fields of Shansi, and will probably eventually become an important feeder of Tientsin. Another line bringing coal towards Peking is that which runs from the Peking Syndicate mines near Chinghwachen by Sinhsiang to Taokow, whence the coal is carried to the capital by the (Honan) Wei and the Grand Canal. The Tientsin-Pukow railway connects these two towns. From Tsinan, through which it passes, one line goes by the great distributing centre of Weihsien to Tsingtao, while from Suchow farther south the Lung-hai system runs eastward to Haichow, near the coast of Kiangsu, and westward by Chengchow, where it crosses the Peking-Hankow line, to Tungkuan on the Hwang Ho; it is to be continued to Sian-fu and will eventually provide an outlet for the fertile valley



EASTERN BASINS OF THE HWANG HO AND YANGTZE KIANG

of the Wei. The Grand Canal, one of the great waterways of ancient China, runs from Hangchow, in the province of Chekiang, to Tientsin, a distance of 1,000 miles across the Great Plain; its northern section is of comparatively little value, as it is badly constructed and has silted up to such an extent that it is unnavigable at certain seasons.

In addition to Tientsin two other ports are worthy of mention—Chefoo and Tsingtao. The former is a Chinese port on the north of the Shantung peninsula, while the latter lies on Kiaochow Bay on the south of the peninsula, in the territory leased to Germany in 1898. Tsingtao made rapid progress under German control as it possessed an excellent harbour, and was connected with Tsinan-fu on the Hwang Ho. Hence it was able to attract much of the trade that formerly went to Chefoo, which is without a good harbour to protect its shipping from the strong northerly gales of winter, and is unconnected by rail with its hinterland. Its industrial development, begun by the Germans, was continued by the Japanese, who were in possession from 1914 to 1922, when it was retroceded to China; and after Shanghai it is the most important cotton manufacturing town in China. The Japanese, who have built numerous mills there, are convinced that its temperature and humidity are admirably suited to the industry, land is cheap, and labour plentiful. Chinwangtao, in the north of Chihli, may also be noted, as it now exports a considerable amount of coal from the Kaiping collieries.

THE BASIN OF THE YANGTZE KIANG is the largest and most important region in China. Physically, it may be regarded as a series of steps downward from the Tibetan plateau, each step being tilted upwards towards the east in such a way as to cause the formation of a lake basin between its eastern edge and the step farther to the west. The different provinces which make up the region correspond to some extent with these different steps. Szechwan is mountainous in the west and in the extreme east, while in the centre, at a much lower elevation, lies the famous Red Basin formed of Cretaceous sandstone. The next step downward is represented by the provinces of Hupeh and Hunan, the former consisting largely of the basin of the Han, and the latter of the basins of the Siangkiang, the Yuan-kiang, and the Tse-kiang which drain into the Tungting lake, the remains of the vast sheet of water which once covered the whole alluvial plain of the Middle Yangtze. Still

farther east another step consists of the provinces of Anhwei and Kiangsi, whose alluvial parts formed the bottom of a great lake of which the Poyang lake is now the largest remnant. Lastly, there is Kiangsu, a plain of comparatively recent formation, built up in the south by the Yangtze, and in the north by the Hwang Ho at a time when that river flowed to the south of the Shantung peninsula.

The Yangtze Basin contains great areas of fertile land. The mountainous parts of Szechwan are probably incapable of much development, but the Red Basin, with an elevation varying from 600 to 2,000 feet or more, has a fertile soil and a moist climate, and is one of the most productive regions in the world. One part of it, the Chengtu plateau, indeed, would probably be of little use were it not for the marvellous irrigation system, which enables it to support a population that has been estimated at over 1,700 to the square mile. In Hupeh much of the Han valley is very productive, and the same is true of the valleys of the various rivers which flow from Hunan into the Tungting lake, while the alluvial land around the lake itself and on both sides of the Yangtze supports a large population. The mountainous parts of Hupeh are generally barren, but in Hunan they are cultivated in some parts and forested in others. In Kiangsi there is a large area of fertile land around the Poyang lake. Anhwei and Kiangsu are productive throughout, but their northern parts belong climatically to the basin of the Hwang Ho rather than to that of the Yangtze. Throughout the whole Yangtze basin it is generally possible to take at least two crops per year off the soil, whereas in various parts of the basin of the Hwang Ho not more than one crop can be obtained.

The agricultural products of the region have already been mentioned. Opium was formerly one of the staple crops, but the enactments against its use led to a very great decrease in its cultivation, and in Szechwan, where it was perhaps most extensively grown, various attempts were made to find a substitute for it. Cotton was introduced, and wheat, which had been displaced by opium, regained lost ground, while an extension of the area under the mulberry also took place. More recently, however, there appears to have been a return to opium in this province and elsewhere, a return in many cases instigated by the military authorities, who find in opium a profitable source of revenue. Szechwan and

Kiangsu are the chief silk-producing provinces in the Yangtze basin, white silk being obtained in the latter and yellow silk in the former. But, as elsewhere in China, sericulture is in a backward condition, and it has been repeatedly said that Chinese silk might be greatly improved by even slightly better methods of rearing the silkworm. Until recently no attention was paid to modern measures for eradicating disease, while the antiquated methods employed in reeling the silk contributed to a considerable increase in the amount of waste. Schools of sericulture have now been established, and, as in Japan, the results are beneficial, though over so large an area progress will necessarily be slow.

Tea is grown mainly in the provinces of Anhwei, Kiangsi, Hupeh, and Hunan, but some is also produced in Szechwan. Though both black and green tea may be obtained from the same plant, the differences between them being due to the method of preparation, some lands produce a leaf more suitable for the manufacture of the one, and some for the manufacture of the other. In the Yangtze basin, Anhwei is the centre of production of green teas, but from the other provinces mentioned black tea mainly is procured. Hankow is the chief market for the latter, and Hangchow, Ningpo, and Kiukiang, for the former.

Cotton is now extensively cultivated in the valley of the Han, in the lowlands of Hupeh, Hunan, and Kiangsi, in Kiangsu, and in the southern part of Anhwei; and it is from these districts, and more especially from Hupeh and Kiangsu, that the greater part of the Chinese output of raw cotton is obtained. It generally has a short staple, but the best varieties are whiter and softer than Indian, especially in the Yangtze basin where they are superior to those grown farther north. The demand for it has increased greatly within recent years, and there has been a considerable extension of the cotton-growing area, but it is impossible to say how much is actually produced, as a large and increasing quantity is consumed within the country itself. It is clear, however, that China comes next to the United States and India as a producer of raw cotton. The greater part of the export goes to Japan, but a certain amount now finds its way to Europe and even to America. The average yield per acre in China for the years 1920-25 has been estimated at over 220 lb., and it is said that in the Yangtze basin between 300 and 400 lb. per acre may be obtained. The quality, however,

remains irregular; American varieties, which appear to do well in North China, are unstated to the lower Yangtze, and efforts are being made to improve native varieties.

Among other products of this region may be mentioned the tallow tree (*Stillingia sebifera*), which is found in Hupeh and other provinces; and vegetable wax, which is deposited on the wax-tree (*Fraxinus Chinensis*) in Szechwan by an insect known as *Coccus pela*. From the seeds of the wood-oil tree (*Aleurites Fordii*), grown in Szechwan, Hupeh, and Hunan, is expressed an oil much used in the manufacture of paints and varnishes. Grass-cloth is made from a fibre formerly believed to be hemp, but now recognized as ramie (*Boehmeria nivea*). In Hupeh and Kiangsi its growth and manufacture are of considerable importance.

The basin of the Yangtze, although not so rich in minerals as that of the Hwang Ho, nevertheless contains large stores of some of the more important. Coal is found underlying the sandstone in the Red Basin of Szechwan, where it is at present almost entirely worked by native methods; and, though much of it is said to be inferior, some at least is good. In Hunan, also, the red sandstone, which prevails everywhere in the mountainous districts, appears to cover large deposits of anthracite and bituminous coal. The latter, at least, extends into Kiangsi, where it is worked at Pinghsiang; the mines were formerly under the control of the company which owned the Hanyang ironworks, but since the practical disorganization of that company in 1928 they have apparently been taken over by Kiangsi province. The output, part of which was formerly converted into coke for use in the smelters, finds its principal market at Hankow, and at various other ports lower down the river. Coal is also found in Anhwei, Kiangsi, and Kiangsu, but is as yet little worked. Iron appears to be well distributed, but the most productive district at present is in Hupeh, where the Tayeh deposits are situated some distance to the south-east of Hankow. From these deposits, which appear to be very extensive, a good quality of hematite is obtained. Part of it was used in the iron and steel works at Hanyang, but at present the whole output is exported to Japan. A large quantity of iron ore also exists in Anhwei. The Kanchow district of Kiangsi contains valuable copper mines which have as yet been exploited only to a slight extent. Gold, silver, and precious stones are found in various places,

and Hunan produces the greater part of the world's supply of antimony.

The manufactures of the region are varied. Cotton and silk goods are produced by both Chinese and European methods. A large quantity of cotton yarn was formerly imported from India and Japan, to serve as a warp upon which the people in their own homes wove a weft spun from native cotton. The events of the War, however, led to a considerable development of the Chinese spinning industry,¹ with the result that imports of foreign yarn have undergone a substantial decrease. Hupeh manufactures in native workshops large quantities of piece goods for export to other parts of China, and modern factories, owned mainly by Chinese and Japanese, have been established at Shanghai, (which has about one-half of the spindles in China), Wuchang, and elsewhere. Silk fabrics are produced to a great extent by the peasantry in the districts in which the silkworm is reared; and Szechwan, and more especially Kiangsu, are noted for their piece goods. In addition, there are steam filatures at Shanghai, Hankow, and other towns.

At Hanyang, which is part of the triple town of Hankow-Hanyang-Wuchang at the confluence of the Han and Yangtze, are the Han Yeh Ping iron and steel works, established by Chinese enterprise in the last decade of the nineteenth century. At first they were entirely under Chinese management and appear to have been at least moderately successful; but a variety of circumstances, and more especially the revolution of 1911, when the blast furnaces were partially destroyed, forced their owners deeper and deeper into the debt of Japan. As a result, that country obtained a controlling share in their management and the right to provide any further capital which it was necessary to borrow abroad. As already mentioned, the Han Yeh Ping company owned both coal and iron mines, and manufactured pig-iron, steel plates and rails, and a variety of other articles. Much of the output found a market within the country, but pig-iron and large quantities of iron ore were exported to Japan. The Yangtze Engineering Works, controlled by the same company, were situated a few miles lower down the river, and appeared to be making good progress. But in 1928 the whole concern collapsed, the Tayeh iron ore is now shipped direct to Japan, and the Yangtze Engineering Works have been taken over by another

¹ It is estimated that China had over 3,600,000 spindles in 1929.

company. At Shanghai there are important shipbuilding and engineering works.

The manufacture of pottery is still extensively carried on at Kingtehchen, in Kiangsi, with kaolin derived from the decomposed granitic rocks found in the neighbourhood; but the product seems to have lost the high quality which it once possessed, and now consists chiefly of rice bowls, which are exported to all parts of the country. Other industries in the lower Yangtze valley include flour-milling, the manufacture of chemicals, paper, and Indian ink, the extraction of oil from beans and cotton seed, soap-making, the preparation of tobacco, and a great number of pursuits of minor importance.

The Yangtze is the great means of communication throughout its basin, but its value as such varies greatly at different seasons and at different places. During the summer months the river rises rapidly as a result of the heavy monsoon rains. At Hankow this rise averages between 40 and 50 feet, but in the gorges above Ichang it may be anything between 60 and 100 feet. As a rule, steam navigation is easy as far as Hankow, in summer for ocean-going steamers, and in winter for river steamers of 1,000 to 2,000 tons register. Between Hankow and Ichang steam freighters ply throughout the year, though they are handicapped in winter by low water. Above Ichang, the bulk of the traffic between it and Chungking, the great port of Szechwan, was formerly carried on in junks hauled along by gangs of Chinese; but, within recent years, specially constructed boats, sometimes with cargo floats in tow, have been able to sail between the two towns throughout the year. Difficulties are encountered especially in winter when the water is low, but it is believed that the cost of improving the river would for the present, at least, prove prohibitive. On the other hand, junk traffic, which is easier during low water than at any other season of the year, has practically ceased. Of the tributaries of the Yangtze, the Han can be navigated by small steamers for a distance of 300 miles above Hankow, and part of the Kan-kiang can be similarly utilized during the summer months, but elsewhere junks alone are possible.

A number of important trading centres have grown up upon the banks of the Yangtze. Chungking is the port of Szechwan, and more especially of the Chengtu plateau, while Ichang is the port

of transhipment for goods going to and coming from that province. Hankow, in addition to being an important manufacturing town, seems destined to become one of the great commercial centres of China. It is already connected with Peking by rail, and will some day be connected with Canton by a line which at present has not advanced beyond Chuchow (where it is joined by a branch from the Pinghsiang mines), but will, when completed, follow the Cheling Pass route which goes southward along the valley of the Siang and its tributary the Lui, crosses the Cheling Pass, and descends the valley of the Pei-kiang or North River for the greater part of the remainder of the way to Canton. A line from Hankow to Chengtu has been projected, but not much progress has yet been made with its construction. Kiukiang, which is situated on the Yangtze, near the mouth of the Poyang Lake, is the great collecting and distributing centre for the rich province of Kiangsi. From it, an important way of communication from the Yangtze to the Si-kiang, known as the Ambassadors' Route, leads up the valley of the Kan-kiang, across the Meiling Pass, and down the valley of the Pei-kiang to Canton. Wuhu is a port for north-east Anhwei with different parts of which it is connected by a number of minor waterways. Nanking has increased in importance since the opening of the Tientsin-Pukow railway, which brings down from the north much goods formerly sent eastwards to the Grand Canal by the Hwai and its tributaries. From Pukow these are either shipped direct to Shanghai, or transferred to Nanking on the opposite side of the Yangtze and forwarded by rail. As Nanking has both coal and iron in the neighbourhood, it will probably develop into a large manufacturing centre. Chinkiang is situated where the Grand Canal crosses the Yangtze, but its trade is not so great as might have been expected, as the canal, though it is still used to a considerable extent, has not been altered to suit modern conditions, and has even been allowed to fall into decay in places. Shanghai, situated on the Whangpoo about twelve miles from its confluence with the Yangtze and between fifty and sixty miles from the sea, is the great commercial entrepôt, not only for the Yangtze basin but for the whole of North China.

CHEKIANG AND FUKIEN. The two provinces of Chekiang and Fukien belong neither to the basin of the Yangtze nor to that of the Si-kiang. Lying along the south-east coast of China, they are to

a great extent cut off from the interior by the various ranges of the Chinese massif which run parallel to one another and to the coast. The northern part of Chekiang belongs, indeed, to the delta lands of the Yangtze, but in the south, and in Fukien, there are few plains and the land is generally mountainous. The rivers are naturally short, and, with the exception of the Min, are not of great value as means of communication. The summers are hot and the winters mild, the lowlands at least being protected, except in the north of Chekiang, from the cold winds of winter which blow from the continental interior. The agricultural products are of considerable importance. Rice is the chief crop in the lowlands, while upon the terraced hillsides maize, millet, the tea plant, and the mulberry are extensively cultivated. Green tea comes from Chekiang and black from Fukien, but both provinces have suffered by the great decline in the foreign demand for Chinese teas. Chekiang, where some attention is paid to modern methods of sericulture, produces large quantities of silk, and its piece-goods rank with those of Kiangsu as the best in China. Cotton, in good repute for its whiteness and durability, is grown throughout the whole region, and sugar-cane in the south. The camphor tree (*Cinnamomum camphora*) is found especially in Fukien, and the distillation of camphor was an important industry for some years. Unfortunately, the reckless destruction of the older trees was unaccompanied by the planting of others to take their place; the end of the industry is in sight, and camphor wood is now used mainly in the furniture trade.

Minerals are believed to be fairly abundant, but so far little has been done to develop them. The chief trading centres include Hangchow, Ningpo, Foochow, and Amoy. Hangchow, on Hangchow Bay, is at the southern entrance of the Grand Canal, and is also able to communicate with the interior by means of the Tsientang; it is connected with Shanghai, and will eventually be connected with Ningpo, by the Shanghai-Hangchow-Ningpo railway. Ningpo, near the south shore of Hangchow Bay, and Foochow, on the Min-ho, about 35 miles from its mouth, have considerable local trade, though the latter no longer exports the tea for which it was once so famous. Amoy, situated on an island at the mouth of the Kiulung-kiang on the south-east coast of Fukien, was formerly the great centre for the export of tea from Formosa. Since the annexation of that island by Japan this trade has been lost,

and Amoy, which has an excellent harbour, is seeking, apparently without much success, to develop commercial relations with the interior of Fukien.

THE SIKIANG BASIN. The four provinces of Yunnan, Kweichow, Kwangsi, and Kwangtung may be considered as forming the basin of the Sikiang, although the north of Yunnan and Kweichow is drained to the Yangtze, the south of Yunnan to the Red River of Tongking, and the west to the Mekong and the Salween. The whole region is mountainous in character; in the west the ranges run from north to south, but farther east their trend is from north-east to south-west. The different provinces may be regarded as so many steps downward from the Tibetan tableland to the Pacific Ocean. Yunnan, which is the first step, is a plateau with an average elevation of about 7,000 feet; it slopes towards the south and east, but is much cut up by mountain ranges which enclose the high plains upon which the majority of the inhabitants live, the valleys in the west and south being generally too unhealthy for settlement. Kweichow, which is the second step downward, has a height varying from about 5,000 feet in the west to less than 3,000 feet in the east, and like Yunnan is much cut up by mountain ranges which enclose high plains. Kwangsi, which is the third step, is considerably lower than Kweichow, the average height of the mountains being from 2,000 to 3,000 feet. In Kwangtung the land gradually descends to the delta of the Sikiang.

Throughout the whole region rice is the staple crop, but in many of the upland districts wheat, barley, and beans are cultivated, while maize is grown in Kweichow and Kwangsi and in the lowland valleys of Yunnan. Opium was formerly an important crop in Yunnan and Kweichow, and though for a time it disappeared from the trade returns, it is once more being extensively cultivated. Tea is grown to some extent in Yunnan and Kwangtung, but, while the product of Yunnan is still sought after in Tibet and parts of China, that of Kwangtung is now of little account in the world's markets, and Canton has practically entirely lost the tea trade for which it was once so famous. Yellow silk is obtained from Yunnan and white silk from Kwangtung; the latter is one of the chief silk-producing provinces of China, but its product is inferior in quality to the best of that from Kiangsu and Chekiang. Sugar-cane is largely grown in Kwangtung, particularly in the Tung-kiang valley,

but the output is decreasing as a result of Javanese competition. Among other products may be mentioned cotton, which is grown but not to a great extent, cassia, ramie, tobacco, ground-nuts, and spices.

The mineral wealth of the region has as yet been exploited only in a superficial way. Coal is widely distributed and is mined in various places, but the output at present is mainly from Kwangtung, where there are deposits at Shaochow on the Peikiang, and in the vicinity of Canton; iron, copper, lead, zinc, as well as gold and silver, are also found. Tin is worked on an extensive scale by native and modern methods at Kochiu, near Mengtsh in Yunnan. The industry, which is said to have given employment to 200,000 men during the War, is handicapped by the fact that tin locally smelted is not uniformly pure and has to be sent to Hong Kong for further treatment. Quicksilver is obtained in Kweichow and antimony in Kwangsi and Kwangtung. Attempts have been made to open up the mineral wealth of the country by foreign capital and on modern lines, but so far they do not appear to have met with much success, and will probably not do so until communications, especially in Yunnan, have been much improved.

The manufactures of the region, which are not of great importance except in Kwangtung, include the production of silk and cotton goods, the preparation of tea, paper-making, and a few other industries of a similar nature. Canton, and Fatshan a little farther up the Sikiang, are great industrial centres, and they and the surrounding districts manufacture cotton and silk goods, fireworks, leather, tobacco, matting, and a great variety of articles of minor importance.

The Sikiang with its tributaries is the great means of communication in the region which it drains. During periods of high water the main stream is navigable by steamers as far as Wuchow, on the borders of Kwangsi, but at other seasons of the year only smaller boats can get as far as that town. Hence, there has been a great development of the use of motor-boats both on the main river and on its tributaries, and by means of these not only Kwangtung and Kwangsi, but to some extent the south of Kweichow and the east of Yunnan, are enabled to trade with Canton. That city is situated on a distributary of the Sikiang, and owes its importance as a commercial centre to its position. It is connected

by waterways with almost every part of the fertile and well-populated province of Kwangtung, and has trade relations, not only with the remainder of the basin of the Sikiang, but with that of the Yangtze. On the other hand, it is in easy communication with Hong Kong, and large ocean-going steamers are able to ascend the river as far as Whampoa, twelve miles below the city. Railways are beginning to move outwards in different directions. One line connects Canton with Kowloon, opposite the island of Hong Kong; another runs to Samshui, at the confluence of the North River with the Sikiang; and the railway to Hankow has been completed as far as Shaochow, 140 miles from Canton. Other ports of this region include Wuchow, which is now the entrepot of Kwangsi; Samshui, which taps the trade of the North River; and Kongmoon, which serves the district north and west of Macao. Nevertheless, Canton continues to prosper, largely as a result of the efforts of its inhabitants, who are among the most energetic and industrious people in China.

The west and north of Yunnan are difficult to reach by way of the Sikiang, and a large proportion of the goods imported into these districts comes from Burma through Tengyueh to Tali-fu, whence it is distributed over the country, some of it even finding its way northwards into Szechwan. The route from Burma is a mule track, and the carriage of goods along it is both tedious and costly, but it has not suffered as much as was expected by the competition of the French railway from Haiphong in Tongking to Yunnan-fu by way of Mengtsz, chiefly owing to the high freights charged on the railway. Various schemes have also been suggested for connecting some Burmese river-port by rail with Tali-fu, and Yunnan-fu with Chengtu, but it is unlikely that anything will be done in either direction in the immediate future.

Great Britain, France, and Portugal have each a foothold in the province of Kwangtung. To Great Britain belongs the island of Hong Kong and the leased territory of Kowloon on the mainland. Portugal possesses Macao, and France has for some time had control of Kwangchow-wan. Hong Kong, which is a free port and has an excellent harbour, performs the same functions as a collecting and distributing centre for southern China that Shanghai performs for central and northern China. It is also engaged in sugar refining and other industries. Macao has lost much of the importance

which it formerly possessed, and Kwangchow-wan has not yet developed much trade of its own.

MANCHURIA.¹ To the east of the Mongolian plateau, which is bordered by the Great Khingan range, lies the Manchurian lowland, drained in the north by the Amur, in the centre by the Sungari and its tributary the Nonni, and in the south by the Liao. Farther east are the mountains of eastern Manchuria, which pass southwards into the Liaotung peninsula. The central part of the lowland is a great plain, much of which is under 500 feet, but in the east and west it rises towards the bordering mountains, and in the north it passes into a broken region of hill and mountain, in which the Little Khingan is a well-marked feature. Manchuria, which before its recent seizure by Japan formed an integral part of the Chinese State, extends north to the Amur and east to the Ussuri; on the north-west it crosses the Great Khingan and occupies a small part of the Mongolian plateau. The climate is continental in type and not unlike that of Central Canada, though the summers are distinctly warmer; in January the temperature ranges from 25° F. at Dairen to - 1-7° F. at Harbin; while in August the temperature of Dairen is 75-6° F., and in July that of Harbin is 72° F. The rainfall is more than 25 inches in the south of the plain and less than 20 in the north. The plain is a typical grassland, but the mountains are forested.

Manchuria, a steppeland formerly occupied by pastoral tribes of Manchu stock, is now an important agricultural region with a population of over 25,000,000, the great majority of whom are Chinese. With a soil and climate suitable for the cultivation of cereals and soya beans, with a developing railway system, and with, for years, a greater freedom from the ravages of civil war than the remainder of China, Manchuria offered a field for emigration to the peasantry of Chihli and Shantung, of which full advantage has been taken. In the industrial development of South Manchuria, that is of the province of Liaoning,² Japan has played a great part, especially in Kwantung, the territory leased to it in the south of the Liaotung peninsula, and along the South Manchurian Railway; but the Japanese have not succeeded in colonizing

¹ Manchukuo, as a separate State under Japanese control, has not yet been recognized either by China or by the Great Powers (July, 1933).

² Formerly known as Fengtien.

the country, and their number, less than a quarter of a million, is insignificant compared with the influence which they seek to exercise.

The crops include several varieties of millet, the most important being "kaoliang" or great millet, (*Sorghum vulgare*), which is the staple food of the people. Wheat, barley, and buckwheat are grown, especially in the north; and rice and maize are cultivated to some extent in the south. The area under soya beans has increased greatly within the last twenty-five years and will probably continue to do so for some time to come, as the northern districts, where climatic conditions favour the growth of the best beans, are gradually being brought under cultivation. The soya bean can be utilized in a great variety of ways. For human food it is converted into a sauce, or worked up as a paste, or made into bean curd; it can also be used as a table vegetable or converted into a kind of confectionery. The oil which is extracted from it is used as an illuminant, and as a lubricant, and also enters into the manufacture of a variety of articles, such as waterproofs, umbrellas, varnish, and ink; while in Europe, to which it has for some time been imported in increasing quantities, it forms an important constituent in the manufacture of soap. The refuse from the beans after the oil has been extracted is given as food to cattle or is used as manure. The cultivation of opium on a large scale seems at present to be confined to the hill country round Kirin and to the Mongolian borderland, where, partly owing to the distance from the coast, farmers find it more profitable than other crops. Wild silk is obtained in considerable quantities in that part of Liaoning in which the hills slope towards the south. Ginseng (*Panax ginseng*), which the Chinese believe to have valuable medicinal qualities, grows both in a wild and in a cultivated condition. The cultivation of sugar-beet and the manufacture of sugar have been undertaken on a large scale, but without conspicuous success, under the auspices of the South Manchuria Railway, which is controlled by Japan. Cotton has become a crop of some importance along the railway leading to Mukden from Peking and Dairen, and tobacco is grown everywhere, the best varieties coming from the district around Kirin.

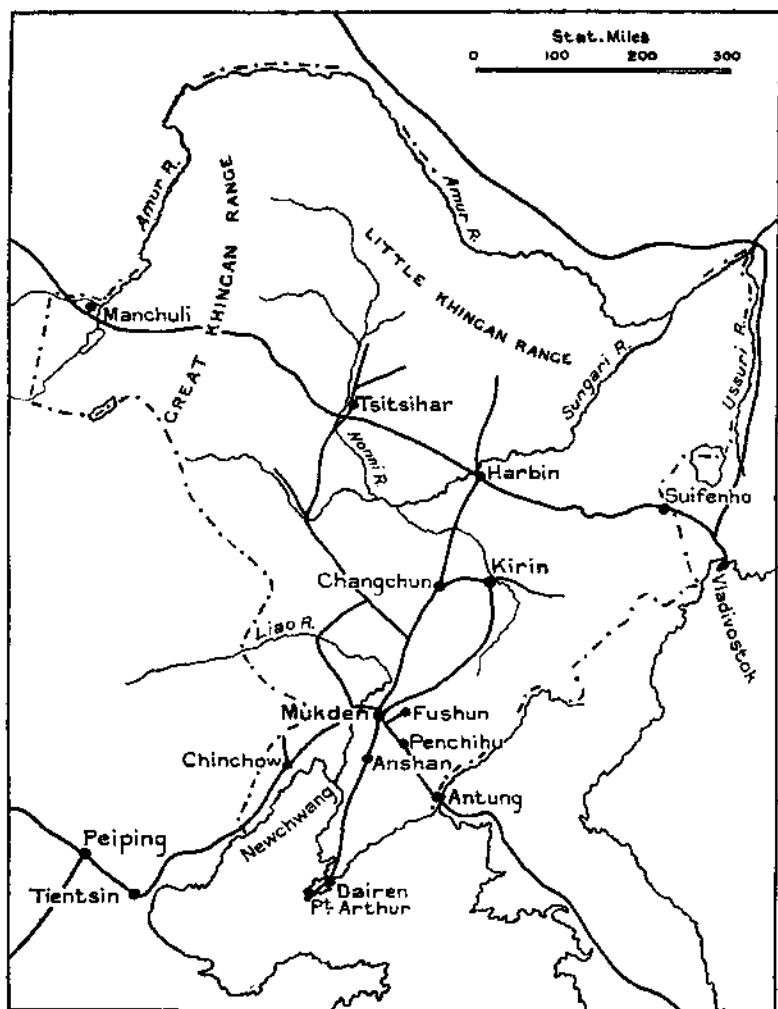
Trapping is carried on in the mountains and forests of the north, where bears, leopards, tigers, sables, and squirrels are all found,

In these districts, also, there are thousands of farms where dogs and goats, which have developed magnificent coats of hair to protect them from the cold of winter, are reared for the sake of their skins.

The mineral wealth of Manchuria is gradually being developed. Gold is worked by native methods in several places, but the output is not great. The principal productive coal mines, which are situated at Fushun, near Moukden, and are owned by the South Manchuria Railway, have an annual yield of about 7,000,000 tons of bituminous coal. Iron occurs in various places, but the most important deposits discovered so far are at Anshan, on the railway from Moukden to Dairen. Here a Sino-Japanese company, in which the South Manchuria Railway is largely interested, has established an important ironworks. Coal is obtained from Fushun and Penchihu (south of Fushun), and limestone occurs in the neighbourhood. As yet, however, the results have been somewhat disappointing, and the chief product is pig-iron exported to Japan.

The progress which Manchuria has made in modern manufactures during the last few years is most marked in the southern part of the Liaotung peninsula and in the zone of the South Manchuria Railway. At Newchwang, Harbin, and Dairen there are numerous mills for the extraction of oil from soya beans and the manufacture of bean-cake. Chinchow-fu, in Liaoning, is the chief centre where carpets and rugs are made from camel's-hair and sheep's wool imported from Mongolia, but it will probably suffer from the competition of Moukden, where mills for spinning and weaving Mongolian wool have recently been established. Fushun manufactures ammonium sulphate as a by-product of its mines, and has begun to refine zinc, the ore being imported from Australia; while from the shales which have been removed from the open cut coal mines oil is now extracted. Cotton mills have been built at several points along the South Manchuria railway; their success will probably depend upon the extent to which cotton can be grown in the Moukden region. Antung is of growing importance as a silk-reeling centre. Much of the millet grown in the north is too far from good lines of communication to enable it to make its way to the coast, and it is disposed of to distilleries and breweries in Harbin.

The development of Manchuria in the past has been much retarded by the absence of good means of communication. The



MANCHURIA

roads, which were badly made, were impassable quagmires during the rainy season, and were only available for heavy traffic when they were frozen hard during the winter months. Within the last few years, however, there has been a marked increase in the mileage of roads suitable for motor traffic. The Liao, on the other hand, offers a good means of penetration into the interior during the summer, but is ice-bound in winter. In these circumstances railways are invaluable. The trans-Siberian route to Vladivostok is carried across Manchuria by the Chinese Eastern Railway under Sino-Russian control; it runs from Manchuli on the western frontier, by Harbin, to beyond Suifengo on the eastern. From Harbin there is a branch to Changchun, whence the South Manchuria Railway, under Japanese control, runs to Dairen and Port Arthur. Moukden is connected with Tientsin and Peking by the Peking-Mukden Railway, and with Antung by a line which is continued through Korea to Fusan. Newchwang is linked up by short branches with the lines from Moukden to Tientsin and to Port Arthur.

The two principal ports, Newchwang and Dairen, compete with one another. The former is situated at the mouth of the Liao river, and has the further advantage of offering a shorter land route than Dairen into the interior. On the other hand, it is ice-bound during the winter months, and it has to some extent been silted up, though steps are now being taken to remedy this defect. Dairen, to the east of Port Arthur, in the leased territory acquired from Russia at the conclusion of the Russo-Japanese war, is open all the year round; and the longer land route which it involves to the interior is compensated for, to some extent, by favourable rates on the South Manchuria Railway, and still more by the efforts the Japanese are making to develop the port, the trade of which is now much greater than that of Newchwang.

EASTERN TURKESTAN

Sinkiang or Eastern Turkestan includes two distinct regions, The first of these, sometimes called Kashgaria, consists in the main of the basin of the Tarim, which is surrounded on three sides by the Kunlun, the Pamirs, and the Tien Shan. The climate is arid and the greater part of the country enclosed by these mountains is covered by the shifting sands of the Taklamakan desert. Cultivation is mainly confined to the oases formed by streams which

descend from the snow-covered ranges around, but with few exceptions lose themselves as they approach the desert. The principal products are cereals, including wheat, barley, and rice, cotton, and fruits. Horses, camels, sheep, and goats are also raised in considerable numbers by the Kirghiz and other nomadic folk. The more important towns, Kashgar, Khotan, and Yarkand, contain bazaars in which are sold carpets and cotton, woollen, and silk goods, the chief manufactures of the people, together with textiles and other commodities imported from India and Russia.

The second region lies between the Tien Shan and the Altai. Much of the land is exceedingly poor, and it is only in the vicinity of the rivers, and especially in the valleys of the Ili and Manass, that cultivation and settlement are possible. The northern slopes of the Tien Shan provide considerable areas of good pasture land. Urumchi, the chief town, trades in skins and furs. Kuldja, the only other town of note, is on the Ili.

Formerly, all trade between China and the west went through Turkestan. At present the most frequented route passes by Lanchow and Ansichow in Kansu, and Hami in Turkestan, to Turfan and Kashgar. From Hami one branch crosses the Barkul Pass and from Turfan another turns the Bogdo Ula to reach Urumchi, whence the route runs by Kuldja to Bukhara. From Ansichow an ancient road to Kashgar, still used, links up the oases to the south of the Taklamakan. From Kashgar one trade route leads westward by the Terek Pass to Andijan on the Trans-Caspian railway; and from Yarkand another goes southward by the passes of the Karakoram to Leh in Kashmir.

TIBET

The greater part of the high Tibetan plateau is of little economic importance, and is only frequented during the summer months by a few nomad tribes. In the south, in the valleys of the Indus and Brahmaputra, and in the south-east, in the valleys of those rivers which flow from the Tibetan plateau through China and Indo-China, cultivation is possible, and it is there that settlement has taken place. The principal agricultural products include the hardier cereals, vegetables, and fruits, but the chief wealth of the people is to be found in their herds of goats, sheep, asses, and yaks. Mineral wealth appears to be considerable, and gold

has long been extensively worked by primitive methods. Trade, which is carried on mainly with China but to some extent with India, consists in the export of wool, musk, borax, and hides, and in the import of tea and cotton goods. The principal routes from China lead to Lhasa from Chengtu in Szechwan, by way of Tachienlu and Batang, and from Sining-fu in Kansu, by way of Donkyr and the Tangla Pass. From India the chief road is by Sikkim and the Chumbi valley to Gyangtse.

MONGOLIA

Mongolia includes parts of two of the great physical regions of Asia. The north-west of the country consists of the Altai and other mountains which belong to the Central Asian Highlands, while the remainder forms the Mongolian plateau, which has an average elevation of 3,000 to 4,000 feet, and is part of the region of relative depression north of the folded Kuniun mountains. The whole country has an extreme climate, the summers being hot and the winters cold. In the desert of Gobi, in the south, the annual rainfall is less than 10 inches, but in the remainder of the country it is generally sufficient for the growth of grass on the plateau, and of coniferous trees on many of the mountain slopes. Hence the people are almost exclusively confined to pastoral pursuits, and possess great numbers of horses, cattle, sheep, and camels, with which they wander, each group within its own territory, ever on the search for fresh pasture. Inner Mongolia, which lies between China Proper and Manchuria on the one hand and the Gobi Desert on the other, has a somewhat better climate; unlike Outer Mongolia, which is now independent, Inner Mongolia is under Chinese control, and is attracting large numbers of Chinese settlers, who engage in agriculture in the more favoured localities, especially in those in which irrigation is possible. Towns are few, and Urga alone is of any importance. Formerly, the tea sent from China to Russia was carried by Mongol caravans from Kalgan to Kyakhta, but since the opening of the trans-Siberian line most of it has gone by rail. The exports of Mongolia consist of pastoral products, which are sent to China, tea, cotton, and miscellaneous articles being received in exchange.

FOREIGN TRADE OF CHINA

The following tables show the value of the foreign trade of China

in millions of Haikwan taels, and the chief importing and exporting countries for the three years 1928-29-30—

			Imports	Exports	Average value of Haikwan tael
1928	..	..	1,196	991	2s. 11 ¹ / ₁₆ d.
1929	..	..	1,266	1,016	2s. 7 ¹³ / ₁₆ d.
1930	..	..	1,310	895	1s. 10 ¹¹ / ₁₆ d.

Imports from	Percentage of total imports	Exports to	Percentage of total exports
Japan	25	Japan	24
United States ..	17	Hong Kong ¹ ..	17
Hong Kong ¹ ..	17	United States ..	13
Great Britain ..	9	Great Britain ..	6

The annual value of the exports of China for the five years 1908-12 averaged £48,000,000, while the average value of the imports for the same period was £61,000,000. Between 45 and 50 per cent of the value of the exports was made up of raw and manufactured silk, soya beans, bean-cake and bean-oil, and tea. Raw cotton, sesamum, hides, straw braid, and tin were also important articles of export, and together accounted for about one-seventh of the total value. During the two years 1929 and 1930 over one-third of the exports consisted of silk and soya bean products. China ranks next to Japan as a silk-producing country, and her output might be greatly increased both in value and amount were improved methods of rearing the silkworm and manufacturing the silk more generally adopted. With the introduction of the soya bean and its products into Europe and Japan during recent years the trade in it has rapidly developed, and it holds the second place among the exports of the country. Before the war tea was exported to Russia and also to the United States, but the British market had been almost entirely lost, chiefly owing to the failure of the Chinese to provide a tea at once good and cheap; at various times during the last few years the Russian market has also been closed, and

¹ Many of the imports and exports of Great Britain go by way of Hong Kong.

Chinese trade has suffered accordingly. Chinese cotton is sent to Japan, where it is preferred to Indian, as it is whiter. On the other hand, Indian cotton is imported to China, for the mills at Shanghai, where it is in demand, as it gives a better staple than Chinese. There is still a considerable export of Chinese cotton, notwithstanding the greater consumption within the country itself. Eggs, wheat and flour, and coal figure more prominently in the trade returns than hitherto, and now contribute over one-tenth to the total value of the exports.

Before the War the principal imports of China consisted of cotton goods, opium, rice, oil, sugar, metals, minerals, railway plant, fish, and coal. During the three years 1910-11-12 these accounted for nearly two-thirds of the total value of all goods brought into the country from abroad. Almost 30 per cent of the imports consisted of cotton goods from the United Kingdom, Japan, India, and the United States. The United Kingdom supplied the bulk of the piece goods, though Japan and the United States shared the trade in plain, grey sheetings, and Japan was gaining control of the market in drills. The extent to which the Japanese have been able to improve their relative position during and since the War is indicated by the fact that, whereas in 1913, of all the piece goods imported into China, 56 per cent, according to value, were manufactured in Britain, while 18 per cent came from Japan; in 1929, 22 per cent were from the former country and 66 per cent from the latter. In 1913, again, yarn was obtained mainly from India, but in 1930 rather more than one-third of that which was imported was spun in Japan. In China hand labour is still in many respects cheaper than machine labour, and much of the imported yarn is used along with Chinese cotton in the domestic manufacture of a rough but durable cotton fabric. Among other imports may be noted mineral oil, sugar, iron and steel goods, machinery, and railway plant. The first of these, which comes chiefly from the United States, Sumatra, and Borneo, has grown greatly in favour with the Chinese and has largely displaced vegetable oils as an illuminant. Sugar is imported from Java and the Philippines, and iron and steel goods, machinery, and railway plant from Great Britain, the United States, Canada, and Japan.

JAPAN

THE five large and four thousand small islands which form the nucleus of the Empire of Japan are the remains of a great mountain system lying off the east coast of Asia, with which they were once connected. Their total area is about 161,000 square miles, or one and a third that of the British Isles. The largest is Honshu, which contains about 54 per cent of the total extent of the country, and is the centre both of its political and economic development. The physical configuration and structure of this island are extremely complicated. In Honshu, a midland valley, which in the south-west includes the Inland Sea, runs parallel to the general direction of the island; in places it is crossed by transverse fractures, and in the neighbourhood of these it is frequently interrupted by great volcanic outpourings, the most important of which form the Japanese Alps in the centre of Honshu. To the east of the valley lies a folded range of Palaeozoic rock, while to the west of it another range, likewise of Palaeozoic rock, contains many mountains of volcanic origin. Between these different mountain ranges and along parts of the coast, there lie numerous plains of recent origin, the most important being the Kitakami plain between the central and eastern ranges of the north, the plain of Niigata¹ on the west coast, the Kwanto plain, the largest in the country, round Tokyo, the plain round Nagoya and Gifu to the west of the meridional mountains in central Honshu, and the Kinai plain, which contains the cities of Kyoto and Osaka. In Shikoku there are several plains of limited extent, while in Kyushu the most important is that of Tsukushi in the north of the island.

Of the other parts of the country, Yezo, renamed Hokkaido, is very mountainous, owing to the fact that two ranges appear to cross one another, the schist range of Sakhalin and the volcanic range of the Kuriles. Formosa, acquired from the Chinese in 1895, is somewhat larger than Kyushu. A high mountain range composed of ancient rocks extends along the eastern part of the island, while

¹ Formerly Echigo.

the west consists generally of an undulating, fertile plain of Tertiary and later times.

CLIMATE. The climate of the Japanese Islands shows considerable variations from north to south and from east to west. This is due to a combination of circumstances—the great latitude over which the islands extend, the position of different regions with regard to the Asiatic land mass, and the influence of the sea with its warm and cold currents.

Although the heat of summer and the cold of winter are alike less extreme than on the corresponding parts of the coast of Asia, the proximity of that continent exercises a considerable influence. During the winter, when anti-cyclonic conditions predominate, cold winds blow outward from Siberia in a south and south-easterly direction, and strike the west coasts of Japan. On the other hand, the mountainous backbone of the country shelters the land lying to the east of it, and partly for this reason the east coast is warmer than the west in winter. During the summer months Japan lies within the monsoon area, and southerly winds prevail. The heaviest rainfall, therefore, occurs at this season, although to the north-west coasts considerable precipitation is brought by the continental winds of winter which pick up moisture as they blow across the Sea of Japan.

The influence of warm and cold currents in the surrounding seas, though probably not so great as was at one time believed, must not be altogether neglected. The warm Pacific current, or Kuro Siwo, bifurcates to the south of Japan and washes both its eastern and western shores. The eastern and stronger branch follows the direction of the coast as far as latitude 38° N., after which it bears away across the Pacific, while the western and weaker branch enters the Sea of Japan by the Tsushima Strait, and leaves it by La Perouse and Tsugaru Straits in the north. The latter probably partly accounts for the fact that the west coasts are not colder than they are during the winter months, and the former may tend to increase the heavy rainfall on the south-eastern coasts during the summer months. A cold current from the north, passing along the eastern coasts of Hokkaido and Honshu as far as latitude 39° N., tends to lower the temperature of these coasts, especially during the summer months.

In Hokkaido the winter is long and cold, and during it the mean

temperature is below 32° F. for several months, but in summer in the wanner districts it may for a time be as high as 70° F. Somewhat similar conditions prevail in the northern part of Honshu, though the cold of winter is less and the heat of summer somewhat greater. Over the remainder of that island, except along the south coast, the winter mean in the lowlands is between 32° and 40° F.; the west coasts are notably colder than the east for reasons already stated, but in both regions the snow often lies upon the ground. The mean temperature for the summer months is about 75° F. on the plains. Along the southern coasts of Honshu, in Shikoku and Kyushu, sub-tropical conditions prevail, the winter mean is over 40° F. and the summer mean between 75° and 80° F. Formosa has a tropical climate except in the highlands.

The rainfall is considerable over the greater part of Japan. In the south and north-west of Honshu, as well as in the south of Shikoku and the whole of Kyushu, it is generally over 60 inches, and in places over 80, while in the interior and on the north-east coast it is between 40 and 60 inches. In Hokkaido it is between 30 and 40 inches, except along the west coast, where it is higher, and in the north-east, where it is lower. Formosa has from 80 to over 100 inches.

VEGETATION. The forests of Japan belong to several distinct types, the distribution of each of which is determined by the climatic conditions just described. The temperate forest extends over Honshu, north of the thirty-seventh parallel, and over the whole of Hokkaido. In the north of the latter island coniferae alone are found, but farther south coniferous and deciduous trees intermingle. Among the principal species of this forest are varieties of the pine, maple, oak, beech, chestnut, and ash, and these are also found at higher altitudes farther south.

Over southern Honshu, Shikoku, and Kyushu, the prevailing type of vegetation is the sub-tropical rain-forest, in which deciduous and broad-leaved evergreen trees intermingle. Camphor, magnolias, and several varieties of oak and pine are characteristic of the region. In Formosa the forest is tropical, and the banyan, the bamboo, and the camphor tree are among its chief products.

NATURAL REGIONS. It is difficult to divide Japan into natural regions owing to the way in which uplands and lowlands are distributed, and to the still undeveloped condition of much of the country,

but certain broad distinctions may be drawn. Hokkaido differs greatly from southern Honshu, and still more from Shikoku and Kyushu, while northern Honshu occupies an intermediate position between the regions lying north and south of it respectively. Formosa, again, is partly within the tropics and its products are of a tropical nature.

GENERAL CONSIDERATIONS. Owing to the irregular topography of the country the cultivable land is very limited, and does not exceed 16 per cent of the whole area. As Japan for long supported a population at least half as great as it now is, without importing food supplies from abroad, it is obvious that cultivation must have been very intensive in character. Agricultural holdings were generally small, but the farmer and his family supported themselves by engaging in one or other of various subsidiary employments. What manufactures there were, were therefore chiefly carried on as domestic industries, and the modern factory system did not exist. Since Japan within recent years became a food importing country, various attempts have been made to increase still further the productivity of the soil, and, at the same time, to extend the margin of cultivation by bringing in land hitherto believed to be useless.

In explaining the industrial development of Japan, due regard must be had not only to the geographical conditions of Japan itself, but to certain mental and moral characteristics of the Japanese people. Animated as they were by a desire—in which patriotic and religious motives were combined—to make their country independent and respected, they entered on their task with all the energy which they had accumulated during their long period of seclusion from the rest of the world. Their material progress was facilitated by the mineral resources of the country, more especially coal; its climatic conditions, which favoured the production of certain raw materials such as silk; its abundant supply of cheap labour, afforded by a large population accustomed to a frugal life; and its proximity to China and other eastern countries, offering alike sources of raw material and markets for manufactured goods. The industrial advances which have been made during the last fifty years are remarkable, but it is, nevertheless, doubtful whether Japan will ever become a great manufacturing country. Its mineral resources are, in some respects, inadequate. At the present rate of consumption the actual reserves of coal will be used up in little more

than fifty years, and the value of the probable reserves is, as yet, unknown; iron ore is not abundant and has to be imported from abroad. With the exception of silk and copper, Japan is by no means rich in raw materials; and the economic development of China, with its great resources—a not unlikely contingency—would not only check the growth of the cotton and silk industries, at present the most important in Japan, but might tend to deprive the latter country of its most promising market for manufactured goods of various kinds.

HOKKAIDO, which measures just over one-fifth of the whole country, consists to a great extent of forest-covered mountains. Up to the present, settlement has taken place mainly in the south-west in the valley of the Ishikari, and in the south-east in the valley of the Tokachi, where there are lowlands of considerable size. The relatively unfavourable conditions of soil and climate have prevented the growth of a large population, and, although the number of inhabitants has more than trebled within the last thirty years, it is even now only about two and a half millions, while the density is only 70 to the square mile as against 405 to the square mile in the whole of Japan. The cultivated land amounts to less than 10 per cent of the total area, and on it the chief crops consist of peas and beans, although some rice and other cereals are also grown. It is believed that there are considerable areas which might be converted into useful pasture land, and the raising of cattle for meat and dairy produce has made a good start. The export of timber is a rapidly growing industry, hard woods being obtained in the centre and south of the island and soft woods in the north. The coal mines of Hokkaido, and more especially those near Yubari in the province of Ishikari, are being developed, and now produce about 4,000,000 tons of coal annually. Other minerals also occur, but none is as yet of much importance. Fishing is still one of the chief industries of the island.

Hakodate is the chief town of the island, mainly as a result of the fact that it is situated on a good harbour in the peninsula, which is the nearest part of Hokkaido to Honshu; but the difficulties of communication inland, and the proximity of Otaru and Muroran to important producing centres, have led to a relative decline in its trade. Otaru, situated near the mouth of the Ishikari river, serves the chief agricultural districts, and is also the principal timber port

of the island, while Muroran, lying to the east of Volcano Bay, is the outlet for the coal mines. Large steel works have been constructed in the vicinity of the latter town, and it is hoped to utilize the magnetic iron in the sands of Volcano Bay. Kushiro, which is connected by rail with the Tokachi valley and exports timber, will probably become the chief port of south-eastern Hokkaido.

HONSHU, SHIKOKU, AND KYUSHU. Northern Honshu is in some respects very different from the remainder of this region. Its climate and vegetation are intermediate between those of Hokkaido and southern Japan, and, while rice is grown throughout the whole area, the mulberry and tea plant are not extensively cultivated farther north than central Honshu. In the north, moreover, the land yields only one crop each year, apart from inter-culture, while in the centre two crops, and in the south three, may sometimes be obtained. The density of population is 260 to the square mile in the northern region as compared with 550 in the southern, and the latter also contains the chief mines, factories, and towns. As, however, there are numerous points of resemblance between the two regions, they may be taken together.

The agricultural land of Japan consists in part of low-lying plains, generally covered by recent alluvium, in part of upland districts, which can be cultivated, and in part of high plains and pastures. Rice, the staple food of the people, occupies about one-half of the cropped area, but as irrigation is practically essential, its cultivation is mainly confined to the low-lying plains or to the lower slopes of the hills, where terrace agriculture is possible, and very little is grown in the upland districts. The most productive areas are in the south, where the temperature is high and the rainfall abundant; in the north-east of Honshu the drier summers are more suitable for the cultivation of such cereals as wheat and barley. About one-third of the paddy fields can be drained and bear a second crop, and these, along with the upland districts, are mainly cultivated with barley, wheat, beans, potatoes, and millets. On the high plains and pastures, which are uncultivated, a certain amount of stock is raised, but pastoral farming is not yet, and perhaps never will be, an important industry in Japan. For centuries the teachings of Buddhism restricted the people to a vegetarian diet, and even yet little meat is consumed (in 1928, for example, only 1,100,000 animals were slaughtered, and of these over 700,000 were pigs).

A further drawback is the fact that the bamboo grass which covers wide areas is not only injurious to sheep, but crowds out imported forage grasses. Nevertheless, considerable attention is now being given to the improvement of the existing breeds of horses, cattle, and sheep.

Next in importance to the production of food comes the cultivation of the mulberry and the rearing of the silkworm, pursuits which are chiefly carried on in the upland districts of central Honshu. Farther south, much of the land is more suitable for rice, while in the north the danger of frost renders a spring crop of mulberry leaves uncertain. The trees are planted either in fields or in hedges, and the area cropped in this way is gradually extending. Three crops of leaves are obtained annually, the spring crop being the most important. The rearing of the silkworm demands considerable skill and labour on the part of the farmer, who has been aided within recent years by the assistance of Government experts. Since 1885-9 the output of cocoons has increased about ninefold; to this increase improved methods of hatching and rearing the silkworm have largely contributed. Formerly, the cocoons were reeled off at home by the farmers themselves, but, since the establishment of filatures on modern principles, the greater part of this branch of the industry has been transferred to them, with the result that the output of raw silk has improved both in quantity and in quality. Japan is now the principal silk-exporting country in the world, and it is estimated that about one-third of the agricultural population is engaged in sericulture as a subsidiary employment. The large supply of cheap labour thus provided is an important factor in the success of the industry; attempts to produce raw silk in the United States had to be abandoned on account of the cost, and even in Italy people were for a time seeking more profitable employment than that afforded by the gathering of mulberry leaves.

The tea-plant is grown chiefly in central and southern Japan, generally on the lower slopes of hills, though, where there is good drainage, it also thrives on level plains. Japanese teas are said to be deteriorating, and although attempts have been made to check this retrograde movement in the cultivation of the plant and in the preparation of the leaf, the exports to the United States, the chief foreign market, are declining. Notwithstanding the large home consumption there is at present a steady fall in the area cultivated.

Among other plants grown are flax, hemp, rape, and rushes. The cultivation of cotton and indigo is declining. The manufacture of tobacco is a State monopoly, and of late years the area planted has been restricted in order that more attention might be given to improving the quality of the product.

The extensive use of fish for food in Japan, though partly resulting from the religious ideas of a people who do not eat meat, is also accounted for in part by the distribution in the surrounding seas of warm and cold currents, which contain a great variety of species, and in part by the many indentations of the coast, which provide suitable facilities for the fishing industry. Over 700,000 people make fishing their sole occupation, and a number nearly as great follow it in addition to agricultural or other pursuits. With the better internal communications the home demand has increased, while the recent improvement in fishing vessels has led to a much larger supply than before. Among the principal fish caught are herring, sardines, bonito, mackerel, and yellow-tail. Japan has also a number of vessels engaged in whaling and sealing in the North Pacific.

The mineral wealth of the region under consideration is considerable, but it has as yet been only partially exploited, and its full extent is unknown. Gold and silver occur chiefly in the sedimentary and eruptive rocks of Tertiary age, but the total production is not great, and the value of the annual output of the two combined is little more than £2,000,000. Copper is much more important and is obtained from nearly every geological formation; it is found chiefly in veins in the inner mountain zone, and embedded in sedimentary rocks in the outer zone. The chief producing districts are in Akita and Tochigi in Honshu, and Ehime in Shikoku, but the industry appears to be suffering from the competition of the United States and the Belgian Congo, and the output which in 1916 and 1917 exceeded 100,000 tons was in 1929 little over 75,000 tons. Iron ore, including both magnetite and hematite, is fairly well distributed throughout the region. The most important deposits of each occur in the Palaeozoic limestone along, or near, its contact with the eruptive rocks. But the total resources of the country are not great,¹ and the only mines of importance operated at

¹ Estimates of the total resources vary widely. *The Japanese Year Book* estimates them at 5,000,000 tons, but Foster Bain, quoting Japanese authorities, gives 80,000,000 tons—one-half of which may be utilizable.

present are situated near Kamaishi, in the province of Iwate, in the north of Honshu. The annual output does not meet the home demand, and Japan obtains the greater part of the iron ore it requires from China, Korea, and the Straits Settlements.

The most important mineral in Japan is coal. Its distribution is widespread, but it occurs chiefly in the Mesozoic and older Tertiary rocks, and it is not found in those of Carboniferous age. The coal in the Mesozoic strata, insignificant in amount, is mostly semi-anthracitic in character; in the older Tertiary rocks it ranges from lignitic to bituminous, and in the younger Tertiary formations it is generally lignite of poor quality. It is among the older Tertiary rocks that the chief coal mines of the region have been located. The most important are those in the north and west of Kyushu, which produce over two-thirds of the total output of 31,000,000 tons. In Honshu, the most productive mines lie along the Pacific seaboard to the north-east of Tokyo, and to that town the bulk of their output is sent. The actual reserves of coal in Japan have been officially estimated at 1,750,000,000 tons. Although the output of coal has more than doubled within the last twenty years, it is not keeping pace with the needs of the country, and since 1923 imports have on the whole exceeded exports. As the coal seams are generally thin, much labour is required, and the increase of wages in Japan since the Great War has placed the mining industry in an unfavourable position relatively to South Manchuria and China, from which the bulk of the imported coal comes. Moreover, the mines are not well situated as regards the chief manufacturing areas, which are becoming more and more dependent upon hydro-electric power, for the generation of which the physical character of the country provides ample facilities. Petroleum is found in various places, but practically the whole amount obtained at present comes from Akita and Niigata. The output is declining and about three-fourths of the amount consumed is imported.

In no respect is the recent development of Japan more marked than it is in regard to the industrial changes which have taken place. Old Japan, it is true, had its arts and handicrafts, many of which, such as the manufacture of porcelain and lacquer ware, had reached a high state of perfection. But the growth of industry on modern lines is typical of the great changes which were brought

about by the renewal of intercourse between Japan and the West, and by the social and economic revolution which resulted therefrom. If the old industries have not perished they have at least suffered, while, if the new have passed beyond the purely experimental stage, it is yet too early to predict with confidence the economic future of the country.

Of the more important industries the manufacture of silk has perhaps been least affected. Reeling, as already stated, is now mainly performed by machinery, but in the weaving of silk fabrics the hand-loom more than holds its own. Power-looms have been introduced, but they number less than 10 per cent of the whole, and must be regarded as in the nature of an experiment. Japanese manufactured silk consists largely of habutae, a simple cloth of undyed silk usually woven on the domestic loom ; the chief centres of production are Fukui and Kanazawa, in the west of central Honshu, and Kawamata in the north-east.

In Japan the spinning and weaving of cotton has made remarkable progress. In its earlier stages the industry was favoured by the cheapness of labour, the proximity of coal, the comparative ease with which raw material could be obtained from India and China, and the neighbourhood of the vast Chinese market for the manufactured commodity. At this stage, the bulk of the exports consisted of coarse yarn sent to China and India. But with the growth of the cotton industry in China, where the cost of labour has not risen to the same extent as in Japan, the export trade in the coarser yarns declined, and Japan has been forced to concentrate on woven goods and the higher counts of yarn. As a result, American cotton is more extensively used than formerly, labour is becoming more skilled, and night work has been abolished. The chief manufacturing districts are in and around Osaka, Kobe, Okayama, Nagoya, and Tokyo; and the total number of spindles is about 7,000,000.

The production of iron and steel within the country itself is making much slower progress. At Wakamatsu, in the north of Kyushu, the government has established large iron and steel works, and there are private concerns at Kamaishi and elsewhere. But the growth of the industry in Japan proper is handicapped by the high cost of fuel and the inadequate supply of raw material. Engineering establishments have sprung up in many towns, and

the Japanese are now able to do much of their own work of this kind, although they still import the more complicated and delicate machinery which they require. Shipbuilding is carried on at Nagasaki, Kobe, Osaka, near Tokyo, and at Ugo Bay near Okayama; and within recent years a number of iron and steel ships have been built at these ports.

Among the native industries in which the Japanese excel are the manufacture of cloisonné ware, porcelain, matting, and other articles of a similar nature made in the home or the small workshop.

FORMOSA, which has an area of about 14,000 square miles and a population of over 4,000,000, is being rapidly developed by the Japanese. The low-lying western part of the island is settled by people of Chinese origin, and the mountainous eastern part is occupied by aboriginal tribes, said to be of Malay stock. The products of the island are tropical and varied. The southern plains, which receive considerable moisture from the monsoon in summer but are dry in winter, are particularly suited to the growth of the sugar-cane. New varieties of this plant have been introduced by the Japanese, who also employ modern methods for the extraction of the sugar. The result is that the production has now greatly increased, though for the first few years after the Japanese occupation it fell off considerably. At the time of the cession the average export was about 29,000 tons per year, but, during the last two years for which statistics are available, it amounted to over 400,000 tons, and it is the hope of Japan to convert Formosa into another Java. Tea is grown in the northern part of the island. One variety, known as "oolong," is in considerable demand in the United States, to which much of it is exported. The production of camphor is a government monopoly. Formerly, the camphor tree grew all over the island, but, as a result of reckless destruction, it is now found only in the mountainous districts, where great numbers of young trees have been planted by the Japanese in order to replace those which had been cut down for the distillation of camphor. Formosa is the chief source of the world's supply of that commodity. Rice is the staple food of the people, and large quantities are produced on the western plains, whence there is a considerable surplus for exportation to Japan proper. The mineral wealth of the island is considerable, and gold, copper, coal, and petroleum are produced

in increasing quantities. The chief ports are Keelung in the north, and Takau in the south-west.

CHOSEN (KOREA). In the peninsula of Korea, as in Eastern Asia generally, the mountains tend to run parallel to the coast line. In the north, where they are a continuation of those of eastern Manchuria, they cut across the peninsula, but farther south they form an axis to it and divide it into two slopes, an eastern and a western.

On the east they present a steep escarpment to the sea from which they are separated by a narrow coastal plain, but on the west the slope is more gradual, the rivers are larger, and there are numerous valleys which contain much fertile soil. It is on the west accordingly that the bulk of the population is found. Climatic conditions are somewhat more favourable than in corresponding latitudes on the mainland, the winters being milder and the summers cooler. The rainfall occurs mainly in the summer, and is greater on the east coast than on the west.

The principal crops are rice, which is the staple food of the people, and cotton and soya beans upon which, along with rice, the economic prosperity of the people mainly depends. Under Japanese supervision the cultivation of American Upland cotton and sericulture have become important industries, and both are regarded as having a promising future. Ginseng is abundant, and its sale is a profitable government monopoly. Various minerals are found; iron ore is obtained in Whang-hai and South Pyong-an; there are smelting works in Whang-hai, and iron ore and pig-iron are exported to Japan. Gold is mined at Wonsan in North Pyong-an province, and in South Pyong-an anthracite is worked. Manufactures are mainly concerned with the supply of local needs. The communications of the country are improving. The principal railway is that which runs from Fusan to Antung, with branches to Seoul and Jin-sen. The exports include rice, beans, fish, raw cotton, and iron ore; while grain, cotton, and silk goods, oil, timber, sugar, coal and machinery are the principal imports. Fusan and Jin-sen are the chief ports.

The Koreans display little energy either in political or economic matters, and have usually been dependent on one or other of their neighbours. Their country was annexed by Japan in 1910, and for all practical purposes may be regarded as part of the Island Empire.

Its area is 85,000 square miles, and its population is 19,500,000, of whom less than half a million are Japanese.

COMMUNICATIONS. Owing to the mountainous character of the country, the development of means of communication in Japan has been slow. In feudal times the building of good roads was naturally not encouraged, and, although within recent years many improvements have been made, the condition of the highways is still unsatisfactory. One reason for the slow progress in this respect is that the attention of the government has been directed to the construction of railways, of which it has now nearly 9,000 miles, chiefly in Honshu. Tokyo is connected with Kyoto and Kobe, and with Shimonoseki in the extreme west, by lines which follow the coastal plains for the greater part of the way; and with Aomori in the north by two lines which run, one to the east and the other to the west of the Central Highlands. From Kyoto one railway goes north and west towards Shimonoseki, and another north-east to Niigata. There are in addition several branches running across the country connecting the different systems. In Hokkaido a number of lines have been built to develop its varied resources, and in Kyushu the coal-producing districts are connected with the coast. In Formosa a railway runs from Takau to Keelung, along the western plains.

The difficulties of communication by land, and the facilities for it by sea, have naturally encouraged the growth of a considerable mercantile marine. During the period of Japanese seclusion, the building of ships capable of making long sea voyages was prohibited, and the coasting trade was confined to small ships and junks. Since the war with China, and more especially during the European war, rapid progress has been made, and Japan had at the end of 1930 about 4,000,000 tons of steam shipping. Certain lines have regular sailings for China, India, Europe, and North and South America.

FOREIGN TRADE. The following table shows the value of the foreign trade of Japan for the three years 1929-31—

	Imports (in thousands of yen)	Exports	Rate of exchange (sterling to yen)
1929	2,216,000	2,148,000	Is. 10-751d.
1930	1,546,000	1,470,000	2s. 0-339d.
1931	1,235,000	1,147,000	2s. 1-943d.

The principal commodities imported or exported were as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Raw cotton ..	25-0	Raw silk ..	33-7
Grains, etc. ..	7-5	Cotton goods ..	19-0
Iron and steel ..	6-6	Silk tissues ..	7-2
Mineral oil..	5-2	Paper ..	1-9
Wool ..	5-2	Pottery ..	1-7
Machinery ..	5-2	Sugar ..	1-5

Raw cotton is imported mainly from the United States and British India, but small quantities come from China and Egypt. The grains include wheat from Canada, Australia, and the United States; and soya beans from Manchuria. The United States and Germany together supply about one-half of the iron and steel goods imported, Britain's share being less than that of either. Mineral oil comes mainly from the United States and the Dutch East Indies; wool from Australia; and machinery from the United States, Britain, and Germany. Raw silk, the chief export, goes mainly to the United States, while silk manufactures are more widely distributed, the chief purchasers being Australia, British India, the United States, France, and Britain. China and India are the largest markets for cotton piece-goods, but other Eastern countries collectively absorb a considerable amount. Paper and sugar are sent to China and pottery to the United States. Of the post-war changes, probably the most noteworthy is the extent to which Japan has developed its trade in cotton piece-goods not only with China, but with British India and the Dutch East Indies.

The relative position of the chief importing and exporting countries is as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
United States ..	28-7	United States ..	38-7
British India ..	12-1	China	16-0
China ..	10-3	British India ..	9-1
Australia ..	6-8	Dutch East Indies	4-5
Germany ..	6-6	Great Britain ..	3-6
Great Britain ..	6-1		

PORTS. The chief ports of Japan Proper are Yokohama, Kobe, Osaka, Moji, and Nagasaki. Yokohama, the principal port of the country, is situated near the entrance to Tokyo Bay, and serves the capital and the populous region surrounding it. As it is the great market for raw silk, it is also the port through which this commodity is sent abroad, and its export trade is accordingly large. As an importing centre it is surpassed by Kobe, the port through which is received much of the raw cotton and other material required for the manufacturing district of which Osaka is the centre. Through these two ports is conducted 75 per cent of the trade of Japan. Osaka is handicapped by the want of a good harbour for large ships, but carries on considerable trade with China and Korea, Moji is the chief port of Kyushu, and Nagasaki owes its importance to the coal found in its neighbourhood.

CHAPTER XXVIII

THE MALAY ARCHIPELAGO

THE islands of the Malay Archipelago are in the possession of European and American powers. The Greater Sunda Islands (Sumatra, Java, Bali, Borneo, and others), Celebes, the Moluccas, and the Lesser Sunda Islands (which stretch in a long chain from Lombok to Timor) belong to Holland, with the exception of the north of Borneo, which is under the protection of Britain, and the eastern part of Timor, which is owned by the Portuguese. The Philippines were ceded to the United States by Spain in 1898.

THE NETHERLANDS EAST INDIES

JAVA, along with Madura, has an area of 50,777 square miles. A series of volcanic mountains, running from west to east along the axis of the island, separates the lowlands of the north from the broken highlands and lowlands of the south. Volcanic mud or alluvial deposits cover a great part of the surface, and the soils derived therefrom are very fertile. On the lowlands the mean annual temperature approaches 80° F. with a very slight range throughout the year. Owing to its position, the island is alternately opposed to the north-west monsoon and the south-east trades. From the latter the northern lowlands are partly protected by the mountains, and have not only a lower annual rainfall—less than 80 inches over considerable areas—but a relatively dry season during the northern summer. As a result, the natural vegetation in these lowlands tends to be of the monsoon forest type in contrast to the selva, which is characteristic of the plains in the west and south; it is in the former region, accordingly, that population first attained its maximum density. The natives, of whom it is estimated there are 41,000,000, belong mainly to the Malay race, but in addition there are about 200,000 persons, classed as Europeans, many of whom, however, have been born in the East Indies. The control exercised by the Dutch Government at home, and by its representatives in Java, has enabled that island to become the most prosperous, as it is the most densely populated of all in the eastern seas.

There are two main types of agriculture in the island. In the one the native cultivator on his small holding—generally less than two acres in extent—is engaged in the production of food, chiefly for home consumption; in the other large estates of over 1,000 acres are managed by Europeans and worked by skilled native labour. Of the native crops rice is the most important, but, although a certain amount is still exported, a larger quantity of inferior quality has to be imported to satisfy the home demand. The secondary food crops of the native agriculturists include maize, millet, and cassava, and they also cultivate kapok, cotton, coco-nut palms, and ground-nuts. Of the products obtained from European plantations coffee was formerly the most important, but it now holds a relatively low place among the exports of the island. This is partly due to the fact that the output of *Coffea arabica* and *Coffea liberica*, which were at one time exclusively grown, has declined owing to leaf disease; *Coffea robusta*, introduced from the Belgian Congo, has only partially taken their place, and in quality is somewhat inferior to them. The cultivation of sugar, which is now the leading export industry of Java, is almost exclusively confined to the centre and east of the island, where, both to the north and the south of the main mountain range, there is a low rainfall during the harvesting season. The development of the industry has been very marked within recent years, and Java now stands second only to Cuba in the export of cane sugar. The bulk of the exports go to India, Hong Kong, and Japan. Tea has long been grown in Java, but the substitution of plants from India for Chinese varieties towards the end of last century led to a considerable increase in the area cultivated. The gardens are mainly situated in the west of the island, where the rainfall throughout the year is more regular than elsewhere. The British Isles, Australia, and the Netherlands are the principal consumers of Java tea; in the first of these countries, at least, it is chiefly used for blending with other varieties.

During the past ten years large plantations of *Hevea brasiliensis* have reached the productive stage, and rubber is now one of the chief exports of the island. It is grown mainly in the wetter districts of the south. The cultivation of tobacco is an old-established industry and is still of considerable importance, though less is now produced than formerly owing to the great extension of the area

under sugar. *Cinchona* plantations have long existed in the mountain districts, especially in the west. Partly owing to the favourable conditions under which it is grown, and partly owing to the superior methods adopted for the improvement of the bark, the Javanese product has practically ousted that of other countries from the world's markets. Other exports include cocoa, tapioca, and pepper.

The commerce of Java is carried on mainly from the ports on the north coast. Batavia is the seat of the Government, and through its harbour at Tanjong Priok passes most of the trade of the western part of the island. Semarang, an open roadstead, serves the central districts, and Surabaya is an important trading centre in the east. Tjilatjap, near the centre of the south coast, is protected by a small island from the south-east trade winds. These various ports are connected with one another by rail, and an extensive system of steam trams renders nearly the whole island accessible to trade.

SUMATRA. The island of Sumatra has an area of about 163,000 square miles and a population of 8,000,000. The west of the island is mountainous, and the east a flat, alluvial plain. Much of the latter region is still covered with dense forests, but within recent years there has been great economic development: large rubber plantations owned by European and American companies have been established on the east coast, mainly in the region opposite Malaya; while in the south, in Palembang, the cultivation of rubber by natives, Javanese peasants for the most part, has added greatly to the output of Sumatra, which now produces over one-half of the rubber of the Netherlands East Indies.* Along the east coast, also, the oil-palm is grown on European plantations, and palm-oil and palm-kernels are exported; other plantation crops include tea and tobacco. Pepper is cultivated mainly by the natives in the south of Sumatra, which is one of the most important pepper-producing areas in the world. The mineral wealth of the island appears to be greater than that of Java. Petroleum is found in various places, and some coal is also worked. Banka and Billiton, which lies off the east coast of Sumatra, are famous for their tin; under a

¹ Not only did native rubber contribute to the fall in price of that commodity, but the reason given by the Netherlands East Indies for refusing to agree to restriction is that it is impossible to regulate the output of native rubber.

convention of 1931 it was agreed that the Netherlands East Indies should produce about one-fifth of the world's supply of that mineral. The principal ports are Emmahaven, the port of Padang, on the west coast; Sabang, on a small island off the northern extremity of Sumatra; Belawan, on the north-east coast, where numerous plantations have been established; and Palembang, on the Musi River in the eastern plains.

BORNEO, CELEBES, MOLUCCAS, ETC. All round the coasts of Dutch Borneo the growing of coco-nuts and the preparation of copra are increasingly practised by the Malays and Chinese. Rubber is cultivated both in native plantations and in those managed by Europeans. The cultivation of *Hevea* by the natives of Sumatra and Borneo has made great progress within recent years. Though the product is cruder than plantation rubber it is easily marketed, and at present it provides over one-third of the total output of the Dutch East Indies. Of greater importance is the mining of petroleum at various points on the east coast, and the output of Borneo now considerably exceeds that of Java and Sumatra combined. Celebes exports coffee, copra, and spices through Macassar, its port on the south-west coast. The Moluccas are chiefly noted for their spices, such as nutmegs, mace, and cloves. The cultivation of coco-nuts has become one of the most important industries of the Lesser Sunda Islands, and coffee is grown mainly for markets within the Dutch possessions.

THE PHILIPPINE ISLANDS

The Philippine Islands, which are said to number over 7,000, have an area of about 114,000 square miles. Luzon, the largest, covers 41,000 square miles, and Mindafiao is not much smaller. Of the others, Cebu, Negros, Leyte, and Panay may be mentioned. Most of the islands are mountainous, and volcanic activity has everywhere been great. The mean annual temperature is about 80° F., and at Manila the range is from 77° F. in January to 84° F. in May. The mean precipitation varies from 40 to 100 inches, or more, according to position with regard to the rain-bearing winds. The population is chiefly of Malay stock and is estimated to number about 13,500,000.

Over one-half of the land is still forested, and nearly two-fifths of it is covered with secondary forest and cogon grass, which have

grown up on abandoned clearings in the original forest. Little more than 10 per cent of the total area is ever under cultivation at one time. The forests are known to contain valuable building and cabinet woods, in addition to rubber, gums, and other products. Agriculture has hitherto been carried on by very primitive methods, but efforts are being made by the Government to develop it. Rice is the principal food crop, but it is not grown in sufficient quantities to meet the home demand, and large quantities have to be imported. Owing, probably, to some reason connected with the soil, the Philippines have a monopoly of the cultivation of the plant (*Musa textilis*) from which Manila hemp is obtained, and that article accounts for over one-seventh of the exports of the archipelago. It is mainly grown in those districts on the Pacific slope of the islands where the rainfall is fairly evenly distributed throughout the year, but the area under cultivation is being extended. Copra and coco-nut oil, obtained from the coco-nut palms, which grow everywhere but flourish best near the coast, together rank second in importance to sugar. Factories for the extraction of the oil have been erected at Manila and elsewhere. Considerable attention has also been given to the production of sugar, more especially in the islands of Negros and Luzon, and it is now the chief export of the Philippines. Attempts are also being made to cultivate rubber. Tobacco is grown mainly in the valley of the Cagayan river in northern Luzon, and cigars are manufactured at Manila. The mineral wealth of the islands is practically untouched, but it is believed to be considerable; gold, copper, coal, are all known to exist. Over 75 per cent of the exports goes to the United States and over 60 per cent of the imports comes from there. Manila is the chief port.

AFRICA

CHAPTER XXIX

AFRICA

AFRICA, which has an estimated area of 11,500,000 square miles, is remarkable alike for the regularity of its coast line and the comparative simplicity of its topographical features. Its general appearance is that of a plateau, the walls of which rise in some places steeply from the sea, and in others are separated from it by plains of no great breadth. To the south of the Equator this plateau has an average elevation of about 3,000 feet, but to the north it generally falls to about 1,000 feet, except in certain regions which may be regarded as extensions of the southern plateau. The first of these lies in the east, where it forms the highlands of Abyssinia and is continued northwards along the coast of the Red Sea; the second runs from south-east to north-west across the centre of Africa, north of the Equator, and appears in the Darfur plateau, the Tibesti hills, and the Tasili plateau; the third bends round the Gulf of Guinea, and gives rise to the Upper Guinea plateau and the Futa Jallon mountains. Between the first and second of these extensions of the southern plateau lies the lowland basin of the Bahr el Ghazal, while between the second and third lies that of the Middle Congo. The mountains which appear on the plateau itself owe their existence, as a rule, either to volcanic action or to the denudation of surrounding land; and, as they generally occur near the rim, they give to the continent something of the appearance of an inverted saucer. Another feature of importance in the plateau region is the continuation of that great rift-valley in which the Jordan, the Dead Sea, and the Red Sea all lie. From the southern extremity of the Red Sea it makes its way southwards, and is occupied by a long line of lakes, of which Rudolf and Nyasa are the most important; while a western branch, which runs from the northern end of Nyasa, contains Lake Tanganyika, Lake Edward, and Lake Albert. In the north-west of Africa is the Atlas region, which differs in many respects from the remainder of the continent, and belongs physically to the mountain system of Europe.

CLIMATE. The position of Africa within the parallels of 37° N.

and 35° S., and the relative simplicity of its structural features, render a general description of its climatic conditions comparatively simple. A large area, extending roughly from about lat. 20° N. to about lat. 10° S., excluding the Abyssinian and East African Highlands, but including the east coast as far south as the Zambezi, is hot at all seasons of the year. Of the remainder of the continent, the greater part has hot summers and warm winters ; but there are notable exceptions in the Atlas region in the north, and in the High Veld in the south, in both of which the winters are cool. Along the south-west coast there is a comparatively narrow strip of land, which, owing to the proximity of cold currents, does not get hot in summer, but remains warm at all seasons of the year. The rainfall varies greatly from one region to another. During the northern summer, when the Sahara becomes an area of low pressure, the equatorial belt of constant precipitation moves northwards, and, in July, extends from just south of the Equator to a line which runs from the mouth of the Senegal inland to the north of Timbuktu, and, after curving round the Tibesti hills, goes by way of Khartoum almost to the Red Sea. In the northern part of the area covered by this belt, the rainfall is a summer one ; but in the south there are two periods of maximum precipitation, one when the sun is going north and the other when it is returning to the south. Monsoonal influences make themselves felt in two regions during the northern summer : in Abyssinia, where great heating on the uplands draws in part of the monsoon current from the Indian Ocean ; and on the west coast, south of the Senegal, where the trade winds of the South Atlantic are pulled across the Equator and blow as south-west winds. In other parts of Africa comparatively little rain falls at this period of the year. The Mediterranean States lie under the influence of the tropic belt of high pressure, while the winds which blow from it towards the south deposit but little moisture when crossing the Sahara. To the south of the Equator the land mass is, on the whole, a region of high pressure and outflowing winds ; and it is only in the extreme south of Cape Colony, where westerly winds prevail during the southern winter, that much precipitation occurs.

By the month of October, the conditions resulting from the movement of the sun back to the Equator have asserted themselves.

The belt of equatorial rainfall is practically confined within the parallels of ten degrees north and south of the Equator, and does not extend eastward beyond the fortieth meridian ; the Mediterranean States and Cape Colony both come under the influence of oceanic westerlies, and along the east coast, from the Zambezi southwards, the rainfall is beginning to increase.

In January, when the land mass south of the Equator is at its hottest, the belt of constant rainfall does not extend for more than a few degrees north of the Equator, but, to the south of it, it covers a great part of the Congo basin. At the same time, the south-east trade winds, strengthened by a monsoonal indraught, blow into the low-pressure area over the land; as these winds deposit moisture (unlike those which blow over the Sahara), there is rainfall over the greater part of Africa, south of the Equator, at this season of the year, the principal exceptions being the south-west coast and part of Cape Colony. On the other hand, there is a comparatively heavy precipitation in the Mediterranean States, and even the coast lands of Tripoli and Egypt receive some rain.

The annual precipitation of Africa is, therefore, distributed somewhat as follows : on both sides of the Equator, and especially in the basin of the Congo, on the Guinea coast, and in the highlands of Abyssinia, there is a heavy rainfall. To the north, precipitation rapidly diminishes, and beyond the latitude of Khaitoum very little moisture is received until the Mediterranean States are reached. To the south of the Equator, conditions are somewhat different owing to the influence of the south-east winds, and beyond the twentieth parallel the rainfall decreases from east to west.

VEGETATION. The north-west part of Africa, with its winter rainfall and hot dry summers, is characterized by a hard-leaved evergreen vegetation, which soon passes, with decreasing precipitation, into poor steppe and scrub-land. These, in turn, give place to the deserts of the Sahara where vegetation is almost entirely wanting, except in the oases scattered here and there over its vast extent, and in the lands which owe their fertility to the waters of the Nile. Farther south, where there is a light summer rainfall, a transitional belt of semi-desert, in which acacia forests and occasional grasslands are found, leads to the rich savanna lands of the well-watered Sudan. In Abyssinia, where there is also a summer rainfall, the vegetation is somewhat different, and woodlands,

grasslands, and deserts all occur. In the belt of heavy equatorial rainfall along the coasts of the Gulf of Guinea and in the greater part of the Congo basin, dense forests cover the land; and a somewhat similar forest is found in a gradually narrowing strip along the east coast of the continent from Zanzibar southwards. The savanna lands of the Sudan are continued to the east and south of the equatorial forests, and extend over the greater part of the African plateau as far south as the twentieth parallel, but beyond that they are confined to the eastern part of the sub-continent. On the west and south they pass into steppe-land which in turn gives place to scrub (a strip of which makes its way along the west coast from the mouth of the Cunene almost to that of the Congo), and in the rainless west to desert. The region of winter rains in the south-west of the continent has a vegetation similar to that of the Mediterranean States.

THE PEOPLES OF AFRICA. Several great divisions of the human family are represented among the peoples of Africa. To the north of the Sudan, various branches of what has been called the Mediterranean race form the basis of the population. The Berbers in the Mediterranean States, the Egyptians in the valley of the Nile, and the inhabitants of north-east Africa as far south as Kenya, are all connected with one another, and pass under the general name of Hamites, though they have been diversely affected by various invaders from the neighbouring continent of Asia. Of these, the Arabs, who are of Semitic origin, form a large part of the population of the Mediterranean States, and are also found in many parts of the Sahara; but the Tuaregs, who live within the French sphere of influence, are Berbers who have taken up a nomadic life. To the south of the Sahara the greater part of Africa is populated by the negro race. Of this there are two main branches—the Sudanese and the Bantu—the distinction between them being based on physical as well as on linguistic and cultural grounds. The Sudanese belong to the Sudan, but in places there is considerable intermixture; for example, the Fulani, who are of Hamitic origin with a strong infusion of negro blood, dominate the negro population in many places. The remainder of the negro population of Africa consists of Bantus, who are found in West Africa from the Cameroon to Angola, in the Belgian Congo, in the highland regions of East Africa, and in South Africa where they are

represented by the Kaffirs, Zulus, Bechuanas, and others. The Hottentots of south-west Africa are probably derived from an intermixture of a Hamitic stock and Bushmen, the latter of whom are woolly-haired, yellow-skinned people, now practically confined to the Kalahari region.

CHAPTER XXX

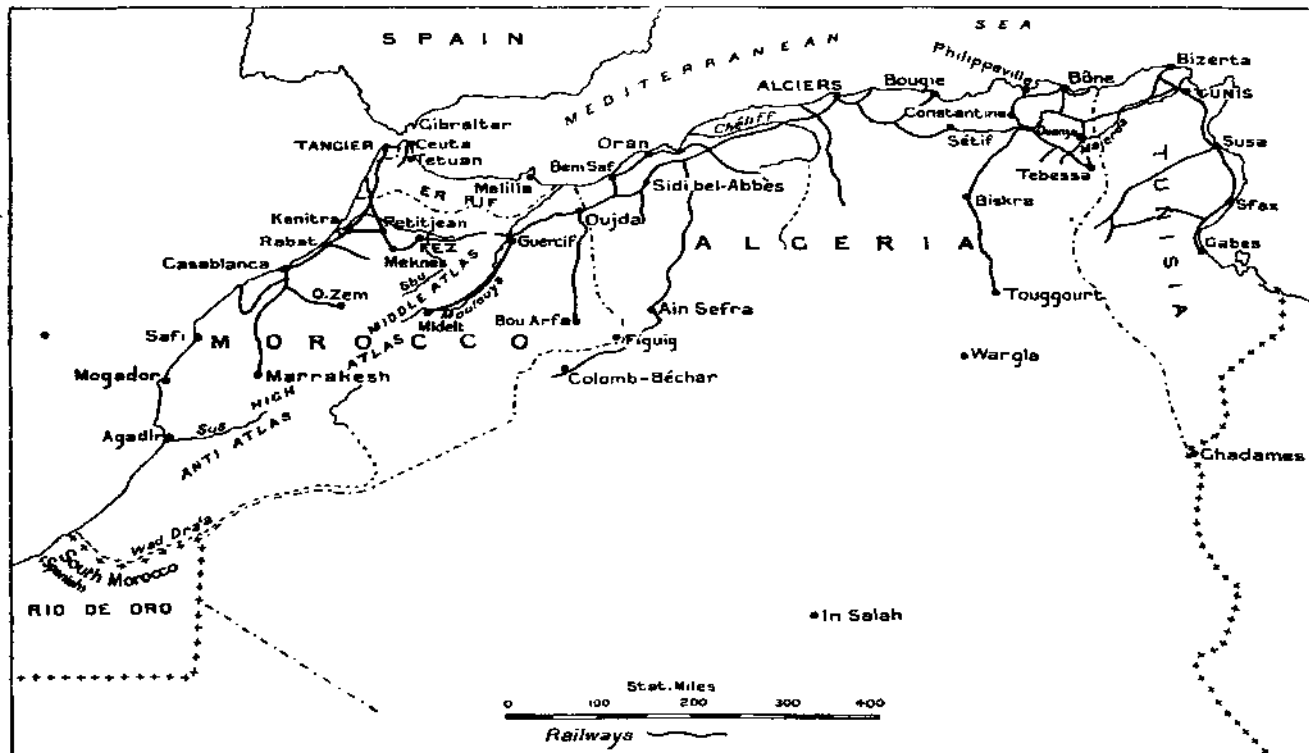
THE MEDITERRANEAN STATES

THE MEDITERRANEAN STATES—Morocco, Algeria, and Tunis—form a region which differs in many respects from the remainder of Africa. Physically, they belong to the Atlas system of folded mountains which traverses the whole region and gives a certain amount of unity to it. The High Atlas, which runs through Morocco from the south-west, is continued to the north-east by the Middle Atlas, and along the Mediterranean coast by the Algerian Tell. In the south-west, the Anti-Atlas breaks off from the main range, while, farther to the north-east, a branch of the High Atlas runs eastwards as the Saharan Atlas. Between the Middle Atlas and the Algerian Tell on the north-west and north, and the Saharan Atlas on the south, lies the Algerian plateau or plateau of the Shotts ; while to the south of the High Atlas and the Saharan Atlas is the Saharan plateau. Over a great part of this region the climate is of the Mediterranean type, the winters being mild and moist and the summers hot and dry ; but local variations from these general conditions are frequent, owing to the irregular topography of the country. Vegetation is also characteristic of the Mediterranean region, the plants growing in winter and finding their resting period during the summer. South of the Atlas ranges both climate and vegetation rapidly approximate to the Saharan type.

MOROCCO¹

Morocco has an area of about 219,000 square miles, and a population which has been variously estimated, but which probably numbers about 5,400,000. The High Atlas and the Middle Atlas run through the country from south-west to north-east; while in the north another folded range, Er Rif, follows the Mediterranean coast from the Straits of Gibraltar to Melilla. Bordering the High Atlas on the north-west is a tableland, known as the Moroccan Meseta; its height varies from 1,200 to 2,300 feet or

¹ The standard work on Morocco is *Le Maroc*, by A. Bernard (Seventh Edition, 1931).



NORTH-WEST AFRICA

more. Between the Meseta and the Atlantic lies a coastal plain, which broadens out in the north into the plain of the Sbu, between Er Rif and the Middle Atlas. In the east is a small part of the plateau of the Shotts, and to the south lies the Sahara.

CLIMATE varies greatly with position and altitude. On the coastal plain the range of temperature between summer and winter is not great. Mogador, for example, has a January mean of 57° F. and a September mean of 68° F. On the Meseta the range is greater, and Marrakesh has a January mean of 51° F. and an August mean of 84° F. In the mountains, snow lies in many places for a great part of the year. Precipitation also varies; on the coastal plains and in the plain of the Sbu from 16 to 24 inches of rain fall; on the Atlas Mountains and in Er Rif the amount is over 20 inches; and on the Meseta it is less than 16 inches, and in places less than 12. On the plateau of the Shotts, and in the Sahara, it is generally low.

POLITICAL DIVISIONS. Berbers and Arabs constitute the predominant elements in the population of Morocco, but a considerable influx of French has taken place within recent years. In 1912 France declared a protectorate over the greater part of the country, and the disturbed political conditions which have so long prevailed are gradually being brought to an end. Of the regions over which Spain claims control one lies along the Mediterranean coast and includes Er Rif, while another embraces a considerable stretch of country in the south-west between the Wad Dra'a and the southern frontier of Morocco; the former has only recently been brought under control, and the latter has never been effectively occupied. The town of Tangier, with the district surrounding it, is internationalized.

In the French zone there appears to be every prospect of economic development on a considerable scale. Not only is it estimated that at least one-half of the arable area as yet remains untilled, but it is believed that under French supervision the native agriculturist will greatly increase the productivity of the lands which are already cultivated. Moreover, railways and roads are being built, irrigation works constructed, and mineral resources investigated. The progress which has been made within the last twenty years is generally admitted to be remarkable.

THE COASTAL PLAINS are covered over in many places with a

fertile, black soil, known as *tirs*, somewhat similar to that of Russia. The region is well suited to agriculture, and contains the greater part of the cultivated land in the country. The Rarb and the plain of Sbu are well adapted to stock raising, but they, and still more the Chaouia, Dakkala, and Abda, which lie farther south between the Meseta and the Atlantic, contain large areas of rich soil. Barley, wheat, millet, and maize, as well as various kinds of seed, are extensively grown on the plains; and in the vicinity of the towns, where irrigation is practised, large quantities of olives, figs, almonds, oranges, and other fruits are produced. This region contains about one-third of the total population of Morocco, and a number of the most important towns in the country are found within it. Casablanca, on the coast, is the great port and commercial centre of the Protectorate. Fez, on the Sbu, is the chief trading town in the north, and Kenitra near the mouth of the same river ranks next to Casablanca as a port. Agadir is the port of the detached plain of Sus which lies in the angle between the Atlas and the Anti-Atlas. Rabat, Safi, and Mogador are other ports on the Atlantic coast. European methods of manufacture have been introduced, chiefly in connection with the preparation of agricultural produce for the market; there are, for example, flour mills and breweries at Casablanca, and oil-presses at Fez. Miscellaneous industries are also increasing in number and importance. Native pursuits include dyeing, tanning, carpet-making, etc.

THE MESETA has a rainfall generally too low for successful cultivation, and it is devoted chiefly to pastoral pursuits, large numbers of cattle, goats, and sheep being raised upon it. Along the foot of the adjoining mountains is a belt of country which can be irrigated by mountain streams, and on the edge of this belt stands Marrakesh, the capital and chief market of southern Morocco. It is the centre of a rich fruit-growing district, which, it is believed, could be greatly extended by the more efficient use of the water supply. Considerable progress has been made in working the large supplies of phosphates which are found on the Meseta to the south-east of Casablanca and elsewhere.

THE ATLAS AND SAHARA. Of the other regions of the French Protectorate it is unnecessary to say much. Many parts of the Atlas ranges are forested; the olive, the cork-oak, and the cedar are among the most important trees on the lower slopes; and, on

the upper, mixed deciduous and coniferous forests grow where climatic conditions are favourable. There is little agriculture except in the valleys, the population is scanty, and the further development of the region is probably contingent upon the discovery of mineral wealth. The Sahara is habitable only in the oases, such as those at Tafilelt, where the water from mountain streams can be used for purposes of irrigation before it is lost in the desert.

THE SPANISH ZONES. In the lowlands of the northern Spanish zone much of the soil is very fertile, water is abundant, and the climatic conditions are favourable, but, notwithstanding these advantages, agriculture is in a very backward condition, a result very largely of the long unsettled political state of the country. Iron ore is mined in Er Rif and shipped from Melilla. In the southern Spanish zone, where the rainfall is low, the cultivation of the date palm and stock-raising are the main pursuits of the people.

COMMUNICATIONS AND TRADE. Morocco has about 500 miles of normal gauge railway and over 750 miles of narrow gauge. The normal gauge line runs from Marrakesh by Ber Rechid (connected by a branch with the phosphate deposits at Oued Zem), Casablanca, Kenitra, Petijeau (where it is joined by the line from Tangier), and Meknes to Fez. Fez is connected with Oujda, close to the Algerian frontier, by a narrow gauge line, and from it there breaks off near Guercif, another which follows the valley of the Moulouya to Midelt, while from Oujda a normal gauge line runs south to Bou Arfa.

The chief exports are phosphates, eggs, wheat, barley, and alfa, while the imports include textiles, sugar, tea, iron and steel goods, machinery and hardware, cement, and timber. The bulk of the exports go to France, Great Britain, and Spain, and over two-thirds of the imports comes from France and Great Britain.

ALGERIA¹

The French colony of Algeria extends along the Mediterranean coast for a distance of about 650 miles. Including the deserts it has an area of 847,000 square miles, and a population of 6,000,000, of whom over 800,000 are Europeans.

Three distinct physical regions may be recognized. The Tell

¹ *L'Algérie*, by A. Bernard (1931), gives a valuable account of the country.

includes the whole country from the crest of the mountains down to the coast; the high plateau of the Shotts lies between the Algerian Tell and the Saharan Atlas ; the south belongs to the Sahara. Climatic conditions vary greatly from one region to another. Algiers, on the coast, has a mean temperature for January of 54° F. and for August (the warmest month) of 78° F.; for Tebessa, on the plateau, the figures are 44° F. for January and 79·5° F. for July; while for Biskra, in the Sahara, they are approximately 52° F. for January and 90° F. for July. Rainfall decreases from east to west and from north to south. On the slopes of the Tell it varies from about 20 inches in the west to 40 in the east, the high plateaus have from 15 to 20 inches, and the Sahara less than 10 inches.

THE TELL may be subdivided into three parallel belts. The first consists of the coastal districts and the lower slopes of the hills by which they are bordered, the second of plains like the Mitidja and the valleys of such rivers as the Cheliff, and the third of the slopes of the higher hills. Throughout the whole region irrigation is necessary to ensure the growth of summer crops ; on the coastal belt it is carried on by somewhat primitive methods, but in the inland plains and valleys (where the larger rivers can be utilized) it is practised on a more extensive scale. In the first of these regions, the alluvial soils at the mouths of rivers have been converted into gardens from which large quantities of early vegetables are sent to France ; vines, olives, and fruit trees, such as the orange, the lemon, and the almond, grow on the neighbouring slopes. The larger valleys and plains of the interior, such as those of Sidi bel Abbes and Setif, are chiefly devoted to the growth of cereals; dry farming methods are practised and large quantities of wheat and barley are produced. Other crops of this region include the vine, olive, cotton, tobacco, and a dwarf palm (*Chamaerops humilis*) from which vegetable fibre is obtained. Where irrigation is available, forage plants are also grown during the summer months. In the mountainous belt, the district known as the Kabylia, to the east of Algiers, is the best developed; and various fruits are grown in the lower valleys, while cereals and vegetables are cultivated in the upper. At still greater altitudes there is good pasturage for sheep and goats. The whole of the Tell region contains considerable areas of forest land. From sea-level to an altitude of about 2,500 feet, the principal trees are the olive, the cork-oak, and the

Aleppo pine; but higher up, there are several varieties of oak and cedar. On saline soils in the larger valleys near the coast, the eucalyptus tree has been extensively planted within recent years. The chief products of the forests are cork, tan bark, and fuel. Large quantities of iron ore are obtained from open mines at and around Beni-Saf in Oran, and Zaccar in Algiers. Zinc and lead are also worked in various places.

THE HIGH PLATEAUS. Here, irrigation is only practicable to a slight extent, and the greater part of the region is a steppe land, on which large numbers of sheep and goats are pastured during the summer months by Arabs, who drive them up from the Sahara where they have wintered. Alfa grass is the prevailing type of vegetation, and one variety (*Stipa tenacissima*), which covers considerable areas, is collected and exported for the manufacture of paper. The mineral wealth of this region appears to be considerable. At Ouenza, on the Tunisian frontier, there are great deposits of pure hematite, and copper is also found in the same locality. Near Tebessa, beds of phosphate rock, which appear to be continuous with those of Tunis, yield the greater part of the Algerian output of phosphates. The development of the whole region has been handicapped by the want of good railways, a drawback which is only now being overcome.

THE SAHARA. In the Sahara, settlement is only possible in the oases, which have, since the advent of the French, been greatly increased both in extent and in number by the sinking of artesian wells. The date palm is the chief tree of the oasis, and provides not only the staple food of its population, but an important article of export, while in its shade, fruits, vegetables, and cereals can be grown to supply local needs.

COMMUNICATIONS, TRADE, ETC. Since they conquered Algeria, the French have made great efforts to develop its resources; and they have so far succeeded, that, in almost all respects, the colony is greatly in advance of the neighbouring country of Morocco. Nevertheless, the region is essentially agricultural, industrial development having been restricted alike by the want of power and by the difficulty of obtaining skilled labour. Over 3,000 miles of railway have been constructed; the main line runs from Morocco, by Sidi bel Abbes, Algiers, and Setif, to Tunis, with branches to Oran, to Bougie, to Philippeville by Constantine, and to Bone,

ports of Algeria on the Mediterranean; other lines run to the oases of the Sahara, one to Ain Sefra and Colomb-Béchar and the other to Biskra and Touggourt. The external trade of the country is conducted very largely with France. The principal exports are wine (which is the most important), wheat, sheep, minerals, olive oil, and barley; and the imports consist mainly of manufactured goods, such as textiles, vehicles (including motor-cars, etc.), machinery, sugar, paper, and petrol.

TUNIS

Tunis, which is a French protectorate, and has an area of about 50,000 square miles, forms the most easterly section of the Atlas region, but in some respects its physical features differ from those of Algeria. The Tell region may be considered as including not only the northern slopes of the mountains down to the sea, but the valley of the Majerda to the south as well; the high plateaus are more contracted and irregular than they are farther to the west; and in the Saharan region there are a number of dried-up salt lakes, some of which are below sea-level. On the whole, climatic conditions are similar to those which prevail in Algeria, though in the Sahel (the east coast region) the rainfall is lower. In the main, the country is agricultural. On the Tell, and especially in the valley of the Majerda, wheat and vines are extensively cultivated, and the cork-oak and the olive flourish; barley is grown in the drier lands of the Sahel, which is also noted for its olives; on the steppe-lands of the plateau sheep and goats are grazed, and alfa is collected; in the Saharan region the Djerid group of oases produce some of the finest dates grown. Minerals, the principal of which are zinc, lead, iron ores and phosphates, are obtained, the ores in the hills of the north-west, and the phosphates on the borders of the Sahara. The manufacture of carpets is carried on in some of the towns, the most important of which are Tunis, Sfax, Bizerta, and Gabes. The principal exports are cereals, phosphates, olive oil, hides, cattle, and mineral ores and crude metals; and the imports consist mainly of iron and steel goods, cotton fabrics, and food-stuffs. The bulk of the trade is transacted with France, but Italy, Algeria, Great Britain, and the United States also share in it. There are 1,260 miles of railway in the country, but, with the exception of the line from Tunis into Algeria, most of it is narrow gauge.

ITALIAN LIBYA

Italian Libya, the former Tripoli, which occupies that part of the Mediterranean coast between Tunis and Egypt, falls into several distinct physical regions. Along the coast from the Tunisian frontier to the Gulf of Sidra there lies a low plain of varying width, known as the Jefara. This is bounded on the south by several ranges of hills, named the Jebel, which form the much dissected escarpment of Hamada-el-Homra, the rocky plateau separating Tripoli proper from the oases of Fezzan. To the east of the Gulf of Sidra is the elevated tableland of Cyrenaica. The climate of the northern part of Tripoli is transitional between the Mediterranean and the Saharan types. Sufficient rain to permit of cultivation falls on a narrow coast strip of the Jefara, on the Jebel, and in parts of Cyrenaica ; and in these districts Mediterranean products are grown. But over a great part of the country scanty pasturage alone is available, and a large proportion of the inhabitants are nomads or semi-nomads whose wealth consists of their horses and camels, sheep and goats. Alfa is collected in the mountain districts, and date palms are grown in the oases of Fezzan. Sponge fishing and tunny fishing are important pursuits. The principal exports are sheep and goat skins, sponges, tobacco and cigarettes, tunny, wool, alfa, and esparto. Tripoli was at one time extensively engaged in the trans-Saharan trade, but, with the opening up of West Africa by European nations, this has greatly declined in importance. Tripoli was ceded to Italy in 1912. The region, including the desert, has an area of over 600,000 square miles, and a population of about 800,000, of whom 30,000 are Europeans.

CHAPTER XXXI

THE BASIN OF THE NILE

THROUGHOUT a great part of its course the Nile plays an important part in the economic development of the countries through which it passes, and hence it is necessary to know something of the régime of that river and its tributaries. It rises on the Lake Plateau of Equatorial Africa, where the Kagera and various other streams flow into Lake Victoria. The Victoria Nile from Lake Victoria, and the Semliki from Lake Edward, both descend rapidly from the plateau to Lake Albert in the western branch of the rift-valley, and the river which leaves Lake Albert—the Bahr el Jebel—also has a swift descent into the plains of the Sudan. From the Nile-Congo watershed, on the south-west of these plains, come a number of streams, the majority of which eventually unite to form the Bahr el Ghazal which flows into the Bahr el Jebel, the combined river taking the name of the White Nile. A short distance below the confluence of these rivers, the Sobat flows into the White Nile, which is also joined at Khartoum by the Blue Nile, and near Berber by the Atbara, all three rivers flowing from the Abyssinian plateau.

From the point at which it enters the Sudan plains to its confluence with the Blue Nile at Khartoum, a distance of over 1,000 miles, the fall of the Nile is very gentle, and only averages about two inches to the mile. Below Khartoum, however, the river passes through a series of cataracts before it enters the Nile Valley at Aswan, where its course again becomes gentle. In this valley, the origin of which is still a matter of controversy, the Nile has, by the deposition of silt, built up a plain which has a length of about 600 miles and a breadth varying from 5 to 10 miles. The delta at the mouth of the river has likewise been built up of silt.

On the equatorial plateau there is a double rainy season, and the discharge from Lake Victoria is fairly constant throughout the year. Farther north, on the slopes of the plateau and in the basin of the Bahr el Ghazal, there is a heavy summer rainfall, which leads to much flooding in the southern plains of the Sudan,

but does not affect the height of the river below Lake No. The basin of the Sobat has also a summer rainfall, but its effect is not felt in the valley of the White Nile until November. The Blue Nile and the Atbara are, therefore, the factors of most importance in determining the rise and fall of the waters of the Nile, as far, at least, as the lower part of its course is concerned. On the Abyssinian plateau, whence these two rivers flow, there is a heavy monsoonal rainfall between the middle of May and the middle of September. Both rivers come down in flood, the Blue Nile reaching its maximum about the beginning of September, and the Atbara about the third week in August, with the result that the maximum height of the Nile at Haifa is reached about the second week of September. But to this, it ought to be noted, the White Nile contributes but little, as, when the Blue Nile is in high flood, the waters of the White Nile are ponded back and do not flow downstream until the later months of the year, when the former river has fallen very considerably. Below its confluence with the Atbara, the Nile receives no regular stream, but only the results of occasional showers on the hills between it and the Red Sea. Consequently, in its progress through Egypt it loses in volume as a result of evaporation, seepage, and the withdrawal of water for irrigation purposes. At Haifa, where the Nile enters Egypt, the regime of the river is somewhat as follows : it is at its lowest about the beginning of June, when it begins to rise rapidly and continues to do so until the middle weeks of September, when it is at its highest. During October and November it quickly loses volume as a result of the fall of the Blue Nile and Atbara; and, after the waters of the White Nile have been drained off between October and December, the river falls steadily until the following June. At Cairo the maximum occurs about a month later than at Haifa. During the flood period the Blue Nile and the Atbara bring down large quantities of volcanic matter from the Abyssinian plateau, and it is this silt that has built up the plain and delta of the Nile which constitute modern Egypt, the rate of deposition being -10 of a metre per century. Concerning the fertilizing qualities of the silt there are some differences of opinion.

EGYPT

Egypt may be divided into three regions—the valley, of the

Nile, its delta, and the surrounding deserts. The delta has a Mediterranean rainfall, but it is only slight, and diminishes rapidly inland; while Alexandria has a mean annual precipitation of 8.53 inches, Cairo has one of 1.35 inches only. Without irrigation, therefore, cultivation in the Nile valley would be impossible. The mean temperature at Alexandria for January is 58° F. and for August 80° F. ; at Cairo the figures are 54° F. for January and 83-5° F. for July; and at Aswan, 62° F. for January and 92° F. for July.

THE VALLEY AND DELTA OF THE NILE. The system of irrigation which for long prevailed in Egypt was that known as basin irrigation. The banks of the Nile were strengthened by artificial embankments called berms, and by means of transverse walls the whole valley was divided into a number of basins. In this way the flood was regulated, but the only crops which could be grown were flood crops, sown at the time of high Nile, and winter crops, sown after the floods had withdrawn from the land. For the growth of summer crops, such as cotton or sugar-cane, perennial irrigation was necessary, and that was only possible in the immediate vicinity of the Nile, where, by primitive apparatus, a certain amount of water could be withdrawn from the river at low water and distributed over the land. Perennial irrigation on a large scale was first begun in 1820, when a barrage was constructed below Cairo, and a number of deep canals were made in the delta, but it was confined to that region, where, indeed, it was only partially successful, until the British occupation of the country. The barrage was then put in a state of repair, and, in order that there might be a sufficient supply of water during the summer months when the river was low, a large dam was constructed at Aswan, where the bed of the river contracts just below a wide expansion. When the Nile began to fall after its annual flood, the gates of this barrage were closed and the water ponded up to a depth of 75 feet, so that a lake about 60 miles long was formed. This water was allowed to escape during the spring and early summer, when it could be utilized for the cultivation of summer crops. At Asyut, a regulating barrage was built for the better distribution of the water ponded up at Aswan, and part of Upper Egypt was then brought under perennial irrigation.

To increase the perennially irrigated area the Aswan was, in 1910, raised by an additional 5 metres, while a barrage at Isna ensured

that the higher land near Qena and Luxor would be irrigated even in years of deficient flood. At present (1933) another 9 metres is being added to the height of the dam, and when this is completed the stored water, which will be five times the original amount, will extend upstream to the Second Cataract. The extra water will be largely utilized in providing irrigation facilities for the northern Delta.

Steps are now being taken to provide for the construction of a great dam across the White Nile at Gebel Aulia, 27 miles south of Khartoum; and further projects involve the damming of Lake Albert and the cutting of a fresh channel for the Bahr el Jebel, so that the great loss of water which at present takes place in the swamps of the sudd region may be avoided. If these schemes are carried out they will add very largely to the perennially irrigated area in Egypt.

The climatic conditions of Egypt are such, that, with the aid of irrigation, the land can be cultivated at all seasons of the year. The summer crops, which require to be watered regularly during the whole period of their growth, are cotton and sugar cane; rice and maize are autumn crops and are sown just before the time of high Nile; the winter crops sown later in the year include wheat, barley, clover, and beans. Of these various crops cotton now covers an area only second to that under maize, but, although with the development of irrigation that area has been greatly extended, the yield per feddan showed until recently a well-marked decrease, as the following figures indicate—

Years	Average cotton-growing area (in feddans)	Average total crop (in kantars)	Average yield per feddan
1896-7 to 1900-1 ..	1,136,800	5,991,400	5-27
1901-2 to 1905-6 ..	1,377,200	6,198,200	4-51
1906-7 to 1910-11 ..	1,590,200	6,692,000	4-20
1911-12 to 1914-15 ..	1,729,500	6,975,000	4-03
1915-16 to 1918-19 ..	1,458,700	5,236,700	3-58
1919-20 to 1923-24 ..	1,641,000	5,740,000	3-49
1924-25 to 1926-27 ..	1,832,000	7,642,000	4-17
1927-8 to 1929-30 ..	1,699,000	7,562,000	4.44

1 feddan =1.038 acres. 1 kantar=99.049 lbs.

To explain this decline a number of causes have been suggested, and it is possible that all operate to a greater or less extent. After the Aswan reservoir came into use there was continuous infiltration from the high-level canals into the surrounding soil; at the same time the fellah, long accustomed to regard water as the one thing necessary for successful cultivation, had not learned that he might have too much of it, and regularly over-watered his crop when he had the chance. As a result the level of the water-table was raised, and the roots of the cotton plant were either asphyxiated by the rising water or were injured by the return of noxious salts, which in the low water-table days, had been precipitated to a depth beyond the reach of the root system. To overcome these evils a complete reconstruction of the drainage system has been planned, and is gradually being carried into effect. Again, with the change from basin to perennial irrigation, the silt of the Nile is no longer distributed over the land to the same extent as before, and it may be that Lower Egypt at least is beginning to suffer from the want of it.

The high price of Egyptian cotton, moreover, led to the substitution of a two years' for a three years' rotation of crops over large areas, and it also led to the cultivation of cotton on inferior lands. It has been argued, too, that the elimination of the *sharaqui* or annual fallow by the introduction of perennial irrigation, was a direct cause of, the decrease of the fertility of the soil. Fertilizers to restore or impart fertility were not adequately used, and the yield consequently declined. More recently, too, the crop "suffered severely from insect pests; of these the most serious was the pink boll-worm, which since 1913 had become widespread throughout the country. Late ripening varieties suffered most, and for that reason Mit Afifi, the staple brown cotton of Lower Egypt was displaced by Sakellarides (commonly known as Sakel) which ripens earlier and produces a lint of finer quality but yields a lighter crop. Partly as a result of the commercial depression of the last few years, the situation has again changed. The area under cotton now shows a decrease, and more land is being put under wheat and other crops, the import of which is at present necessary. At the same time, the cultivation of Sakel has been restricted to the northern part of the Delta where it is least likely to suffer from wilt, and its place has been taken by Maarad, Giza 7, and other varieties with a somewhat

shorter staple but a much heavier yield per feddan. In Upper Egypt an improved Ashmouni is the chief crop. The increased yield per feddan since 1922 appears to be due in part, also, to the measures taken to lower the water-table, and to the spread of agricultural knowledge among the fellaheen.

Cane sugar is chiefly cultivated in Upper Egypt along the course of the Ibrahimieh canal, which leaves the Nile at Asyut and waters a considerable tract of country on the west bank of that river. Maize covers a greater area than any other crop and is mainly grown in Lower Egypt, which also produces the bulk of the rice raised in the country. Barley tends to be about equally divided between Upper and Lower Egypt, but wheat is more extensively cultivated in the latter district than in the former.

The great majority of the 14,000,000 inhabitants are engaged in agriculture, and only in a few places are there any manufactures of importance. Alexandria and Kafr-el-Zaiyat extract oil from cotton seed, and in several towns of the delta cotton is ginned. Some cotton and woollen goods are woven to supply local needs, but the bulk of the textiles used are imported from Europe. Cigarettes are made at Cairo and Alexandria.

THE DESERTS. In the deserts there is little economic activity except in the oases where the typical products of such places are grown. More important are the mineral resources of these regions. At Hurghada, on the western shore of the Red Sea, and at Abu Durba, on the eastern shore of the Gulf of Suez, productive oil-fields have been located. The former are the more important, and now provide Egypt with part of the oil which it requires for fuel. Phosphates are obtained at Safaga and Quseir, farther to the south, and near Isna in the Nile Valley.

COMMUNICATIONS AND TRADE. The Nile is now navigable throughout Egypt since a canal has been constructed to avoid the rapids and barrage at Aswan. The principal railway runs from Alexandria southwards as far as Aswan. From Cairo, lines run to Damietta, and, by way of Benha, Zagazig, and Ismailia, to Port Said and Suez. The Suez Canal gives great strategic importance to Egypt though it hardly affects its trade.

Cotton is the chief export of the country, and accounts for about 80 per cent of the total value of the exports. Cotton seed, cereals, and vegetables together made up the greater part of the remainder.

Cotton and woollen goods, building wood, iron and steel, machinery, and coal are the principal imports.

THE ANGLO-EGYPTIAN SUDAN

The Sudan, which is under the joint control of Great Britain and Egypt, has an area of about 1,000,000 square miles. Its population, which is now over 5,600,000, at one time numbered 9,000,000, but was reduced during the Dervish tyranny to less than 2,000,000.

The climate varies greatly from one region to another. Except along the Red Sea littoral south of Suakin, rain seldom falls north of the 17th parallel, but south of it there is a gradual increase both towards the Equator and towards the Abyssinian mountains.

Over a great part of the basin of the Bahr el Ghazal, and of the country between the Bahr el Jebel and the Sobat, there is a mean annual rainfall from 30 to 40 inches ; and in the extreme south, where there is a double rainy season, the amount received is still greater. The mean temperature is generally high. Such observations as have yet been made seem to indicate that at Berber it varies from 67° F. in January to 94° F. in June ; at Khartoum from 69° F. in January to 92° F. in May ; and at Mongalla from 77° F. in July to 82° F. in January.

The natural regions of the country may most conveniently be studied by observing the relation of vegetation to rainfall. To the north of the 17th parallel, desert conditions prevail except along the banks of the Nile, where there is a riverain population engaged in agriculture ; in a few oases scattered here and there ; and in some districts south of Suakin, where cultivation is possible on land which is annually inundated by rivers in flood, as at Tokar and Kassala where much cotton is grown. The date-palm is the chief asset of all this region.

South of the rainless area there lies a belt of country which, as regards its vegetation, is transitional between the desert to the north and the true savanna to the south. The northern parts consist, in the main, of poor scrub-land, on which camels, goats, and sheep are raised, but farther south there are forests of acacia and large areas of grassland, where in years of good rainfall a considerable amount of agriculture is possible. Dura (*Sorghum*

vulgare), beans, lentils, melons, and onions, as well as some wheat and barley, are all grown ; and in many places, as in the south of Darfur and in the Gezira (the country between the White and the Blue Nile), there is good grazing for cattle and sheep. In the forests of *Acacia verec* in the south of Kordofan and elsewhere, gum, one of the most important exports of the Sudan, is found in large quantities, and some ivory and ostrich feathers are also obtained from Kordofan.

Along the banks of the White Nile and the Blue Nile, agriculture is more profitable and the population is denser, but the further development of the land in the neighbourhood of these two rivers depends upon the extent to which they may ultimately be used for purposes of irrigation. At the present time, the quantity of water which may be withdrawn from them is, in the interest of Egypt, strictly limited, but owing to the much higher winter temperature which prevails in the Sudan, certain crops can be grown there during that part of the year in which Egypt does not demand water. At present considerable progress is being made in the Gezira, which forms a vast alluvial plain, somewhat more fertile in the east where it has been built up by the deposits of the Blue Nile. It is generally covered with grass and scrub, and is occupied by semi-nomadic peoples, who cultivate considerable areas during the rains, but move with their herds towards the rivers during the dry season. In this region Egyptian cotton of the best quality can be profitably grown during the cooler part of the year, and in order to provide the necessary water a dam has been built across the Blue Nile near Sennar, and a canal constructed from it to the neighbourhood of Wad Medani, lower down the river, where an area which has now been increased to nearly 700,000 feddans is rendered productive by means of irrigation. From the middle of July sufficient water can be withdrawn from the river for this purpose, and until December, the surplus is allowed downstream, but in that month the sluices of the dam are closed and water stored for use after the middle of January when the whole discharge of the Blue Nile is required for Egypt. Cotton is cultivated on about one-third of the irrigated land, the remainder being partly under corn and partly fallow. The development of this region, which has been undertaken by the Sudan Plantations Syndicate, is expected to lead to more permanent settlement than has hitherto been the case.

In the southern Sudan, where there is a rainfall of over 30 inches, the vegetation assumes a richer and more varied form. The forests contain rubber-producing plants, such as *Landolphia owariensis*, and valuable timbers, such as African mahogany; while on the extensive grasslands a good deal of cultivation and cattle-raising is carried on by native tribes. Rubber and coffee have been successfully grown on experimental farms, and cotton cultivated under summer rainfall is becoming an important crop. But, although the region is probably the richest in the Sudan, it is handicapped by the lack of communications and the want of enterprise shown by the majority of its negroid inhabitants.

COMMUNICATIONS AND TRADE. The principal railway is that which crosses the Nubian Desert from Haifa to Abu Hamed and then follows the Nile to Khartoum. From it there breaks off, near Berber, a branch for Suakin and Port Sudan on the Red Sea, to the second of which the bulk of the export and import trade has now passed. Sennar has been connected with the latter railway at Haiya by a line which passes through Gedaref and Kassala. Another line runs from Khartoum up the Blue Nile to Sennar, crosses over to Kosti on the White Nile, and goes on to El Obeid in Kordofan. The Nile below Khartoum is navigable, except at the cataracts, but on account of these it has little more than local importance; above Khartoum, it is navigable as far as Gondokoro. The principal exports of the Sudan are cotton, gum arabic, cattle and sheep, hides, sesame, ground nuts, and ivory; the imports include cotton goods, sugar, coffee, iron and steel goods, and machinery.

UGANDA

The Protectorate of Uganda, which has an area of 92,200 square miles, lies on the plateau of East Africa, where it occupies most of the northern part of the region lying between the eastern and western rift-valleys. Except in the north, where it slopes down towards the Sudan, and in the east and west, where it includes parts of the rift-valleys with the heights which border them, the average elevation of the land is about 4,000 feet, and much of it consists of rolling country in which numberless rounded hills are separated from one another by broad and swampy rivers.

Notwithstanding its position on the Equator, the high altitude

of Uganda gives it a more moderate climate than might have been expected. Entebbe, which is situated on Lake Victoria at a height of 3,906 feet above sea-level, has a mean annual temperature of 71° F., with a range of about 3° between July (the coldest) and January (the hottest month). The rainfall, which occurs at all seasons of the year, but is heaviest in the months of April and December, is between 40 and 60 inches, except in the north-east, where in places it is sometimes much less. In the north the natural vegetation consists mainly of steppe and thorn scrub, but farther south there are rich, rolling savannas which are interspersed with patches of equatorial forest. The settled population consists of Sudanese negroes in the north, and Bantus in the west and centre. Among the latter are to be found—often as a superior social class—a nomadic, pastoral people of Hamitic or mixed Hamitic and Bantu blood. In the east some, at least, of the natives appear to belong to the Masai group of East Africa. The total population is estimated at 3,500,000.

As regards agriculture and food supply the people of the northern and central districts grow millet and vegetables, while those who inhabit the damp country lying round Lake Victoria depend upon their banana groves. Considerable attention has of recent years been given to the cultivation of cotton, which now forms the chief export of the native agriculturist. The greater part of the crop is grown in the Eastern Province and Buganda, some of the most productive districts being those which are traversed by the various waterways connected with Lake Kioga. Uganda cotton finds its chief market in India where it is much in demand. Plantations under European control have been established in various parts of the country, but more especially in Mengo to the north of Lake Victoria. From these the chief product is now coffee, little attention being given at present to rubber. Coffee is also an important crop of the native cultivator, but his holdings consist mainly of *C. robusta*, while on those of the European *C. arabica* predominates. In Ankole in the Western Province some tin is mined. Among other exports are oil-seeds, wild rubber, timber, and ivory. Most of the trade passes over the Uganda railway and through Mombasa. The chief line within the country itself is that from Port Bell on Lake Victoria to Namasagali, where it taps the cotton growing districts round Lake Kioga. At Mbulamuti it is joined by the Kenya and

Uganda railway which enters Uganda near Tororo whence a branch line runs north to Soroti.

While it is true that the natives are for the most part engaged either in the cultivation of food-stuffs or in pastoral pursuits, it has also to be noted that they have shown themselves singularly apt to benefit by European instruction; it is probable that the general improvement in agriculture, which is taking place as a result thereof, will enable the Protectorate to export an increasing amount of produce in the future. In the meantime in the cotton growing districts the native has taken full advantage of the opportunities offered by the cultivation of that plant to improve his economic position to a remarkable extent.

ABYSSINIA

Abyssinia belongs in part to the Abyssinian Highlands, where the Archaean rocks of the African plateau are covered in many places with great masses of volcanic material, and in part to the lands of lower elevation which lie to the east and south-east thereof. The total area of the country is estimated at 432,000 square miles, and its population, which is mainly of Hamitic origin, has recently been estimated at 5,500,000.¹ Notwithstanding the fact that the country is as yet but partially known, three natural regions may be recognized. The Kwolla, which rises to a height of 5,000 feet above sea-level, has a tropical climate and yields cotton, coffee, and other products of a tropical or sub-tropical character. The Woina Dega, which lies, roughly speaking, between 5,000 and 8,000 feet, produces cereals and fruits like those of southern Europe. The Dega, which is above 8,000 feet, is a pastoral country in which sheep and goats are reared. Apart from coffee no other crop does more than satisfy a purely local demand. The mineral wealth is believed to be varied if not considerable, but apart from potash, which is worked near the Eritrean border, little has been done to develop it. Economic progress is slow, and the country has but little trade with the outside world. The chief exports are hides, skins, coffee, and beeswax, and the imports consist, in the main, of cotton goods. Most of the trade passes over the railway from Addis Ababa to Jibuti in French Somaliland, but some makes its way by river steamers on the Baro, Sobat, and White Nile, to Omdurman.

¹ *Economic Conditions in Ethiopia, 1929-31* (Department of Overseas Trade).

CHAPTER XXXII

EAST AFRICA

ERITREA and Somaliland, Kenya Colony (formerly British East Africa), and Tanganyika Territory (formerly German East Africa) may all be considered as belonging to East Africa, though they do not form parts of a single geographical unit.

ERITREA

Eritrea, which lies along the coast of the Red Sea between the parallels of 12° N. and 18° N., is an Italian Crown Colony. In the north, the land rises from a coastal plain to the northern continuation of the Abyssinian plateau, and then falls to the plains continuous with those of Sudan ; in the south, the colony is confined to a coastal strip consisting mainly of a series of table-topped mountains with an average height of about 3,000 feet. In the east the rainfall is low, ranging from about 8 inches at Massawa to 2 inches at Assab ; in the mountains it is probably between 20 and 25 inches; on the western plains about 12. As a result the coastal plain is almost a desert, and agriculture is confined to the highlands where cereals can be grown. There, and on the western slopes of the mountains, cattle and sheep are raised in large numbers, while on the western plains attempts are being made to grow cotton with the aid of irrigation. The chief exports are skins and salt, and the chief imports cotton goods and food-stuffs. Massawa, the port of the colony, is the terminus of a railway which when completed will reach the cotton-growing districts in the west. The potash of Abyssinia is exported by means of a light railway from the Eritrean frontier to Mersa Fatimari, south of Massawa.

SOMALILAND

The Somali coast and a considerable part of the interior is divided among Britain, France, and Italy, while the remainder of the horn of Africa belongs to Abyssinia. Throughout the whole region little rain falls, and most of the country is covered with scrub. The inhabitants are, to a large extent, nomadic, and wander about with their herds of camels, cattle, and sheep, though, in the more

favoured parts of the interior, maize, millet, and other cereals are grown. In French territory the only place of importance is Jibuti, the chief port of Abyssinia. British Somaliland exports hides, skins, and live-stock, mainly from the port of Berbera. In Italian Somaliland the country near the Juba river is cultivated and oil-seeds and cotton are grown. The chief port is Mogadishu.

KENYA COLONY

The physical features of Kenya Colony present some striking contrasts. In the north, Northern Frontier Province, Turkana, and Tana River consist of a great undulating plain which slopes upward from the coast towards the north-west, where it reaches a height of 3,000 feet along the Abyssinian frontier. To the south of this region, that is to the south of a line connecting the southern extremity of Lake Rudolf with the mouth of the Tana, conditions are very different. Along the coast there is a plain which at Mombasa has a width of only two miles, but broadens out to over twenty miles in the neighbourhood of the Tana river, where it merges into the coastal part of the northern plain already described. From this coastal plain a steep ascent leads to the nyika, a belt of country from 120 to 200 miles in breadth, which is continuous with the inland part of the northern plain. To the west of it is the highland plateau, which has an elevation of 4,000 to 8,000 feet. Much of this plateau is covered with volcanic outpourings, and upon it stand the great volcanic masses of Kenya and Elgon. It is traversed from north to south by the Eritrean rift-valley, which lies from 1,200 to 2,000 feet below the general level of the plateau. Beyond the rift-valley the land gradually sinks towards Lake Victoria, which is at a height of 3,726 feet above sea-level.

Over the greater part of the country, altitude is an important factor in determining climatic conditions. At Mombasa (lat. $4^{\circ}4'$ S.) the mean temperature varies from 76° F. in July and August to 82° F. in March; while at Machakos (lat. $1^{\circ}31'$ N.), which is at an elevation of 5,400 feet, it ranges from 59° F. in July to 68° F. in February. At Kisumu, on Lake Victoria, the temperature is somewhat lower than it is on the coast. Rainfall also varies greatly from one place to another. On the southern part of the coast, over a large part of the highland area north of Nairobi, and in the vicinity of Lake Victoria, there is a mean precipitation of

40 to 60 inches. The remainder of the country has in the south from 20 to 40 inches, and in the north probably less than 20 inches. There is a double rainfall maximum : on the coast, the heavier rains fall from April to June, and the lighter from October to December; in the highlands, the earlier rains last from March till the end of May, and the later from October till the end of December.

VEGETATION. In many parts of the coastal plain, more especially in the south, there are coco-nut plantations and mangrove swamps. The nyika, which lies behind the coastal plain in the south, and extends over the greater part of the northern plain, is semi-desert; during the short rainy season parts of it are covered with grass, but elsewhere acacia thickets are its most characteristic feature. The plateau region is a savanna in which there is rich grassland interspersed with forests according to local variations in soil and climate. The rift-valley is mainly grassland.

GENERAL CONDITIONS. From the point of view of economic development, Kenya Colony presents some features of exceptional interest. Although the whole country lies between the parallels of 5° N. and 5° S., there are considerable areas which, on account of their high altitude, are well adapted to European settlement. On the other hand, it is probable that Europeans will never themselves be able to perform all the work involved in the cultivation of the land, and that they will always be compelled to rely upon native assistance. But the natives have a considerable source of wealth in their herds and agricultural lands, and only a limited need of money; and it often happens that there is a scarcity of labour just at those seasons when it is most in demand. There is always the danger that in procuring this labour the interests of the Kenya natives may in various ways be sacrificed to those of the European settlers. At present, the European population, almost entirely of British origin, numbers over 16,000, and it is unlikely that there will be a rapid increase in the near future. The native population, which is estimated to number 3,000,000, is of mixed ethnic origin. The Galla and Somali of the northern plain are Hamites, but elsewhere the Bantus predominate. The Masai, who occupy the southern part of the plateau region, are of mixed Hamitic and negro blood. The Asiatic community, which does not reach 40,000, consists mainly of Indians.

The coastal plain and the highland plateau are the regions of

economic importance. The first is a planter's country, the second a settler's. Much of the nyika is of little value, and, except in the vicinity of the rivers, provides but scanty pasturage for the herds of nomad tribesmen.

THE COASTAL PLAIN is not suitable for permanent European settlement, and very little has as yet been done for its development. The coco-nut palm grows well both upon the plain itself, and upon the slopes of the plateau facing the sea, and copra and coco-nuts are exported. Rubber has failed to fulfil its promise and the area under it is declining. On the flood plains of the Tana and elsewhere some cotton is cultivated, and the industry might be extended if irrigation were available.

THE HIGHLANDS are capable of producing a great variety of crops, but it is not yet quite certain which will prove best adapted to their environment, and at the same time best able to stand the heavy cost of transport to the coast. Sisal has become an important export; it is well adapted to poor lands, and can be grown with a rainfall of 30 inches or less. Coffee does well in those districts which have a rich soil, and have either sufficient rainfall or are capable of irrigation; at present the chief plantations are near Nairobi and in the Fort Hall district at the foot of Mount Kenya. The product has a good reputation on the London market, where it is said that the higher grades possess precisely those qualities of sharpness without harshness which distinguish the best of the mild coffees.¹ Coffee which is entirely a European crop in Kenya is now its chief export. Cereals are cultivated west of the rift-valley. Maize is extensively grown by both Europeans and natives, but it is rather expensive to export; its cultivation has been greatly encouraged, however, by the introduction of a flat rate to the coast. Although the area under wheat has greatly increased within recent years, it cannot yet be said to have established itself satisfactorily, mainly on account of the difficulty of finding a permanently rustless variety. Sesame and cotton are native crops, the latter being grown in the Kavirondo country bordering Lake Victoria. The natives possess large numbers of cattle, and stock-farming among Europeans is on the increase. For sheep, the rift-valley is better adapted than the uplands, on which cattle thrive. Until recently when gold was discovered in the

¹ Report of the Imperial Economic Committee No. 19.

Kavirondo region the only minerals worked were the soda deposits of Lake Magadi, near the southern frontier.

COMMUNICATIONS AND TRADE. The Uganda railway, which runs from Mombasa into Uganda, is the chief means of communication in the colony. From Mombasa it ascends, often by steep gradients, to a height of nearly 8,000 feet on the eastern escarpment of the rift-valley. After descending about 2,000 feet into the valley, it branches at Nakuru before rising again to over 8,000 feet on the western escarpment. One branch runs across the cereal-producing region of the Uasin Gishu plateau, and to the south of Mount Elgon, on its way to Uganda, while the other goes to Kisumu, the chief port on Lake Victoria. There are also connections with Lake Magadi and Tanganyika Territory. The principal exports are coffee, maize, sisal and flax, carbonate of soda, hides, and oil-seeds, while the imports consist of cotton goods, motor-cars and motor spirit, and agricultural implements and machinery.

TANGANYIKA TERRITORY¹

German East Africa, with the exception of the districts of Ruanda and Urundi in the north-west, administered by Belgium, is now known as Tanganyika Territory and is governed by Great Britain under a mandate from the League of Nations. It has an area of 365,000 square miles and a population of over 4,800,000, of whom less than 7,000 are Europeans. With the exception of the Masai, who dwell to the south-west of Kilimanjaro, the majority of the natives are of Bantu stock.

The physical geography of the country is briefly as follows: The 600 miles of coast are bordered by a hot, moist, and frequently unhealthy lowland of varying breadth and height, beyond which lie various highlands, of which the Usambara, the Usagara, and the Uluguru are among the more important. The coastal plain and the mountain slopes which face the sea have a mean annual rainfall of at least 30, and in places of over 60 inches. Beyond the highlands, but at a lower elevation, lie plateaus with heights of 3,500 to 4,000 feet above sea-level. The rainfall on these plateaus, sheltered by the mountains, is naturally low; in the east it probably does not exceed 30 inches and is sometimes much less, but it increases in the

¹ *The Handbook of Tanganyika*, edited by G. F. Sayers, contains much useful information.

west as the land rises towards the hills which border the rift-valley in which Lake Tanganyika lies. At Dar es Salaam, about the middle of the east coast, the mean temperature is 78° F., with a range from 73.5° F. in August to 82° F. in January; at Tabora on the plateau the range is from 70° F. in June and July to 77.5° F. in October; and on the slopes of Kilimanjaro, near Moshi, at an elevation of about 5,000 feet, it is from 58.5° F. in July to 68.5° F. in February.

The coastal plain, and the seaward slopes of the highlands which border it, are generally forested, but, farther inland, the vegetation is of the savanna type, and, in the regions of low rainfall on the eastern part of the plateau, tends to pass into semi-desert. There are, therefore, two fertile areas—an eastern and a western—separated by a wide stretch of sparsely populated country. German authorities have estimated that not much more than one-fifteenth of the whole region is capable of development.

Agriculture is mainly in the hands of the natives, but a number of plantations under European management were established by the Germans in the healthier parts of the colony, more especially in the north-east on the slopes of Kilimanjaro and the Usambara. On these plantations sisal, cotton, coffee, and various other crops are cultivated. Sisal, which is at present the chief export, can be grown in many places, but on account of the cost of transport it has been planted chiefly on the coast or along the railways within a short distance of the ports. Cotton, the cultivation of which by Europeans was much encouraged by the German authorities, has not proved altogether a success, partly because the most healthy districts are not those best suited to the growth of the plant. On the other hand, the native population is giving it more attention, and it now forms one of the chief exports. Considerable areas had been planted with Ceara rubber before the War, but the industry has completely collapsed owing to the impossibility of competing with the more cheaply-produced rubber of the East. The native crops include cotton, rice, sesame, and coco-nuts in the eastern districts, and cotton, coffee (mainly *C. robusta*), and ground-nuts in the western. Beeswax is collected in various places. Stock-raising is an important native industry, mainly on the drier central plateau, and considerable quantities of hides and skins are exported. The mineral wealth does not appear to be of great

importance, but gold, mica, and diamonds are worked on a small scale, and coal and iron are known to exist.

The different parts of the country have not yet been connected by a good system of communications, and at present there are only two important railways. One runs from Tanga, by way of the plantation district on the Usambara, and Moshi on the slopes of Kilimanjaro, to Arusha at the foot of Mount Meru; it is connected by a branch line with the Uganda railway; the other starts at Dar es Salaam and goes to Kigoma on Lake Tanganyika, so that it has not only opened up the plantations on the Uluguru and other ranges, and the cattle-raising region on the plateau behind, but it acts to a rapidly increasing extent as an outlet for some of the eastern districts of the Belgian Congo. A branch from Tabora runs to Mwanza on Lake Victoria. Some of the products of the northern districts leave the Territory by way of the ports on Lake Victoria or the Uganda railway.

CHAPTER XXXIII

SOUTH AFRICA

AFRICA, south of the Zambezi, has an average elevation of about 3,500 feet, but there are three well-marked plateau regions which lie between 4,000 and 6,000 feet, or more, above sea-level. The first of these is to the north and west of the Molopo-Orange valley, and is sometimes called the Damanama plateau;¹ the second is the High Veld which extends almost from the south-west corner of the continent to the Limpopo ; and the third is the Matabele-Mashona plateau between the Limpopo and the *Zambezi*. The South-west plateau belongs to what was formerly German South-west Africa; the High Veld, with part of the lower land on the north-west and the coastal plains on the south and east, is divided among the provinces which make up the Union of South Africa ; and the Matabele-Mashona plateau constitutes Southern Rhodesia.

THE UNION OF SOUTH AFRICA

The Union of South Africa includes the four provinces of the Cape of Good Hope, Natal, the Orange Free State, and the Transvaal, while South-west Africa, which formerly belonged to Germany, is now administered by the Union under mandate from the League of Nations. For various reasons, economic development has been slow as compared with Canada or Australia.² Except in Natal, much of the land suffers from want of sufficient moisture, and for long more care was given to pastoral than to arable farming. Attempts to increase the cultivated area have latterly been made, and in many places the land is now irrigated when the rivers are in flood. Within the last few years, also, considerable attention has been given to conservation schemes, though, owing to the physical structure of the country, anything on a very large scale appears to be difficult, if not impossible. The long droughts and occasional heavy downfalls have affected the character of the soil, which has

¹ It lies in Damaraland and Namaqualand.

² See *The Agricultural Development of Arid and Semi-arid Regions*, by H. D. Leppan (1928).

in many places been washed away owing to the absence of a continuous covering of vegetation, with the result that considerable areas are becoming less, rather than more, fertile. As a result of these conditions, less than 6 per cent of the total area of the Union is at present under cultivation, and, although the extension of irrigation¹ and dry fanning may lead to a considerable increase of arable land, it will be some time before the country can supply itself with the food-stuffs which it requires and has at present to import. The economic development of the whole region, too, has been hindered by the existence, often in the more fertile districts, of a large native population, and by the fact that much of the manual labour required is provided by coloured people—either African or Asiatic. European immigration has, therefore, been discouraged, and out of a total population of over 8,000,000, only about 1,800,000 are of European descent. On the other hand, the political differences, which for so long separated the Briton and the Boer, appear to be in process of solution, while the discovery of great stores of mineral wealth, which for a time accentuated these differences, has done much within recent years for economic progress in the country. The growth of manufacturing industry has, however, been retarded by the low productivity of native labour, the high wages paid to skilled Europeans in the mines, and the smallness of the whole market.²

THE CAPE OF GOOD HOPE

The low coastal plateau on the extreme south of the African continent is bordered on the north by the Langebergen and other folded ranges, which lead up to the plateau of the Little Karroo. To the north of the Little Karroo, another series of folded ranges, of which the most important are the Zwartebergen, mark the ascent to the higher and broader Great Karroo. Beyond the Great Karroo, the Stormberg, the Nieuwveld, and the Roggeveld form the escarpment of the High Veld, which gradually falls away towards the Orange River.

The distribution of precipitation presents some features of

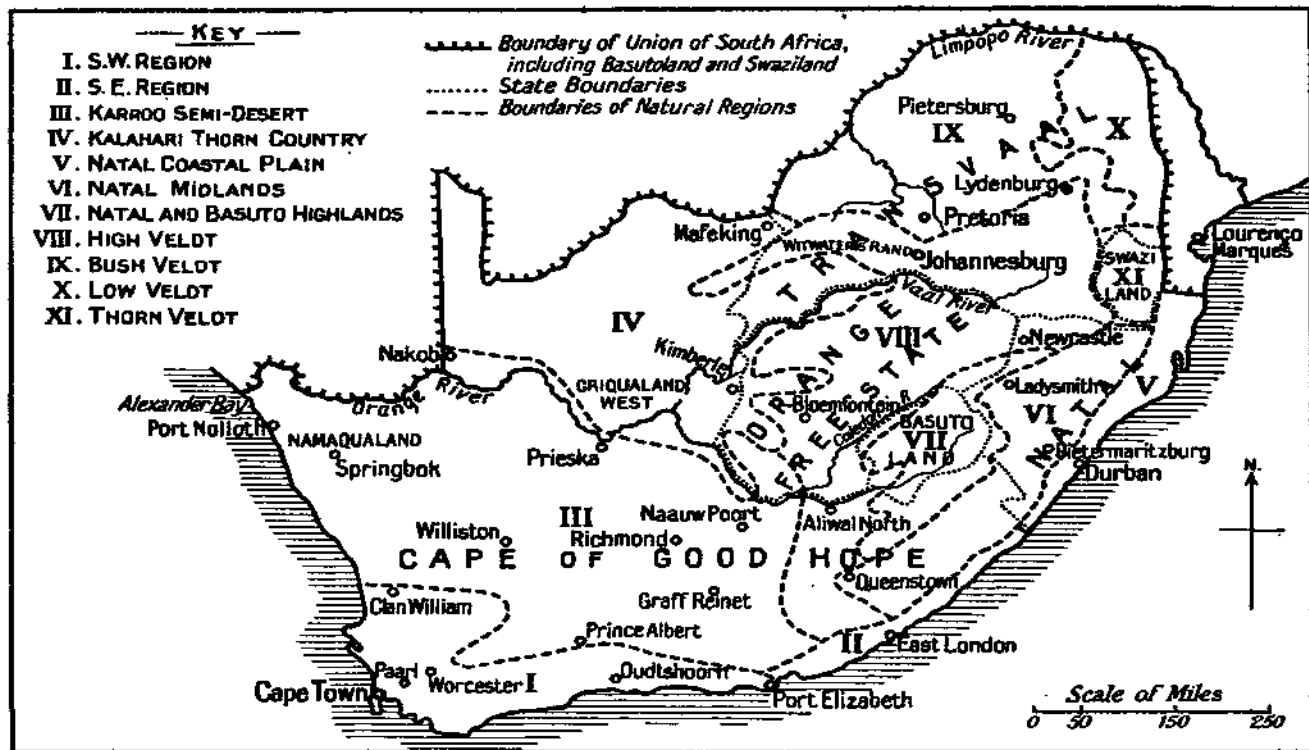
¹ In 1930 nearly 7 per cent of the cultivated area was irrigated. Agricultural statistics are based upon the *Report on the Agricultural and Pastoral Production of the Union of South Africa 1929-30 Agricultural Census No. 13.*

² *South Africa*, by Tan H. Hofmeyr (Benn, 1931).

special interest. In the south-west of the province, from Clanwilliam on the west coast to Port Elizabeth on the south, the greater part of the rainfall occurs during the winter half of the year ; but the amount is limited, and only over a comparatively small area does it exceed 20 inches. The remainder of the country, on the other hand, receives most of its moisture from the south-east trade winds during the summer months; but there is a steady decrease in amount from east to west, and, while the eastern part of the province has a mean precipitation of over 20, and in places of over 30 inches, there is a large area in the west which has less than 10 inches.

NATURAL REGIONS. The south-east and the south-west coastal areas are marked off from the regions which adjoin them by more equable temperature and greater precipitation ; and from one another by the seasonal distribution of their rainfall. The eastern slopes of the High Veld are covered with grass, and may therefore be considered apart from the western, which have a vegetation somewhat similar to that of the Karroo, along with which they may be treated. The north-west of the province is one in which little economic activity appears to be possible, except in Griqualand West which has great mineral wealth.

THE SOUTH-WEST REGION has mild, moist winters and hot, dry summers. At Cape Town the mean monthly temperature ranges from 54° F. in July to 69° F. in January. The soils of the region are on the whole rather infertile, but cereals and fruit are both extensively grown, though for the latter, at least, irrigation is often necessary. Wheat, oats, and barley, the principal cereals cultivated, find a more favourable environment here than in any other part of the province. Fruits and the vine are grown, more particularly in the rich lands around Paarl, Worcester, and Stellenbosch. Light wines and brandy are both manufactured, but the export trade has met with varying fortune; during recent years there has been on the whole a considerable increase in the amount of wine sent to Great Britain. Fruits include grapes, peaches, oranges, and pears, for all of which there appears to be a growing market in Great Britain, where they arrive in the early part of the year, and some weeks before the produce of other parts of the southern hemisphere. Turkish tobacco is grown mainly in the country round Stellenbosch.



NATURAL REGIONS OF SOUTH AFRICA

THE SOUTH-EAST REGION, with its summer rainfall and somewhat higher temperature, is more suitable for the cultivation of maize than of wheat, and some of the chief maize-growing districts in the province lie within it. Kaffir corns (varieties of *Sorghum vulgare*) are also extensively grown, and other crops include oat-hay, tobacco, and fruit. Cattle are reared in large numbers, particularly in the eastern part of the region. There are considerable areas of fertile soil, of which the best use is not always made, as much of the land in the Transkei territories is in the hands of natives, whose standard of cultivation is not high.

THE KARROO SEMI-DESERT. On the Karroos the rainfall is meagre, generally below 15 inches, while the heat of summer is often great. Graaff Reinet, for example, has a mean monthly temperature ranging from 51 °F. in July to 72° F. in February. The Karroos are, in the main, pastoral; but, as the vegetation chiefly consists of dwarfed shrubs, the carrying capacity of the land is low, three to ten acres being required for one sheep. Ostrich rearing, formerly a profitable industry round Oudtshoorn and other irrigated districts in the Little Karroo, is, owing to changes in fashion, now of little account, and many of the farmers once engaged in it have turned to the cultivation of tobacco. A little wheat is grown, but stock-raising is the chief occupation of the farmer. Cattle were formerly reared for transport, but, with the development of railways, they are now less used for that purpose, and more attention is being paid to dairying and beef production. Sheep and goats are both raised for the sake of their fleece. The conditions over the remainder of this region are very similar to those on the Karroos proper. Towards the west it passes into the coastal desert of Namaqualand where copper is found.

THE KALAHARI THORN COUNTRY includes part of the Cape Province. It is a region of low rainfall and great extremes of temperature, and it is covered mainly by thorn bush and sparsely-spaced tufts of desert grasses. The pasturage, though incapable of carrying a large amount of stock, is good, and, especially in the east where the rainfall is heavier than in the west, cattle are more numerous than in the country farther south. Sheep and goats are also raised in relatively large numbers. Griqualand West, although treated separately, really belongs to this region.

GRIQUALAND WEST. The diamond mines of this region, to

which it mainly owes its importance, consist of " pipes " of, a breccia known as kimberlite ; these penetrate the stratified rock of the country, and are due to volcanic action, though the precise way in which they have been formed has not yet been determined. Those mines which are worked at present are situated in the vicinity of Kimberley, and are owned by the De Beers Company which has an agreement with the London Diamond Syndicate and with the other important producers in South Africa (Premier Mine in the Transvaal, Jagersfontein in the Orange Free State, and South-west Africa) to restrict output. As a result, prices were more than maintained for a number of years, but since 1920 there has been a marked decline, due in part to competition from other countries, notably the Belgian Congo, and, in part, to the discovery of alluvial diamonds in South Africa itself. Alluvial diamonds, which are more valuable than mine diamonds, are found in this region and at Alexander Bay, south of the mouth of the Orange river, as well as in the western Transvaal.

THE HIGH VELD. In the north-east of the Cape Province, in the country round Aliwal North, lies part of the High Veld. It has a lower temperature than the Karroos, but a higher rainfall, and grass intermingled with herbaceous shrubs is the predominant vegetation. Some wheat and maize are grown, but the chief agricultural pursuit is stock-raising, and cattle and sheep are reared in large numbers.

NATAL

From the heights of the Drakensberg which, in Natal, form the escarpment of the High Veld, the land descends in a series of deeply incised terraces to the coastal plain which borders the Indian Ocean. Climatic conditions, which are mainly determined by altitude, afford the best basis for the division of the country into natural regions. The coastal plain, which has a breadth of 10 to 15 miles (except in Zululand where it is broader), and rises from sea-level inland to a height of about 1,000 feet, is a sub-tropical region. Durban, on the coast, has a mean annual temperature of 71° F., with a range from 64.5° F. in July to 76.5° F. in January and February. The Midlands, which extend up the mountain slopes to an altitude between 4,000 and 5,000 feet above sea-level, are more temperate in character. Pietermaritzburg (2,225 feet), for

example, has a mean annual temperature of 66.5° F., and a range from 57-5° F. in June to 73-5° F. in February. On the Highlands, which occupy the remainder of the country, the temperature is still lower. Precipitation appears to be heaviest along the coast, which has a mean annual rainfall of just over 40 inches; the Midlands generally have been 25 and 40 inches; and in the Highlands the amount is probably about the same.

THE COASTAL PLAIN contains some regions of great fertility. Sugar is extensively grown on a narrow belt of country which does not extend inland far from the coasts of Natal and Zululand; in the latter region with its higher temperature, heavier rainfall, and richer soil, conditions are more favourable, but for various reasons, of which better methods of cultivation in Natal is one, the yield per acre is practically the same. Recently, there has been a considerable increase in the area under sugar, partly as a result of the decline in the production of tea, and partly because of protective tariffs, and Natal is now more than able to meet the rapidly-growing demands of the Union. Tea is cultivated farther inland than sugar, as in Natal it thrives best at elevations between 500 and 1,000 feet above sea-level. The product is of good quality, but has a peculiar flavour which renders it unsuitable for export; the market for it is almost entirely confined to South Africa, where it provides but a relatively small part of the total amount consumed. Since the prohibition of cheap indentured labour from India the area under tea has declined; unindentured Indians appear to find more profitable employment in the sugar plantations, while native labour is inefficient and relatively dear. Tobacco has hitherto been grown mainly by Indians, and the bulk of it is of poor quality. The cultivation of wattle, which was formerly confined to the Midlands, is now being extended to the coastal plain, apparently with favourable results. Fruits, such as bananas, pine-apples, oranges, and lemons, cereals, such as maize and Kaffir corn, and arrowroot, are all extensively cultivated. Cotton was a promising crop, especially in Zululand, before the recent fall in price.

THE MIDLANDS are mainly devoted to agricultural pursuits. Arable farming is widespread, and the growing of wattle trees is an important industry which now attracts considerable attention. The bark is exported mainly to Great Britain and Germany, but recently factories have been established for the extraction of the

tannin within the country itself; the timber is in demand for use as pit-props in the mines at Johannesburg. The cultivation of cotton was increasing until recently, particularly in the north. There are extensive coalfields in the country traversed by the railway from Dundee to Newcastle, and from the mines in the districts of Klip river, Utrecht, and Vryheid, over 4,000,000 tons per year are produced. The quality of the coal is superior to any other in South Africa, a fact which goes far to explain the importance of Durban as a coaling port.

THE HIGHLANDS are more suitable for pastoral than for arable purposes, and considerable numbers of cattle and sheep are raised. Many of the Boer farmers from the Transvaal bring their flocks and herds to this region during the winter months, when food is scarce upon the High Veld.

THE ORANGE FREE STATE

Practically the whole of the Orange Free State belongs to the High Veld, and, owing to its great altitude, possesses a temperate climate. At Bloemfontein, which is 4,518 feet above sea-level, the mean annual temperature is 61° F. June, the coldest month, has a mean of 48° F., and December, the hottest, one of 73° F. The rainfall diminishes from the east, where it is between 25 and 35 inches, towards the west, where it is less than 20, or even 15 inches; and the grassland of the former region gives place to the Karroo bush of the latter. Though the country is mainly a pastoral one, the fertile alluvial soils and heavier rainfall in the valleys of the east have led to the cultivation of wheat on a considerable scale; and a large part of the wheat grown in the province comes from the basin of the Caledon River, which has been called "the granary of South Africa." In the east and north, maize is grown, but both districts frequently suffer from drought, hailstorms, and locusts. Since the Boer War (1899-1902) there has been a marked development in the pastoral industry, and cattle and sheep are both more numerous than they were before it. Cattle are raised mainly on the grasslands in the east of the province where a dairying industry, often on a co-operative basis, has recently been established, but sheep and goats are more widely distributed, as they also thrive on the Karroo bush in the south-western districts. Sheep have been imported from Australia for breeding purposes, and the yield of

wool is now said to be not only heavier but of better quality. In the western part of the country, which is more arid than any other, the agricultural population depends entirely upon underground water. Irrigation and dry farming have been attempted in various places, but as yet no striking progress appears to have been made.

The mineral output of the Orange Free State is not great. Coal of second rate quality, but useful for steam and domestic purposes, is found in the north of the country near Vereeniging, and there are diamond mines at Jagersfontein, Koffiefontein, and elsewhere, those at Koffiefontein being controlled by the De Beers Company.

THE TRANSVAAL

The Transvaal may be divided into four main regions. The high veld, which includes most of the land with an elevation of over 4,000 feet, lies in the south, east, and west, and consists in the main of vast rolling plains of grassland intermingled with perennial herbs and occasionally shrubs. To the north of it at a height of 3,000 to 4,000 feet lies the bush veld, a savanna region, in parts of which trees become the dominant feature in the vegetation. It is bordered on the east by the low veld which occupies the wide, open valleys of the Limpopo and its tributaries, and is from 1,800 to 3,000 feet above sea-level. The vegetation is that of a bush-covered country with tropical trees. Lastly, in the south-east of the Transvaal there is part of the thorn veld which lies between the Drakensberg and the coastal plain; its general appearance is that of a grassland with scattered thorn bush.

THE HIGH VELD. Lines drawn from Pitsani, on the main railway line some little distance north of Mafeking, to Johannesburg, from Johannesburg to Pilgrim's Rest, about thirty miles north-east of Lydenburg, and from Pilgrim's Rest to a point on the Natal frontier to the east of Wakkerstroom, mark off the greater part of the High Veld from the remainder of the country. But a distinction is frequently made between the region to the east of Johannesburg and that to the west. The former—the High Veld proper, as it is called—has an elevation of over 5,000 feet, and consists in the main of rolling downs; while the latter, which is known as the Middle Veld, and usually lies between 4,000 and

5,000 feet above sea-level, is more irregular in appearance and is frequently broken by long lines of low hills.

Over the whole of the High Veld the summers are hot, but in winter the thermometer frequently falls considerably below freezing point. Johannesburg, which has an altitude of 5,735 feet, has a mean annual temperature of 59° R, with a range from 50-5° F. in July to 65-5° F. in January. The range between day and night temperature also is often great. The annual precipitation decreases from over 40 inches in the east to between 15 and 20 inches in the west. On the High Veld proper the rains, which occur in summer, are tolerably certain ; but on the Middle Veld they are more irregular and vary considerably from year to year.

The vegetation is that of a grass steppe practically unbroken by trees or shrubs, except in the moister and warmer districts. The whole of the High Veld is devoted to stock-raising, and its importance may be gauged by the fact that, in 1930, about four-fifths of the total number of sheep in the country (5,600,000) were found in those districts which almost entirely belong to it. Over two-fifths of the cattle in the Transvaal are also in this region. The High Veld proper is peculiarly adapted to stock, though it is sometimes necessary to "trek*" to lower lands during the winter months. In the Middle Veld the grass is not so good, and animals fed upon it are more subject to disease. On the High Veld, the land has hitherto been cultivated only to a limited extent, but attention is now being given to more intensive methods, including irrigation and dry farming, and the arable area is increasing. Maize is the most important crop. Formerly it was mainly grown by the native workers on Boer farms, but it is now treated as a European crop, and considerable quantities are available for export. As the climate is dry during the ripening period, the grain contains but a low percentage of moisture and artificial drying is unnecessary. Transvaal maize is therefore well adapted for manufacture, or for export without risk of injury in transit.

The Witwatersrand, which lies along the northern margin of the Middle Veld west of Johannesburg, has acquired peculiar importance on account of the vast quantities of gold which it contains. The rocks, which constitute what is known as the Main Reef Series, consist of a quartz conglomerate or banket, in which the gold lies in particles so small that they are rarely visible to the naked

eye; and it was not until the introduction of the cyanide process that the region assumed its present importance. Cheap native labour, recruited in Portuguese East Africa as well as in the Union, and the proximity of coal also contributed to the rapid growth of the mining industry. In 1930 the value of the annual output, reckoned at the standard price of gold, was £40,000,000, or over 50 per cent of the world's production.

Among the first coal mines to be worked were those at Boksburg and Springs to the east of Johannesburg, but the main supply is now obtained at Witbank and at Middleburg. Part of the output, which amounts to about 7,000,000 tons a year, is exported, by way of Lourenso Marques, to the west coast of India and elsewhere. Transvaal coal is not of high quality, but in a country which is practically treeless, and far removed from other sources of supply, it plays a very important part in industrial development. In the western Transvaal, alluvial diamonds are found in the basins of the Vaal and its tributaries. The Premier diamond mine lies north-east of Pretoria; as a general rule the stones obtained from it are less valuable than those found in the other great mining areas of the Union.

THE BUSH VELD, along with which may be considered the low country to the east of it, has a more tropical climate and its development has been retarded by malaria and livestock diseases. Pietersburg (4,130 feet) has a range of temperature from 53° F. in July to 71° F. in January, while the annual mean at Komati Poort in the low country is 73° F. The rainfall, which occurs mainly in summer, decreases from about 30 inches in the east to about 15 in the west, except on such mountains as the Zoutpansberg where it is considerably higher. The pasturage is regarded as the finest in South Africa, and important ranching districts are situated upon it; though its carrying capacity is low it accounts for over half of all the cattle in the Transvaal. Cereals, including one-fourth of the maize crop of the province, are grown, partly to provide food for stock during the dry season. The cultivation of cotton has given promising results especially in Barberton and Rustenburg; of the 144,000 acres under this crop in South Africa in 1924-25 more than half was in the Transvaal. The recent fall in prices has led to a great reduction in the area cropped, and in 1929-30 the Transvaal had only 18,000 acres under cotton, two-thirds of which

was in the districts just mentioned. Other difficulties arise from the uncertainties of the weather, the occasional scarcity of native labour, and pests such as locusts, termites, and grasshoppers. In this region also is produced a considerable part of the South African tobacco crop. Large deposits of iron ore are found in the Rustenburg district, and it is proposed to connect them by rail with Pretoria where an iron and steel industry is to be established. Asbestos is known to exist in large quantities in Lydenburg, Barberton, and elsewhere. At Messina, in the valley of the Limpopo on the northern frontier, there are important copper mines.

FOREIGN TRADE. The following table indicates the value of the foreign trade of the Union of South Africa for the three years, 1929-30-31—

	Imports	Exports	Rate of Exchange
	£	£	Until Sept. 1931 £100sterling=£100 + $\frac{1}{4}$ to. $\frac{3}{8}$. There- after varied be- tween £85 $\frac{1}{4}$ and £70 S. Africa.
1929	82,113,000	80,855,000	
1930	63,356,000	67,855,000	
1931	51,959,000	60,270,000	

The principal imports and exports for the same years were as follows—

Imports	Percentage of Total Imports	Exports	Percentage of Total Exports
Textiles	25-7	Gold	53-5
Metals	9-9	Wool	13-8
Machinery	9-4	Diamonds	10-1
Motor-cars, etc.	6-8	Cereals (maize)	3-0
Mineral Oil	4-6	Hides	3-0
Wood	3-6	Fruit	2-2
Leather	2-1	Sugar	1-9
Paper	2-0		

The principal importing and exporting countries were as follows (based on the years 1929 and 1930)—

Imports from	Percentage of Total Imports	Exports to	Percentage of Total Exports
United Kingdom	44.3	United Kingdom	67.0
United States	16.4	India	6.0
Germany	6.5	France	4.1
Canada	3.3	Belgium	3.8
India	3.2	Germany	2.4
Belgium	2.2	United States	1.6
France	1.9		

As much of the shipping engaged in the South African trade is British, it is probable that part of the imports credited to the United Kingdom is really from continental countries. It is certain that a considerable portion of the goods declared to be for export to Great Britain are sent there for distribution over Europe. The principal imports from the United Kingdom are textiles, iron and steel goods, and machinery. The United States supplies machinery, mineral oil, and motor-cars and lorries. From Germany come railway and electrical machinery, hardware, and miscellaneous goods. Canada sends wheat, paper, motor-cars, and timber. Bags and rice are the chief imports from India, railway material from Belgium, and silk goods and wearing apparel from France. Great Britain takes the greater part of the gold export, though some goes to the United States and India; wool and diamonds also go to Great Britain; France, Belgium, and Germany buy wool, hides, maize, and bark. Belgium, Holland, and the United States also are purchasers of diamonds.

SOUTH-WEST AFRICA

This region, which was formerly a possession of Germany and is now administered by the Union Government, has an area of 312,000 square miles. The population, which consists of Bantus along with some Hottentots and Bushmen, probably does not exceed 300,000. The physical features of the region are comparatively simple. From a low coastal plain in the west, the land rises in a series of plateaus, generally between 4,000 and 6,000 feet above sea-level, and then falls away towards the north and the east. Along the coast, and in the southern parts of the interior, the rainfall is meagre; but it

increases to about 12 inches in the central districts, and to about 22 in the northern. In the last-mentioned area agriculture is possible, and maize and other crops can be grown, but they are always liable to suffer from drought. It is for stock-raising purposes, however, that the country is best adapted, as water can often be obtained by sinking wells and tapping underground streams. Cattle thrive in the northern and central districts, and sheep in the central and southern. Diamonds are found along the coastal strip between the 24th and the 28th parallels, and copper is mined at Tsumeb and elsewhere in the north of the country.

BASUTOLAND

Basutoland, which is governed by a Resident Commissioner under the direction of the High Commissioner for South Africa, consists of a mountainous region bordering upon the Cape of Good Hope, Natal, and the Orange Free State. The Drakensberg lies along the south-east frontier of the country, and beyond it are several parallel and subsidiary ranges. Much of the soil along the western frontier is fertile, and the climate is favourable both for arable and pastoral farming. Wheat, maize, kaffir corn, cattle, wool, and mohair are all produced and, with the exception of maize, exported by the natives, who practically form the entire population.

THE BECHUANALAND PROTECTORATE

The Bechuanaland Protectorate belongs to the South African plateau, and the greater part of it lies between 3,000 and 4,000 feet above sea-level. In the east, where there is a mean annual rainfall of 20 to 25 inches, the country is a grassland and is inhabited, but in the west it passes into the Kalahari steppe. The population is almost entirely a native one ; and the chief wealth consists of cattle, sheep, and goats. Maize and kaffir corn are grown; but in years of deficient rainfall, which occasionally occur, the crops are a complete failure. There are believed to be considerable supplies of underground water both in the east and in the west, but so far they have been utilized only to a slight extent.

The Protectorate, which is also under the control of the High Commissioner, has an area of 275,000 square miles, and a population, almost entirely Bantu, of 153,000.

SOUTHERN RHODESIA¹

The Rhodesian plateau, to which Southern Rhodesia belongs, lies between the Limpopo and the Zambezi. The greater part of the region has an elevation of over 3,000 feet; but a considerable area, which runs from south-west to north-east, and forms the divide between the waters of the Zambezi and those of the Limpopo and the Sabi, is over 4,000 feet, and in places over 5,000 feet, above sea-level. To the north and to the south, the land slopes down to the valleys of the rivers between which it lies, and only there is it less than 1,000 feet in height. The greater part of the highland region is built up of granitic and metamorphic rocks. Lower down the slopes there are sedimentary formations, generally consisting of sandstones, shales, and conglomerates, covered over in many places with superficial deposits such as laterite.

Notwithstanding the fact that Rhodesia lies within the tropics, it has, on the whole, a temperate climate. Bulawayo, which has an altitude of 4,469 feet, has a mean annual temperature of 66° F., with a range varying from 56° F. in July to 73° F. in November and December; while Salisbury, at an elevation of 4,480 feet, has a mean of 65° F. and a range from 56° F. in June and July to 70° F. in November. The rainfall, which takes place almost entirely between the beginning of November and the end of March, decreases from east to west. The greater part of Mashonaland in the north-east has between 30 and 40 inches, while Matabeleland in the south-west has, as a rule, between 20 and 30 inches. The highlands are generally healthy, and it is probable that the greater part of the country with an elevation over 4,000 feet could be rendered fit, as much of it, indeed, at present is, for European settlement.² At lower levels the white man is liable to contract malaria, though, when the land between 3,000 and 4,000 feet is cleared and drained, it is possible that he may be able to occupy it. Below 3,000 feet, it is unlikely that he will settle.

MINERALS. Within the highland area is found much of the mineral wealth which at present is, and for some time is likely to

¹ See *The Year Book of the Colony of Southern Rhodesia* (1932).

² The area is 150,000 square miles. The European population, of whom nearly 90 per cent live above 4,000 feet, numbers 50,000. The native population, indigenous and alien, is estimated at 1,055,000.

be, one of the principal reasons for the exploitation of the country. Gold, which is obtained both from reefs and from banket formations, comes first in importance, and the annual output is now over £2,000,000. Many of the mines lie along the route taken by the railway between Bulawayo and Salisbury. Rhodesia is the world's largest producer of chromite, and in its output of asbestos it comes next to Canada and Russia. The most extensive deposits of asbestos occur in the south-east of the country at Shabani and Mashaba, where their exploitation is still in its early stages. Chrome is mined at Selukwe, about half-way between Bulawayo and Salisbury, and to the north of the latter town. In addition, silver, lead, iron, copper, and tin are known to exist, but have been worked as yet only to a limited extent. Coal is believed to be widespread over considerable areas, but the principal mines from which it is obtained at present are at Wankie, near the western frontier of Matabeleland, where the annual output now amounts to over 1,000,000 tons. The coal from this field produces coke of good quality, for which there is now an important market in the copper-mining districts of Katanga in the Belgian Congo.

AGRICULTURE. Rhodesia is suitable both for arable and pastoral farming. For the former, the best districts are apparently in Mashonaland, where the rainfall is heaviest, but in Matabeleland also there are considerable areas of fertile soil. The chief crops grown by European farmers are maize and tobacco. The former, which is a summer crop, is the principal food-stuff of the native population in the mining districts. The cultivation of tobacco, which is now considerable, has, in many cases, given a new importance to light granitic soils, formerly fit for pasture only. Wheat, which cannot be cultivated in summer, as it is liable to rust, is sown as a winter crop but not to any great extent. In 1925-26, a large area was for the first time placed under cotton, but low yields combined with low prices led to a great reduction in the following two years. Present conditions are, however, believed to be not altogether unpromising. Attention is being paid to the cultivation of citrus fruits, such as the orange and the grape fruit, for which Rhodesia appears to be well adapted. But it is as a stock-raising country that Rhodesia is at present most important from an agricultural point of view. The native herds have suffered severely from various diseases in the past, but these have been overcome;

at the same time the breed of cattle has been improved by importation from abroad. The farmer now finds his principal markets for cereals and cattle in the mining districts of the Transvaal, Rhodesia, and the Belgian Congo, but it is possible that an overseas trade in frozen meat may eventually develop. Some maize is sent to Europe.

Bulawayo and Salisbury are the principal towns, but there are a number of small mining and agricultural communities scattered over the highland region.

NORTHERN RHODESIA.

The Protectorate of Northern Rhodesia is still but imperfectly known. The greater part of the region belongs to the African plateau, but there are lowlands in the valleys of the Zambezi, the Kafue, and the Loangwa. The temperature is relatively high, even on the uplands. At Livingstone (3,000 feet) in the south, the annual mean is estimated at 73° F., with a range from 64° F. in June to 81° F. in October; while at Abercorn, which is in the north and has an altitude of 5,100 feet, the mean for the whole year is 67° F., for June 64° F., and for October 72° F. The rainfall, which is less than 30 inches in the south-west, increases to over 40 inches in the north and north-east. As a result of its climatic conditions, Northern Rhodesia, unlike Southern Rhodesia, is unsuitable for European settlement, and its white population consists mainly of temporary residents engaged in trading, mining, and plantation work. Over the greater part of the country, thin forest and savanna are the prevailing types of vegetation. Considerable areas are reported to be fit for cultivation, and maize, tobacco, and other farm crops are grown, though much attention is paid to stock-raising. For both cattle and maize the best market, at present, is in the mining districts at home and in the Belgian Congo. Cotton is grown on experimental farms, but there does not appear to be much prospect of a rapid development of the industry. The mineral wealth of the country is widely distributed, but its exploitation has recently been retarded by commercial depression. At the end of 1931 only two copper mines were still working—the Roan Antelope and the Nkana, both on the railway line near the Congo frontier. Lead and zinc are mined round Broken Hill. Coal, gold, and other minerals are also found.

COMMUNICATIONS OF SOUTH AFRICA

The railway system of South Africa may best be considered as a whole. From Cape Town, a line runs across the Karroo and the High Veld to Kimberley, and then on through Bechuanaland and the Bechuanaland Protectorate to Bulawayo in Southern Rhodesia, where it branches. One line goes north-west to cross the Zambezi at the Victoria Falls, and then north-east to Broken Hill. From there it is continued by way of Sakania, Elisabethville, and Kambove, all in the Belgian Congo, to Bukama on the Lualaba. The other line from Bulawayo goes north-east to Salisbury, and there links up with a line to Beira in Portuguese East Africa, which has thus become a port of Southern Rhodesia. From Port Elizabeth and East London two lines run through the north-east districts of the Cape, and meet at Springfontein in the Orange Free State, from which point the railroad is continued by way of Bloemfontein, Johannesburg, and Pretoria to Messina on the Limpopo frontier of the Transvaal. This line is connected with that from Capetown to Bulawayo by cross-country branches, among others, between Naauwpoort and De Aar, Bloemfontein and Kimberley, Johannesburg and Fourteen Springs, and Johannesburg and Mafeking by Zeerust. From Durban, there is railway communication north and south along the coast, but the most important route is that which runs inland by way of Pietermaritzburg to Ladysmith, where two lines diverge, one going by Van Reenen's Pass to Bethlehem, which is connected with Kroonstad and Bloemfontein, and the other going by Laing's Nek to Johannesburg. Lourenco Marques has been made into a port of the Transvaal by a line which runs from it to a point near Witbank, in the coal-producing area, where it divides, one branch going to Pretoria and the other to Johannesburg. South-west Africa is connected with the main system by a line which leaves it at De Aar and runs by Prieska to Seeheim whence lines diverge for Luderitz and Walvis Bay. Over 100 miles from the latter town a light railway breaks off for Tsumeb in the north.

NYASALAND

The British Protectorate of Nyasaland consists of a strip of country which lies along the west and south shores of Lake Nyasa, and extends southwards as far as Chiwonga on the Shire River.

The lowlands, which lie in the Great Rift, increase in height from 125 feet at Chiwonga to over 1,500 feet along the shores of the lake. Behind them, the country ascends in a series of escarpments and plateaus which have an average elevation of between 3,000 and 4,000 feet, but rise in the Mlanje, in the Shire Highlands, to over 6,000, and in the nyika, in the north, to over 7,000 feet. The climate of Nyasaland, accordingly, varies greatly from one place to another. At Fort Johnston, at the southern end of Lake Nyasa, the mean annual temperature is 76° F., while at Blantyre, 3,000 feet above sea-level, it is only 68° F., the mean annual range in either case being about 14° F. Over the greater part of the country the rainfall is between 40 and 60 inches.

Though it would appear that Nyasaland cannot be regarded as a white man's country in the usual sense of that term, British settlements have existed there for a number of years, and have played an important part in the economic development of the country. Coffee was formerly one of the principal crops grown by the white planters, but, as for various reasons it has proved less successful within later years, it has been superseded to a great extent by tobacco. Cotton, grown mainly by natives, is of good quality, but the difficulties of transport and the competition of tobacco, which is a more profitable crop, have prevented its cultivation to the extent that might have been expected. Tea plantations have been established by Europeans, and appear to be doing well. Maize, which is grown by the natives, is also exported. The development of the Protectorate is handicapped by inadequate communications. The railway which runs from Blantyre, in the Shire Highlands, to Port Herald, on the Shire River, is connected with one from Port Herald to Chindio, on the Zambezi, whence goods are sent to Chinde by boat, or from Murruga on the other side of the river, to Beira by rail. A trans-Zambezi bridge joining Chindio and Murruga is in course of construction, and the railway from Blantyre is being continued northwards to Lake Nyasa.

PORTUGUESE EAST AFRICA

Portuguese East Africa, which extends along the coast from Natal to Tanganyika Territory, and inland to the borders of the Transvaal, Rhodesia, and Nyasaland, and the eastern shores of Lake Nyasa, has an area of about 300,000 square miles; and a,

population which is estimated at about 3,500,000, of whom the majority are Bantus, and less than 18,000 are Europeans. The country consists, in the main, of the East African coastal plain and the slopes of the plateau. South of the Zambezi, it extends on to the plateau itself only in a few places, but to the north of that river, where the coastal plain becomes narrow, it includes the plateau east of Lake Nyasa and south of the Rovuma. Comparatively little is known about the climate, especially in the interior. On the coast, Lourenço Marques, in the south, has a mean annual temperature of 72° F., with a range from 65° F. in June to 79° F. in January; while at Mozambique, towards the north, the figures for the year are 79° F.; for July 74° F., and for December 83° F. The rainfall, which occurs between November and March or April, ranges from 28 to 40 inches over the greater part of the province, the northern districts having, as a rule, more than the southern. In the interior its distribution is more uneven, some places having more than 40 inches, others less than 30. Except in the drier districts of the interior, the country is generally covered with forest or savanna, and along the coast it is often swampy and unhealthy.

Economic progress has for various reasons been very slow. Disturbed political conditions in Portugal have too often been reflected in the inefficient administration of its colonies; and until recently comparatively little had been done to develop the resources of Portuguese East Africa apart from the efforts made by two chartered companies—the Mozambique Company, whose possessions lie mainly between the 22nd parallel and the *Zambezi*, and the recently dissolved Nyasa Company, which administered the region east of Lake Nyasa and north of the River Lurio—and by one unchartered company—the Zambezia, whose territory corresponds to Quelimane and Tete, along the lower course of the Zambezi. Agricultural development, moreover, has been retarded by the constant emigration of natives—many of whom did not return—to the Transvaal, Rhodesia, Belgian Congo, and other parts of Africa, and certain districts suffer from a continual shortage of labour. On the other hand, the fact that the province contains some of the chief gateways into the interior of Africa—Lourenço Marques, Beira, Chinde—has not only led to the extension of railways and the improvement of ports, but has caused the Portuguese to realize

that the region, if undeveloped by them, might pass out of their hands.

Of the export industries the cultivation of sugar is the most important. The chief producing districts are in the low alluvial plain of the Zambezi, but the industry is also carried on in other parts of the province. Much of the product is sent to Portugal, but there is also a market for it in the Transvaal, where sugar from Portuguese East Africa was, for a time, admitted free of duty in return for the privilege of recruiting labour in the latter region. Other exports include copra from large coco-nut plantations in the coastal region of Quelimane; ground-nuts, which are mainly grown by the natives of Mozambique; and sisal, of which considerable areas north of the Zambezi are now under cultivation. Maize is cultivated in various districts and a certain amount is exported. Although numerous attempts have been made to grow cotton, there has until recently been little real progress, and even now the total output is small. In Gaza, in the south, there are considerable areas of good pasture land, of which, however, little use has been made. The mineral wealth of the country is as yet undeveloped; there is a small output of gold and coal, and mineral oil and iron ore are believed to exist, but comparatively little interest is at present taken in mining.

CHAPTER XXXIV

WEST AFRICA

THE coastal regions of Africa, from the mouth of the Senegal almost to that of the Cunene, together with much of the Congo basin, receive a heavy rainfall and are covered with dense forests. They have been divided among a number of European states, whose territory frequently extends inland to the savanna lands lying beyond the forested area. The contrast in conditions of life and economic activities between the forest and the savanna is well marked, particularly in such countries as Nigeria and the Belgian Congo.

BRITISH WEST AFRICA

GAMBIA

The Colony and Protectorate of Gambia consist of several small islands in the River Gambia, together with a narrow strip of land which extends along both banks of that river for a distance of about 250 miles from the estuary by which it enters the Atlantic. The total area is about 4,000 square miles; and the inhabitants, who are mostly Sudanese negroes, are believed to number 200,000. Gambia has a well-marked dry season lasting from November to May, and the mean annual rainfall at Bathurst only amounts to 47 inches. As a result, savanna is the prevailing type of vegetation, except on the banks of the river, especially in its lower course, where there are mangrove swamps. Ground-nuts are extensively grown, and form the chief export of the region. Hides and the products of the oil-palm are of minor importance. There are no railways, and the Gambia, which is navigable by steamers for the greater part of its course within the Protectorate, is the chief means of communication. Bathurst is the capital and only town of importance.

SIERRA LEONE

The Colony and Protectorate of Sierra Leone, which lie between French Guinea on the north and the Republic of Liberia on the

east and south-east, have a total area of about 30,000 square miles, and a population, consisting mainly of Sudanese negroes, of 1,760,000. The country extends from the slopes of the African plateau, across an intervening region of undulating land, to the deltas of the various rivers by which it is drained. The climate is generally considered to be particularly unhealthy for Europeans ; but the high death rate of former times seems to have been due, in part at least, to ignorance of the precautions necessary in regions such as this. Freetown, on the coast, has a mean annual temperature of 81° F., with a very slight range throughout the year, and a mean rainfall of 174 inches, most of which falls from April to November; on the uplands of the interior, the temperature is lower and the rainfall less. Rain forest and savanna forest are the prevailing types of vegetation, but much of the former has been destroyed by the natives in order to obtain land suitable for the cultivation of rice and manioc. The oil-palm is widely distributed throughout the region, and palm-oil and palm-kernels together account for about three-fourths of the total exports. The kola tree (*Cola acuminata*) is also common, and kola-nuts, used as a stimulant on account of the caffeine which they contain, are exported to various parts of West Africa, north of Sierra Leone. Other exports, of less importance, include piassava, ginger, and gold. Freetown, the capital, has a good harbour and is an important coaling station. A railway, which runs eastward from it to Pendembu with a branch from Bauya to Makeni, serves the area in which the oil-palm is most abundant, and has done much to develop the trade in palm-oil and kernels.

THE GOLD COAST COLONY, ASHANTI, AND THE NORTHERN TERRITORIES

The Gold Coast Colony, Ashanti, and the Northern Territories have a total area of about 80,000 square miles, and a population of Sudanese negroes which numbers about 2,860,000. The portion of Togoland under British control which lies to the east may also be included; it has an area of about 13,000 square miles and a population of about 200,000. Except in the north, where it belongs to the Upper Guinea plateau, the country is generally flat or undulating. The mean annual temperature varies; but, as a rule, it falls between 78° F. and 82° F., the range throughout the year

being small. Owing to the configuration of the coast, the rainfall decreases rapidly from west to east and the dry season becomes more marked; Axim has over 80 inches, while Kwitta has less than 20; it also decreases inland, and in the northern part of the country the precipitation is about 40 inches. There are, therefore, two well-marked natural regions. The Gold Coast, except in the east, and the southern part of Ashanti, are covered with forest, and the remainder of the area consists of savanna land.

THE FOREST. The Gold Coast now produces about seven-tenths of the world's supply of cocoa; its rapid advance to this position is due partly to favourable conditions of soil and climate, partly to the adoption of better methods of preparing the bean for market, though the native grower still leaves something to be desired in this respect, and partly to the development of roads and means of transport. Rubber, obtained from *Funtumia elastica* which is indigenous, and from plantations of Hevea, is now of little account. The yield of palm-oil and palm-kernels has decreased, largely as a result of the greater attention paid to the production of cocoa. Kola-nuts are obtained from trees found in the forests north of Kumasi. Mahogany, which is floated down from the interior, is the most valuable timber of the region. Gold ranks next to cocoa in the list of exports, and is obtained partly by dredging the rivers, and partly by mining. Diamonds also are of importance, and a considerable quantity of manganese is exported.

The SAVANNA is freely cultivated, but its exports are inconsiderable. Cotton is grown for home consumption, but it is unlikely that the area under it will be much increased at present. Small quantities of gum and rubber, and some cattle, are at present the chief exports of the region.

COMMUNICATIONS. The country has now a good port in Takoradi and internal communications have been greatly improved during the last few years. The Volta is navigable for some distance, but its course is obstructed by falls; and the only railways which penetrate far into the interior are those from Takoradi and Accra to Kumasi.

THE COLONY AND PROTECTORATE OF NIGERIA

This region, which consists of the colony of Lagos and the former protectorates of Northern and Southern Nigeria, is the most

important possession of Britain in West Africa. It has an area of about 336,000 square miles, and a native population which is estimated at 21,000,000. A strip of the former German territory of Cameroon, including Cameroon Peak, is now attached to Nigeria ; its area is 31,000 square miles.

PHYSICAL FEATURES. The coast land, of recent and largely of deltaic formation, is fringed in places by lagoons. Farther inland, and covering a considerable part of Southern Nigeria, is an intermediate belt of clays, sandstones, and shales, which have built up a plain that rises in the north to a height of about 650 feet. This plain is continued in an east and north-east direction along the valley of the Benue, and northwards along that of its tributary the Gongola on the one hand, and north-westwards along the course of the Niger on the other; for the most part it does not rise to more than 800 feet above sea-level. Enclosed within these two great extensions of the lowland area lies the highland region, which consists in the main of a great massif of crystalline rocks; it forms open undulating country frequently broken by groups of rounded hills, and rises in the Bauchi plateau to a height of over 4,000 feet. To the north-east of the highland, the land falls away in great plains to the basin of Lake Chad; these are covered by an intermixture of alluvial soil and blown sand.

CLIMATE. In Southern Nigeria and in the lowlands of Northern Nigeria, the temperature is similar to that of the Gold Coast. Lagos, for example, has an annual mean of 79° F., with a range from 75° F. in August to 81° F. in February and March ; and Zungeru one of 81° F., with a range from 77° F. in August to 87° F. in March. On the upland districts conditions are somewhat more bracing, and in extreme cases the thermometer even falls below freezing point. Precipitation decreases from south to north ; and, while the coastal districts east of the delta of the Niger have a mean annual rainfall of 160 inches, the lands lying near Lake Chad, in the extreme north-east, have less than 20 inches.

NATURAL REGIONS. The tropical evergreen forest occurs in the south where there is rainfall at practically all seasons of the year. The remainder of Southern Nigeria, except in the north-east and north-west, is covered by the monsoon forest, which also extends up the valley of the Niger into the southern part of Northern Nigeria. The remainder of the country falls within the savanna lands of the

Sudan, as far north, at least, as the eleventh parallel. Beyond this limit, the character of the vegetation changes, and the savanna gives place to a more arid region, in which the gum-bearing acacia and other trees of a similar character are conspicuous. Three natural regions may, therefore, be recognized: the forest, the savanna, and the semi-arid lands.

THE FOREST. In this region, the natives of which are Sudanese negroes, the production of such food crops as yams, cassava, and maize for home consumption is the characteristic feature of local agriculture. Exports, on the other hand, are mainly derived from plants which either grow wild in the forest or require little labour after they have once been established. *Elaeis guineensis* from which palm-oil and palm-kernels are obtained, even when deliberately planted as is often the case, is generally allowed to grow under natural conditions; within recent years, however, numerous small plantations, on which the output per tree is larger, have been established. The cacao tree finds its most favourable environment—good and deep soil with a humid atmosphere—in the south-west of Nigeria. It is grown on plantations so successfully that the colony is now the second largest grower of cocoa, and produces about one-sixth of the world's supply. Rubber, formerly obtained from *Funtumia elastica* and *Landolphia owariensis*, both indigenous to the region, as well as from plantations of *Hevea brasiliensis*, is now of little importance among the exports of the region. Other forest products include kola-nuts, mahogany, and ebony. Cotton grown in the drier parts of the south-west will be referred to later. Coal of Tertiary age is found on both sides of the Niger, and is mined near Udi; among other minerals known to exist are gold, iron, and tin.

THE SAVANNA AND THE SEMI-ARID LANDS. For the support of the population of these regions, which in places is very dense, the chief food crops cultivated are Guinea corn (*Sorghum vulgare*) and other varieties of millet, wheat, maize, and rice. Guinea corn is grown throughout the country, maize in the wetter districts of the south, wheat in the drier districts of the north, and rice in various places where the land is swampy. In years of deficient rainfall, the inhabitants of the northern districts frequently suffer from famine.

Cotton has always been grown by the natives both in the north and in the south for domestic manufacture, and they have also been encouraged to grow it for export to Lancashire. As the indigenous

plant gave a low yield, various attempts have been made to acclimatize and propagate varieties of seed from foreign sources, mainly American. These attempts have resulted in the production of a cotton which suits the local conditions, and gives a better return than the native type; it has readily established itself in the exporting districts. The British Cotton Growing Association, which initiated these experiments, also set up a number of ginneries in the country, but the output did not increase so rapidly as had been expected. The climate and soil are favourable, the agricultural population is industrious and experienced, and the demand was, for a time, good. On the other hand, the methods of cultivation are generally somewhat primitive, and, as a result, much land and labour is required for the production of food crops. Accordingly whenever, for any reason, the price of food crops rises the area under cotton declines. Communications are also defective and until railways or motor roads have been constructed the cost of transport and the waste of labour involved in portorage will act as a check upon production. Existing abnormal conditions have, of course, effectively discouraged cultivation.

Ground-nuts constitute the great export crop of the semi-arid lands of the extreme north. They grow well on sandy soil, and in times of scarcity can be used as food instead of being sold for export. Other products of an agricultural nature which are exported include shea butter, fibres of various kinds, hides and skins, and Kano leather (which is known in Europe as Morocco leather).

Tin, which is the most valuable mineral of Nigeria, is found in various places, the most important of which is the Bauchi plateau. It occurs in the alluvial deposits which cover the plateau and its northern margin, and it is these deposits which are at present being exploited, but the ultimate success of the field will probably depend upon the discovery of paying lodes in the underlying rock. With the extension of the railway to the mineral districts, a rapid increase in the output has recently taken place. Iron ore occurs in various places, and was formerly smelted by the natives, but, with the importation of cheaper foreign iron, these works have been abandoned. Some gold and silver are also found.

COMMUNICATIONS, TRADE, ETC. The Niger, by way of the Forcados distributary, is navigable at all seasons as far as Jebba for vessels drawing not more than three feet of water, and during the

floods for vessels drawing not more than five feet. On the Benue ships drawing ten feet can go as far as Yola during the flood season, but for the remainder of the year the river is practically unnavigable. Both rivers require a considerable amount of supervision to keep their lower courses clear, as they are liable to be choked by vegetation. The principal railway is that which runs from Lagos, by way of Abeokuta, Jebba, Minna (where it meets a line running from Baro, a river port on the Niger some distance above its confluence with the Benue), Zaria and Kano (a great native trading centre in the north of the country) to Nguru. Port Harcourt, on Bonny River, is the starting-point of another main line from the coast to the Udi coalfield, beyond which it runs by Makurdi on the Benue, to Kaduna on the railway from Minna to Zaria. From Kafanchan on this line, and from Zaria, other lines run to the tin-fields of the Bauchi plateau.

The principal exports have already been indicated; palm-oil and palm-kernels constitute about 45 per cent of the total, and the remainder consists of ground-nuts, cocoa, tin, hides, and cotton. The imports consist very largely of cotton goods, iron and steel goods, machinery, mineral oil, and miscellaneous articles.

FRENCH WEST AFRICA ¹

The French possessions in West Africa include Mauritania, Senegal, French Guinea, the Ivory Coast, Dahomey, Upper Volta, French Sudan, and Niger. Mauritania consists in the main of desert and infertile steppes; of much more importance are the other regions mentioned, which belong mainly to the forests and the savanna lands of West Africa.

SENEGAL

Senegal, which has an area of 74,000 square miles, lies between the Senegal and French and Portuguese Guinea. The country, which is generally flat and sandy, lies on the northern margin of the belt of summer rainfall, and, except in the south, the total precipitation is less than 20 inches. For the greater part of the year, most of the land between the Senegal and Gambia has the appearance of a desert, and cultivation is only possible during the

¹ *Exposition Colonials Internationale de 1931. Publications du Gouvernement General de l'Afrique Occidentale Francaise*, 10 volumes.

rainy season. Where the rivers overflow their banks, however, the crops are planted after the floods have subsided. In addition to food crops, such as rice, maize, and millets, ground-nuts are extensively grown, and form the chief export of the colony. From the wetter districts palm-kernels are obtained, and, from the drier, some gum; other products include hides, cotton, and wool. The native population numbers over 1,000,000. The Sudanese negro is in possession of the land, but during the dry season various pastoral tribes—the so-called "Moors"^{1*}—migrate into the country from the north. The chief towns are St. Louis at the mouth of the Senegal, and Dakar just south of Cape Verde.

FRENCH GUINEA

French Guinea, which has an area of 90,000 square miles, extends from the coast between Portuguese Guinea and Sierra Leone, across the Futa Jallon plateau, into the basin of the Niger. It lies within the belt of heavy summer rainfall; and on the seaward slopes, where precipitation is heaviest, there are tropical forests in which the oil-palm and various species of *Landolphia* are found. In the interior, where the rainfall is much lower, savanna prevails, and large numbers of cattle are raised. Rubber was formerly the chief export, but partly as a result of the reckless exploitation of the indigenous vines, and partly because of the competition of plantation rubber from other parts of the world, it has declined in importance, and palm-kernels now hold the first place. Hides and skins are exported in quantity, and live cattle are sent to Liberia and Sierra Leone. The export of bananas is rapidly increasing, and that of ground-nuts is also important. The population numbers about 2,200,000, of whom less than 2,000 are Europeans. Konakri is the capital and chief port of the colony.

THE IVORY COAST

The Ivory Coast lies between Liberia and the Gold Coast, and extends inland to the Upper Guinea plateau. In the south, where the land is covered with tropical forests, the mean annual rainfall probably averages 60 inches, and rubber-producing plants, such as *Funtumia dastica* and *Landolphia owariensis*, oil-palms, and mahogany are found. Cocoa, which has become the chief export of the

colony, is also grown there. The difficulties of transport to the coast have retarded the progress of this region, and some of it is still undeveloped. The savanna lands in the north contain a large agricultural population, which cultivates rice, millet, maize, and cotton, and carries on considerable trade with the Sudan. Since the decline in the price of rubber, the export of palm-oil, palm-kernels, cotton, and mahogany has become of greater importance. The area of the colony is about 120,000 square miles, and its population is over 1,700,000, 3,000 being Europeans. Grand Bassam is the chief commercial centre.

DAHOMÉY

As a result of the war, the French received the greater part of the former German Protectorate of Togoland, and this region may be treated along with the colony of Dahomey. In the west a range of mountains runs from south-west to north-east, with an average elevation of 2,000 to 2,500 feet. Towards the north this range broadens out eastward into a plateau which is about 1,000 or 1,200 feet above sea-level, but in the south it presents a fairly continuous escarpment towards the east. In the east of the country the plateau slopes gradually towards the sea on the one hand, and to the basin of the Niger on the other. On the coast especially, the rainfall is variable and in places does not exceed 25 or 30 inches, but in the interior it appears to range from 40 to 60 inches, except in the north, where it is less than that amount.

The south of Dahomey is, or rather was—for much of it has been destroyed—covered with forest, the centre is a savanna, and in the north there is an area of steppe and thorn-bush. Economically, the first of these regions is the most important at present, as it contains the oil-palm from which the greater part of the exports of the country is obtained. A certain amount of cotton is grown on the savanna, where ground-nuts are also cultivated, and in the north cattle are reared. Plantations have been established both by French and Germans for the production of cocoa, sisal, and other products, but their output is small. Kotonu and Lomo (in Togoland) are the chief ports.

The area of Dahomey is estimated at 57,000 square miles, and the population at 860,000. French Togoland has an area of 21,000 square miles, and a population of over 500,000.

FRENCH SUDAN AND UPPER VOLTA

These regions, which may be considered together, lie east of Senegal, and north of the other French colonies already mentioned. They consist in the main of a somewhat broken plateau of moderate elevation. In the south-west, the mean precipitation is over 40 inches, but it rapidly diminishes towards the north and east, and, at Timbuktu, is only about 8 inches. The vegetation ranges from the rich savanna of the more favoured districts to the acacia thickets bordering the Sahara. Considerable areas depend for their fertility upon the annual floods of the Niger, and schemes for the artificial irrigation of large areas in the Middle Niger basin are under way. The population consists, in part, of nomad pastoralists of Hamitic or mixed Hamitic and negro origin, such as the Tuaregs, the Fulani, and the so-called 'Moors'; and in part of sedentary agriculturists who are mainly Sudanese negroes. The latter are the more numerous, and agriculture is the chief industry of the region; millet, rice, and maize are all grown to meet the home demand, which is considerable, as the population numbers nearly 6,000,000. The attempts made to cultivate American cotton have so far proved unsuccessful, and recourse is now being had to the improvement of indigenous varieties. Among other exports are ground-nuts, shea butter, skins, and rubber. The pastoral tribes possess large numbers of cattle, sheep, and goats, some of which they sell in the coast colonies. The region, which has an area of 670,000 square miles, is one in which a certain amount of economic development is possible, and, as the French have established good government and the population is industrious, such development will probably take place.

The Colony of the Niger lies west of the region just described and north of Nigeria. It has an area of about 460,000 square miles and is largely desert in the north, sparsely populated by Tuaregs and Fulani. In the south, near the Nigerian frontier, large quantities of millet are grown by settled peoples such as the Hausa, and cattle and ground-nuts are exported.

COMMUNICATIONS OF FRENCH WEST AFRICA

Dakar, the chief city of Senegal, is one of the few places on the west coast of Africa which it has been found possible to convert into a good port. It is now connected by railway with St. Louis at the mouth of the Senegal river, which has hitherto offered

the chief line of penetration into the country. The head of navigation for steamers lies between Podor, when the river is at its lowest, and Kayes, when it is at its highest. From Kayes a railway has been constructed to Koulikoro on the Niger, which is navigable by steamers as far as the Nigerian frontier for part of the year. This route is of considerable importance, as by means of it can be exported less valuable articles (such as ground-nuts), which otherwise could not stand the cost of transport. Thies, between Dakar and St. Louis, has also been connected with Kayes. In French Guinea there is a line from Konakry to Kankan on a headstream of the Niger; in the Ivory Coast one from Abidjan to Ferkessedougou (346 miles); and in Dahomey one from Kotonu inland to Save, a distance of about 164 miles. These various lines serve the colonies through which they run, and to some extent the Upper Senegal and Niger as well, though most of the trade of that region passes down the Senegal, and a very little goes across the Sahara.

THE REPUBLIC OF LIBERIA

The interior of the country is, as yet, but imperfectly known, but in places it appears to rise to a considerable height. The land is covered by dense forest, except in the south, where clearings have been made, and in the north, where the forest is replaced by savanna. The population is entirely black, the southern districts being occupied by the descendants of freed slaves, who number about 15,000; while the remainder of the country is still in the hands of the aborigines, of whom there are about 2,000,000. Among the chief exports at present are palm-oil, coffee, piassava, cocoa, ivory, and ginger, but the total output is small. The forest products, which include rubber, obtained from *Funtumia clastica*, and valuable timbers, such as mahogany, have up to the present been exploited only to a slight extent. Communications with the interior are very bad, and the forest paths are often closed as a result of inter-tribal disputes. In fact, when the great natural wealth of Liberia is considered, its economic development can hardly be said to have begun. Monrovia is the chief town.

FRENCH EQUATORIAL AFRICA

French Equatorial Africa consists of the colonies of Gabon,

Middle Congo, Ubangi-Shari, and Chad. The total area of these regions has been variously estimated, but is probably about 900,000 square miles. Gabon and Middle Congo belong in part to the coastal plains and the mountains behind them, and in part to the central basin of the Congo. They receive a heavy rainfall, much of their surface is covered with dense equatorial forest, and they are occupied by people of Bantu stock. Ubangi-Shari belongs to the plateau country which separates the basin of Lake Chad from that of the Congo. It has a fairly long and well-marked dry season, and is a typical savanna land. The majority of its inhabitants belong to the Sudanese branch of the negro race. The colony of Chad slopes down from the plateau to the basin of Lake Chad, within which it mainly lies, and it is transitional in every respect. Climatically it ranges from a region with a double rainy season to one which may only receive an occasional shower once in several years. Its vegetation changes from the savanna of the south to the deserts of the north, and there is a corresponding change in its inhabitants; in the former region they belong to the negro race, and have only a slight admixture of Arab blood, in the latter they are in the main of Arab or Berber extraction.

The country has, as yet, been developed only to a slight extent, partly on account of the great difficulty of obtaining a supply of suitable labour. The density of population is low, and, according to the census of 1926, is in every colony less than five to the square mile, while certain districts appear to have been almost entirely devastated by sleeping sickness. Moreover, communications are inadequate; few roads or railways have been constructed, and little has been done to improve the navigation of the rivers. There are some European plantations in Gabon, from which cocoa, coffee, and vanilla are obtained, but with that exception the bulk of the exports consist of such forest products as timber (mahogany, ebony, teak, etc.), rubber, palm-oil and palm-kernels, and ivory. On the savanna lands, where cattle are kept, the conditions of economic development are in some ways more favourable, but these districts are at present far removed from accessible routes. The Ogowe, the Congo, and the Ubangi are the chief means of communication within the country, and provide about 5,000 miles of waterway navigable by steamers, but their courses are more or less interrupted by rapids. The railway from Brazzaville on Stanley Pool to Minduli,

where there are copper mines, has been continued to the Atlantic at Pointe Noire.

CAMEROON

The greater part of the former German Protectorate of Cameroon is now administered by France. From Cameroon Peak, which now lies in British territory, a series of ranges run on one side or other of the north-west frontier, and almost parallel to it, for a distance of about 250 miles. The elevated land then broadens out eastward into a plateau, 3,000 to 4,000 feet high, which extends almost to the eastern frontier. To the north of this plateau, the land falls rapidly to a plain, which extends almost to Lake Chad, while on the south it slopes down more gradually to a height of between 1,500 and 2,500 feet. Along the coast and for some distance inland, there is a mean rainfall of at least 80 inches, though in places it is much heavier. Towards the east there is a slow, and towards the north a more rapid, decrease in precipitation. Much of the coastal plain is covered with mangrove swamps, and dense forests stretch over the southern and western part of the plateaus; but, in the regions of lighter rainfall farther inland, these give place to extensive savannas. The country, which has an area of 166,000 square miles, has a population of 1,900,000; in the south its inhabitants are Bantus, and in the north mainly Sudanese negroes.

Before the war Cameroon was being steadily developed by Germany, but in a country much of which has a climate unsuitable for Europeans, progress was necessarily slow. In the forests of the south *Funtumia elastica* is abundant, and from it considerable quantities of rubber were formerly obtained. The central districts are rich in oil-palms; and on the European plantations which have been established there, cacao, rubber, sisal, and other crops are cultivated. The exports from the forested areas also include timber and ivory. The savanna lands are mainly suitable for cattle-raising, but it is said that much land north of the Benue is adapted to the cultivation of cotton. The only railway is that which runs from Duala east by Eseka to Yaunde.

THE BELGIAN CONGO¹

The high plateau of the south of Africa is continued northwards

¹ Much valuable information is to be found in *Le Congo Beige*, by L. Franck Brussels (1930).

by the highlands of East Africa and the coastal mountains of West Africa. Between these lies the centred basin of the Congo, the greater part of which belongs to the Belgian colony. It varies in elevation from 1,000 to 2,000 feet above sea-level, the mean temperature is high—between 75° F. and 80° F.—the annual range is slight, and the rainfall, which occurs at all seasons of the year, is probably between 60 and 75 inches. The equatorial forest is the dominant type of vegetation, but there are considerable areas of savanna within it, more especially in the south. The country which lies to the south of the Central Basin is drained by the Kasai and its tributaries ; it is a plateau with a gentle downward slope towards the north, its mean temperature is somewhat higher than that of the previous region, the annual range greater, the rainfall lower—probably less than 45 inches—and there is a well-marked dry season. Except for the gallery forests, which fringe the rivers, and the savanna somewhat farther off, most of the surface is grassland. The Katanga, which borders the Central Basin on the south-east, is a continuation of the high plateau of South Africa and Rhodesia, and varies in height from 4,000 to 6,000 feet above sea-level. The summers are hot and wet, the winters warm and dry. Elisabethville has a range from 60° F. in July to 75° F. in October, and a rainfall of 47 inches. The region is a wooded savanna, which passes into grassland in the more elevated parts, and into tropical forest in the river valleys.

To the east of the Central Basin the land rises gradually to the mountains which border the rift-valley and then falls steeply to the depression in which lie Lakes Albert, Edward, Kivu, and Tanganyika. Temperature varies with altitude, and the rainfall is lower than farther west. Savanna, mountain forest, and steppe are all found within the region. North-east of the Central Basin an undulating plateau, which forms part of the Congo-Nile divide, is drained by the Uele, the Bomu, and their tributaries. It varies in height from 4,000 feet in the north and east to 1,600 feet in the south and west; as in the Kasai region the mean temperature is somewhat higher, and the annual range somewhat greater than in the Central Basin ; rainfall occurs at all seasons, but is low during the southern summer, and gallery forest and savanna are the prevailing types of vegetation. West of the so-called Crystal mountains, through which the Congo cuts its way from

the Central Basin to the sea, are the coastal districts and the hill country of Mayumbe. In the latter region, at least, the mean temperature is somewhat lower than to the east of the mountains, the annual range is greater, and there is a well-marked dry season. Forest and savanna are the characteristic vegetation of this region.

Prior to the war the Belgian Congo had an area of about 910,000 square miles; its population was then about 7,000,000, and is now probably rather less than 9,000,000. The majority are of Bantu stock, but scattered throughout the forest regions are small tribes of Batwa or pygmies. In the northern districts, and more especially in the Uele region, Sudanese negroes are in possession of the land. By the acquisition of Ruanda and Urundi, which lie on the East African plateau and formed part of German East Africa, the Belgian Congo has gained 19,000 square miles of territory and an additional population of at least 4,000,000, mainly Bantus.

Of the various natural regions enumerated above, the Central Basin and the Katanga are at the present time the most important from the economic standpoint.

THE CENTRAL BASIN. Agriculture of a primitive type, carried on in forest clearings, is the main occupation of the inhabitants of this region. Among the principal crops cultivated are manioc or cassava, maize, rice, sugar-cane, yams, millet, and bananas. Of these, the first four have been introduced into the country since the end of the fifteenth century. From the European point of view the most important products are palm-kernels and palm-oil, copal, ivory, and rubber. The elephant is found in all the wooded districts of the country, and in 1892 ivory accounted for two-thirds of the value of the exports of the Congo. Since then its relative importance has declined, and within recent years its output has been less than in the years immediately preceding the war. About 1896 rubber advanced to the first place—a position which it held for over fifteen years. It was mainly obtained from various species of *Landolphia*, and notably from *L. owariensis*. Partly owing to the decreased productivity of the accessible areas, due to reckless exploitation, and partly because of the abolition of forced labour, the output had begun to decline by 1910. To counteract this decline large plantations of rubber-producing trees were established, those consisting of *Hevea brasiliensis* apparently being most successful;

but the continued fall in price has led to the abandonment of many, and rubber now takes a low place in the list of exports.

The oil-palm (*Elaeis gmneensis*) is widely distributed throughout the Congo. Previous to 1911, the bulk of the exports of oil and kernels were from Mayumbe, where the oil was extracted entirely by native methods. Since that date, modern factories have been established in various parts of the Central Basin, where the tree is abundant, or where it can be cultivated, and the export of oil and kernels has rapidly increased. Copal, which is used in Europe for the manufacture of varnish, is a resin secreted by certain trees of which *Copaifera Demeusei* is the most important in the region under consideration. It is found either in the fissures of the bark, or in the marshy ground surrounding the trees, or on sandbanks where it has been deposited by rivers during times of high water. Piassava and raffia are obtained from the *Raphia*' palm of which several varieties flourish in the forest, and plantations for the cultivation of fibre-producing and other plants have been established. Round Nyangwe and Kasongo on the Lualaba, attempts to grow cotton have given promising results.

KATANGA. The copper deposits of the Katanga occupy a belt of country which begins a little to the west of the Lualaba, not far north of the eleventh parallel of south latitude, and runs first in an easterly, and then in a south-easterly direction. In the west, the breadth of the belt varies from 25 to 40 miles, but in the south-east, it is considerably broader; its total length is about 250 miles. The most important mining centres at present are Elisabethville, Luishia, Kambove, Fungurume, and Rume, the first four situated near the railway from Bukama to the Rhodesian frontier. Lubambashi, near Elisabethville, is the principal smelting centre for the whole region. Dolomitic limestone, which is used as a flux, is found in the vicinity, but coke, or coal for the manufacture of coke on the spot, has to be imported from the Wankie coalfield in Rhodesia. As this is expensive, only high-grade ores could at first be smelted on an extensive scale, but the recent completion of two works at Panda, near Kambove, one for concentration of the ore by gravity and flotation, and the other for extraction of copper by the electrolytic process, has rendered possible the utilization of the poorer ores. The Belgian Congo now produces about 8 per cent of the world's output of copper. The labour employed is mainly

African, and is obtained partly from the Katanga itself, and partly from Ruanda and Urundi, Rhodesia, and Nyasaland. In order to avoid the necessity of importing all the food-stuffs required by the mining population, attempts are being made to develop farming on European lines in some of the districts which are suitable for white settlement, but progress in this direction is slow. In the northern parts of the Katanga, important deposits of tin have been discovered on the north-west slopes of the Mitumba and Kibara mountains; they have been worked near Kiambi, but the output is still small. Gold and diamonds are also known to exist, and from one of the copper mines near Kambove is now obtained nearly the whole of the uranium from which the world's supply of radium is produced.

OTHER REGIONS. Of the other regions of the Belgian Congo it is unnecessary to say much. In Mayumbe, where climatic conditions are rather more favourable to Europeans than in the Central Basin, there are various plantations upon which cacao and other crops are grown. The native population of the savannas and grasslands is mainly engaged in the cultivation of cereals, and in the east in stock-raising. In some of these districts cotton growing seems likely to become an important pursuit; the Uele region produces a large part of the total cotton crop of the colony, which is now about 10,000 tons. Gold is found in various parts of the Congo, but the greater part of the output comes from the placer deposits along the headstreams of the Ituri, in the northern part of the Eastern Highlands. Kilo is the centre of this mining area. Alluvial diamonds are obtained in the southern Kasai and Sankuru regions, and the Belgian Congo now ranks next to South Africa as a producer of precious stones. Coal is found near Bukama.

COMMUNICATIONS. Within the colony, the Congo and its tributaries, of which the most important are the Ubangi and the Kasai-Sankuru, offer over 8,000 miles of waterway, the greater part of which is navigable by steamers. Unfortunately, the fairway of these rivers is often interrupted by falls and rapids, or obstructed by sandbanks, and their courses require to be regularized, where possible, before full advantage can be taken of them. The earlier railways in the country were designed to link up the navigable reaches of the Congo. One was constructed between Matadi and Leopoldville to circumvent the series of rapids by which the Congo descends from the Central Basin to its estuary; another runs from

Stanleyville to Ponthierville to avoid Stanley Falls ; a third connects Kindu with Kongolo. The development of the Katanga has given an impetus to railway enterprise in this part of Africa. The line from Cape Town to Broken Hill in Northern Rhodesia has been continued into the Belgian Congo, and now runs to Bukama on the Lualaba, so that Beira, which is connected with this line by way of Salisbury and Bulawayo, has become an outlet of the Katanga. From Lobito another railway, with the same region as its objective, has been constructed across the Angolan plateau, and that port has now entered into competition with Bcira. On the other hand, the northern Katanga and part of the Eastern Highlands have been brought within the hinterland of Dar es Salaam by the construction of the line from Kabalo on the Lualaba, to Albertville on Lake Tanganyika. But, as all these railways lead to foreign ports, the Government of the Congo has constructed a line from Bukama to Port Francqui on the Kasai. By it Matadi, which is already the chief port of the Congo, has become one of the outlets of the Katanga, but whether it will be able to compete with Lobito, with its easier access and much better harbour, is more than doubtful.

ANGOLA

Angola, which is the largest of the Portuguese possessions, has an area of 484,000 square miles. The coast is fringed by a plain which, in the north, has a breadth of 150 miles or more, but narrows towards the south, and practically disappears before the frontier is reached. Behind this plain the land rises in steep escarpments to the plateau of southern Africa, to which the greater part of the country belongs. In the north, in the districts drained by the tributaries of the Congo, this plateau has generally a lower elevation than farther south, where it reaches a height of 5,000 to 7,000 feet over considerable areas. Very little accurate information regarding climate is available. In Kabinda (the detached part of Angola lying north of the Congo) and in the basin of the Congo, the temperature is high at all seasons, though, owing to the greater elevation of the latter region (1,500 to 3,000 feet), it is less so there than in the Belgian Congo. On the plateau, and especially on its more southerly parts, the climate is said to be healthy and bracing, and much of it is believed to be suitable for European settlement. Except in the north, on either side of the mouth of the Congo, the coastal plain

receives comparatively little moisture. Round Loando there is less than 20 inches, while farther south a considerable area, which includes the western slopes of the plateau, has less than 10 inches. On the plateau itself the northern districts appear to have at least 40 inches, and in places over 60 inches. Farther south, along the line of the Benguella railway, observations indicate amounts varying from 25 to 55 inches. The south is probably not so arid as was at one time believed, but it is questionable whether the rainfall there is sufficient for the needs of agriculture. As regards vegetation, the Congo basin and the districts on either side of its estuary contain much tropical forest; the plateau is a savanna, and in places a grassland or semi-desert; the coastal plain and the adjacent slopes of the plateau, except in the river valleys, are steppe-land and desert. The native population, which probably numbers about 2,600,000, consists of Bantus and Bushmen. The former inhabit the greater part of the country, while the latter are confined almost entirely to the southern districts.

THE CONGO BASIN AND KABINDA. In these regions the chief products are coffee, cocoa, and palm-oil. All are now grown in plantations. Rubber and ivory which once bulked largely among the exports are of little importance. Diamonds, found in the Lunda district in the north-east, have recently been the most valuable export of the colony. Of the timber trees *nkomba* (*Oldfieldia Africana*) is probably the most important.

THE CENTRAL AND SOUTHERN PLATEAU. In the north of this region, the natives are engaged in the cultivation of food-stuffs—they grow maize and beans for export—and, in the more arid districts of the south, in stock-raising; they are also employed on plantations owned by Europeans. Coffee and the oil-palm are cultivated in various places between the coastal plain and the plateau; cotton is grown inland from Loanda and on the Malange plateau farther south; and along the line of the Benguella railway there are plantations of sisal, tobacco, coffee, and other crops. Regarding the suitability of the whole Angolan plateau for European settlement on an extensive scale there is some diversity of opinion. The northern districts are too hot to permit it; and the south is probably too arid for arable farming, except in specially favoured localities, though much of it might be used as pasture land. On the central plateau the conditions appear to be more favourable,

as the climate is well adapted to the needs of European life, and the cereals and fruits of temperate latitude can be cultivated. But whether the land can support a large white population will depend upon the amount of fertile soil which it possesses, and according to some recent investigations this does not cover such large continuous areas as had been supposed. It may be that mixed pastoral and arable farming will eventually prove the best means of developing the region.

THE COASTAL DISTRICTS are generally infertile, except when irrigation can be practised, as is the case near Benguella, where there are sugar-cane plantations along the courses of several minor rivers flowing down from the plateau. From various places along the coast, fishing is engaged in, and considerable quantities of dried fish are exported to Europe. Whaling stations have also been established by Norwegians and Americans. The principal seaports are Ambriz, Loanda (which owes its importance to the facilities offered by the Quanza for penetration into the interior), Lobito, the terminus of the Benguella railway, and Mossamedes. Amboim is the outlet of an important coffee-growing region on the slopes of the escarpment.

COMMUNICATIONS, ETC. If little has been done to develop the agricultural resources of Angola, still less has been attempted to exploit its mineral wealth, which is believed to include considerable stores of gold, copper, and oil. One great drawback is the inadequacy of the existing means of communication. The principal railway is that which starts from Lobito, and runs eastward across the plateau; it is now connected with the railway from Cape Town to Bukama, the total distance from Lobito to the junction at Tshilongo being 1,175 miles. Other lines run from Loanda to Malange, and from Mossamedes to Lubango.

THE ISLANDS OF SAO THOME AND PRINCIPE, which also belong to Portugal, are included within the Customs union of Angola, although they form a separate province. Sao Thom6, which lies upon the Equator, is entirely of igneous formation; and its soil and climate are alike adapted to the cultivation of the cacao plant, which grows on the hill slopes to a height of over 2,000 feet above sea-level. The island produces about 8 per cent of the world's supply of cocoa. The work on the plantations is carried on by negroes imported from Angola.

ISLANDS LYING OFF THE COAST OF AFRICA

Madagascar has an area of 240,000 square miles, and a population of 3,600,000. A plateau, which occupies the central part of the island from north to south, slopes down steeply to the east and gently to the west. Climatic conditions vary greatly from place to place. The east coast is exposed to the south-east trades and receives rain at all seasons of the year; the plateau is hot and damp in summer but cool and dry in winter; the west coast is without rain during the winter months. The east of the island is forested, and rubber, both wild and cultivated, is obtained, but owing to various causes the output is tending to decrease. On the plateau, where the gneissic and granitic soils are infertile, though perhaps not so much so as was at one time believed, cattle-raising is the chief pursuit and hides are exported. The principal food-stuffs cultivated are rice, manioc, maize, and sweet potatoes, the first two also being grown for export. Other products include raffia fibre and tanning bark. Gold is found in various places, and graphite, which is on the plateau, is an important export. The principal ports are Tamatave on the east coast, Diego-Suarez in the north, and Majunga on the west coast.

REUNION

The volcanic island of Reunion lies to the east of Madagascar. It has a mean annual temperature of 78°F. and a rainfall of over 60 inches, most of which falls between December and April. Sugar is the principal product of the island, but the amount grown has greatly declined within the last half-century. Other products include Mauritius hemp (*Furcraea gigantea*) and manioc. Reunion is a French possession.

MAURITIUS

This island, which is a British possession, is also of volcanic origin. Climatic conditions are somewhat similar to those in Reunion. Sugar which is the principal product is exported mainly to British India. Mauritius hemp ranks next in importance. Port Louis is the chief seaport.

NORTH-WEST AFRICAN ISLANDS

The islands off the north-west coast of Africa include the Azores. Madeira, the Canary Islands, and the Cape Verde Islands. The soil

of all is volcanic, and much of it is fertile. The Azores have a mild and temperate climate, and large quantities of pine-apples are raised under glass for export to the markets of London and Hamburg. Oranges are also grown. Madeira, with an excellent climate, is engaged in various agricultural pursuits. Wine, fruit, and embroidery are among the principal exports. The Canary Islands are almost entirely dependent upon bananas, early vegetables, and tomatoes for their exports abroad, the British Isles providing the chief market for these. The Cape Verde Islands are still in a very undeveloped condition. The chief exports, which go to Lisbon, include coffee and castor-oil seeds, fruit, and maize. The Canary Islands are Spanish, but the others are Portuguese.

AMERICA

CHAPTER XXXV

NORTH AMERICA

NORTH AMERICA, which may be considered to extend as far south as the Isthmus of Tehuantepec, has an area, exclusive of Greenland and the West Indies, of a little more than 8,000,000 square miles. It therefore contains about one-seventh of the land surface of the globe, and comes third in the list of continents according to size ; it is about twice as large as Europe, and has an extent about sixty-six times that of the British Isles.

Taking into consideration the geological and physical features of the whole continent, several main physiographical regions may be recognized. The first of these is the Laurentian Plateau. If a line be drawn from the Arctic Ocean, east of the mouth of the Mackenzie River, through the Great Bear and the Great Slave Lakes to the western extremity of Lake Athabasca, and from there in a gentle southward curve to the northern end of Lake Winnipeg, along the eastern shore of that lake, and then southwards to the Lake of the Woods, eastwards from there to Lake Superior, along the northern shores of the Great Lakes as far as the north-eastern extremity of Georgian Bay, and from there at a varying distance from Lake Ontario and the St. Lawrence River to a point on that river a few miles below Quebec, it will mark off the old Archaean nucleus about which the greater part of the remainder of the continent has grown up. This Laurentian region consists of an old mountain mass, whose height has been reduced by weathering and glacial action so that it now presents an appearance which has been variously described as that of a roughened plateau or a somewhat accidented plain. In the east the average elevation is probably between 1,500 and 1,600 feet, but elsewhere there are considerable areas which have a height of less than 1,000 feet above sea-level.

From the St. Lawrence, there runs in a south-westerly direction an elevated region known as the Appalachian Highland, which may be divided longitudinally into four belts parallel to one another. The first of these belts, the Piedmont Plateau, stretches from

central Alabama to New York with a width varying from 125 miles in North Carolina to 50 miles in Maryland, and it also reappears in the east of New England. On the south-east, where it adjoins the coastal plain, it has an elevation of 400 to 500 feet, but on the north-west, along its junction with the second belt, it rises to 1,000 feet or more above sea-level. This second belt is a mountain range, highest in New Hampshire and in North Carolina, formed of the same hard and resistant rock as the Piedmont Plateau. In Virginia it is known as the Blue Ridge, while in New England it forms the Green Mountains of Vermont and their continuation, the Hoosac Mountains of Massachusetts and Connecticut. The third belt, the Great Appalachian Valley, stretching from the St. Lawrence to Alabama with an average breadth of about seventy-five miles, is a region of relative depression carved out of softer Palaeozoic rocks, though within it are many short ranges running parallel to one another. In the north it is occupied by Lake Champlain and the Hudson, and farther south by the Shenandoah and the upper waters of the James and the Tennessee. The western boundary of this belt is formed by the escarpments of the Allegheny and Cumberland plateaus, of more or less horizontal Palaeozoic strata, which slope away towards Lake Erie, the lower Ohio, and the lower Tennessee. These upland regions vary in height; in Pennsylvania they do not exceed 2,000 feet, but in Kentucky and West Virginia they have an elevation of 3,000 to 4,000 feet.

Between the Piedmont Plateau and the Atlantic, there is a low coastal plain which begins in the north at Cape Cod, sweeps round the southern end of the Appalachian system, and, skirting the Allegheny Plateau, extends northwards as far as the mouth of the Ohio. On the west, its boundary touches the Ozark uplift, and then runs in a south-westerly direction to the Rio Grande Del Norte. This region, which may be called the Atlantic and Gulf Coastal Plain, slopes upwards from the shore, but seldom exceeds a height of 300 feet on its inland margin. It is of recent formation, and consists of weak and unconsolidated rocks, usually covered with deep and fertile soil.

From the Laurentian Plateau and the Appalachian Highland on the east to the Rocky Mountains on the west, and from the Arctic Ocean in the north to the Gulf of Mexico in the south, there stretch the great continental plains of which the Gulf Coastal Plain forms

the southern part. The character of this continental interior varies considerably throughout, and several important subdivisions must be recognized. The sub-Arctic Plain, around the shores of the Arctic Ocean and along the lower course of the Mackenzie River, corresponds generally in configuration and altitude with the Gulf Plain, and on the south gradually merges into the Great Plains. In the east of the continental basin the altitudes are low and the plains are either flat or gently rolling, while in the west they rise by degrees to a height of 5,000 feet along the foot of the Rocky Mountains. As these two regions—the Prairie Plains and the Great Plains—gradually merge into one another, it is difficult to draw exactly the dividing line between them ; but it may be taken roughly as following the Missouri Coteau in Canada, and in the United States as separating eastern and western North and South Dakota, eastern and central Nebraska and Kansas, and eastern and western Texas. To the east of this line, however, there are two regions which cannot properly be included within the Prairie Plains, one being the Ozark uplift, and the other the Lake Plains, a region lying to the south of the Great Lakes and formerly covered by them.

The Western Cordilleras are the last great physical region of North America ; their structure is very complicated, and only their salient features can be mentioned here. In the north, bordered by mountain ranges, there is an undulating plateau country which forms the basin of the Yukon. Farther south, besides the Rocky Mountains proper there are, in the east, the Selkirks and the Gold Ranges, between the last of which and the Coast Range lies the interior plateau of British Columbia. South of the international boundary, the term Rocky Mountains is generally applied to the wide stretch of country extending from the western margin of the Great Plains in the east to the Wasatch Mountains in the west. Over this tract there are many ranges running north and south, with great intervening valleys known as parks. To the north-west of it lies the Columbia Plateau, which has been built up by volcanic outpourings filling the depressions between the Rocky Mountain system and the Cascades; to the south of it there is the Colorado Plateau, an elevated region composed of horizontal rock in which deep canyons have been cut by the Colorado and its tributaries. Between the Wasatch Mountains and the Colorado Plateau in the east and the Sierra Nevada in the west, lies the Great Basin,

a region of inland drainage with a general elevation of 5,000 feet, and with many short ranges running across it from north to south. The general characteristics of this region are preserved in the country to the south of the Colorado Plateau, though there the drainage is to the sea, and in the Mexican Plateau, where many of the basins are again closed. To the west of the Cascades and the Sierra Nevada lies a series of coastal ranges, with the Puget Sound valley and the California valley intervening.

Mexico is the southern continuation of the Cordilleran system. Two great ranges, the Sierra Madre Oriental and the Sierra Madre Occidental, whose precise relationship with the Rocky Mountain system has not yet been definitely determined, border the country on the east and west respectively, while the intervening region is a plateau which rises from a height of about 4,000 feet on the United States boundary to over 8,000 feet in the south. This plateau has been built up in part by the debris from the surrounding mountains, and in part by discharges from the volcanoes which form so prominent a feature in the topography of the country.

CLIMATE. A comparison and study of the position of the isothermal lines for January and July throw a considerable amount of light upon the general conditions which determine the temperature of North America. In January the isotherms, outside of the tropics, trend from north-west to south-east with a curve to the south; in July, over a great part of the continent, they run in a somewhat similar direction, but in the west they bend towards the north and are crowded together along the Pacific coast, to which they run almost parallel for considerable distances, and which they leave in lower latitudes than those in which they enter along the Atlantic. In the winter months the land is much colder than the sea, and there is a decrease in temperature along the parallels of latitude with an increase in distance from the coast. The isobaric charts show an area of high pressure over the western part of North America during the winter months, but at this season most of the continent lies within the westerly wind belt, the chief characteristic of which is the continuous succession of eastward-moving cyclones and anti-cyclones. Thus, while the prevailing winds over much of the area to the east of the Rocky Mountains are from the west and north-west, these winds are not permanent, and the influence of the Atlantic and the Gulf is felt when onshore winds result from the

passage of high or low pressure systems. As the winds which blow from the west and north-west are cold, the temperature of the eastern shores of Canada and the United States is greatly reduced by them. The west coast, on the other hand, is protected from cold land winds by the Western Cordillera, and the prevailing winds north of the fortieth parallel blow from the west and south-west on the east side of the North Pacific depression; they are relatively warm, and have a moderating effect upon the climate of the west coast. Farther south the winds have a northerly component, as in the south of California, where they come from the north-west. South of the twenty-fifth parallel, the country lies within the belt of constant trade winds, the land mass is comparatively narrow, and the isotherms tend to follow the parallels of latitude.

In summer, the greatest extension northward of the isotherms is in the western part of the continental interior, where the influence of sea winds is least felt, and where the dryness of the atmosphere and the barrenness of the land lead to very high temperatures. Here a trough of low pressure develops, while the high-pressure system of the North Atlantic extends over the south-eastern part of the continent, and the similar system of the North Pacific encroaches upon the neighbouring lands. This distribution of pressure, combined with cyclonic activity, which, though less vigorous than in winter, still persists, especially in the south and east, leads to a marked change in the direction of the prevailing winds. To the east of the Mississippi they blow from the south-west, while further west they have a southerly or south-easterly direction. On the west coast, in higher latitudes, winds from the west and north-west arc blowing, and these exercise a cooling influence which prevents the range between summer and winter temperatures from being great. In lower latitudes the trade winds blow off-shore, except in the extreme south where monsoon conditions prevail, the trade winds of the southern hemisphere having been pulled across the Equator.

North America may therefore be divided into several regions as far as temperature alone is concerned. The Arctic lands in the north have very long, cold winters, and short and cool summers. The eastern parts of Canada and the United States have winters which are cold in the north but cool in the south, and warm along the Gulf coast; and summers which are warm in the north, but become

hot in the south and around the Gulf. The great interior region has, on the whole, a more extreme climate, varying, however, according to latitude. The winters in central Canada and in the northern States are very cold, while the summers are warm. Farther south the cold of winter is seldom so great, but the heat of summer is more intense. Along the Pacific coast the climate is more equable than in any other part of North America outside of the tropics.

The rainfall of North America east of the Rocky Mountains occurs chiefly during the summer months. Owing to the direction of the winds, moist air from the sea is then drawn into the very heart of the continent, and precipitation takes place as a result of cooling caused partly by increasing altitude, but chiefly by the expansion and uprising of the air in the hot continental interior. As the Atlantic trade winds are, to some extent, affected by low-pressure conditions over the land at this season, the heavy rainfall which takes place along the southern part of the Atlantic coastal plain, around the Gulf, and on the eastern slopes of the mountains of Mexico, has a monsoonal character. On the west coast there is a considerable rainfall as far as Vancouver, brought by the north-westerly winds from the Pacific high-pressure area, but farther south the winds contain little moisture, and, as temperature increases rapidly inland, there is little precipitation. On the west coast of Mexico, however, there is a heavy monsoonal rainfall due to the trade winds of the south Pacific being pulled across the Equator and turned to the right.

During the winter months the winds over the eastern part of the continent tend to blow outward. In the east, the heaviest rainfall is along the south part of the Atlantic coastal plain and round the Gulf, where, owing to the relatively high temperature, there is a considerable amount of water vapour in the atmosphere, which is drawn inland by cyclonic storms and precipitated. To the Mexican coast, also, the trade winds bring a considerable amount of rainfall. On the Pacific coast, precipitation is heavy as far south as San Francisco, the heat equator having moved southwards and the whole region being brought within the influence of the south-westerly winds. Between Vancouver and San Diego precipitation takes place mainly during the autumn and winter months, but south of the latter place the winds are off-shore, and the surrounding region is as dry in winter as it is in summer.

The annual distribution of precipitation over North America as determined by these conditions is somewhat as follows : the Atlantic and Gulf Coastal Plains and the interior of the country as far north as the fortieth parallel and as far west as the ninety-fifth meridian (with the exception of the north-west corner of this region), have a rainfall of between 40 and 60 inches per year, except around, and for some distance east of, the Mississippi delta, where the latter amount is exceeded. The shores of the Gulf of St. Lawrence, and the country south of the Great Lakes and east of the ninety-seventh or ninety-eighth meridian (except in the north-west) have at least 30 inches annually. A third region is that which lies to the south of Hudson Bay and east of a line which oscillates between the 97th and 102nd meridians, and over which the mean annual precipitation is between 20 and 30 inches; this amount is also received by a great part of the Mexican Plateau, especially in the south. On the eastern slope of the Mexican tableland, the precipitation is much greater, and rises in places to over 80 inches per year. On the Pacific coast there is a heavy rainfall which, as a rule, does not extend far inland, except in the Puget Sound region. Along the coast from Sitka to Vancouver Island it is over 80 inches per year, and as far south as San Francisco there are at least 40 inches. The greater part of the western slope of Mexico has at least 20 inches, while a more restricted coastal strip has over 40 inches. Over the remainder of North America the total precipitation falls between 10 and 20 inches annually except in two regions. The first of these is in the extreme north of Canada, where a triangular area, with its base along the Arctic shores, receives less than 10 inches ; and the second, which receives a like amount, is situated in the south-west of the United States and the north-west of Mexico. The first region lies in an area of low temperature and high pressure, while the second lies on the west side of a continent within the belt of constant trade winds.

VEGETATION. In this section the natural vegetation regions of the continent will alone be described, changes introduced by man, such as the substitution of agricultural land for woodland, being deferred until later.

The forests of the Atlantic and Pacific slopes differ greatly in their essential characteristics, the result of differences both in their past and present climatic environment; but they are connected

by a great belt of woodland called the Northern Forest, which stretches across the continent from the one ocean to the other. Its northern boundary is coincident with the limit of tree growth, which runs along the coast of Labrador near the sixtieth parallel, across north-west Canada from the mouth of the Churchill to that of the Mackenzie, and along the north-eastern and north-western slopes of Alaska. The southern limit on the Atlantic coast may be taken as the fiftieth parallel, and on the Pacific as the sixtieth. On these coasts the Northern Forest gradually merges into the Atlantic and Pacific Forests respectively; on the south-west it is limited by drought, and on the north by high winds during cold weather. The most valuable tree is the white spruce, but jack pine, black spruce, larch, birch, and aspen poplar are also found. This forest is not of great value; in the north the trees grow in open formation, and, owing to the shortness and low temperature of the vegetative season, seldom reach a considerable size. In the south they are suitable for timber, but over the greater part of the area the coniferous trees destroyed by fire have been replaced by aspen. To the south of the Northern Forest, on the Atlantic side, lies a region in which conifers and summer-green trees are either interspersed or grow in separate formations. In Canada, this mixed forest occupies the basin of the St. Lawrence and the Maritime Provinces, while in the United States it includes New England and extends over a considerable part of those States which border the Great Lakes; it also runs southward along the higher slopes of the Appalachians as far as the thirty-fifth parallel. Among the conifers are different varieties of pine and spruce; and among the summer-green trees the birch, beech, and maple.

South of about the thirty-sixth parallel, the Southern Pine Forest extends along the Atlantic coast with a breadth varying from 100 to 200 miles, crosses over the Florida peninsula, and stretches along the Gulf coast as far as the flood plains of the Mississippi; it reappears in Louisiana and gradually merges into the deciduous Mississippi Forest. The characteristic tree of this region is the long-leaf pine (*Pinus palustris*), and the southern cypress is also extensively found. The first of these trees, although coniferous, requires a somewhat warmer climate than the white pine, and is usually found on drier soils; the cypress, on the contrary, generally grows in swampy localities and near the coast.

The deciduous forest extends along the lower eastern slopes of the Appalachians, sweeps round their southern end, and, to the north of the Gulf of Mexico, covers all the country, not already described, east of the lower Mississippi, and of a line drawn from its confluence with the Ohio to the southern extremity of Lake Michigan, together with the trans-Mississippi states of Arkansas and Missouri, and parts of Texas and Oklahoma. The characteristic trees of this region, with its high summer temperatures, are the broad-leaf, summer-green trees, such as chestnuts, oaks, hickories, walnuts, and tulip trees.

On the Pacific coast the Northern Forest extends south as far as the sixtieth parallel. Here begins the Pacific Coast Forest which runs southwards in a narrow strip to the fiftieth parallel, where it extends inland and embraces the region of heavy rainfall around Puget Sound. South of it, the Coast Forest covers the well-watered mountain slopes, as far inland as the crests of the Cascades and Sierra Nevada, and as far south as the thirty-fifth parallel, beyond which it runs along the higher ridges of the southern Coast Range to the boundary of the United States. This forest is composed chiefly of coniferous trees ; in the north there are the Alaska cedar, the Sitka spruce, and the hemlock ; south of latitude 54° the red or Douglas fir appears and is the most characteristic tree of the coastal region as far as latitude 42° ; in the interior the yellow pine is the principal tree, but the Douglas fir, the hemlock, and the red cedar are still important.

In California, the chief trees are the redwood and the yellow pine along the coast ranges as far south as San Francisco; the sequoia, the sugar pine, the Douglas fir, and the yellow pine along the Sierra Nevada at an elevation of 4,000 to 8,000 feet; and oaks in the valleys between. South of San Francisco, chaparral, a mixed forest of stunted hardwood trees and shrubs, including various oaks, covers the coastal ranges.

The Interior Forest includes all the wooded areas between the extreme east of the Coast Forest and the eastern crests of the Rocky Mountains, and between the Northern Forest and Mexico. This forest is thin and poor, when compared with that along the coast, and is found on high mountain slopes which catch the rain, and along the river courses. On the east of the Sierras and Cascades, and on the west of the Rocky Mountains, especially in the south,

there are to be found mountain mahogany, yellow pine, spruce, Douglas fir, and various junipers.

The unforested areas of North America fall into three main groups—the tundras, the grasslands, and the deserts and semi-deserts. The tundras lie to the north of the limits of tree growth, and in Canada are sometimes known as the Barren Grounds. The extremely short vegetative season, after the snow has melted and the ground has thawed, prevents the development of higher forms of plant life, and in some regions mosses and lichens are the dominant species. Under more favourable conditions there are many shallow-rooted flowering plants and berry-bearing bushes, all forming a continuous covering, but elsewhere large tracts are bare.

The grasslands cover a much more extensive area, occupying the whole country between the Atlantic and the Pacific Forests. Two distinct types must, however, be recognized. A large region, which lies east of the line separating the Prairie Plains and the Great Plains of North America, and west of the Atlantic forests as already described, as well as the northern part of the unforested area belonging to the Canadian section of the Great Plains, consists of mixed woodland and grassland, the latter predominating. This is the debatable area between woodland and grassland. The rainfall is sufficient for the former, and it is believed, indeed, that the whole prairie region was at one time forested, but that, the trees being once destroyed, grass obtained the mastery owing to climate and soil being slightly more favourable to it. Whatever be the true solution of this question, and it has been the subject of much controversy, the region under consideration now forms the greatest natural meadow in the world, the grasses growing in close formation. To the west of it, the country is an original steppe, except along the valleys of the rivers, where trees are sometimes found. From east to west this steppe becomes more xerophytic in character; in the east it approaches meadow, and in the west desert, the controlling factor being the increasing scarcity of moisture.

Large areas in Oregon and Idaho, Nevada, Utah, Arizona, and New Mexico are unforested, and over the greater part of this region sage bush, which covers hundreds of thousands of square miles, is the prevailing vegetation. It is here that there is a nearer approach to desert conditions than in any other part of the United States.

Farther south these same conditions extend over Lower California and a considerable part of the Mexican plateau.

NATURAL REGIONS OF NORTH AMERICA. CANADA. As the greater part of Canada east of the Cordilleras drains into the Gulf of St. Lawrence, Hudson Bay, and the Arctic Ocean, while the corresponding part of the United States drains into the Atlantic and the Gulf of Mexico, there is some justification for seeking a division of North America into natural regions which do not violate international boundaries.

The Laurentian Plateau is clearly marked off from the remainder of Canada. The Archaean rocks of which it is composed, the character of its topography, the poor and scanty soil by which the greater part of it is covered, and its climate which is typically that of the high latitudes of the eastern part of a great land mass, all separate it from surrounding regions. Over so large an area temperature and rainfall naturally vary, and it contains parts of two vegetation zones, but the dominating geological, topographical, and climatic facts give it its distinctive characteristics and constitute it one great natural region which may be divided into a number of sub-regions.

The Maritime Provinces form a natural region for somewhat different reasons. They do not belong to the Laurentian region, and are separated by the Appalachian uplift from the more recently formed lands of the continent. Their geological structure is varied, but is largely Carboniferous, the soil is good in places, and the climate is less extreme than on the Laurentian Plateau, or even in the St. Lawrence valley. Their position gives them a certain unity, and makes them Canadian rather than American; their ports are Canadian ports giving access to the Canadian interior; and their economic conditions are different from those of the New England States farther south.

The third region comprises the lowlands on both sides of the St. Lawrence, between the Laurentian Plateau on the north and the Appalachian system on the south, and the Ontario peninsula may also be included within it. The whole of this region is underlain by nearly horizontal Palaeozoic strata; but the surface soils generally consist of glacial or alluvial deposits, and the land is relatively flat, fertile, and suitable for cultivation. Its climate is intermediate between that of the Maritime Provinces and that of

the continental interior, and many of its products occur throughout the whole region. The St. Lawrence is one of the most important factors in its economic development, and binds its various parts together.

The next region, which may be called the Winnipeg Basin, lies east of the Cordilleras and west of the Laurentian Plateau. Its northern boundary may be provisionally defined as lying in the belt of country, north of the 54th parallel, which separates the agricultural regions of central Canada from those regions farther north where, because of the lack of a sufficiently long summer, cultivation is impossible except in specially favoured localities. The whole of this area has been covered with glacial drift or has formed the floor of glacial lakes. Its topography is flat in the east, undulating in the west, and hilly only in places. Its climate is extreme, its rainfall limited, and its vegetation is that of an unforested or only slightly forested country. North of the intermediate belt, lie the Athabasca-Mackenzie Plains with their generally flat physical features, their cold winters but fairly warm summers, and their forest vegetation.

In the Cordilleran region physical features form the best basis for the division of the country into natural regions. In the north is the basin of the Yukon (which includes the United States territory of Alaska) with its low temperature, scanty vegetation, and great mineral wealth. Farther south is the interior plateau of British Columbia, bordered by high mountains, and separated from the Yukon in the north and the Columbia plateau in the south by the coalescence of irregular ranges. The temperature is higher than in the Yukon, the rainfall is greater than south of the international boundary, and, although the region is not homogeneous, it may for present purposes be treated as one.

THE UNITED STATES. The New England States, which belong to the northern part of the Appalachian system, are mountainous in parts, but in the south consist of a glaciated peneplane from which much of the soil has been removed, and over which great glacial blocks frequently render cultivation difficult. They are isolated from the remainder of the continent, and communication with the interior is greatly impeded. The inhabitants eventually found agriculture unprofitable, and turned to manufactures, seeking a source of power in the waters descending glacial-dammed valleys.

The remainder of the Appalachian system may be divided into two parts, a northern and a southern. The northern with the corresponding part of the coastal plain is occupied by what will here be called the Middle Appalachian States, which may be regarded as forming a unit despite differences in topography, climate, and products. Their position with regard to the ocean and the interior, their communications, and above all their large supplies of coal, knit them together and make them the great manufacturing region of the United States. The Southern Appalachians differ from the Northern in structure, in climate, and in economic resources. But they possess both coal and iron, and their position in relation to the great cotton-growing region of the United States is leading to a distinct type of economic development.

To the west of the northern part of the Appalachians is the glaciated area of the central plains. The Wisconsin ice-sheets covered all the area east of the Missouri and north of a line drawn from Nashville, by way of Philadelphia, to New York. Over the central plains the till deposited by the ice-sheets generally forms a fertile soil, the land is flat, and, outside of the forested area easily cultivated; the climate, cold in winter, is warm in summer, and the rainfall is sufficient for the growth of wheat and maize. All these conditions mark this area out as the great agricultural region of the United States. Along with it may be included the remainder of the prairie region north of the Ozark uplift.

The Atlantic and Gulf Coastal Plains, along with which that part of the prairie belt south of the Ozark uplift may be included for the sake of convenience, are destined by climatic conditions to be the great cotton-producing region of the United States. Their economic development differs in many respects from other parts of the country, and these differences are primarily due to the nature of the geographic control.

The Great Plains are marked out by physical features, climate, and vegetation as one large natural region. Their undulating surface, considerable elevation, dry climate, and xerophilous vegetation combine to distinguish them from the regions farther to the east. Within so great an area there are naturally considerable differences, but with certain exceptions, to be noted later, the general character of the country remains the same throughout.

As in Canada, so also in the United States, the Cordilleras are most

conveniently divided into natural regions determined by physical features. The Columbia plateau, built up of lava outpourings, receives but a small rainfall, and a large part is semi-desert covered with sage bush. The soil, however, is fertile, and when water can be obtained large crops are produced. The Rocky Mountain region presents a much less desert-like appearance. The topography is more varied, the rainfall greater, and the vegetation richer. The hill-tops are bare, but the lower slopes are well forested and the parks grass-covered. The Great Basin differs in physical structure and climate from surrounding areas. The region is largely semi-desert, but in places there are facilities for irrigation, and the soil is fertile. The Colorado Plateau is in the desert part of the United States. Physical configuration, soil, and climate all make the region one in which very little economic activity is possible. The Pacific Slope is distinguished from the remainder of the Western Cordillera by its physical configuration, its coastal position, its generally heavier rainfall, its slight range of temperature, and its richer vegetation. As in some of the previous regions several subdivisions must be recognized.

The division of Mexico into natural regions will be discussed later.

CHAPTER XXXVI

CANADA

THE LAURENTIAN PLATEAU. The general characteristics of the Laurentian region have already been described, and it remains to trace their effect upon its economic development. The great shield of pre-Cambrian rocks weathers down into a poor and infertile soil. From the upper parts of the plateau much of this soil was removed by the glacial ice-sheet, and in many places the bare ice-polished rocks still appear on the surface. In the valleys the soil is frequently much deeper, but it is only along the river courses, where the debris from the rocks has been resorted by river action and mixed with organic matter, that it is really fertile. An exception to this general statement ought to be made, however, in favour of the "clay belt" of northern Ontario, a region which has attracted considerable attention within recent years. It lies on the northern slope of the watershed between the St. Lawrence system and James Bay, and consists of the bed of what was once a great shallow lake, now referred to as Lake Ojibway, which lay in front of the ice-sheet as it retreated towards the north. The soils of this region, which has an estimated area of 16,000,000 acres, consist of great deposits of sand and clay, rendered more or less fertile by the debris carried by the ice-sheet from the shales and limestones around James Bay. On the west coast of James Bay, also, the soil appears to be more fertile than is generally the case in the Laurentian country.

To the unfavourable conditions of soil which prevail in the greater part of the region must be added conditions of climate equally unfavourable. On the whole, the Laurentian region has a summer temperature too low for successful agriculture, and it is only in the more southerly parts that cultivation is ever likely to be profitable. With the development of the mineral resources of the region, and the consequent opening up of its communications, it is quite probable that numerous small agricultural communities may ultimately settle in favoured localities. These will probably have recourse to mixed farming, but, although they will meet a gradually

growing local demand, they are hardly likely ever to affect the world's supply of agricultural produce. With regard to the "clay belt" itself there is still much diversity of opinion. In some places the soil is undoubtedly fertile, but in others the conditions are much less favourable. The depth of the humus covering, which may be so great as to prevent the mineral constituents of the soil being reached except at great expense, the facilities for drainage, and the chemical composition of the soil itself over wide areas, are all matters which must be investigated before any definite conclusion regarding the agricultural potentialities of the region can be arrived at.

Climatic conditions in the clay belt are but imperfectly known, but must be taken into consideration. The growing season, though warm, appears to be short, and is probably best suited for the cultivation of hay, root-crops, and the hardier cereals. Within recent years, numbers of farmers have settled along the railways by which the region is now traversed, but it is probable that for a long time at least their economic activities, and the conditions governing their success or failure, will be similar to those prevailing in other parts of the southern Laurentian area.

To the south of lines connecting the Seven Islands, in the Gulf of St. Lawrence, with the southern part of James Bay, and the mouth of the Albany with the Lake of the Woods, the Laurentian area is covered mainly with coniferous trees, and this is one of the great lumbering districts of Canada. The multitude of rivers, the hard winters, and the spring floods, all facilitate the movement of the timber from the forest; while the falls, which occur on the margin of the plateau, provide water-power for saw-mills. In this region, also, and for somewhat similar reasons, the manufacture of wood pulp has become of considerable importance. Among the chief centres of the industry are the districts round Chicoutimi, near Lake St. John, where water-power is abundant, Sturgeon Falls on Lake Nipissing, and Hull, Buckingham, Lachute, and Sault Ste. Marie, all on the margin of the Laurentian Plateau.

Although only relatively small areas of the Laurentian Plateau have as yet been carefully prospected, the mineral wealth of the region would seem to constitute its chief claim to economic importance. These deposits, which are frequently associated with igneous rocks, are as yet known to exist only in the south; but as the igneous history of the productive districts recurs throughout

the whole region, it is believed that the mineral deposits may likewise be widely distributed.

The most important minerals obtained from the region under consideration are nickel, silver, copper, and gold. The first of these is found chiefly in the nickel-copper mines at Sudbury, which, although previously known, were not regarded as of much importance until attention was drawn to them in 1883. Since then they have been extensively worked, and they now produce about nine-tenths of the world's supply of nickel, together with a considerable quantity of copper. The ore obtained from the Sudbury mines is smelted in the neighbourhood, nickel is refined at Port Colborne on Lake Erie, and copper at Copper Cliff, near Sudbury; but some of the nickel-copper matte is still sent to Swansea in South Wales. Copper is known to exist in other parts of the Laurentian area, and important developments are likely to take place within the next few years in the Flin Flon district on the Manitoba-Saskatchewan boundary, about seventy miles north of the Pas. This district has been linked up with the Hudson Bay railway, while power is provided by a hydro-electric installation on the Churchill. In 1903 extensive deposits of silver were found at Cobalt, about 90 miles north-east of Sudbury. Mining rapidly developed, and during the four years 1910-13 the annual output of the region averaged 30,000,000 ounces. Since then there has been a marked decline, and the present yield at Cobalt and its outlying districts, such as Gowganda and South Lorrain, is about one-fourth of that amount. Along with the silver, cobalt and nickel are also found, the former in such quantities indeed that it is unsaleable.

The most important deposits of gold yet found in the region are those at Porcupine, on the Hudson Bay slope of northern Ontario, about 100 miles north-west of Cobalt. Since they were made accessible by the opening of the Temiskaming and Northern Ontario Railway, they have been extensively worked, with the result that Ontario has become the chief gold-mining province in the Dominion. Within the same gold-bearing district as Porcupine, lie the Kirkland Lake field 65 miles S.S.E., and the Rouyn field in the neighbouring part of Quebec; the three together produce nine-tenths of the average output of gold in Canada, \$46,000,000 in 1929-31. In this same field nearly one-fourth of the copper output of Canada was obtained in 1929-31. Iron ores occur in various parts

of the Laurentian region, but have not been worked to any great extent. For some time the Helen and Magpie mines in Michipicoten were the chief producers of iron ore in Canada, but their combined output was small, and did not go far to meet the needs of the country. Mining has apparently ceased in the Laurentian region, as all the ore hitherto discovered requires special treatment before being sent to the blast furnaces, and is therefore unable to compete with the high grade ore from the Mesabi range in Minnesota.

Although great interest is at present being taken in the Laurentian Plateau, and more especially in its southern parts, geographical conditions decree that it will remain a mining and lumbering rather than become an agricultural country.

THE MARITIME PROVINCES. The Maritime Provinces belong in part to the Appalachian system. On the north-west of New Brunswick, where the rocks are chiefly Silurian and granitic, and along the Bay of Fundy, where they are mainly pre-Cambrian, the land rises to heights of over a thousand feet, while the intervening area, covered with Carboniferous strata, seldom exceeds a few hundred feet. In Nova Scotia, a much dissected upland rises gradually from the Atlantic seaboard to heights varying from 600 to 1,000 feet, and falls steeply to the Annapolis-Cornwallis valley, separated by a narrow ridge from the Bay of Fundy. Cape Breton is a continuation of this upland, but is higher and more irregular in outline. Along the Atlantic coast the rocks are generally of pre-Cambrian age, but in the west Carboniferous and later formations with large granitic areas are found. Cape Breton consists in the main of Archaean upland and Carboniferous lowland, while Prince Edward Island is a low-lying Carboniferous area.

The climate of the Maritime Provinces is, as a result of latitude, less severe than that of most of the Laurentian Plateau, and, as a result of proximity to the ocean, less extreme than that of Central Canada. The following figures show its general characteristics—

	Mean temperature for three warmest months	Mean temperature for three coldest months	Mean annual precipitation inches
Charlottetown (P.E.I.) ..	62-1° F.	18-0° F.	41-78
Halifax (N.S.)	62-4	23-9	54-74
Fredericton (N.B.) ..	63-1	15-4	43-71

The chief agricultural areas of the Maritime Provinces are found in the Carboniferous lowlands of New Brunswick ; along the shores of the Bay of Fundy, where land reclaimed from the sea may be fertilized year after year by the opening of the sluices in the dykes ; on the western intervale lands of Nova Scotia, and in Prince Edward Island.

Within the last fifty or sixty years the character of agriculture in these regions has undergone a very considerable change. The area under wheat has decreased, while that devoted to dairy-farming, stock-rearing, and fruit-growing, has largely increased. The reasons for this change, which is even more marked in the St. Lawrence Lowlands, will be discussed in connection with that region. The great fruit-growing districts are the Annapolis and Cornwallis valleys in Nova Scotia, which contain over 70 per cent of the orchards of the Maritime Provinces. Apples are the chief crop, the climate being well suited to the growth of the hardier varieties at least, but plums, cherries, and other fruits are also grown.

In Nova Scotia the fishing industry is of considerable importance, and gives employment, directly or indirectly, to about one-third of the population. The Lunenburg fleet, so called because it is largely owned and manned by the inhabitants of the county of that name, is engaged in the deep sea fisheries on the Banks of Newfoundland and in the Gulf of St. Lawrence, where cod and haddock form the bulk of the catch. Among the fish found offshore in various parts of the Maritime Province are herring, mackerel, and lobsters. Prince Edward Island is noted for its oysters.

The importance of the Maritime Provinces has been greatly augmented by their mineral wealth, and about half of the total coal production of Canada (excluding lignite) is obtained from the coalfields of this region. These are the Sydney coalfield, which extends for thirty-two miles along the sea coast of the north-eastern extremity of Cape Breton and produces the greater part of the output of the province; the Inverness coalfield, along the west coast of Cape Breton; the Pictou coalfield in the north-west of Nova Scotia, and the Cumberland coalfield in the west. In New Brunswick the Grand Lake coalfield, about seventy miles north of the city of St. John, has a small output. For the three years 1929-31 the average production of the Maritime Provinces was 6,000,000 short tons. The coal is bituminous and of good quality; much of it is suitable

for the production of gas and coke, and it is a good steam coal. Part is consumed at home, chiefly in the iron works, but considerable quantities are sent by rail or shipped, more especially from Sydney and Louisbourg, up the St. Lawrence as far as Montreal, and along the Atlantic coast as far as Boston.

Although iron ore occurs in many parts of the Maritime Provinces, it is no longer worked to an appreciable extent. Since 1896 the Wabana mines in Bell Island, Newfoundland, have been the principal source of supply for the iron works which are situated chiefly at Sydney. In normal times, Nova Scotia produces about 400,000 short tons of pig-iron, most of which is converted into steel.

The agricultural development of the Maritime Provinces will probably be slow. The valuable timber resources of the region retard the expansion of farming and give an impetus to lumbering; the development of the coalfields and the facilities for the importation of iron ore encourage the growth of manufactures; the rich fishing grounds of the continental shelf call many of the inhabitants to the sea, and, along with the possession of the winter ports of the Dominion on the Atlantic, enable them to retain much of their old interest in maritime affairs. Halifax, on the east coast of Nova Scotia, is generally free from ice throughout the year, and St. John, in New Brunswick, is always open. Both are connected by rail with Montreal.

THE ST. LAWRENCE LOWLANDS, which begin near Quebec and extend south-west to the Detroit River, a distance of 660 miles, are, on the whole, flat or gently undulating, fertile, and suitable for cultivation. The climate is somewhat more extreme than in the Maritime Provinces, but less so than in the centre of Canada. Its general character is indicated by the undernoted figures.

	Mean temperature for three warmest months	Mean temperature for three coldest months	Mean annual precipitation in inches
Quebec ..	634° F.	12-9° F.	4046
Montreal ..	67-0	15-7	40-99
Toronto ..	654	23-3	34-11

The relatively heavy precipitation—between 30 and 50 inches for the whole region—is due in part to the fact that many of the

cyclonic disturbances which pass across the eastern half of North America leave the continent by way of the St. Lawrence valley.

With the exceptions already mentioned in the discussion of the Laurentian region, the agriculture and manufactures of Ontario and Quebec are practically confined to the St. Lawrence Lowlands, where soil and climate are favourable, and where the rivers and lakes offered a great means of communication along which settlement took place.

The change in agricultural conditions, indicated in the section on the Maritime Provinces, is more pronounced in this region, and especially in Ontario. During the thirty years which preceded the outbreak of war, the area under wheat had decreased, while increased attention had been paid to dairying, fruit-farming, and stock-raising. The change was due to the opening up of the wheat-fields of the west; the eastern farmer, his land exhausted by successive crops of wheat, found himself unable to compete with the virgin soils of the west, and, after a time, abandoned the cultivation of that cereal in the less suitable districts, finding in the products of the dairy, the orchard, and the pasture, articles for which there was a considerable demand both at home and abroad. The change is less marked in Quebec, where the main object of the French *habitant* is to obtain from his farm a living for himself and his family rather than to grow for the market, and where the great conservatism of the bulk of the people renders them impervious to new ideas.

Before the War, manufactures in Canada were still in the earlier stages of development, and consisted chiefly in preparing the products of the farm, the mine, and the forest for use at home and for export abroad. Further progress was for long retarded by a variety of conditions. For one thing there was not a large amount of available capital; much money had been invested in land and in agriculture, much was required to finance agriculturists at certain seasons of the year, and large sums had also been spent in laying down railways and in opening up communications. Another drawback had been the smallness of the Canadian market; the French *habitant* had always made it his aim to purchase as little as possible; for long the Ontario farmer was too poor to buy much; export to a foreign country was impossible. Moreover, the Canadian, belonging to an essentially agricultural community, was not,

until recently, seriously interested in manufactures ; and there was the additional difficulty that the requisite skill was not always easily obtainable. On the other hand, Canada has great advantages in its large exports of wheat and timber, both offering opportunities for the expenditure of additional labour ; in its supplies of water-power which are gradually being developed and which will eventually do much to compensate it for its lack of coal in certain areas ; in its mineral wealth, which is only now becoming properly known ; in its rapidly increasing agricultural population, demanding alike food and clothing, and the means wherewith to cultivate the soil ; in its expanding railway system, with its constant demands for rolling stock ; and in all the needs of a vigorous and prosperous community. Since the War these favourable factors have contributed to a very marked industrial development. In addition to the manufactures already indicated, the leading industries of Canada now include the working of iron and steel, the construction of motor-cars and railway rolling stock, the production of electric power, printing and publishing, and the manufacture of electrical apparatus and cotton and rubber goods.

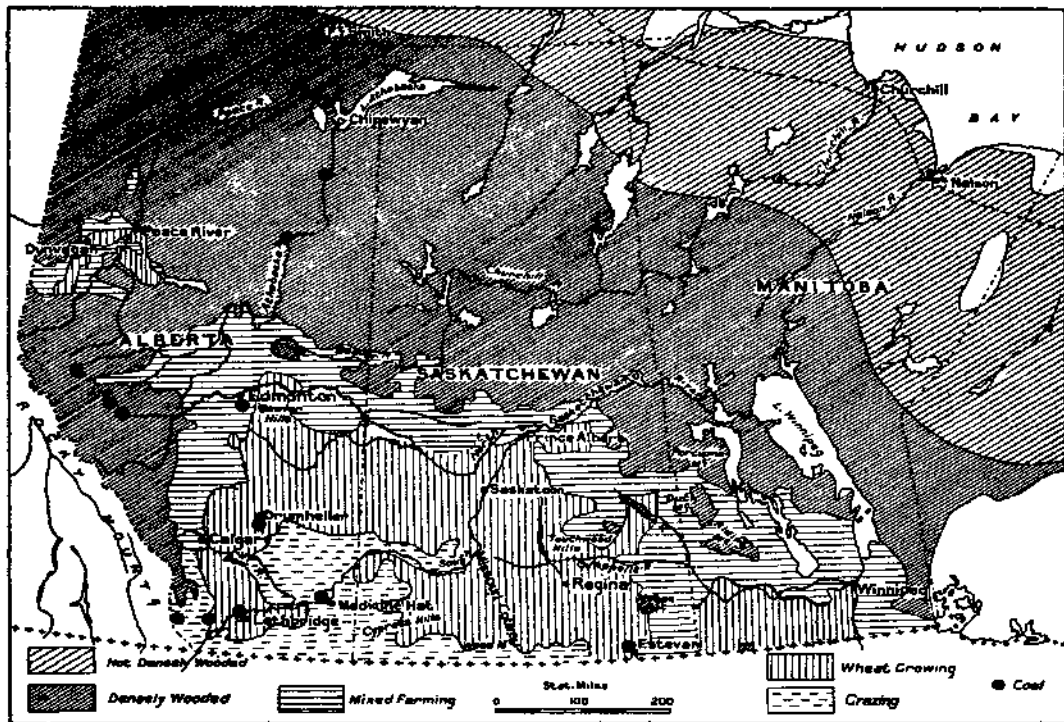
The St. Lawrence Lowlands contain the chief manufacturing districts in the country, and about 80 per cent of the total value of the manufactured products of the Dominion may be credited to the two provinces of Quebec and Ontario, the industrial life of which is largely, though not entirely, concentrated in the lowlands. It is in this region, where the want of coal, already referred to, is most seriously felt, that the development of hydro-electric power has been most rapid. From Niagara Falls, power is now transmitted over a wide area, in some cases to a distance of nearly 250 miles ; and there are also important stations at Big Chute on the Severn River, at Shawinigan on the St. Maurice, and at various other places. In proportion to their population, Quebec and Ontario have more developed water-power than any country in the world with the single exception of Norway, and water-power in one form or another is used by most manufacturing industries in these two provinces.

Ottawa is the centre of the timber industry ; pulp-mills have been established at Hull and at several other places where water-power is available ; and paper is manufactured at Toronto. The tanning of leather and the manufacture of boots and shoes are

leading industries of Quebec; and Montreal and Toronto provide the Dominion with ready-made clothing. Flour-milling is carried on at a number of towns, especially in Ontario, and butter and cheese are made for export at many places throughout the region. Cotton is manufactured near Quebec with power derived from the Montmorency Falls, at Sherbrooke in the Eastern Townships, and elsewhere. Iron and steel works have been established, among other places, at Hamilton, Toronto, and Midland, where agricultural implements are also manufactured. The St. Lawrence Lowlands have little mineral wealth of their own, but about two-thirds of the world's supply of asbestos is obtained from the Eastern townships, where the chief producing area lies round Thetford on the borders of the Appalachians.

THE WINNIPEG BASIN, as already defined, has an area of nearly 200,000 square miles. In general appearance it is a great plain sloping gently down to the north and east; but it may be subdivided into regions known respectively as the first, second, and third steps or slopes. The first of these is bounded on the east by the Laurentian country, and on the west by a line of heights, including the Pembina, Riding, Duck, and Porcupine Mountains, which cross the international boundary about forty miles west of the Red River and run in a north-westerly direction. This step, which has an average elevation of about 800 feet, belonged to the bed of the glacial Lake Agassiz, and the glacial deposits with which it is covered constitute a stiff, compact, "unctuous" clay of great fertility. The second step is bounded on the west by a height known as the Missouri Coteau, which crosses the international boundary about 250 miles west of the previous escarpment, and like it runs in a north-westerly direction. This step, which consists chiefly of rolling prairie, is drift-covered, and has an average elevation of 1,600 feet. The third step, also drift-covered, has a breadth of 465 miles at the international boundary, and rises from a height of 2,000 feet in the east to one of 4,000 feet along the foothills of the Rocky Mountains. The second and third steps are generally more undulating in character than the first, and are broken up in places by stretches of more elevated plateau country.

The climate of the Winnipeg Basin is continental in character, and the range between summer and winter temperatures is, as shown in the table on page 493, very considerable.



THE PRAIRIE PROVINCES

Based on map of Natural Resources of Canada published by Dept. of Interior, 1930.

	Mean temperature for three coldest months	Mean temperature for three warmest months	Mean annual precipitation in inches
Winnipeg	1-1 °F.	63-6 ° F.	204
Regina . .	2-7	61-5	17-7
Medicine Hat	15-7	66-3	12-7
Calgary . .	16-1	57-8	16-1
Edmonton	11-6	59-1	16-9
Prince Albert	4	59.4	16-6

It will be observed that over the whole region, the plateaux excepted, the mean summer temperature is sufficient for the growth of wheat and other cereals, although there is danger in many places from early autumn frosts. The great difference between winter temperatures in the east and in the west is due to the influence of the warm Chinook winds which prevail over the latter area. These winds, which blow chiefly in winter, appear to owe their high temperature to compression while they are descending the eastern slopes of the Rocky Mountains.

The mean annual rainfall, which is less than 15 inches over a considerable area in the south-west of Saskatchewan and the south-east of Alberta, increases towards the east, the north, and the west, and over the greater part of the region ranges from 15 to 20 inches. Of this about two-thirds or more falls during the six months April to September.

Grassland, which varies in character from steppe to meadow, is the prevailing type of vegetation; on the Canadian side of the frontier it is surrounded by a belt of willow and poplar groves, which, in turn, passes into the northern coniferous forest. Except in a few places, as in the north-east of the settled part of Saskatchewan and in the Peace River District, farming has not yet developed in the wooded area.

Over so vast an area, agricultural conditions are naturally far from uniform. In southern Manitoba that part of the first step which lies within the basin of the glacial Lake Agassiz, with its fertile soil, favourable climate, and easy communications, is an important but not extensive wheat-producing region. The second step, which includes the remainder of south-west Manitoba and that part of Saskatchewan east of the Missouri Coteau, contains nearly 30 per cent of the land under wheat in the Prairie Provinces,

the most productive area being that which runs from south-east to north-west between the less fertile tracts of Moose Mountain and the Beaver and Touchwood Hills on the one hand and the escarpment of the Missouri Coteau on the other. Throughout all this area wheat may be regarded as a certain crop, but owing to climatic conditions there may be a wide range between a good crop and a bad one; for the years 1926-28 the average yield was about 19 bushels per acre, but for the years 1929-31 it was less than 13 bushels.

In the northern parts of the eastern and middle steps, the land is more broken in character, the drainage in places is bad, and the climate is less favourable. Considerable areas, moreover, on the eastern step especially, are occupied by communities of Russians and Galicians, whose knowledge of agriculture is somewhat primitive, and who farm for subsistence rather than for export. Mixed farming, accordingly, prevails here to a greater extent than in the south.

The third step includes about three-fifths of the wheat land of the region under consideration, but its distribution is somewhat irregular. In the south, such districts as Wood Mountain and the Cypress Hills are, on account of their topography and soil, unsuited for arable farming. Moreover, in the south-west of Saskatchewan and the south-east of Alberta there is a large area in which the mean annual rainfall does not exceed 13 inches. It is in this semi-arid region that the practice of summer fallowing, followed throughout the whole of the prairie provinces, is of most advantage. There is a three years' rotation: in the first, wheat is sown on land which has been ploughed; in the second, the seed (wheat or another cereal) is harrowed into the stubble; and in the third, the land lies fallow. The moisture received while the land is fallow is conserved by a covering of loose soil on the surface which prevents evaporation. The uncertain climate, however, leads to great variation in the yield—in the south-east of Alberta it ranged from less than 6 bushels in 1924, to over 30 bushels in 1927—and the farmers in the south of that province appear to depend upon favourable years occurring with sufficient frequency to enable them to continue. To the east, west, and north of the semi-arid region, wheat is grown over large areas; but in some parts, especially in the north-west, oats form a more suitable crop, and the general tendency there is to the development of mixed farming.

The following figures indicate the nature of the progress made in wheat cultivation by this region within recent years.

CANADA.			THE WINNIPEG BASIN.	
	Area Acres	Production Bushels	Area Acres	Production Bushels
1901.	3,961,000	84,814,000	2,516,000	62,820,000
1911.	10,373,000	215,851,000	9,301,000	194,083,000
1921.	23,261,224	300,858,000	22,181,329	280,098,000
1926.	22,852,531	399,008,000	21,764,788	375,697,000
1928.	24,119,000	566,726,000	23,158,000	544,598,000
1930.	24,897,000	420,672,000	23,960,000	397,300,000
1931.	26,114,650	304,144,000	25,352,722	284,000,000

[For Canada the average yield per acre in 1928 was 23.5 bushels, and in 1931 11.6 bushels.]

The rapid development of Canadian agriculture, which, as indicated above, has taken place within recent years in the Winnipeg Basin, has naturally led to much speculation as to the future possibilities of the region. It is generally admitted that the present production of the land could be greatly increased, but with regard to its potential resources there is much difference of opinion. Over twenty years ago several estimates of the future production of wheat in the Winnipeg Basin were made by competent authorities, and they varied in amount from 250,000,000 bushels annually to 800,000,000 bushels. All such estimates, however, must, from the very nature of the case, be extremely hypothetical in character, and for their fulfilment must depend not only upon the potential resources of the country, but upon the extent to which its demands are met. With regard to the first of these, it would appear unlikely that the average yield for the five years 1927-31 (about 392,000,000 bushels) could be doubled. A recent authority¹ has calculated that half of the potentially arable area in the Prairie Provinces is already cultivated, and that practically all the best land and most of the good land is now utilized. Of what is left, much lies in

¹ O. E. Baker in *Economic Geography*, Vol. iv, p. 416.

regions climatically more suitable for mixed farming than for wheat growing.

In the second place, any further increase in the arable area would involve a corresponding increase in the rural population. It was once calculated that a rural population of 900,000 was absolutely essential to procure an annual *yield* of 250,000,000 bushels; and it was during the period 1911-21, when the rural population increased from 848,000 to 1,250,000, that this yield was first obtained. On the same basis the present rural population of 1,468,000 would just suffice in normal times for the production of the average crop of to-day. A large population acquainted with the agricultural methods of Central Canada could no doubt be obtained in time if required. Prior to the War a considerable movement of farmers from Eastern Canada, and more especially Ontario, had taken place, and there had also been a large influx from the United States, made up in part of Canadians or their descendants who emigrated from Canada during the 'eighties, in part of native-born Americans, and in part of naturalized Americans from the continent of Europe. From Great Britain, and from several continental countries, especially Scandinavia, Russia, and Galicia, there has also been a steady flow. The settlers from the Eastern Provinces and the United States were perhaps the most suitable, as they already possessed a knowledge of farming under Canadian conditions; of those from Great Britain, the Scottish were generally recognized as more adaptable than the English; while of those from continental countries, Icelanders, Scandinavians, and Galicians were amongst the most satisfactory. The following figures for the fiscal years 1905-14 (inclusive) and for 1922-31 (inclusive) indicate the extent of the immigration into the whole of Canada in pre-war and post-war days, and the countries from which the immigrants were mainly drawn—

	1905-14	1922-31
From the United Kingdom ..	995,117	487,857
From the United States ..	859,640	238,068
From other Countries ..	676,042	507,768
Total	<u>2,530,799</u>	<u>1,233,693 1</u>

¹To this must be added 288,874 returned Canadians.

During the first of these periods emigration from Canada was estimated at rather less than one million, and during the second period at about one million and a quarter. Within recent years the chief immigrants from the continent of Europe have been Germans and Ruthenians, followed by Poles, French, and Magyars.

The climatic conditions of the country present another set of problems. Over no small part of the area on which wheat can be profitably grown, there is the ever-recurring danger of the crop being damaged by early autumn frosts, and, although it is not necessarily rendered useless thereby, it is greatly reduced in value. One of the great demands of the farmer, therefore, is for quick ripening and frost-resisting varieties, and the development of such is being carried on with success on experimental farms in various parts of the Dominion. Marquis and other varieties of wheat, which are now extensively grown throughout the region and which are reported to ripen earlier, and to be more prolific, or less liable to rust than the older varieties, were first produced on these farms. In the semi-arid area, the deficiency of moisture frequently renders ordinary agricultural methods of no avail, and irrigation and dry farming have to be summoned to the farmer's aid. The two largest districts irrigated at present are situated where water can be obtained from the Bow river between Medicine Hat and Calgary, in the block of 3,000,000 acres which was granted to the Canadian Pacific Railway; a third is in the neighbourhood of Lethbridge, where the St. Mary River has been tapped; and a fourth, west of Medicine Hat, draws its supplies from the Bow. In these districts over 950,000 acres have been provided with irrigation canals, but the land is as yet only partially settled, probably because comparatively few farmers have the capital and experience necessary for successful work on an irrigated region. It is not improbable that the future may see a considerable development of irrigation in the western parts of the semi-arid region where a number of streams come rapidly down from the Rocky Mountains. For the full benefit to be derived from irrigated land, it is maintained that hay and fodder must be grown as well as cereals. The ranching industry of the region will therefore also benefit, as stock raised on the prairies can be "finished" for market on the irrigated lands.

Within recent years, also, there has been a very considerable development of mixed farming. In Manitoba wheat now occupies

less than one-half of the cropped land, while as compared with it the areas under oats, barley, flax, hay, and clover have all undergone a more than proportionate increase. During the same period live-stock farming has likewise become much more important; between 1914 and 1925 the total number of cattle in the Prairie Provinces was doubled, though since then there has been a marked decline. This is regrettable, because mixed farming is essential to the country. The fertility of the soil, which has been seriously affected by continuous crops of grain, can best be restored by the use of farmyard manure and the cultivation of leguminous plants. Weeds can be more effectively dealt with when the land is occasionally put under grass, and with a rotation of crops there is not the same danger of fungoid diseases or insect pests becoming established. On the economic side, also, mixed farming offers certain advantages. It tends to better methods of tillage, and allows for the more profitable use of by-products such as straw, which at present is often burned where cattle are not kept. A more varied production will also provide some of the raw materials required for industry by the urban communities, and will render them less dependent upon the wheat-grower than they are at present.

The subject of communications will be dealt with in a later section. The development of railways is absolutely essential for the economic welfare of the north-west, but, as there is no reason to believe that it will be wanting, the subject need only be mentioned here.

As the Winnipeg Basin is underlaid mainly by Cretaceous and, in places, Tertiary materials, those metallic minerals found associated with the older rocks are generally absent. The mining industry is therefore confined to the exploitation of the seams of coal, varying from lignite to sub-bituminous and bituminous, which are found over the greater part of Alberta south of the fifty-fifth parallel, and extend eastwards into Saskatchewan. Lignite is found in the Cypress Hills and Wood Mountains of southern Saskatchewan, and is also believed to exist in Turtle Mountain in Manitoba. The principal mining centres at the present time are in the vicinity of Drumheller (north-east of Calgary), Edmonton, and Lethbridge in Alberta, and Estevan on the Souris River in Saskatchewan, but there are many small mines scattered over the country, especially in Alberta, where it is said that almost every rancher owns one.

Notwithstanding the lignitic character of much of the coal, it is of considerable economic importance, as the country is treeless, and cheap fuel of some kind is absolutely essential for the agricultural population which is so rapidly increasing in numbers. From the mines in Alberta and Saskatchewan a considerable amount is sent as far east as Winnipeg. Natural gas has been found at Medicine Hat and elsewhere in the south of Alberta, and petroleum near Edmonton and Calgary.

Winnipeg, situated at the confluence of the Assiniboine and the Red River, and midway between the international boundary and Lake Winnipeg, is the great collecting and distributing centre, and the chief industrial town, of the region. Other towns serve mainly as local centres for the districts in which they are situated, and carry on a few manufactures.

THE ATHABASCA-MACKENZIE PLAINS. To the north of the Winnipeg Basin, and between the Laurentian Plateau and the Rocky Mountains, the Athabasca-Mackenzie plains slope down gently towards the Arctic. In the south there are extensive grasslands intermingled with trees, but farther north the country is covered by the thin and poor sub-Arctic forest. Owing to decreasing altitude towards the north, together with the increasing length of the day during the summer months, the mean temperature at that season of the year remains relatively high, as the following figures indicate—

	June.	July.	Aug.	Mean.
Dunvegan, 56° N. (approx.) (On Peace River)	56-5° F.	61-3 ⁰ F.	57-4° F.	58-4° F.
Chipewyan, 59° N. (approx.) (On Lake Athabasca)	54-0	61-5	58-2	57-9
Fort Simpson, 62° N. (approx.) (On Mackenzie River)	55-5	60-2	55-7	57-0

Of the agricultural capacities of this country it is difficult to speak with certainty. It is true, no doubt, that crops of barley have been raised at Fort Simpson, and that wheat has been grown at Fort Providence in almost the same latitude. But it must be borne in mind that, although these crops are grown only in the most favourable localities at the present time, they are always liable to be destroyed by frost. It is probably safe to

argue that while, with the development of frost-resisting wheats and the slight improvement in local climatic conditions which appears to follow the tilling of the soil, the cultivation of wheat may extend, in the low lands, some distance to the north of the Winnipeg Basin, the southern part of the region under consideration is mainly suitable for a limited amount of mixed farming, and the more northerly parts will remain as they are at present. The discovery of mineral oil in the Devonian rocks of the Mackenzie basin may, however, lead to economic development in another direction.

BRITISH COLUMBIA. This section of the Western Cordilleras, although considered as one natural region, really consists of a large number of such regions, each of which conforms to one or other of a few distinct types. It extends from the Rocky Mountains in the east to the Coast Range on the west, and includes both; in the south the intervening land is occupied by a grouping of several irregular ranges, and in the north between the 58th and 60th parallels there is a mountainous country which separates it from the Yukon Plateau lying beyond. To the west of the Rocky Mountains in the south, and separated from them by the Upper Columbia and Kootenay rivers, is the Selkirk Range, which in turn is separated from the Gold Ranges or Columbia Mountains by the southward flowing Columbia. Beyond these lies what is known as the Interior Plateau, a mountainous region with an average height of about 3,500 feet ; it is intersected by river valleys, which, in the case of the larger ones, rise to an elevation of less than 1,000 feet above sea-level, while the intervening heights seldom exceed 5,000 feet. The west coast is much broken up by deep, fiord-like indentations, and is fringed by a long chain of islands, which are the continuation northwards of the Olympic mountains of Washington.

The geological formation of the region is extremely complicated. The Rocky Mountains consist chiefly of sedimentary measures of pre-Cambrian and Palaeozoic age with infolded Mesozoic strata; between these and the Interior Plateau, the Selkirks and the Gold Ranges are mainly formed of pre-Cambrian and Palaeozoic sediments with igneous intrusions; the coastal ranges are built up of granitic rocks; while the interior plateau contains large tracts of country covered by volcanic rocks of Tertiary times, and great areas of intrusive granitic rocks.

The climate of the whole of this region is very different from that of eastern and central Canada, as it is influenced by the prevailing westerly winds which, blowing over the North Pacific, are relatively warm in winter and cool in summer. Thus the range between summer and winter temperatures is reduced, especially on the coast, but climatic conditions everywhere vary greatly with position and exposure. In winter the isotherms run from north-west to south-east, while in summer they trend northwards, more or less parallel to the coast, before making their great bend to the south-east. Along the windward slopes of the coastal mountains the precipitation is very high, being frequently between 70 and 100 inches, and on some of the islands even the latter amount is exceeded. On the leeward slopes it decreases, and over a wide belt running north and south across the Interior Plateau it does not exceed 10 inches, but on the west side of the Rocky Mountains it increases again to over 30, and in some places to over 40 inches per year. The following figures are typical of different parts of the region—

	Mean temperature for three coldest months	Mean temperature for three warmest months	Mean annual precipitation in inches
Victoria	39.3 ° F.	58.8 ° F.	37.8
Kamloops (alti- tude 1,100ft.)	26.4	67.2	10.5
Port Simpson . .	35.2	56.2	94.1

The vegetation of the region varies with climate. The greater part, except in the north, is forested, but in the southern interior, where the rainfall is low, there are wide stretches of grassland. Of the trees the most valuable is the Douglas fir, but the red cedar, the hemlock, the white pine, and the Engelmann spruce, among others, are of commercial value. Lumbering is now the most important industry of British Columbia, which produces about one-half of the Canadian output, and large quantities of valuable wood are exported. Within recent years, sawmills have been set up in the mountainous districts away from the coast for the supply of timber to the treeless plains farther east, but Vancouver is still the principal seat of the industry. The manufacture of wood pulp and paper is also important.

Agricultural conditions differ considerably from those prevailing east of the Rocky Mountains. There is much fertile land, but it is scattered throughout the country, in the river valleys, along lake shores, on the deltas, and in other districts which have been cleared of timber. In the dry belt, where grassland occurs, irrigation is necessary to ensure good crops. Mixed farming is general in the southern part of the province. Cereals are grown in many places, but are chiefly used for feeding stock, ranching being an important industry. Farther north, along the National Transcontinental Railway, and in the Peace and Athabasca river districts, some attention is being paid to the cultivation of wheat, but the amount produced is still small. As much of the land is forested, and as cultivation is more difficult than in the east, it is probable that progress will be slow, and that it will not be until more intensive cultivation is necessary in the Winnipeg Basin that wheat-growing on a large scale will prove remunerative west of the Rocky Mountains.

Fruit-growing is one of the most important industries in the south of British Columbia. In all the fertile valleys, west of the Rocky Mountains and south of Cariboo, apples, pears, cherries, plums, and small fruits can be grown. Peaches, grapes, and nectarines are chiefly raised in the interior, south of the Canadian Pacific main line, where the warm, dry summers produce excellent crops, but render irrigation necessary. Among the principal districts in which fruit is at present grown are Vancouver Island, New Westminster, Okanagan, Lillooet, Yale, and Kootenay.

British Columbia accounts for nearly one-half of the annual value of Canadian fisheries. The Skeena, the Fraser, and other rivers along the west coast are ascended each year by vast numbers of salmon, and these contribute about two-thirds of the value of the annual output. Halibut fishing from Prince Rupert ranks next in importance, and a certain amount of whaling is also carried on.

Mineral wealth is both abundant and varied, though its full extent is unknown. Gold occurs in placer deposits in many parts of the interior; it is worked by hydraulic methods, chiefly in the Cariboo and Atlin districts, though the output is relatively small. Gold-copper deposits are frequent in the regions of contact between intrusive granites and older rocks, which lie to the west and south of the Arrow Lakes; here the chief producing region at present is

in the Osoyoos district to the east of Lake Okanagan, Within recent years, also, important mining areas have been developed in the north, where the Premier mine on Portland Canal produces about two-thirds of the gold obtained in the Province. The total output of gold in British Columbia is, however, much less than was formerly the case, and during the three years 1929-31 did not average £700,000.

But more important than the gold is the copper frequently found along with it. The principal copper-producing mines at present are Hidden Creek on Portland Canal and Britannia on Howe Sound, north of Vancouver. Copper Mountain, near Princeton, has recently been closed down. Silver-lead deposits are found in the east of Kootenay, though some occur farther west in the Yale District. The most important sources of silver, however, are the Premier mine, already mentioned, and the Sullivan mine in the valley of the Kootenay, near Kimberley. The latter is also the chief source of lead in the Province. Iron ores exist in various parts, but so far their exploitation has not advanced beyond the preliminary stage. The coal areas are extensive and widespread. In the Rocky Mountains, the Cretaceous measures containing coal generally occur in long narrow bands among the folded and faulted Palaeozoic and Mesozoic strata, and are found at intervals between the international boundary and the Athabasca River. The coals are, as a rule, bituminous, but in places they pass into anthracite, as at the town of that name and at Bankhead, where the present Canadian supply of anthracite is obtained. Farther south are the Elk River and Crowsnest basins, the first of which manufactures considerable quantities of coke at Fernie, while the second (in Alberta), produces bituminous coals. In Vancouver Island, mining is pursued on the east coast at Nanaimo and Comox, where the amount produced is about 1,000,000 tons. Much of the coal and coke from the Elk River and Crowsnest areas makes its way across the frontier into Montana, Idaho, and Washington; while the mines in Vancouver Island serve the coast from Washington to Alaska. Coal has also been located in many places which at present are too distant from good means of communication to render exploitation profitable.

The economic activities of the Cordilleran region are intimately connected with its past history and present conditions. To the geological changes which have taken place it owes the variety of

its mineral wealth ; configuration and climate determine alike its timber resources and its agricultural areas; from the rivers it draws its vast supplies of fish. At present a mere handful of people (694,000 in 1931) are working the vast resources of this region, but it is not impossible that the future may see a great industrial population settled here, sending its products not only to the agricultural lands farther east but to all parts of the Pacific area. The principal towns include Vancouver, Victoria, and New Westminster. Vancouver, with a population of 246,000, is situated on Burrard Inlet and is the western terminus of the Canadian Pacific and Canadian National Railways; it has good harbour facilities, and is an important Pacific port. Within the last few years it has begun to export wheat to Europe by way of the Panama Canal, and no less than 79,000,000 bushels of the 1927-8 crop passed through it. Victoria (39,000), the capital of British Columbia, is on the south-east of Vancouver Island; it has an excellent harbour, and is an important shipping centre. New Westminster, on the Fraser, is largely engaged in canning salmon and is developing as a port; Nanaimo and Rossland are mining towns; Nelson is the business centre of the Kootenay District, and Trail is a great metallurgical centre. Prince Rupert, the northern terminus of the Canadian National Railway, is growing in importance. It has considerable coastal trade, and has also begun to export wheat.

THE YUKON region of Canada occupies the south-eastern part of the Yukon Plateau, which stretches from the northern border of British Columbia into Alaska. It is bounded on the east by the last ranges of the Rocky Mountains which overlook the valley of the Mackenzie, and on the west by the Coast Ranges. The interior of the country is cut up by valleys varying from 1,000 to 3,000 feet in depth, but the uplands form broad plains and are the remains of a plateau which has been dissected by the Yukon and its tributaries. The climate is severe, and, although a certain amount of cultivation is possible, the economic value of the region depends entirely upon its minerals. Of these, gold is no longer the most important, but some is still obtained from the Klondike, a district bounded by the Yukon, Klondike, and Indian rivers. It occurs in placer deposits, both in the valleys of existing streams and in the remains of older valleys on the hillsides. The continuously frozen character of the subsoil, in which the gold occurs,

rendered placer mining more difficult than usual; and it was not till the expensive method of thawing the ground by steam was introduced in 1899 that the maximum yield was obtained, but after that the output gradually declined, and is now insignificant. The silver output from the Mayo district is about twice as valuable. Coal and copper are also found and worked to some extent. A railway has been constructed from Skagway, at the head of Lynn Canal, across the White Pass to White Horse, from which point there is river communication by the Lewes and Yukon rivers to Dawson, the chief town of the Klondike.

COMMUNICATIONS. The political and economic growth of Canada is to a great extent the result of the development of its railway system. In earlier times, it is true, the St. Lawrence and the Great Lakes offered a means of access into the country, and rendered possible the foundation of Quebec and Ontario, but the close settlement of the region farther west could not be effected until the advent of the railway. Since then the progress of agriculture and the extension of railways have been inter-dependent.

All the more important railways of Canada, with the exception of the Canadian Pacific, are owned by the Government. The old Intercolonial Railway connects Montreal with Halifax and St. John, the winter ports of the Dominion; but the political conditions prevailing at the time the railway was built rendered it advisable that it should be as far as possible from the American frontier, and accordingly it does not follow the most direct route. This is taken by the Canadian Pacific, which, however, passes through Maine, in the United States, on its way from Montreal to St. John. From Montreal westward, the line runs north of the Great Lakes, by Sudbury and Port Arthur, to Winnipeg. It then pushes its way across the prairie regions to the Western Cordillera, enters the Rocky Mountains by the Bow Valley, crosses Kicking Horse Pass, and descends into the valley of the Columbia. It leaves this river to cross the Selkirk Range, and follows, first the South Thompson River, and then the Fraser River, almost to its terminus at Vancouver. Among the more important branches of the Canadian Pacific Railway, one runs from Montreal, by Toronto, through peninsular Ontario to Detroit; a second breaks off at Winnipeg and goes by Saskatoon to Strathcona—on the opposite bank of the Saskatchewan from Edmonton; a third

leaves the main line near Medicine Hat, and, entering the Rocky Mountains by Crowsnest Pass, taps the coalfields in the valley of the Elk River, and then, after following first the Kootenay and some of its tributaries, and later the Columbia and the Kettle, crosses to Hope on the Fraser, where it rejoins the main line ; while a fourth runs from Calgary and joins the Winnipeg-Strathcona line near the latter town. In conjunction with the Minneapolis, St. Paul, and Sault Ste. Marie Railway, the Canadian Pacific also connects Sault Ste. Marie, Winnipeg, and Pasqua (west of Regina) with Minneapolis and St. Paul.

Two important routes of the former Grand Trunk Railway run from Montreal: one to Portland, in Maine, and the other to Chicago, by way of the Ontario peninsula, with the different parts of which the main line has many connections. The trans-continental extension of the Grand Trunk system was provided by the National Trans-continental Railway from Moncton to Winnipeg built by the Dominion Government, and its continuation to Prince Rupert built, with Government assistance, by the Grand Trunk Pacific Railway Company, a body closely associated with the Grand Trunk Railway. The route of this trans-continental railway is as follows : from Moncton in New Brunswick it runs to the St. Lawrence near Quebec, keeping within, but, for a considerable part of the way, near to, the Canadian frontier. Crossing the river above Quebec, it strikes westwards considerably to the north of the Canadian Pacific Railway. There are connections with Quebec, Montreal, and Port Arthur, but the first great town into which the main line actually runs is Winnipeg. From Winnipeg the railway goes by Saskatoon to Edmonton, and from that town is continued westwards towards the Yellowhead Pass, by which it crosses the Rocky Mountains. It then follows the Fraser as far as the great bend of that river to the south, and, crossing into the basin of the Skeena, descends by its valley to the Pacific coast at Prince Rupert. This route, which was completed in 1914, lies entirely within British territory ; it offers, because of the more northerly position of Prince Rupert, a shorter sea voyage to Yokohama and northern China than Vancouver does, and it opens up a part of the Laurentian Plateau hitherto untapped by railways.

The main line of what was the Canadian Northern Railway, which had to some extent been built up by the acquisition of

smaller concerns, starts from Montreal and goes by way of Ottawa and North Bay on Lake Nipissing, to Port Arthur. From there it runs to Winnipeg, passing to the south of the Lake of the Woods, and therefore entering the United States for a short distance, and from Winnipeg to Edmonton, on which part of the route it lies farther north than either the Canadian Pacific or the Transcontinental. It then strikes across to the Yellowhead Pass and turning south follows the North Thompson River, the Thompson, and the Fraser, to the coast at New Westminster and Vancouver. This route is able, because of its easy gradients, to convey grain from part of the Winnipeg Basin to the Pacific coast, whence it may be shipped either to the Far East, or by the Panama Canal to Europe. Other lines run west from Winnipeg to Regina, north by Saskatoon to Prince Albert, east to the vicinity of Dawson Bay on Lake Winnipegosis, and south-east to the Winnipeg-Edmonton line near Lake Dauphin.

About 150 miles east of Prince Albert is Hudson Bay Junction, whence a line runs to The Pas on the Saskatchewan, the starting-point of the railway to Churchill on Hudson Bay. This line, the length of which is 511 miles, has been constructed by the Canadian Government with the object of offering an alternative and shorter route from the wheat-growing regions of Canada to the British Isles.¹ From Montreal, and from Churchill, the distance to Liverpool is practically the same. At the present time, much of the grain going east is sent to Montreal by Winnipeg and the Great Lakes; but as Winnipeg is over 400 miles distant from the head of navigation on Lake Superior, and as there is, in addition, the cost of conveyance from there to Montreal, with a trans-shipment at Port Colborne or elsewhere, it is obvious that all places in the north-west which are not more than 400 miles, at the least, nearer to Winnipeg than to Churchill will find it cheaper, other things remaining the same, to export their grain by the Hudson Bay route. Under these conditions the hinterland of Churchill will include the central and northern parts of the agricultural regions on the second and third prairie slopes; from Saskatoon, for example, the distances to Churchill and Fort William are respectively 834 and 890 miles. The difficulties in the way of the development of the route are connected with the navigation of

¹ The line was completed in 1932.

Hudson Bay and Hudson Strait. Neither of these, it is true, is ever frozen over, but at most times of the year there is much floating ice, from which modern steel-built ships are peculiarly liable to receive injury, and special boats will probably have to be built for the trade. Moreover, the harbour at Churchill will be frozen up about the end of October, and, although it may be kept open a few weeks longer by ice-breakers, the period between the end of harvest and the close of navigation will necessarily be a short one; freights and cost of insurance will therefore be higher. Nevertheless, the line may prove of considerable value, as not only will it relieve to some extent the congestion which always occurs on the existing lines when the season's crop begins to move eastward in the autumn, but it will aid in the development of the Flin Flon and other mineral districts of the region.

When the Grand Trunk Pacific Railway failed to take over the working of the National Trans-continental line on its completion, as it had agreed to do, the Government itself undertook the task. Later it acquired the Canadian Northern system, and as it already possessed the Intercolonial, the Hudson Bay Railway, and several smaller lines it now has under its direct control over 20,000 miles of railroad. These are collectively known as the Canadian National Railways.

Of the waterways of Canada, the most important is that afforded by the St. Lawrence and the Great Lakes. The St. Lawrence has been dredged until it now has a minimum depth of 30 feet, which is being increased to 35 feet, from Montreal to tide-water. With the aid of several canals, of which the most important are the new Welland Canal, with a minimum depth of 30 feet, between Lakes Ontario and Erie, and the Sault Ste. Marie—commonly known as the "Soo"—the minimum depth of which is about 20 feet, between Lakes Huron and Superior, navigation is possible as far as Port Arthur. Between Montreal and Lake Ontario navigation is at present restricted to boats drawing not more than 14 feet, and proposals for a deep sea waterway from Montreal to the Great Lakes have for some years been under the consideration of the Governments of Canada and the United States. Many of the other rivers of Canada, such as the Assiniboine, the Red River, and the Saskatchewan, are also navigable, but the traffic upon them is rather of a local character, and they are not of much use for the transport of grain.

FOREIGN TRADE. For the three years 1929-31 the value of the imports and exports of Canada (special trade) was as follows—

	Imports	Exports	Rate of exchange
1929 ..	\$1,298,993,000	\$1,182,412,000	\$4-89¼ to the £
1930 ..	1,008,479,000	1,885,996,000	4.87 ^{1/64} „ „
1931 ..	628,098,000	605,336,000	4.68. ^{26/32} „ „

The principal imports and exports were as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Mineral oil ..	6-0	Wheat	24-8
Motor-cars ..	5-0	Paper	15-1
Coal	5-0	Timber	7-5
Machinery ..	5-0	Wood pulp ..	4-1
Rolling-mill products	4-6	Chemical fertilizer	3-7
Electric apparatus	2-8	Gold quartz, etc.	2-6
Cotton manufactures	2-6	Whisky	2-2
Fruits	2-6	Motor-cars ..	2-1
Whisky	2-3		
Sugar	2-2		

The relative positions of the chief importing and exporting countries was as follows (1929-31)—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
United States ..	66-1	United States ..	43-9
United Kingdom	15-9	United Kingdom	26-0
France	2.0	Japan	2-8
Germany	1-7	Germany	2-1
		Belgium	1-9
		France	1-8

Over four-fifths of the imports are from the United States and the United Kingdom. Coal, motor-cars, and raw cotton come almost entirely from the United States, and alcoholic liquors from Great Britain, while the textile trade is almost equally shared between them. Machinery, iron and steel goods, and electrical apparatus are imported mainly from the United States, but the United Kingdom, as well as some other countries, has an appreciable share of the trade. Mineral oil from the United States is supplemented by supplies from further afield, and the same is true of fruit, the greater part of which comes from the United States.

The United States and the United Kingdom take between them 70 per cent of Canadian exports. Wheat finds its principal market in the United Kingdom, though a certain amount goes to European countries and the Far East. The United States is the chief purchaser of timber and wood-pulp, but the United Kingdom takes a limited quantity of each. Cyanamid, the principal fertilizer exported, goes almost entirely to the United States, and that country refines all the gold-bearing quartz and gold dust, which is exported. The exports of whisky to the United States, hitherto large, are declining as a result of a change in export regulations.

The chief ports of the Dominion are Halifax and St. John, through which the Atlantic trade is carried on during the winter months; Montreal and Quebec, which conduct it during the summer months when the St. Lawrence is open; and Victoria and Vancouver on the Pacific coast. Prince Rupert is mainly a port of call for coasting vessels. In 1930-31 Vancouver ranked first according to tonnage of sea-going ships, and was followed by Victoria, Halifax, and Montreal. According to value of exports and imports, Montreal comes first, and is followed by Vancouver, Halifax, and St. John.

NEWFOUNDLAND

The island of Newfoundland has an area of 42,700 square miles. It belongs in the main to the Laurentian region, though in the west there are Carboniferous rocks which are the continuation of those in Cape Breton Island. The climate is, on the whole, less extreme than on the adjacent parts of the mainland. On the submarine plateau to the south and east of the island, and off the coast of Labrador, there feed at certain seasons of the year enormous quantities of fish which have come down from the north with the

Arctic current. Of these, cod are the most important, and dried cod and cod-oil constitute over 35 per cent of the total exports of the island. In the earlier part of the year before the cod have made their appearance, many fishermen go sealing in the Arctic. Lobsters, herring, and salmon are also caught along the coasts. In Bell Island, in the Bay of Conception, the Wabana mines, which now extend under the sea, are said to contain the largest deposits of low-grade iron ore in North America. They are extensively worked ; much of the product is sent to Sydney, but considerable quantities are shipped to Holland and Germany. Other minerals obtained, or known to exist, include copper, coal, and silver-lead. Agriculture has hitherto been of comparatively little importance, but, with increased knowledge of the interior of the island, the area devoted to it is likely to extend. Lumbering and the manufacture of paper from wood-pulp are also important industries, and paper now accounts for nearly 50 per cent of the exports.

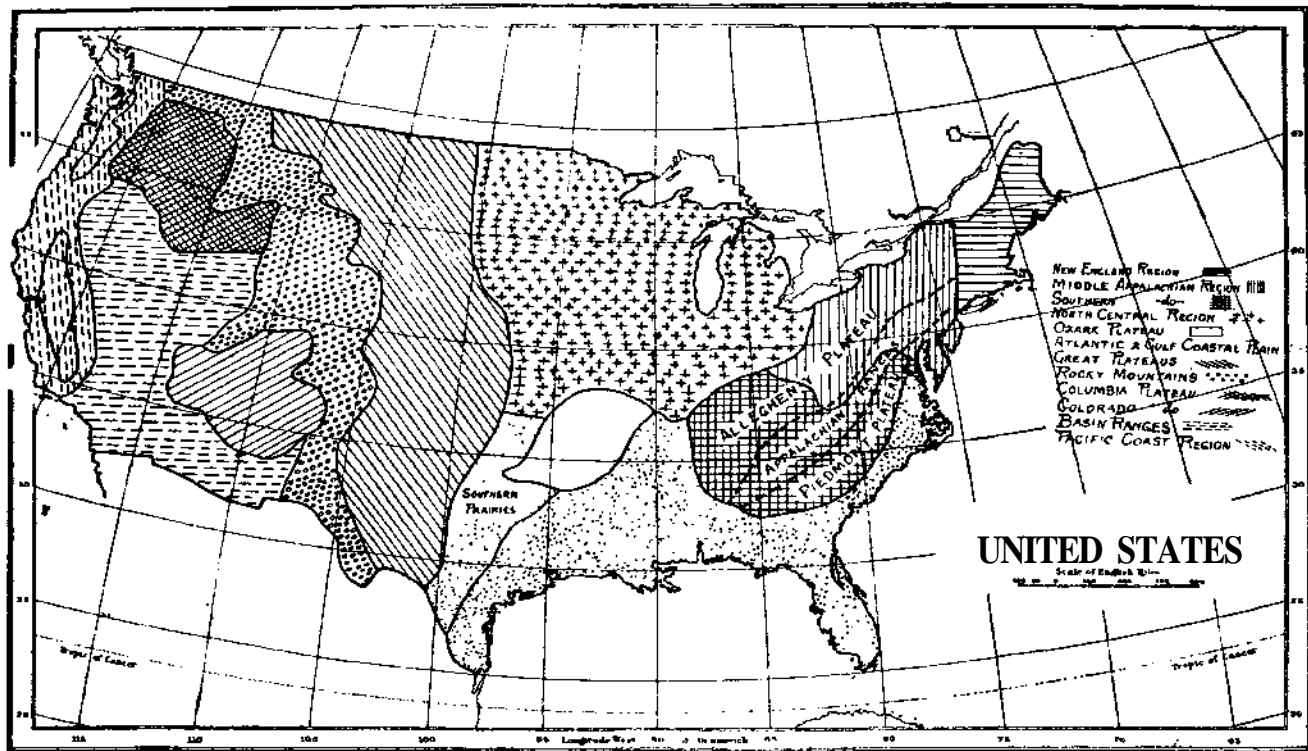
CHAPTER XXXVII

THE UNITED STATES¹

GENERAL CONSIDERATIONS. To the remarkable economic development of the United States a number of factors have contributed. The relative position of the different natural regions into which the country may be divided is singularly fortunate. The great Appalachian coalfield, and the large deposits of iron ore within reasonable distance of it, have led to the growth of manufactures in the northeast, that is, in the region where communication with Europe is most practicable. In the hinterland of the industrial area with its dense population, and with easy access to Europe—a fact of very considerable importance when the exports from the United States were mainly of an agricultural nature—lie the food-producing areas, wheat and maize near at hand ; and somewhat farther off, livestock, which, when prepared for human food, can stand a heavier cost of transport. In the south, but still with easy access to Europe and New England, which are its chief markets, lies the most extensive cotton-growing area in the world. The more distant western mountains are rich in minerals, and especially in metals of high value in proportion to their bulk, on which the charges for freight are relatively low. Even the fruit and timber of the Pacific slope can now be shipped cheaply to the industrial regions of the east.

In addition to the great and varied natural resources of the country, certain historical and economic factors in its development may be noticed. During the nineteenth century, immigration from Europe took place on an extensive scale, due in part, no doubt, to the better prospects offered by a new country, but in part to the fact that the republican form of government appealed to many who were dissatisfied with political conditions at home. But not only did Europe supply the United States with a population; it gave the new country the civilization and the scientific

¹ The statistics of manufactures are based upon the Census of 1919, the Biennial Census of 1927, and, as far as it is published, the Census of 1929. The agricultural statistics are based on the returns of the Department of Agriculture. The mineral statistics are those given by the Geological Survey.



NATURAL REGIONS OF THE UNITED STATES

knowledge which it had evolved in the course of centuries. This combination of the learning of the Old World—even if it has taken a somewhat materialistic turn in its altered environment—with the hitherto untouched resources of the New, has undoubtedly been the most potent cause of the rapid progress which has been made.

NEW ENGLAND. In New England the connection between geographical conditions and economic development is of particular interest. The country, except in the mountainous districts to the north, consists of a raised peneplane, high in the interior, low along the coast. This peneplane is being gradually reduced to base level by rivers which, when they flow over rocks of weak structure, form wide valleys such as that of the Connecticut. The ice-sheet, which at one time covered the whole region, has left its mark in the scanty soils of the uplands, in the innumerable boulders in the lowlands, and in the drift-dammed rivers where many waterfalls occur. The more recent depression of the coast has led to the submergence of river valleys and to the formation of numerous bays and harbours.

The climate is cold in winter, when the mean temperature varies from 15° F. in the north to 33° F. in the south, but warm in summer, when it rises from 65° F. in the north to 70° F. in the south. The rainfall, which is fairly well distributed throughout the year, is generally between 40 and 50 inches in the lowlands, and between 35 and 40 inches in the uplands.

The early colonists settled near the coasts and in the lowland valleys, agriculture and fishing being their chief occupations; and it was but slowly that they spread to the less favoured uplands. With the opening up of the wheatfields in the west, New England, with its soil, scanty in some places, boulder-strewn in others, and of varying fertility throughout, found itself at a disadvantage in agriculture, as it was unable to make use of the improved machinery which was reducing the cost of production; as a consequence, much of the poorer land has been abandoned during the last half century. Considerably more than half the area in farms is under hay and pasture, dairying being the main occupation of the agricultural community. Fruit-growing and the raising of garden "truck" are important in the south-east, with its light soil, relatively mild climate, and easy access to populous centres; in the Connecticut valley tobacco is grown.

Fishing, another occupation of the early settlers, is still carried on from a number of ports along the New England coast. The advantages possessed by the region are the numerous good harbours formed in the drowned river valleys, and the proximity of the fishing grounds of Newfoundland and the continental shelf Gloucester, in Massachusetts, and Portland, in Maine, are two towns largely engaged in this industry; and cod, mackerel, and sardines are among the principal products.

The growth of manufactures has been, however, the most striking fact in the economic development of the New England States, and, although the place which these States hold is relatively less important than it was fifty years ago, the progress which they have made has been very great. At the Census of 1929 it was calculated that, with 2.2 per cent of the area of the United States, they had over 12 per cent of the average number of wage-earners engaged in manufacturing industry, and that according to value they produced over 9 per cent of the total output. Various causes have led to this important position. Domestic industries were naturally started by the early settlers, and these were developed during the latter half of the eighteenth century, when for a time commercial relations with Great Britain were broken off. The rivers, with their numerous waterfalls, offered a plentiful supply of power, and climatic conditions favoured the growth of textile pursuits. Early smelting furnaces obtained their ore from shallow glacial ponds or marshes, and their fuel from the neighbouring forests. Communications by river and sea facilitated both the import of such raw materials as were required and the export of manufactured goods. The opening up of the trans-Appalachian wheatfields, moreover, left much labour and capital, hitherto necessary for agriculture, free to be employed in other directions. The momentum acquired by certain industries from these early advantages is still effective, though changed conditions render some of them less important than formerly. The rivers, for example, supply directly by water-wheels and motors less than 20 per cent of the power used, coal from Nova Scotia and Pennsylvania providing the greater part of the remainder. On the other hand, the facilities for importing raw material and exporting manufactured goods, and the inherited skill of the workers, are now of the utmost value.

The textile industries, which are to a great extent localized in

New England, are the most important of its manufactures, and about one-third of all the workmen engaged in the leading textile pursuits of the United States are to be found in this region. The manufacture of cotton goods takes first place in the group, and New England possesses about 40 per cent of the spindles of the whole country, Massachusetts having about three-fifths of the number and Rhode Island one-seventh. Of the cotton towns, the most important is Fall River, situated on the east of Narragansett Bay, where it is entered by a small stream which formerly provided the necessary power. Lawrence, Lowell, and Manchester make use of the waters of the Merrimac to drive some of their mills. Providence, at the head of Narragansett Bay and on Providence River, is the centre of the industry in Rhode Island. With the recent great development of cotton manufactures in the southern States there has been a relative decline in the importance of the country to the east of the Hudson. In 1909 the output of the latter region was, according to the value of the products, one-half that of the United States, but by 1929 it had fallen to about 30 per cent. There are even indications of an actual decline; in 1919 New England had 17,500,000 active spindles, in 1929 less than 14,000,000. The general character of the New England industry as compared with that in the south is indicated by the fact that in 1919 it produced over seven-tenths of the finer yarns, less than one-half of the medium, and less than one-fourth of the coarse.

New England produces over 60 per cent of the woollen manufactures of the United States, Massachusetts again being the leading state, Rhode Island second, Maine third, and Connecticut fourth. This industry is somewhat more widely distributed throughout southern New England than cotton, as in earlier times it was pursued to some extent in every farming district where there was a sufficient water supply. At present, therefore, it is carried on in a large number of towns, but Lawrence and Providence are the most important. The pre-eminence of New England is especially marked in the manufacture of those classes of goods known as "woollens" and "worsted," over three-fifths of the national output of each being produced there. Of carpets, it produces only about one-eighth of those made in the country. Boston is the chief wool market of the United States. Clothing wools are imported from Australasia and the Argentine, combing wools from the British Isles,

and carpet wools, which form the bulk of the imports (brought mainly to Philadelphia and New York), from China and Asia Minor.

This group of states also ranks first in the manufacture of boots and shoes, producing in 1929 over one-third of those made in the country. The early tanners and shoemakers settled here, as grazing was an important pursuit, and large quantities of oak and hemlock could also be obtained for tanning. In the manufacture of leather New England has failed to retain its supremacy, but boots and shoes are still made by machinery where they were so long made by hand. As steam-power had been introduced before the change in manufacturing methods, the location of towns engaged in this industry was not determined by the proximity of water-power; and Brockton, Lynn, and Haverhill are mainly indebted to their position within easy reach of Boston, the market both for the leather and the manufactured product.

Though New England now produces little ore, the momentum which the iron industry acquired there in colonial times has enabled it to retain a leading place in the manufacture of special kinds of iron goods. Connecticut makes large quantities of brassware, chiefly at the town of Waterbury, and ammunition works, which use brass to a considerable extent, are localized in Massachusetts and Connecticut. Textile machinery, as might be expected, is made in these states and in Rhode Island; and cutlery and hardware of all kinds are produced in the Connecticut valley and in the western parts of the state of that name.

As a result of the proximity of suitable timber, especially in the northern part of the region, the facilities for obtaining water-power, and the plentiful supplies of pure water, the manufacture of wood-pulp and paper takes a high place in this group of states, which accounts for about one-fourth of the total output.¹ Massachusetts and Maine are the leading paper states in New England, and the first of these produces according to value over one-third of the fine paper made in the United States.

THE MIDDLE APPALACHIAN REGION. The states of New York, Pennsylvania, New Jersey, Maryland, Delaware, and West Virginia, together with the eastern part of Ohio, have a strong claim to be treated as a separate region. Their area is less than one-twentieth

¹ 25 per cent in 1929.

that of the whole United States, but they have 25 per cent of the population, and in 1929 they employed about 40 per cent of the wage-earners engaged in industry, and accounted for about 40 per cent of the gross value of the products.

Geographical conditions have determined, to a high degree, the economic growth shown by these remarkable figures. The region belongs essentially to the Appalachian system, the coastal and lake plains being developed only to a slight extent. During glacial times the continental ice-sheet covered nearly the whole of New York and the northern parts of Pennsylvania and New Jersey, leaving in many valleys a deep and generally fertile soil, and offering numerous facilities for the use of water-power. On the Piedmont and Allegheny plateaus, and in the Great Valley, there are many districts capable of cultivation.

As a result of its position and varied topography, the climate of the region is not the same throughout, but on the whole the winters are cold and the summers warm. The mean winter temperature ranges from 17° F. to 21° F. in the north of New York State to 30° F. to 35° F. in Maryland and Delaware, and the mean summer temperature from 60° F. to 65° F. in the northern districts to 70° F. to 75° F. in the southern. Over the greater part of New York State the rainfall is from 35 to 40 inches annually, and over the remainder of the region from 40 to 45 inches.

The surface of the land is too diversified to permit the Middle Appalachian States becoming a great agricultural region. Truck farming is the most remunerative form of cultivation on the coastal plain; it is also followed to some extent on the Piedmont Plateau and in the Great Valley, but these regions with their cooler winters and hotter summers are more suitable for corn and winter wheat than for vegetables; dairying and, in the south, stock-rearing are the characteristic pursuits of the Allegheny Plateau, where the altitude and damp climate are unfavourable to cultivation. New York is the most important dairying State in the Union.

The second factor of importance in the economic development of this region is its enormous supplies of coal. Anthracite, obtained nowhere else in the United States but in two small coal-fields in the Rocky Mountains, is worked here in large quantities, the mines being found in the east central part of Pennsylvania, in a district bounded on the west by the Susquehanna, on the north



MIDDLE APPALACHIAN REGION

by the north branch of that river, and on the east by the Delaware and Lehigh rivers. The production in 1929 and 1930 averaged 72,000,000 tons. Anthracite is now used chiefly as a domestic fuel, for which it is valued on account of its cleanliness, its freedom from smoke, and its excellent heating qualities. The demand for it is largely local, Pennsylvania, New York, and New Jersey taking considerably more than half of the output. Bituminous coal, which occurs throughout the whole length of the Appalachian system, is obtained chiefly in west Pennsylvania, eastern Ohio, West Virginia, and the adjacent parts of Virginia and Maryland. The beds usually run in long curves from north-east to south-west, following the general trend of Appalachian folding. The coal is easily worked, and the greater part is won by drifts along the outcrop, or by gentle slopes down the dip of the bed, very few deep mines having as yet been sunk. In addition, machine cutting is facilitated by the right thickness of the beds, and nearly 80 per cent of the bituminous coal mined in the region is obtained in this way. The production from the Pennsylvania fields in 1929-30 averaged 134,000,000 tons, from Ohio 23,000,000 tons, from West Virginia and Virginia 141,000,000 tons, and from Maryland 2,000,000 tons. This amounted in all to three-fifths of the total coal production of the United States. Pennsylvanian coal finds its chief markets in Pennsylvania and New York, where it is used in all the industries of these states, but considerable quantities are sent by rail to New England, or by the Great Lakes to various ports in the North Central States and Canada. A certain amount also finds its way to tide-water at New York, Philadelphia, and Baltimore, whence some of it is shipped north and south along the Atlantic coast.

For a number of years almost two-thirds of the coke manufactured in the United States came from Pennsylvania, mainly from Connellsville on the Pittsburgh seam. With the substitution of by-product plant for the old beehive ovens, there has been a migration of the coking industry from the fields which produce coking coal towards the industrial centres, north and west, where the by-products (coal-tar, ammonia, benzol, etc.) can be most profitably used. At the same time the improved methods of making coke have made it possible to use coals hitherto regarded as unsuitable for that purpose. Thus, although Pennsylvania is still the largest producer

of coke in the United States, the Connellsville district now ships less than one-third of what it did a number of years ago. Ohio with coal from Pennsylvania and West Virginia, and Indiana with coal from West Virginia have, on the other hand, become large producers. West Virginia, indeed, consumes comparatively little coal, and a large part of the output of the well-known Pocahontas and New River fields is sent to tide-water at Baltimore and Hampton Roads for shipment to New England or abroad. Large quantities are also sent to Michigan, Ohio, the Lake ports, and elsewhere. The Ohio mines send part of their output to Canada by the Great Lakes, and a considerable proportion of Maryland coal finds its way to the coast by the railways following the Potomac.

The position of this group of states has been an important factor in their economic development. Their seaboard is conveniently situated with regard to Europe, and, although New York is over a hundred miles farther from England than Boston is, it has a much larger hinterland, Boston being cut off from the interior by the Hoosac Mountains of Massachusetts. New York, Philadelphia, and Baltimore are all favoured in regard to their communications with the interior. Behind them, the older Appalachians are much lower and narrower than in any other part of their course, and they are crossed also by several great rivers—the Delaware, Susquehanna, and Potomac—which, by means of the water gaps they have cut, afford easy access to the continental interior. Further, in this region, the ranges of the Great Valley lie to the west, and the Valley itself is open and was easily occupied in earlier times, thus aiding in the development of the towns on the coast. The Delaware and the Susquehanna, moreover, are navigable and make useful waterways, but the Potomac is generally unsuitable for such a purpose.

The Great Lakes on the north-west have also played an important part in the development of the Middle Appalachian States by providing a waterway, on which can be cheaply carried much of the raw material necessary for many of the industries established in the region. Of great significance, too, are the easy facilities which exist for communication between the Atlantic and the Lakes by means of the valleys of the Hudson and Mohawk rivers. Lastly, the Allegheny and Monongahela, which along with their tributaries drain the Allegheny Plateau, have, as already indicated, rendered

possible water transport, by way of the Ohio and the Mississippi, to the central and southern states.

The most important industry of the Middle Appalachian States is the manufacture of iron and steel. A certain amount of ore is found in the ridges of the Great Valley in Pennsylvania and in New York, and, until the middle of last century, the deposits from which it is obtained were the chief source of supply. But the development of the Lake Superior ores, and the greatly increased use of coke in place of anthracite in smelting iron, caused the industry to move farther west, and it became concentrated to a great extent in the Pittsburgh area in west Pennsylvania where it was easy to obtain coke from the Connellsville district and ore from Lake Superior. With the changes in the coking industry the advantages of that area are no longer so pronounced, and the manufacture of iron and steel is rapidly developing at various points between the Appalachian coalfields on the one hand and the Great Lakes on the other. In 1929 the region under consideration gave employment to over 60 per cent of those engaged in the iron and steel industry in the United States, and manufactured about three-fourths of the total output. Pennsylvania is, of course, the leading state, and in 1930 produced one-third of the pig-iron and over one-third of the steel of the whole country. The chief centres are Pittsburgh and Youngstown, and around each are a number of satellite towns. In the first group are Pittsburgh itself at the confluence of the Allegheny and Monongahela, Homestead and Duquesne in the valley of the latter river, and McKeesport in that of its tributary the Youghiogeny, all admirably situated for receiving coal and coke. In 1921 Youngstown produced more iron and steel than did Pittsburgh itself; in its vicinity are Warren, Sharon, and Akron. Cleveland and Buffalo are on Lake Erie, and Easton and Allentown are near the iron ore deposits of the Great Valley.

The manufacture of what are known as "foundry and machine shop products" is carried on to a great extent in this region where iron and steel and coal can easily be obtained, and where the large industrial population creates a strong demand. Of the total output in the United States of such articles, which range in variety from steam rollers to nut-crackers, and from motor engines to sewing machines, about one-third is produced in this region, the chief towns

engaged including New York, Philadelphia, Buffalo, Pittsburgh, Erie, Newark, and Columbus.

The textile pursuits of the Middle Appalachian Region rank in importance after those of New England, but several striking differences are to be noted. The spinning and weaving of cotton is of comparatively little account, and the output, which in gross value amounts to less than one-third that of the textile industries of the United States, consists chiefly of woollen and silk goods and hosiery. Pennsylvania and New York are the principal carpet-making states in the Union, Philadelphia, where the industry has been established for over a century, being the chief town engaged in it. Silk is manufactured mainly in Pennsylvania, New Jersey, and New York. Pennsylvania in 1929 produced over two-fifths of the silk goods of the country, but Paterson in New Jersey, with water-power from the Passaic River, is still the most important town engaged in the industry. As much of the raw material used in the manufacture of carpets and silk goods comes from the East, the facilities for importing it into this region would appear to be one of the reasons for the localization of these industries. Hosiery is made in the Mohawk valley, where industry in its early stages was fostered by the power derived from the Adirondack streams. Cohoes manufactures knit goods, Troy collars and cuffs, and Gloversville gloves.

The manufacture of clothing is another industry which is localized to a remarkable extent in the Middle Appalachian States, which produce about 80 per cent of the output of the whole country, New York City alone providing over 60 per cent. This is accounted for in part by New York being the commercial and social capital of the United States, but it is largely due to the fact that, for a time, the labour required in the industry was almost entirely recruited from those immigrants who entered by the port of New York, but, being unfitted for agriculture, did not pass into the interior. No less than 98 per cent of the tailors and tailoresses employed in New York in 1905 were of foreign birth or of foreign parentage.

Among other industries of the region oil is refined in the vicinity of New York, where it is obtained by pipe line from a great part of the continental interior and imported from abroad; copper ores, domestic and foreign, are smelted and refined at Camden and Newark in New Jersey; there are shipbuilding yards at Jersey City and

Camden, and sugar refineries at Philadelphia; Buffalo is an important flour-milling centre. The manufacture of paper, the printing and publishing of books and newspapers, flour-milling, and meat-packing are also important industries.

The dominant factors in the economic development of the Middle Appalachian States are, therefore, their vast mineral resources and their favourable situation, alike with regard to Europe and with regard to the interior of the continent. It is noteworthy, as illustrating the importance of the latter factor, that, although five out of the ten largest cities in the United States are situated within this region, only one lies within the borders of the Appalachian coalfield. The growth of the others as manufacturing centres is due to the facilities which they possess for the collection of raw material and the distribution of manufactured goods; and similar facilities for collecting exports and distributing imports have made several of them into great seaports. New York is most favourably situated in this respect, because it has not only the same advantages as Philadelphia and Baltimore for access to the interior by means of the routes created by the transverse Appalachian rivers, but it is at the outlet of the Hudson Valley, which brings it into communication both with the St. Lawrence and the Great Lakes. Philadelphia and Baltimore, although they have the advantage of being situated on waterways which penetrate well into the interior, are not quite so conveniently placed for carrying on trade with Europe, nor have they the same choice of routes to the trans-Appalachian States as New York has. Buffalo owes its importance to its position on Lake Erie, at the termination of the route followed by the Erie Canal. The situation of Pittsburgh in relation to the Appalachian coalfield has already been described. Newark and Jersey City share in many of the advantages of New York.

THE NORTH CENTRAL REGION. This region, which lies west of the Allegheny Plateau and east of the Great Plains, south of the international boundary and north of the Ozark uplift, is the great agricultural, and the second most important manufacturing area of the United States. Broadly speaking, the land, which rises in all directions from the Mississippi, is flat or undulating, and only in comparatively few places is it mountainous. In the north, in parts of Michigan, Wisconsin, and Minnesota, there are outliers of the Laurentian area which contain much mineral wealth. The

greater part of the region was at one time covered by the ice-sheet, and the soil conditions are largely determined by that fact. The terminal moraines formed by the retreating glaciers consist in the main of stony soil; but between them there are extensive tracts of more or less level land, covered over with glacial debris derived from an intermixture of different kinds of rock. These tracts, which are often poorly drained and therefore contain a relatively high proportion of organic matter, are among the most fertile in the region. Underlying the surface there are in places extensive deposits of coal.

The climate is continental in character; the range between the heat of summer and the cold of winter is considerable; and precipitation decreases from the east toward the west and north-west. Over the greater part of North Dakota the mean temperature for the three coldest months is from 5° F. to 10° F., while in Kansas it is from 29° F. to 33° F. The mean summer temperature varies from 65° F. to 70° F. in the northern states to between 74° F. and 78° F. in the southern. In the extreme east of the region the annual precipitation is between 40 and 45 inches, but along the western boundary it ranges from between 25 and 30 inches in Kansas to between 15 and 20 inches in North Dakota. Throughout the region considerably more than half of the rainfall occurs during the summer half of the year.

The following figures are typical of the climatic conditions of different parts of the area under consideration—

	Mean temperature for three coldest months	Mean temperature for three warmest months	Precipitation
Columbus (Ohio)	31° F.	73° F.	372 inches
Bloomington (Ill.)	26°	74°	36-1
Topeka (Kansas)	30°	76°	34-1
Grand Forks (N.D.)	8°	65°	20'1

Physical features, soil, and climate alike constitute this region the most important in the United States for the production of cereals. The surface of the land offers few obstacles to the use of machinery, the fertility of the soil encourages extensive rather

than intensive methods of cultivation, and the temperature and rainfall are sufficient for the growth of wheat throughout the whole region, and for the growth of maize in its southern half. Spring wheat is, as a general rule, cultivated north of the winter isotherm of 20° F., where the high summer temperature and low rainfall, decreasing in the ripening period, are conducive to the growth of a grain rich in protein. Winter wheat is grown in the region which lies between the spring wheat belt and the cotton belt, that is, roughly between parallels 41° and 37°, but the greater part of the crop is obtained from the region under consideration, more especially from Kansas and Nebraska, which lie in the semi-arid region where hard winter wheat is the chief crop. Nearly all the maize is grown south of the mean summer isotherm of 66° F., and of a line showing a mean night temperature of 55° F., but in the main corn belt these temperatures are at least 4° higher. Weather conditions are, however, very important. It would appear that for every half-inch of rainfall in July, above or below that required to produce an average crop, the average yield of maize is increased or decreased by two bushels per acre. Again, unfavourable weather during the winter often leads to the loss of part of the winter wheat crop; on an average one-tenth of the area sown has to be re-cropped in the spring.

The North Central States produce about three-fifths of the wheat crop of the country. North Dakota, South Dakota, and Minnesota, whose most fertile parts belong to the bed of the glacial Lake Agassiz, form the chief hard spring wheat region and have about one-fourth of the area under wheat in the United States. Farther south, in the region of hard winter wheat, Nebraska and Kansas have over one-fifth of the wheat area; and Indiana, Illinois, Ohio, and Missouri, which grow semi-hard winter wheat, have nearly one-seventh. The yield per acre is relatively low: only in the east does the average exceed fifteen bushels, and elsewhere it is usually somewhat below that amount. With the favourable conditions of soil and climate which prevail, it is probable that the future will see a considerable increase in the yield per acre, as increasing demand brings the land under more intensive cultivation. The development of the spring wheat area was rendered possible by the introduction of agricultural machinery, which facilitated extensive methods of cultivation, and by the improvement in flour-milling

machinery necessary to remove from the flour of spring wheat all the fine particles of bran, the presence of which had hitherto affected both its colour and quality. On the other hand, mixed farming has made great progress during the last twenty years; and in the Dakotas, and more especially in Minnesota, where the wheat area has greatly declined, maize (for fodder), oats, and hay are cultivated on a much larger scale than was formerly the case. In the hard winter wheat region there has also been a considerable extension of mixed farming.

The manufacture of flour has naturally become an important industry in the North Central Region, which in 1929 produced over one-half of the American supply. Minnesota is the leading state, and it is followed by Kansas and Illinois. The chief towns engaged in the industry are Minneapolis, which in earlier times derived its power from the Falls of St. Anthony, though much is now obtained from steam; Milwaukee and Chicago, which have excellent shipping facilities; and Kansas City, the centre of the winter wheat region, which is able to export both to the Gulf of Mexico and the Atlantic seaboard.

Maize, which requires a higher summer temperature and a greater rainfall than wheat, is grown mainly in a belt of country denned on the north by the isotherm of 70° mean summer temperature, and on the south by the Ozark uplift and, farther east, by the line separating the more productive glaciated lands to the north from the less productive unglaciated lands to the south, on the west by the isohyet of 20 inches mean annual rainfall, and on the east by the line which marks the junction of the Great Plains with the Appalachian system. Thus defined, the belt includes western Ohio, central and northern Indiana and Illinois, Iowa, the south-west of Minnesota, the south-east of South Dakota, the east and centre of Nebraska, and the northern parts of Kansas and Missouri. It contains nearly one-half of the land under maize in the United States, and produces more than one-half of the total crop.¹ The North Central region, as a whole, has 60 per cent of the area producing maize in the United States and 70 per cent of the total output.

Since 1890, the normal area under maize has increased from 70,000,000 acres to over 100,000,000 acres, a result largely due to the growth of the live-stock industry. Many cattle are reared

¹ O. E. Baker, in *Economic Geography*, Vol. III, p. 447.

in the region, and many others are drafted in from the Great Plains, as far south as Texas, to be finished" for market. The rapid growth of population, both in the North Central and in the Middle Atlantic States, has greatly increased the demand for meat and dairy produce, while the development of transport and the use of refrigerating cars have made it easy to meet that demand. The number of cattle in the maize belt cannot be determined exactly, but of the 55,000,000 on farms in the United States, 25,000,000 are in the North Central region. Hogs are even more concentrated in this region, and over 70 per cent of those in the United States are found within it. But in each case the density within the maize belt is much greater than without it.

Nearly three-fifths of the slaughtering and meat packing of the United States is done in the North Central Region, where the industry is to the maize belt what the manufacture of flour is to the wheat fields. Chicago is the chief city engaged, and produces about 18 per cent of the country's output. It owes its pre-eminence, on the one hand, to its suitable position for receiving live stock from the whole of the north-west, and, on the other, to its facilities for distributing the manufactured product. Kansas City (Kansas) and South Omaha, which practically do nothing else, have grown in importance within recent years as a result of the extension of the corn belt in Nebraska and Kansas; East St. Louis and Indianapolis have also a large output. With the exception of New York, which produces over 5 per cent of the whole, the leading cities in this industry are in the maize-growing states.

Besides wheat and maize, the North Central Region also produces two-thirds of the United States' output of oats and half of its hay, and it contains half of the dairy cattle kept on farms. From the Dakotas and Minnesota comes practically all the flax grown in the country, and from Michigan, especially round Saginaw, about one-sixth of the sugar-beet.

In addition to its great agricultural resources, the North Central Region has much mineral wealth, and three large coalfields of Carboniferous age lie within it. The most important of these is the Eastern Interior, which covers most of Illinois, the south-western corner of Indiana, and a small portion of Kentucky. The output of this field amounts to over 87,000,000 tons, or rather more than one-sixth that of the United States; and the coal from it, besides

supplying a large contiguous manufacturing area, makes its way down the Mississippi as far as Louisiana, and westward into the Dakotas, Nebraska, and other states. The Northern Interior coalfield, which lies in the centre of the lower peninsula of Michigan, has an annual output of nearly 1,000,000 tons, all of which is used locally. The Western Interior coalfield extends over parts of Iowa, Kansas, Missouri, Oklahoma, and Arkansas, the portion within the region under consideration producing over 10,000,000 tons annually, most of which is used locally, either by the railways or for domestic purposes.

In the North Central Region, the chief oilfields are in western Ohio and Indiana (known as the Lima-Indiana field), in Illinois, and in Kansas—the latter extending into Oklahoma and northern Texas. The output of the first and second of these fields is steadily decreasing, while that of the Kansas section of the third, which increased very rapidly for some years as a result of the discovery of large supplies in the south-eastern part of the State, is now stationary. The North Central Region, as a whole, produces about 6 per cent of the total output of the United States. Pipe lines convey the oil from Indiana and Illinois to the Atlantic seaboard, and that from Kansas to the Gulf. Natural gas is obtained in Indiana and Kansas, but the output is much less important than it is in the Middle Appalachian States.

The principal localities in North America which, at present, produce iron ore may be considered as falling within this region, although they really belong to the Laurentian Plateau, of which they form outlying parts. About 85 per cent of the iron ore obtained in the United States is mined in the neighbourhood of Lake Superior, where the chief districts in which it is found are the Mesabi and Cuyuna Ranges in Minnesota, to the west of Lake Superior; the Vermilion Range, a little to the north of the Mesabi; the Marquette, in the upper peninsula of Michigan; and the Menominee and Gogebic Ranges farther south, on the borders of Michigan and Wisconsin. The average production for 1929-30 was 56,000,000 tons, of which 36,000,000 came from the Mesabi Range. In addition to producing hematite, the Cuyuna district constitutes one of the most important sources of mangiferous iron-ore in the United States.

As coal is not available for smelting the ore in the localities in

which it is mined, it is shipped from Duluth, Superior, Two Harbours, Ashland, and Marquette on Lake Superior, and from Escanaba on Lake Michigan, to various ports on Lakes Michigan and Erie. At Chicago, Gary, and Milwaukee on the first of these, and at Cleveland, Erie, and Buffalo on the second, the manufacture of iron and steel has become an important industry, as the costs of production are reduced when the iron ore can be shipped directly to the smelting-works. From Ashtabula, Conneaut, and Erie, all on Lake Erie, very large quantities of raw ore are also sent to the Pittsburgh district, Youngstown, and other places, either on, or in the vicinity of, the coalfields of the Middle Appalachian States. In the North Central Region itself, the production of iron and steel amounts to over one-fifth that of the United States, the chief towns engaged being situated on the lakes to which ore and coal can both be transported at low rates.

In the Lake Superior region of the upper peninsula of Michigan, there is a strip of land about seventy miles long and one mile wide which contains large quantities of native copper. It occurs in masses varying from small particles to lumps of several hundred tons in weight, and is obtained from mines sometimes a mile below the surface of the ground. The output is about one-tenth that of the whole country. Coal for smelting and other purposes is easily obtained by water from Pennsylvania, and a considerable amount of ore goes eastward by the same route, on its way to New Jersey, where much of it is smelted and refined.

Among other industries the manufacture of agricultural implements is perhaps the most characteristic of the North Central Region. The great demand for every kind of field machinery from the prairie states, the proximity of iron and coal, the facilities for obtaining hard timber, and the bulky nature of the finished goods, all account for the fact that here is produced about 75 per cent of the total output of the United States. Chicago and Moline in Illinois, Racine in Wisconsin, and Springfield in Ohio are among the leading towns engaged in the industry. It is less easy to account for the manufacture of motor-cars in Michigan, especially at Detroit, but the facilities for obtaining coal, iron and steel, and hard timber have undoubtedly played a part.

The lumber industry of the region is located chiefly in the states of Wisconsin, Michigan, and Minnesota, which fall within the

northern pine province. The manufacture of wood pulp and paper is also an important industry, especially in Michigan and Wisconsin.

The economic development of the North Central States is therefore the result of a remarkable combination of geographical factors. The prosperity of the region is based upon the great agricultural resources due to its flat or undulating surface, its fertile soils, and its favourable but diverse climate. The large supplies of fuel within its borders, and the still larger supplies which can be easily obtained from the Appalachian fields beyond, enable it to export these agricultural products, not as raw materials, but as manufactured goods. The presence of iron ore and timber has facilitated the growth of these and other industries, and the momentum thus acquired has aided the further industrial development of the region. The Great Lakes provide a means of cheap transportation which has been of immense value, while few physical obstacles hinder the construction of railways, nor is communication with the Atlantic and the Gulf a matter of great difficulty. The position of the more important cities indicates the nature of the forces that have been at work. They are primarily collecting and distributing centres, and, because of their position as such, have become manufacturing as well. Chicago is in a sense typical of the whole region. It is situated where the great routes from the east to the northwest must all converge in order to turn the southern end of Lake Michigan, and it is therefore a great meeting place of land and water ways. To it can easily be brought the wheat of the Dakotas and Minnesota, the live stock of the maize belt and the Great Plains, the iron ore of Michigan, the wood of Wisconsin, the coal of Pennsylvania. Thus, being the collecting centre for the varied products of a large and rich area, it has become a great manufacturing town, with special facilities for the export of its manufactures, and with similar facilities for the import of other commodities and for their distribution over the region from which it obtains its raw materials. Chicago, it is well said, "is the epitome and climax of the prairie and lake region."

THE ATLANTIC AND GULF COASTAL PLAIN. This region is of comparatively recent origin, its elevation nowhere exceeds 500 feet, the rocks of which it is composed are weak and unconsolidated, and it is generally, though not always, covered with a deep and fertile soil. Its southern position, low relief, and proximity to the

ocean have given it a climate, moist, warm, and on the whole equable. Only in Virginia and in Tennessee does the mean winter temperature fall below 40° F., while the mean summer temperature over the whole region ranges from 75° F. to 83° F. The precipitation as far west as the ninety-third meridian is from 50 to 60 inches, except in the north and to the east of the Appalachians, where it does not exceed 50 inches, and in the south where, east of the Mississippi, the coastal belt has over 60 inches. Beyond the ninety-third meridian the rainfall rapidly diminishes in amount, and near the hundredth, that is, in the west of the southern prairies, which for convenience are considered along with the Atlantic and Gulf Coastal Plain, it does not much exceed 20 inches.

Throughout the greater part of this region, as well as on parts of the Piedmont Plateau, the cultivation of the cotton plant is the chief pursuit of the agricultural population. The outer limits of the belt within which it is grown are fixed almost entirely by climatic factors. The necessity, as a rule, for an average temperature of at least 77° F. for the three months, June, July, and August, and for a period of not less than 200 days between the last killing frost of spring and the first killing frost of autumn, confine the commercial production of cotton in the United States to the region south of the thirty-seventh parallel. The western limit of the belt has moved rapidly westward within recent years, and cotton is now grown in some parts of the west of Texas with a precipitation of 17 inches, provided that 75 per cent of that falls in the growing season. The latter region excepted, however, climatic conditions are very favourable. The proximity of the Atlantic and the Gulf of Mexico prevents the great extremes of climate which are characteristic of continental masses, and ensures a sufficiently long growing season. The temperature increases until the maximum is reached in July, after which there is not only a somewhat lower temperature, but a greater diurnal range. In the spring the cyclonic disturbances, originating on the plains of Texas and moving in a north-easterly direction, cause an inflow of warm, moist air from the ocean. As the summer advances, the low-pressure area, developing over the continent, leads to a steady atmospheric inflow from the sea to the land and a heavier rainfall. In August, the land has cooled slightly, while the air temperature over the ocean is at its highest. The temperature gradient is therefore not so steep, and

there is that decrease in precipitation, except along the coasts, which tends to check the growth of the cotton plant, and enables it to mature its seed. The area of the cotton belt has recently been estimated¹ at 295,000,000 acres, but it must not be thought of as exclusively devoted to the cultivation of cotton. In the east more than half of it is still forested, only about 60 per cent is in farms, not more than 30 per cent has been "improved," and the area under cotton is less than that under other crops, of which maize is by far the most important.

But if climatic factors mark the limits within which cotton may be grown, soil conditions are of considerable importance in determining the distribution of the crop within these limits and the average yield per acre. The most productive soils are the red, brown, and black, well-drained bottom lands such as are found in the valley of the Mississippi, and more particularly in the region known as the Yazoo delta to the north of Vicksburg; and the dark coloured clay lands, such as the black waxy prairies of Texas. The sandy loams of the middle and upper parts of the Coastal Plain, east of the Mississippi, and the red subsoil lands of the Piedmont Plateau, are also very productive when well fertilized, as is now often the case.

The following figures indicate the nature of the change which has taken place in the location of the cotton fields between 1850 and the three-year period 1928-9-30—

State	1850 Per cent of production	State	1928-30 Per cent of production
Alabama.. ..	22-9 (564,429 bales)	Texas	30-1 (4,382,000 bales)
Georgia	20-2 (499,091)	Mississippi ..	11-2 (1,630,000)
Mississippi ..	19-11 (484,292)	Georgia	9-1 (1,332,000)
South Carolina	12-2 (300,901)	Alabama	9-0 (1,315,000)
Tennessee ..	7-9 (194,532)	Arkansas	8-2 (1,197,000)
Louisiana ..	7-2 (178,737)	Oklahoma ..	7-4 (1,082,000)
North Carolina	3-0 (73,845)	South Carolina	5-9 (865,000)
Arkansas ..	2-6 (65,344)	North Carolina	5-4 (792,000)
Texas	2-4 (58,072)	Louisiana ..	5-0 (736,000)
Florida	1 8 (45,131)	Tennessee ..	3-0 (447,000)
All others ..	2 (4,719)	All others ..	5-7 (732,000)
	100(2,469,093 ..)		100 (14,510,000 ..)

¹ O. K. Baker, *Economic Geography*, Vol. III, No. 1.

The great development of the cotton-growing area to the west of the Mississippi was due in part to the exhaustion of the soil to the east of it," largely as a result of the wasteful methods of slave cultivation ; in part to the greater facility with which the virgin lands of Texas can be brought under the plough; and hi part to the greater freedom of Texas and Oklahoma from the ravages of the boll-weevil.

Great although the production of raw cotton in the United States undoubtedly is, for some years it only met with difficulty the rapidly increasing demands made upon it by different parts of the world, and it seems unlikely that the future will see any great expansion of the cotton belt beyond its present limits. On the other hand, only a small proportion of the land within the cotton growing area at present bears that crop, and it is believed that part of the remainder might be rendered productive by removing timber, by draining swamps, and by reclaiming impoverished land. But the most fertile areas have already been occupied, and it is probable that only in exceptional cases will the new lands, added at considerable cost, fail to prove less remunerative. Influenced by considerations such as these, various members of the Agricultural Service of the United States have expressed the opinion that it is in the adoption of more intensive methods of cultivation that the best hopes of an increased output actually lie. It is said that one seldom comes across a really first-class field of cotton in the States ; and this indeed might be inferred from the fact that the average yield for the twelve years ending 1930 did not exceed 155 lb. per acre, while "on large tracts, carefully prepared, as much as 500 to 800 lb. per acre are frequently obtained." Various causes contribute to this discrepancy between the actual yield of the land and its potential capacity. The planter too frequently takes his seed from public gins, regardless of whether it is suited to his soil and climatic conditions, or whether it has been bred up to a high degree of productiveness. Outside of the Agricultural Department, seed selection and seed breeding are seldom practised, the application of manure is imperfectly understood, and the due rotation of crops is often neglected. The small farmer, who has in many cases succeeded the slave-owning cultivator, works by primitive methods, and uses antiquated machinery ; and when he is a negro working without direction, as is frequently the case, the yield per acre is below the average.

Since the War the situation within the cotton belt has more than once undergone a complete change. The boll-weevil, which had entered the country in 1892, had by 1920 spread over the greater part of the cotton-growing area, and it has been estimated that the damage done by it and other insect pests between 1920 and 1925 amounted to between 20 and 30 per cent of the total crop. Moreover, labour difficulties had arisen; during the War many negro labourers had gone to the northern States to work in munition factories, or to replace men who were on foreign service, and, finding better wages there and less race prejudice, had remained. The gravity of the situation which developed is indicated by the decline of the average annual output of raw cotton from its pre-war figure of 15,000,000 bales to one of slightly over 9,000,000 bales for the three years 1921-3. In 1924 a very marked improvement began, the output once more approached 15,000,000 bales and in 1926 rose to 18,000,000 bales. This was due in part to a great extension of the cotton-growing area in Texas and Oklahoma, in part to weather conditions which proved unfavourable to the boll-weevil, and in part to the successful combating of that pest by the use of calcium arsenate. (In Texas and Oklahoma the cotton-growing area has increased from about 14,000,000 acres in 1920 to about 21,000,000 acres in 1930; and cotton is now grown in some parts of the west of Texas, even in the Staked Plains, but the yield per acre is below the average and, on the whole, it does not average more than 135 lb.) Since 1926 the average yield has not much exceeded 14,500,000 bales; as a result of wetter summers there has been heavy loss due to weevils, calculated at 18 per cent for the whole crop in 1927 and 14 per cent in 1928.

The production of rice in the United States has undergone great changes within the last seventy years. About 1860, the three South Atlantic States of North Carolina, South Carolina, and Georgia produced 90 per cent of the total output, mainly on the delta lands along the coast. To-day, over 80 per cent of a very much larger crop is grown in Louisiana, Texas, and Arkansas, chiefly on the wide level prairies in the south-west of Louisiana and the south-east of Texas. There the temperature is sufficiently high and water for purposes of irrigation can be obtained, partly from rivers, and partly by artesian wells from a stratum of gravel between 125 and 200 feet below the surface. The drift soils on which the

rice is planted are underlaid, moreover, by an impervious clay which retains moisture as long as it is wanted, but facilitates drainage and allows of the use of heavy harvesting machinery instead of the sickle, which can alone be used where the soil is not dry and firm at the time of harvest. The yield has also been greatly improved by the importation of better milling varieties from Japan. American exports of rice are now considerably greater than the imports.

Sugar-cane is raised largely in the river bottoms of the delta of the Mississippi, where Louisiana now produces the greater part of the cane sugar grown in the continental United States. In 1906, for the first time, the production of beet-sugar surpassed that of cane sugar, and the north and west now outstrip the south in the manufacture of that commodity. Partly on this account, partly because of the importation of cane sugar from Hawaii, the Philippines, and elsewhere, and partly as the result of disease among the canes, the output of Louisiana rapidly declined, but is again beginning to show an upward movement. To the east of the Mississippi delta the coastal region produces fruit and vegetables, and in Florida citrus fruits (oranges and grape fruit) are grown. Cotton, it may be noted, is excluded from the whole of the coastal strip round the Gulf by an autumn rainfall of at least 10 inches.

The mineral wealth of this region is also of some importance. Within the prairie section of it there lies a part of the south-western coalfield of Arkansas, Oklahoma, and north Texas. It has now an output of about 4,000,000 tons, some of which goes northward, where it comes into competition with the product of the Western field, but the greater part of which finds its market in the south. Petroleum is obtained in the plains of Louisiana and Texas, and these states provide about one-third of the United States output (U.S. average 1929-31, 124,000,000 tons; world, 194,000,000).

The Atlantic and Gulf Plains, and that part of the southern prairie associated with them, are therefore chiefly devoted to agricultural pursuits. Climatic conditions, while not so unfavourable to the white man as was at one time believed, account for the introduction into the south of an alien race, unfitted by nature to develop the resources of the country to their fullest extent. On the open prairie lands of Texas, where the negro has never settled in large numbers, economic progress has within recent years been very

great. But the whole region is likely to remain agricultural rather than to become manufacturing, and the chief towns will always be the ports which serve not only the region itself, but, in a greater or less degree, the whole of the Mississippi basin. Of these, New Orleans, on the delta of the Mississippi, is the most important. Houston, Galveston, Mobile, and Savannah export raw cotton, and Houston, Beaumont, and Port Arthur refine and export oil.

THE SOUTHERN APPALACHIAN REGION. One of the most striking features in recent American history has been the economic development of the Southern States—a development which, although it has affected all parts of the south, has taken place mainly within the Southern Appalachian Region. The geographical factors upon which it is based are the agricultural resources of this region, its mineral wealth, and its relation to the remainder of the cotton belt. With regard to the first of these, the conditions vary greatly. The Piedmont Plateau and the Great Valley contain much fertile land; the Appalachian Mountains, though well wooded are naturally unsuited for cultivation; and the Cumberland Plateau, likewise wooded, is not only dissected by rivers to such an extent that communication is in places extremely difficult, but the configuration of the land and the infertility of the soil, derived from sandstones and shales, are such as to make great areas quite useless for the production of large crops. Farther to the north-west, in the limestone lowlands, which may be mentioned here, are the Blue Grass Region of Kentucky and the Nashville Basin of Tennessee, both of which are exceedingly fertile. On the Piedmont Plateau, tobacco is an important crop in Virginia, but farther south, in the Carolinas and in Georgia, considerable quantities of cotton are grown, though the yield per acre is not so high as in various parts of the coastal and Mississippi plains.

The coalfields of the Southern Appalachians are confined to the Cumberland Plateau and its outliers, and occupy portions of eastern Kentucky, Tennessee, Georgia, and Alabama. The Kentucky field, which has been opened up within recent years, is now the most productive part of the region; while Alabama, which contains the well-known Warrior basin, with its centre at Birmingham, ranks second in importance. The output of the whole area is over 75,000,000 tons. The coal areas in the south have been greatly handicapped in the past by the inaccessible

character of the plateau country. But in the present century railway communications have been much improved, and coal from the fields in question, besides supplying the demands of the immediate neighbourhood, now makes its way to the south-east, the south, and the south-west, coming into competition along the coast and the Mississippi with waterborne anthracite from Pennsylvania.

The amount of iron ore obtained in the Southern Appalachian region is small, when compared with that which comes from the country round Lake Superior, but the proximity of coal renders it of considerable economic importance. The largest deposits are found in the Great Valley in Alabama, where limestone can also be obtained; but the ore is smelted at a number of towns which have grown up along the edges of the valley, from Virginia southwards, at points to which ore, coal, and limestone can easily be brought. Among the towns engaged in this industry Birmingham comes first, and the others include Knoxville, Chattanooga, and Roanoke. The production of pig-iron in the whole region barely amounts to 6 per cent of that of the United States.

The cotton industry has made remarkable progress in the southern states in half a century, as is shown by the increase of producing spindles from 554,000 in 1880 to over 18,000,000 or 57 per cent of the total number in the United States in 1929. The product consists, in the main, of medium and coarse counts, as is indicated by the fact that of all the raw cotton consumed in the United States three-fourths is spun in the south. Over 90 per cent of the spindles in the south are in Virginia, the Carolinas, Georgia, and Alabama, and, although it is impossible to give exact figures, it is safe to say that the most of them are in the Southern Appalachian region, as the chief cotton towns in these states—Charlotte (N.C.), Columbia, Greenville and Spartanburg (S.C.), and Augusta, Atlanta, and Columbus (Georgia), are either on the Piedmont Plateau or along the Fall Line.¹ Here raw cotton is at hand (though it is noteworthy that the manufacturing centres are not in the chief producing areas), the climate is favourable, the cost of living is low, labour is cheap, and longer hours are worked. Coal from the Birmingham district is easily obtained, but it is probable that the growth of the industry will depend largely on the power derived from the Appalachian

¹ Charleston (S.C) is, however, an important exception.

streams on their way across the Piedmont Plateau and on to the Coastal Plain. In 1905 only 22 per cent of the power used in cotton factories in this region was water-power, but since then there has been a considerable extension of the use of hydro-electric power. For example, the location of several mills in North Carolina was determined by the development at Charlotte of extensive hydro-electric plant on the Catawaba River.

THE OZARK PLATEAU occupies the south-west of Missouri, the north of Arkansas, and the east of Oklahoma. A gentle uplift of the region, followed by prolonged denudation, led to the removal of the more recent formations and the exposure of the older Palaeozoic rocks. In the upland districts the soil is frequently somewhat poor, but in the lowlands agriculture is successfully pursued. The mineral wealth of the region has given it its chief claim to economic importance. Iron, which was formerly obtained in the St. Francois mountains, appears to be exhausted, but lead and zinc are both extensively worked. Of the former, the Ozark Plateau provides nearly two fifths of the United States supply, and of the latter about one-fifth.

THE GREAT PLAINS. Although the Prairies merge gradually into the Great Plains, yet between the two there are considerable differences in topography, climate, vegetation, and economic development. The latter, which are much more undulating in character, at one time, no doubt, constituted a true plain, but the rivers which descend from the Rocky Mountains have dissected the greater part of it, and converted it into a series of plateaus, which differ greatly from one another according to the nature of the land in each, and the way in which each has been affected by climate and the processes of erosion. The Bad Lands of South Dakota and of parts of Montana consist of unconsolidated clays and soft sandstones, and have been minutely dissected by wet weather streams, while in western Nebraska the precipitation is just sufficient to allow of the growth of a thick sod which has prevented any erosion of the ancient plain.

Over the whole region the range of temperature is very great and the rainfall low. In Montana, notwithstanding the modifying influence of the Chinook winds, the mean winter temperature is always below, and sometimes considerably below, freezing point, while during the blizzards, which here have their full development,

the thermometer may fall to -60° F. The mean summer temperature is between 65° F. and 70° F., though occasionally the thermometer rises to 110° F. In the south, the mean winter temperature is generally over 40° F. and the summer temperature between 70° F. and 80° F. Over the whole region the rainfall is, as a rule, between 10 and 20 inches.

Grass is the typical vegetation of this part of the United States ; owing to the light precipitation it is short and shallow-rooted, and, although stock can be raised upon it, a large area per head is necessary. Millions of cattle wander about at all times of the year upon the open ranges, and, the snowfall being light, they are always able to obtain their food. Severe losses occur during the blizzards, and, partly for this reason, Texas, where climatic conditions are more favourable, has become a great ranching state, though farther north winter shelter is now being provided. From the whole region, cattle are forwarded to the North Central States. Owing to the low rainfall, little arable farming is possible on the Great Plains without the aid of irrigation; and, as the rivers usually flow at some depth below the level of the land, irrigation is costly except in the valley bottoms, where it is chiefly carried on at present. It is estimated that in this region, and in all the country lying to the west of it, California alone excluded, there is water for the irrigation of nearly 40,000,000 acres, or less than 5 per cent of the total area. Of that, about 15,000,000 acres have already been irrigated, but in those schemes which have been carried out by private enterprise—and they cover about 90 per cent of the irrigated area—little storage has been provided, and the greater part of the canal system is dependent upon the natural flow of the streams for its water supply. Hence, in July, August, and September, when the rivers are low, there is little water, and this just at the time when it could most profitably be utilized. In the valleys, which are partly irrigated, forage plants, sugar-beet, and cereals are cultivated; the intervening uplands are mostly used for pasture, but here, as in the valleys, there is a certain amount of dry farming.

The mineral wealth of the Great Plains has not yet been developed. Lignite underlies considerable areas in North Dakota, Montana, and Wyoming, and from Wyoming oil is also obtained. But the region is essentially a ranching one. The population is small, and is almost entirely confined to the valley bottoms, where live the

farmers and ranchmen whose herds graze upon the plains. The few towns which exist are situated, like Denver, at the meeting-places of lines of communication; some have developed local manufactures.

THE WESTERN CORDILLERAS. The geographical conditions of economic development in the group of natural regions which make up the Western Cordilleras, are, on the whole, very different from those which affect the life of the inhabitants of the eastern half of the United States. The extremely broken character of the land, the dry climate of many parts of it, and the difficulties of communication, prevent alike the cultivation of a wide area and the growth of a large population. In extent the Cordilleras cover two-fifths of the United States, but they have only one-eleventh of its inhabitants, one-thirteenth of its output of manufactured goods, and one-fifteenth of the area under cereals. On the other hand, its mineral wealth is of the utmost importance, the result of the varied physical changes through which it has passed. The exposure of old rocks, due to the erosion of earth folds, makes many minerals accessible. Hence it is that the Western Cordilleras constitute the great store-house for some of the most valuable mineral wealth of the United States. Their importance is indicated by the following figures—

AVERAGE ANNUAL PRODUCTION OF GOLD, SILVER, COPPER,
AND LEAD FOR 1929 AND 1930

	United States ¹	Western Cordillera
Gold ²	1,749,000 fine ozs.	1,325,000 fine ozs.
Silver ²	59,357,000 ..	57,800,000 ..
Copper	1,657,000,000 lbs.	1,448,000,000 lbs.
Lead	633,000 short tons	360,000 short tons

¹ Excluding Alaska and the Philippines.

² Gold and silver for 1928 and 1929.

THE ROCKY MOUNTAINS, giving to that term the wide extension which is generally applied to it in the United States, occupy a considerable area in Montana, Idaho, Wyoming, Colorado, and New Mexico. Between the various ranges of which they are composed, lie many intermontane valleys and parks that have been covered

over by material brought down from the surrounding uplands. In many of these the land is suitable for pastoral purposes, and, with the aid of irrigation, sufficient fodder can be grown to serve for winter food. A small quantity of cereals and a considerable quantity of beet for sugar are also grown on the irrigated lands, more especially in Colorado, which, including the Great Plains section, now produces nearly one-third of the United States crop of beet sugar. The tendency is therefore towards a somewhat larger and more settled population than there has been in the past.

The mineral wealth is varied and extensive. Coalfields are found at intervals in a belt of country stretching along the eastern base of the Rocky Mountains, and in another, but more restricted, belt along the western base, while in the intervening park regions there are numerous isolated basins. The coal, which ranges in character from lignite to anthracite, is worked chiefly in Colorado and Wyoming, but also in Montana and New Mexico. The product, which exceeds 21,000,000 tons, is largely used by the railways, and in the mining and smelting industries.

Over one-fifth of the gold mined in the United States is obtained from this region, Colorado and Montana being the chief producing states. In Colorado, the famous Cripple Creek district in the western foot-hills of Pike's Peak, a region of great volcanic activity in Tertiary times, produces nearly three-fifths of the output of the state. On the western slopes of the Wasatch Mountains in Utah, and in Montana, gold is also found, frequently associated with silver, copper, and lead. Over one-half of the silver produced in the United States comes from the Rocky Mountain region. In Colorado the most important districts are in Eagle county in the north central part of the State, in Mineral and Saguache in the south central part, and in San Juan in the south-west; in Utah silver occurs in copper and lead ores in the Wasatch Mountains in the vicinity of Great Salt and Utah lakes; in the north of Idaho it is chiefly associated with lead, and in Montana with copper. Copper is worked chiefly in Montana, which supplies over one-seventh of the United States output of that mineral, the district around Butte producing practically the whole amount. Over one-third of the lead mined in the United States is obtained in the north of Idaho and in the east of Utah.

THE COLUMBIA PLATEAUS, built up of great sheets of lava, lie

between the Rocky Mountains and the Cascades, and cover the most of Washington, the north and east of Oregon, and the whole of Idaho south-west of the Rocky Mountains. Their altitude varies from 500 feet along the valley of the Columbia River to 4,000 feet, and over, in the more distant parts. The soils consist to a large extent of residual material derived from the underlying basaltic plains. The climate is not so extreme as it is farther east within the same parallels of latitude, the temperature being raised in winter by warm winds from the Pacific, and cooled in summer by the high elevation. Over the greater part of the region, the mean winter temperature is seldom below 24° F., and in places it is as high as 36° F., while the summer mean varies from 60° F. to 70° F. The rainfall generally occurs during the cooler parts of the year, the summers being almost entirely dry, and the mean annual precipitation is, as a rule, under 15 inches, though in a few places it rises to 20 inches, or even more. At the same time the capacity of the soil, like that of the disintegrated Deccan trap, to absorb and retain moisture is so great that, although sage bush, mingled with bunch grass on which cattle graze, is the prevalent type of vegetation, large crops of wheat are grown in the wetter areas on the same land every other year without the aid of irrigation. The most important of these wheat-growing districts are in the south-eastern part of Washington, where the Palouse valley with the surrounding country has long been noted for its productivity; in the northern parts of Oregon, where the most fertile districts lie just south of the Columbia River; and in the adjoining parts of Idaho. The Columbia Plateaus produce over one-tenth of the wheat crop of the United States. Elsewhere, and especially in Idaho, large areas are irrigated.

THE BASIN RANGES. Although this region is divided by the Colorado River into two parts, in one of which the basins are closed, and in the other open, the physical characteristics of the whole area are in other respects so much the same that it may be considered as one. The topography of the country is broken by many short and narrow block ranges, and the arable land is confined to the valleys, and to the plains built up by the debris washed down from the mountains. As the soil is derived from a great variety of rocks it often possesses a high degree of fertility, but

climatic conditions are on the whole unfavourable to agriculture. Except in parts of Utah and Arizona, the rainfall is less than 15 inches per year, and over the greater part of Nevada it is less than 10 inches. Cultivation is therefore at present restricted to the river valleys where irrigation is possible, and only an insignificant portion of the whole region is under crops. In the vicinity of Great Salt and Utah Lakes, where the rainfall is slightly over 15 inches, and where Mormon industry has developed an extensive irrigation system, cereals and alfalfa are grown, but beet is the only plant in the production of which the state takes a prominent part. About 8 per cent of the United States crop is grown there, and the yield per acre is somewhat higher than the average for the whole country. The success of beet-growing in Utah is mainly attributable to the fact that its cultivation requires a considerable amount of labour, and the Mormons, who for religious reasons desire to live in communities, are able to find employment without leaving the vicinity of their towns. Within recent years, also, attempts have been made to cultivate many of the plains which lie beyond the reach of irrigation by means of dry farming. The rainfall occurs chiefly during the autumn, winter, and spring months, and a precipitation of 15 inches, or even less, is sufficient to grow good crops of wheat by this method. Large numbers of cattle and sheep are grazed upon mountain pasture and desert scrub; in the Salt Lake region many of them are fed upon the irrigated lands in winter. Flour-milling, sugar-refining, and meat-packing are important industries at Salt Lake City and Ogden. The agricultural potentialities of the region on the whole, are, however, not great.

The mineral wealth of the Basin Ranges is of considerable value. The output of gold in Utah, Nevada, and Arizona amounts to over one-third that of the United States, and of that the greater part is mined in the region under consideration. The chief producing areas are situated in the Tintic range and in West Mountain in the vicinity of Great Salt Lake in Utah; in White Pine county in the east central part of Nevada; in Yavapai county in the west central district of Arizona; and at Cochise in the south. Nearly one-third of the silver obtained in the United States comes from the Basin ranges, mainly from the Tintic and West Mountain ranges of Utah, and the Tonopah district of Nevada. Arizona is the chief copper-producing state of the Union, and, along with Nevada and

the West Mountain region of Utah, yields over one-half of the product of the whole country. A considerable amount of lead is also obtained in the latter State.

There are, therefore, within this region several distinct types of economic activity. Arable farming is carried on chiefly by members of the Mormon community, ranching partly by Mormons and partly by "Gentiles," and mining almost entirely by "Gentiles." The region is one in which development beyond this stage will probably be very slow.

THE PACIFIC SLOPE consists of the Sierra Nevada and the Cascades, the Coast Ranges, and the intervening valleys of California and Puget Sound. These valleys have been built up by debris carried down from the mountains by rivers in the south, and by glaciers or glacial streams in the north, and they contain much fertile soil. Climatic conditions, though determined to a great extent by the proximity of the Pacific Ocean, are very diversified as a result of the irregular topography of the country. The range between summer and winter temperatures is generally less than elsewhere in the United States, and, along the coast, the mean for the three coldest months of the year varies from about 40° to 43° F. in Washington to between 50° and 55° F. in the more southerly parts of California, while the summer mean over the whole coastal area is generally between 55° and 65° F. In the Puget Sound and California valleys, the winters are usually a little colder than on corresponding parts of the coast, while the summers are considerably warmer, the mean varying from 65° to 80° F. The rainfall is heaviest along the coastal ranges, and in higher altitudes on the western slopes of the Sierra Nevada and the Cascades, in the former case varying from 15 inches or less in the south of California to over 100 inches in the north of Washington, and in the latter ranging from 40 to 80 inches or more. In the interior valleys, on the other hand, the precipitation is generally much less; in the Puget Sound region it is between 30 and 50 inches, while in California it is less than 20 inches in much of the Sacramento valley, and less than 10 inches in the greater part of the San Joaquin valley. Over the whole region most of the rain falls during the autumn, winter, and spring months; and in California the summer months are almost entirely dry. The heavy rainfall on the mountains explains the great Pacific forest, the timber from which amounts to over

one-fourth the output of the United States. Washington is at present the leading lumber state in the Union.

Although agriculture is a more important pursuit than formerly, the cultivated area has tended to decrease during the last thirty years. Wheat and barley are grown chiefly in the Willamette, Sacramento, and San Joaquin valleys, and, owing to the greater part of the precipitation occurring during the growing season, large crops can be raised even in districts where the rainfall is light. Since 1900, the area under wheat has greatly declined as the result of the extension of various irrigation schemes which have led to the substitution of more valuable crops; the area under barley is now larger than that under wheat, and California ranks as one of the largest barley-producing states in the Union. Other important crops of the region include alfalfa and cotton, both of which are grown under irrigation. The cultivation of fruit and vegetables, often but not always on irrigated land, is now the most important agricultural pursuit of the state, where the combination of facilities for irrigation with a climate of the Mediterranean type is particularly favourable to these crops. Among the fruits for which the Sacramento, the San Joaquin, and some of the coastal valleys are famous, are grapes, plums, apricots, and peaches. Fruit preserving is, therefore, an important industry, Fresno being noted for its raisins, and San Jose for its prunes. Farther south, in the lowland area which lies between the mountains and the sea, Los Angeles is the capital of a region which produces enormous quantities of oranges, lemons, and other fruits.

The mineral wealth of the region is considerable. Coal, ranging in character from lignitic to bituminous, is found in various places, but chiefly in Washington, in the vicinity of Puget Sound, and on the eastern slope of the Cascades. The total production of the Pacific Region averages 2,500,000 tons, practically the whole of which is mined in Washington. But if California is poor in coal, it is rich in petroleum, and over one-fourth of the United States supply comes from that state, chiefly from the southern part of the San Joaquin valley and the country around Los Angeles. Gold is found in the Sierra Nevada in California, over one-fifth of the whole output of the United States being obtained in that region. Considerable quantities of copper are also mined there.

The Pacific Slope is not, and owing to its great distance from the

more densely populated part of the United States is unlikely to become, a great manufacturing region; and such manufactures as do exist are mainly concerned with preparing the products of the forest, the mine, and the farm for export. In the north, around Puget Sound valley, conditions are somewhat more favourable. The more northerly position of Seattle, Tacoma, and Portland, their proximity to the coalfields of Washington and British Columbia, their greater facilities for trade with Alaska and the Far East, and their easier communication with the remainder of the United States, are all tending to give them a more rapid development than is the case with San Francisco. In the south, also, Los Angeles, which is now the fifth largest city in the United States (population, 1,238,000) is the centre of the Californian oilfields, and is also engaged in the production of cinema films, the export of fruit, and various other industries.

ALASKA has an area one-fifth that of the United States, and is the largest of its outlying possessions. Four great physical regions may be recognized: the Pacific Mountains, which consist of a number of ranges running, as a general rule, more or less parallel to the coast, the Central Plateau, a rolling upland deeply dissected by the Yukon and its tributaries, the Arctic Mountains, which border the Plateau on the east and north, and the Arctic slope, which is a continuation of the Mackenzie Plains. The geological structure of these different regions is as yet imperfectly known, and the rocks of those districts which have been examined vary in age from Archaean to Quaternary.

In considering the climate of Alaska, it has to be noted that the country falls within the same parallels of latitude as the greater part of Scandinavia, and like Scandinavia lies on the western side of a continental land mass. On the other hand, the configuration of the North Pacific is less favourable than that of the North Atlantic for the northerly movement of warm air and water. Where their influence is experienced on the coastal regions as far as Bering Strait, cool summers and mild winters prevail, while the precipitation is heavy, generally being over 100 inches. In the interior, the range of temperature is much greater, and the comparatively few observations which have as yet been made indicate that the mean temperature for January is considerably below zero, while that of July is between 55° F. and 60° F. The precipitation

is light, and probably does not exceed 20 inches. On the upper slopes of the mountains, and on the coast lands beyond Bering Strait, the climatic conditions are generally of an Arctic nature.

The vegetation of the country is also varied. As far west as 152° W., the seaward slopes of the Pacific mountains are clothed to a considerable height with spruce, hemlock, and cedar; and in the river valleys of the plateau country there are larger areas covered with spruce and poplar, hemlock and birch. The bulk of the timber, however, seems more suitable for fuel, for wood-pulp, and for use in the mines than for permanent building purposes; pulp-mills have already been established in south-eastern Alaska. On the plateau there are considerable stretches of arable land, but, under the climatic conditions which prevail, agriculture can never be extensively pursued, and is never likely to do more than supply in part the needs of the inhabitants. Grain only ripens under the most favourable circumstances, but vegetables and hay are raised in large quantities, and numbers of cattle are reared.

The main incentive to the economic development of Alaska was the abundance of its mineral resources. Of these, the most important was gold, the output of which now amounts in value to nearly one-eighth of the total gold output of the United States. The chief producing areas are Juneau in south-east Alaska near the lower end of Lynn Canal, where lode-mining is carried on, Seward Peninsula, which is in the main a region of placer mining, and various areas, also with placer deposits, which occur in the basin of the Yukon, now the most productive district in the country.

Although the production of other minerals is progressing but slowly, it is known that copper is widely distributed. The principal mines worked at present are in the Chitina valley and on Prince William Sound. Coal, chiefly bituminous and lignitic, is abundant, but, owing partly to its inferior quality, and partly to the difficulty of transport, it has not yet been worked to any considerable extent. The most useful seams are those in the Matanuska valley, as they lie in close proximity to the railway from Seward to Fairbanks.

The fisheries of Alaska have now become the chief economic resource of the country. Salmon are caught in great numbers, and there are salmon canneries along the coast as far north as the Yukon River. Halibut, cod, and herring are also obtained; seals are caught off the Pribilof Islands.

A number of years ago 1,200 Siberian reindeer were imported for the use of the Eskimos. These have now increased to over 200,000, and reindeer herding has become a regular Eskimo industry in the tundra grassland, that is in the lowland country along the Bering Sea, where flowering plants and grasses predominate in the vegetation. The meat is shipped to the United States. In the Aleutian and the Pribilof Islands the blue fox is reared.

The chief means of communication in the country is the Yukon river, which is on an average open for a period of between four and five months. The railway from Skagway to White Horse offers one good route into Alaska ; another is the line, already mentioned, which runs from Seward on the coast to Fairbanks on the navigable waters of the Yukon.

COMMUNICATIONS. The railways of the United States, which have a length of 262,000 miles, are so numerous and, especially in the east, cover the land with so intricate a network of lines that it is impossible to do more than to describe briefly a few of the more important.

As New York is the great port of entry into the country, it is the point from which diverge some of the principal lines to the interior. The chief obstacle encountered by these lines is the Appalachian system, which offers a considerable barrier to free communication. The New York Central Railway overcomes the difficulty by a flank movement. Striking north along the Hudson as far as Albany, where it is joined by a line from Boston, and then following the Mohawk westward, it reaches Buffalo, and establishes communication with Chicago, either by its own lines which skirt the southern shores of Lake Erie, or by those of the Michigan Central which pass through the Ontario peninsula to the north of that lake. The Erie Railway, crossing the outer Appalachian ridges where they are low behind New York, and then following first the Delaware and afterwards the Susquehanna and its tributaries, also runs to Chicago with connections to Buffalo, Cleveland, Pittsburgh, and Cincinnati. The Pennsylvania line goes south-west from New York to Philadelphia, and passes through the Blue Ridge at the gap formed by the Susquehanna at Harrisburg; from there one branch follows the river as far as Williamsport and goes on to Chicago, while another runs to Pittsburgh by the valleys of the Juniata and Conemaugh, and from Pittsburgh by

Indianapolis to St. Louis. The Baltimore and Ohio Railway runs from New York to Washington along the coastal plain, passes through the Blue Ridge at the gap formed by the Potomac, and ascends the valley of that river as far as Cumberland, where it divides, one line going by the Youghiogheny to Pittsburgh, and thence to Chicago, the other striking westwards for Cincinnati and St. Louis.

From New York to New Orleans and the south there are several routes. One, followed by the Southern and its connections, runs along the Piedmont Plateau by Charlotte and Atlanta, and turns the southern end of the Appalachians; while another, of which the Norfolk and Western, the Southern, and the New Orleans and Norfolk, are the principal links, crosses the Blue Ridge at the water-gap of the James, and runs to New Orleans by Knoxville and Chattanooga, in the valley of the Tennessee. Chicago and the more important towns on the Ohio and Mississippi are brought into communication with New Orleans by the Illinois Central Railway, which follows the general direction of these rivers.

The Chicago and North Western, the Chicago, Milwaukee, and St. Paul, and other railways connect Chicago with Duluth, St. Paul, Omaha, and Kansas City, the starting-points of some of the more important routes to the Pacific coast. The Great Northern has its eastern terminals at Duluth and St. Paul, the lines from which meet at Grand Forks. It then runs westward, following for the greater part of the way the course of the Missouri and Milk rivers, enters the Rocky Mountains by the valleys of tributaries of the Missouri, and descends the Kootenay for some distance on its way to Spokane. From Spokane it strikes across to the coast and terminates at Tacoma. The Northern Pacific railway likewise starts from Duluth and St. Paul, but it follows the course of the Yellowstone River by whose valley it enters the Rocky Mountains, and after passing through the Bozeman Tunnel arrives at Helena. It then crosses the main watershed at Mullan's Pass, descends to Spokane by Hellgate River and Clark's Fork, and runs to Pasco, near the confluence of the Columbia and the Snake. It is connected with the coast by a line which follows the Columbia to Portland and then turns north to Tacoma and Seattle, but the main route goes direct to Tacoma by the Yakima valley, which opens a way across the Cascades. The Chicago, Milwaukee, and St. Paul Railway

connects these towns, and runs westward from the last mentioned; it enters the Rocky Mountains by the valley of the Musselshell, a tributary of the Missouri, and, after leaving Butte, follows the same course as the Northern Pacific for some distance before crossing the Columbia plateau to Seattle.

The Union Pacific Railway has its eastern terminals at Omaha and Kansas City. From Omaha, the main line runs westward by the Platte River and one of its tributaries to Cheyenne, where it is joined by the line from Kansas City to Denver. The railway then enters the Rocky Mountains by Evans Pass, crosses over the plateau country lying between these mountains and the Wasatch Range, and descends to Ogden, on the shores of Great Salt Lake. From Ogden several lines, connected with the Union Pacific, run to the coast. One goes to Portland by the old Oregon trail, following first the Snake, and later the Columbia. Another adopts the old California trail to San Francisco by way of the Humboldt River and across the Sierra Nevada by the Truckee Pass, while a third, pursuing what is practically the old Spanish trail, crosses the Mohave Desert and the San Bernardino Mountains to Los Angeles.

The Denver and Rio Grande Railway, which has one of its eastern terminals at Pueblo, and is there connected with the Atchison, Topeka, and Santa Fe line from Chicago by Kansas and the Arkansas River, and with the Missouri Pacific from St. Louis and Kansas, as well as with other lines, utilizes the valleys of the Arkansas and the Rio Grande to carry it through the mountains on its way to Salt Lake City, whence it is continued by the Western Pacific, which runs to San Francisco first to the south and then to the north of the line from Ogden by the California trail.

The main line of the Santa Fe system turns southward before Pueblo is reached, crosses the outer ranges of the Rocky Mountains, and enters the valley of the Rio Grande which one line follows to El Paso. Another, however, breaks off at Albuquerque, crosses the southern part of the Colorado Plateau, the Mohave Desert, and the Sierra Nevada, and runs to San Francisco. The Southern Pacific, the last of the trans-continental lines, starts from New Orleans and enters the mountains near El Paso. It then crosses the Arizona and Colorado desert regions on its way to Los Angeles, whence one line follows the California and Puget Sound

valleys to Portland, while another runs along the coast to Sari Francisco.

Of the waterways of the United States, the Panama Canal, although it does not lie within the country itself, is at the present time one of the most important. By it a shorter route has been opened up from the eastern ports of Canada and the United States to the whole of the western seaboard of North and South America, to China and Japan, and to Australasia. The United Kingdom and other maritime countries of Europe may also benefit as far as trade with the west of America is concerned, but the extent to which the older routes will ultimately be affected depends upon a variety of circumstances, not all of which are geographical.

The freight carried along the coasts, or upon the inland waterways of the United States, as it has increased in amount, has at the same time become more specialized in character. On the Atlantic seaboard there is a great movement of coal from the New Jersey terminals and other coal ports farther south to various parts of the Atlantic coast and the Gulf of Mexico. Ice is sent to the southern cities by boat, while crude petroleum from Texas, and phosphates from Florida and South Carolina, go north to be refined. On the Great Lakes, traffic has grown fast and the amount of freight shipped from their ports in 1916 was about five times as great as the amount shipped in 1889, while the net tonnage of vessels passing through the "Soo" Canals is now several times that of the vessels going by Suez. Iron ore moves eastward from Lakes Superior and Michigan to Lake Erie, while coal is sent in the opposite direction. Grain is shipped to ports on the Atlantic seaboard from Duluth, Superior, and Milwaukee, going by way of the Erie Canal. On the Mississippi, the most important article of freight is coal from the Pittsburg region to the cities lower down the river. But, while the movement of coal on the Mississippi has increased, that of most other articles has decreased, and this decrease is true, not only for the Mississippi, but for practically all other rivers and canals in the States. For example, the Erie Canal, which connects the Great Lakes with the magnificent waterway of the Hudson, carried in 1906 only one-half of the freight that it carried twenty-five years previously. This canal has, however, been reconstructed. Formerly it could only accommodate barges carrying not more than 240 tons of freight, but in its remodelled form each lock holds

two 1,000-ton barges coupled tandem. Mechanical power, moreover, has entirely displaced animal traction. The route of the new canal, which follows that of the older one for the greater part of the way, is up the Hudson from Albany to Waterford, and along the Mohawk to a point just west of Rome, and then by Wood Creek, Oneida Lake and River, and Seneca River to the vicinity of Clyde. Practically the whole course so far consists of canalized river and lake, but beyond Clyde the earlier canal has been deepened and improved as far as Tonawanda, whence the course is up the Niagara River to Lake Erie and Buffalo. By this canal it was hoped to control railway rates by restoring competition by water, and to increase the importance of New York as the outlet of the traffic on the Lakes. So far, these hopes have been only partially realized.

It has also been proposed to connect Chicago with the Gulf of Mexico by means of the Chicago Drainage and Ship Canal, which runs from Lake Michigan to the Des Plaines River, the Des Plaines itself, the Illinois, of which it is a tributary, and the Mississippi. But perhaps the most important project under consideration at present is the proposal to canalize the St. Lawrence so as to connect the Great Lakes with the Atlantic by means of a waterway suitable for ocean-going vessels.

FOREIGN TRADE. The following table shows the volume of the foreign trade of the United States for the three years 1929-31—

		Imports	Exports	Rate of exchange
1929	..	\$4,399,361,000	5,175,083,000	\$4-857 to £
1930	..	3,060,908,000	3,781,172,000	\$4-861 " "
1931	..	2,089,802,000	2,377,846,000	\$4-533 " "

Raw silk, the chief import, comes from Japan, and, to a much less extent, from China. Coffee is supplied by Brazil and other countries in Central and South America. South America, and more especially the Argentine, is the chief source of hides, but there is also a considerable import from Canada, from various European countries, and elsewhere. Rubber is obtained from British Malaya and the Netherlands East Indies, and sugar from Cuba, the Philippines, Hawaii, and Porto Rico. Canada sends paper, and more

particularly newsprint. Mineral oil is imported from Venezuela and Colombia; and copper from Colombia, Peru, and Bolivia. Manufactures of jute come from India, and of flax and hemp from the United Kingdom. Tin is imported either directly or indirectly from British Malaya and the Netherlands East Indies. The United Kingdom and Germany supply leather goods.

In pre-war days three-fourths of the raw cotton exported went, in the first instance, to Great Britain, Germany, and France, but within recent years that proportion has greatly declined; Japan has become a large buyer, and various other European countries in the aggregate take a considerable amount. Mineral oil is widely distributed, the United Kingdom and France being among the largest purchasers. The principal markets for motor-cars and motor accessories are in Canada and the Argentine, but Australia and Brazil are also important. Canada, South America, and Japan take large quantities of iron and steel, and Canada and South America are the principal purchasers of agricultural and electrical machinery. Industrial machinery is more widely distributed; Canada is the largest importer, but various South American and European countries also buy largely. Among other exports, wheat and wheat flour go to the United Kingdom, European countries, and China; tobacco to the United Kingdom, China, and Australia¹; textiles and coal to Canada; and copper to Great Britain and Europe.

The relative position of the chief importing and exporting countries is indicated below (1929-31)—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
Canada	12.2	Canada	17.4
Japan	9.5	United Kingdom	17.2
United Kingdom	7.1	Germany	7.4
Germany	5.8	France	5.3
Brazil	4.7	Japan	5.0
Cuba	4.3	Argentina	3.4
British Malaya ..	4.8	Italy	2.7
France	3.8	China	2.7

The principal imports and exports for the years 1929-31 were as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Silk (raw) ..	9.2	Cotton	14.0
Coffee	7.1	Mineral oil ..	11.1
Hides	4.9	Motor-cars and parts thereof ..	9.4
Rubber	4.7	Iron and steel and manufactures thereof (excluding machinery)	5.2
Sugar	4.7	Wheat and wheat flour	3.8
Paper	4.5	Tobacco	3.8
Oils	4.0	Fruit	3.1
Copper	3.1	Wood	3.1
Flax, hemp, jute, etc	2.8	Industrial machinery	3.0
Fruit	2.3	Electrical machinery	2.9
Tin	1.9	Agricultural machinery ..	2.7
Leather	1.8		

CHAPTER XXXVII

MEXICO

THE greater part of Mexico lies between the United States frontier and the Isthmus of Tehuantepec, and consists of a plateau rising from an elevation of 4,000 feet in the north to about 8,000 feet in the south. The plateau is bordered on the east by the Sierra Madre Oriental, between which and the Gulf of Mexico there stretches a coastal plain from 10 to 100 miles in width, and on the west by the Sierra Madre Occidental. Between this latter range and the Pacific there is another coastal plain, less fully developed than that on the east.

The geological structure of the country is as yet but imperfectly known. In the eastern mountains, the principal formation is limestone, and, in the western, there are several areas of Archaean rock and a large extent of recent volcanic material. On the plateau itself, the limestone comes to the surface over wide area[^], while the remainder of the region consists of debris, either volcanic in origin or derived from the weathering of the surrounding mountains. The coastal plains are also of recent formation. Metamorphic and volcanic action, to both of which the country has been subject in an extraordinary degree, account to a great extent for the richness of its mineral wealth.

As a result of its varied configuration the climate of Mexico presents some striking contrasts. In the low-lying regions tropical conditions prevail, but on the uplands temperature is reduced, and over the greater part of the country the climate ranges from sub-tropical to temperate. Three climatic zones are generally recognized. The *tierra caliente*, which includes all the land from sea-level to an altitude of about 3,000 feet on the west coast, and as far north as Vera Cruz on the east, has a mean temperature of about 75° to 80° F., with a small annual range. Between 3,000 feet and 5,000 or 6,000 feet above sea-level lies the *tierra templada*, where the mean temperature is between 62° and 75° F. The annual range here is also small and the region is said to enjoy a perpetual spring. Above 6,000 feet is the *tierra fria*, where the mean annual

temperature, except in the mountains, varies from 58° to 62° F., and where the range between day and night is usually greater than that between summer and winter. The rainfall, which takes place between June and October, is very unevenly distributed. On the coastal plains and the seaward slopes of the mountains, south of the twenty-second parallel, it is generally between 30 and 60 inches, except around the Gulf of Campeche, where it exceeds the latter amount. The remainder of the coastal region and the southern part of the plateau have, as a rule, from 20 to 30 inches, while in the north of the plateau and on the north-west coast there is never more than 20 inches, and in some places there is less than 10.

Climatic conditions afford the best basis for a division of the country into natural regions. The *tierra caliente* is suitable for the cultivation of tropical plants of all kinds, but in places where the rainfall is deficient, recourse must be had to irrigation. Sugar-cane is extensively grown, and forms a valuable crop; although there are some modern factories in the country, the methods generally pursued, both in regard to cultivation and manufacture, are defective. In normal times the output is sufficient to meet the home demand, and even to allow a surplus for export. A rubber-producing plant (*Castilloa elastica*) is found growing wild in the forests and is also cultivated in plantations, the most favourable conditions for which are found south of latitude 20° N., at an elevation of not more than 1,000 feet, and in districts where the rainfall is at least 100 inches. The success of these plantations does not yet appear to be assured. Chemical discoveries have also rendered possible the extraction of rubber from the guayule shrub, which grows extensively on the northern plains. Among other plants of the *tierra caliente* are vanilla, which thrives best in damp districts, tobacco, for which the valleys and sandy coastal plains with their abundance of decaying organic matter are most suitable, and various kinds of fruit. Bananas for the United States and Canadian markets are extensively grown in Vera Cruz and Tabasco. Coffee is also cultivated in this region, but it finds its most favourable environment at a greater elevation.

On the mountain slopes the *tierra templada* rises to a height of at least 5,000 feet. In places where the amount of rainfall is deficient, irrigation is necessary for the cultivation of maize and coffee, the characteristic crops of the region. The former is the

chief agricultural product of the country, and the staple article of diet of the people in years of drought, but it is still found necessary to import some from abroad. Coffee grows in Mexico on the hill slopes south of the twenty-second parallel, at an elevation of from 1,000 to 5,000 feet, but the most favourable districts for its cultivation are found between 2,000 and 4,500 feet, that is, in the upper part of the *tierra caliente* and the lower part of the *tierra templada*, and it is there that the best quality is obtained. The state of Vera Cruz, with a rainfall high but not excessive, is specially adapted to the growth of the plant. The industry appears to be in a healthy condition, more especially in the neighbourhood of large towns where cheap labour can easily be obtained.

The *tierra fria* includes the greater part of the Mexican plateau as well as the higher slopes of the mountain ranges. Much of the land is deficient in moisture, but, with the aid of irrigation, both cotton and wheat can be successfully cultivated. The former is chiefly grown in the district known as the Laguna, where the waters of the Nazas can be utilized, but recently it has spread to several other parts of the plateau, and, if the water difficulty could be solved, might become a crop of considerable importance. Wheat is also cultivated more extensively than formerly, but the value of the product is still much less than that of maize.

Pastoral farming is pursued both on the central plateau and on the mountain slopes. In the latter regions, owing to the heavier rainfall, the grass is more suitable for cattle than for sheep; while, in the former, both cattle and sheep are reared, although the land is not capable of fattening all the cattle bred upon it. Pastoral industries might be considerably extended, as much of the land is suitable for live stock, but they have suffered greatly during the revolutionary wars, and the number of cattle and sheep in the country is probably much less than was formerly the case.

Although the mineral wealth of Mexico is diffused through the whole country, the chief mining districts occur in the plateau region, where they occupy a wide stretch of country lying along the western slope of the eastern sierra. The silver ore deposits have hitherto proved the most valuable, and Mexico now produces about 40 per cent of the world's supply of silver. The principal mines are in the states of Durango and Chihuahua in the north, and of Hidalgo in the south. Gold was formerly obtained almost entirely from silver

ores, but within recent years gold-bearing quartz lodes have been worked, and the total production has greatly increased. Copper is widely distributed and for some years was worked with such success that Mexico became the second largest copper-producing country in the world; it is found mainly in the states of Sonora and Coahuila. Iron is mined in various places and appears to be very abundant. The deposits of northern Coahuila are worked to some extent to supply the foundries of Monterey, while in the state of Durango there is the Cerro de Mercado—a hill said to be capable of producing 300,000,000 tons of pure iron. The most valuable coal deposits which have yet been discovered lie in the state of Coahuila, in the north, but others exist in various places where their development is but slow; the output has never been sufficient to meet the home demand.

The development of the oilfields has been the most striking feature of the mineral industry in Mexico within recent years, the total output having increased from less than 4,000,000 barrels (of 42 gallons) in 1910 to about 189,000,000 barrels, or about 14 per cent of the world's supply in 1924.¹ Practically the whole of this amount comes from the Gulf coastal zone, which lies to the west and south of Tampico. The fields situated within 30 miles of that town generally produce heavy oils, which are used as fuel, while those near Tuxpan, farther to the south, yield lighter oils, suitable for illuminating and lubricating purposes, and also a larger percentage of petrol. The principal exporting ports are Tampico and Tuxpan, to which the oil is brought by rail, steamer, or pipe-line. The exploitation of this region, which is largely in British and American hands, has been seriously retarded by the disturbed political condition of the country; since 1927, moreover, there has been a considerable decrease in production, due largely to developments in Venezuela (where taxation is much lower than in Mexico), and the great increase in the output of the United States. By 1931 the Mexican yield had declined to 34,000,000 barrels, or 2.5 per cent of the world's supply. Of the other oil-fields in the country the most promising appear to be those situated near the isthmus of Tehuantepec.

Manufacturing industry has not as yet made great progress. The poverty of the bulk of the people and their low standard of

¹ 90,000,000 barrels in 1926, or 8J per cent of world's output.

requirements, the comparatively undeveloped state of communications, the want of skilled labour, and the frequently disturbed political condition of the country, all tend to account for the backward state of Mexico in this respect. The cotton industry is at present the most advanced, and the product, which is manufactured partly from native and partly from imported cotton, consists chiefly of coarse unbleached fabrics, but finer goods are also produced. Many of the factories are situated upon the southern part of the central plateau, but the most modern and best organized are at Orizaba, a town of Vera Cruz, at a height of about 4,000 feet above sea-level. In these factories hydro-electric power is extensively used. Other textile industries found in various cities of the plateau region include the manufacture of wool, jute, and linen.

Iron is smelted in various parts of the country, but the most important iron and steel works are at Monterey. The ore and part of the coal and coke required are obtained from Coahuila, the remainder being imported through Tampico. Among other industries are the manufacture of pulque and mezcal (the national drinks) from the agave, the making of hammocks from henequen, and flour-milling.

Of the peninsular parts of Mexico, Yucatan is low-lying and has a heavy rainfall. It is chiefly noted for the extensive growth of *Agave sisxlana*, from which the fibre known as henequen or sisal hemp is obtained. Lower California, on the other hand, is mountainous, has little rainfall, and is chiefly of importance for its large deposits of gold, silver, copper, and probably petroleum.

RAILWAYS. Along with the economic development of Mexico there has been a rapid extension of the railway system, and the Republic has now over 15,000 miles of railroad. Among the principal lines are the Mexican Central and the National Railways, which traverse the plateau, from the United States frontier at El Paso and Laredo respectively, to the city of Mexico. The capital is connected with the Gulf coast at Vera Cruz—the chief port of the country—by two lines, the Mexican and the Interoceanic, both of which have had to overcome great engineering difficulties. One branch of the Mexican Central runs to Tampico, also on the Gulf, while another goes to Manzanillo on the Pacific. The Southern Pacific starts at Nogales on the American frontier and serves the western coastal plains as far south as Tepic. The Tehuantepec Railway, which is

connected with the Mexican Central by the Vera Cruz and Isthmus, is the shortest and easiest trans-continental line in North America. The distance from Puerto Mexico on the Gulf to Salina Cruz on the Pacific is less than 200 miles, and the highest elevation reached does not exceed 730 feet. A large part of the railway system of Mexico is now under the direct control of the Government.

CHAPTER XXXIX

CENTRAL AMERICA

CENTRAL AMERICA contains the colony of British Honduras, and the six republics of Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama. The greater part of the region is occupied by mountains, which have a general trend from west to east, and rise in Guatemala to a height of nearly 14,000 feet. On the Pacific coast there has been great volcanic activity, and volcanic debris has done much to increase the fertility of the soil. The climate varies greatly with position and altitude, but, as in Mexico, three zones are generally recognized, the *tierra caliente*, the *tierra templada*, and the *tierra fria*. On the Atlantic slope, exposed to the trade winds, the rainfall is heavier than it is on the Pacific, where it is partly due to monsoonal influences. Consequently, in the former region much of the land is covered by wet evergreen forest, which passes into temperate forest at higher altitudes, while in the latter monsoon forest and savanna predominate. It follows that it is on the Pacific, rather than on the Atlantic slope, that the majority of the inhabitants live. They are either pure Indians, or of mixed Indian and Spanish ancestry.

GUATEMALA

Guatemala has an area of 48,290 square miles, and a population of about 2,000,000. Except along the coast, and in the north, the land has generally an elevation of over 4,000 feet. Maize, rice, and wheat are grown to meet the home demand. Coffee accounts for over 70 per cent of the total exports, which also include chicle gum (obtained from *Achras Sapota*), hides, wood, rubber, and sugar. The chief ports on the Pacific coast are San Jose" and Champerico, and on the Atlantic coast Puerto Barrios and Livingston. Some of the timber of El Peten, in the north, passes through British Honduras to the port of Belize.

SALVADOR

Salvador has an area little more than one-fourth that of Guatemala, but its population is over 1,400,000. The cultivation of

coffee is the staple industry of the people; sugar and henequen are also grown for export, but perhaps the most characteristic product is balsam, obtained from *Myroxylon Pereirae*, which seems to be confined to a narrow strip along the Pacific coast. The chief ports are Acajutla, La Libertad, and Cutuco (La Union).

HONDURAS

Honduras, with an area of 46,300 square miles, has a population of over 854,000. Bananas, which are cultivated in the hot lands along the north coast, account for over four-fifths of the exports, but coffee, sugar, tobacco, and coco-nuts are also grown for foreign markets. Owing to the undeveloped state of communications the mineral wealth of the country has only been worked to a slight extent. The ports include Amapala on the Pacific, and Tela, La Ceiba, Trujillo, and Puerto Cortez, on the Atlantic.

BRITISH HONDURAS

British Honduras has an area of 8,598 square miles, and a population of about 51,000. The chief exports are mahogany, chicle gum, coco-nuts, and bananas. Belize, the chief port, formerly had a considerable entrepot trade, some of which it still retains.

NICARAGUA

Nicaragua is the largest of the Central American States and has an area of 49,200 square miles; its population is estimated at rather less than 750,000. The eastern lowlands are covered with forest, and the majority of the inhabitants are found on the volcanic belt which lies to the west of the depression in which are situated the great lakes of Managua and Nicaragua. Coffee, bananas, timber, sugar, hides, and skins, are the principal exports. Corinto and San Juan del Sur on the west coast, and Bluefields and Puerto Cabezas on the east coast, are the principal ports.

COSTA RICA

Costa Rica has an area of 23,000 square miles, and a population of 472,000. The chief products grown for export are bananas and coffee, the former going to the United States, and the latter to Great Britain. A railway now runs from Port Limon on the Atlantic to Puntarenas on the Pacific.

PANAMA

Panama has an area of 32,000 square miles, and a population of 467,000. Over half of the land is as yet unoccupied, and of the remainder only a small part is properly cultivated. Various kinds of tropical produce are cultivated, considerable quantities of bananas being exported to the United States. Cocoa, which comes second to bananas in value, is sent to the United States and Great Britain. Panama is bisected by the Canal zone, which extends for 5 miles on either side of the Canal and belongs to the United States. The ports of Colon and Panama are situated in the Republic, and Cristobal and Balboa are in the Canal Zone.

CHAPTER XL

THE WEST INDIES

THE West Indies are generally divided into the Greater and the Lesser Antilles. The different islands of which these two groups are composed vary in size from Cuba, which has an area of 44,000 square miles, to small rocks which just appear above the surface of the sea. The whole region lies within the tropics, and the temperature ranges from over 70 ° F. in the northern winter to over 80 ° F. in the northern summer. The rainfall, which is well distributed throughout the year, is heaviest on the slopes of the islands facing the open sea.

CUBA

The interior of the island contains several groups of mountains, but the most important range is the Sierra Maestra, which runs along the eastern part of the south coast. The most fertile districts are found on low plateaus and in the river valleys. Within recent years a considerable amount of American capital has been invested in the sugar industry ; the methods both of cultivation and manufacture have been improved; and Cuba now produces about one-fourth¹ of the world's supply of cane sugar, the bulk of that which is exported going to the United States. The production of industrial alcohol from molasses is also of importance. Tobacco is grown in various districts, but notably in the Vuelta Abajo district in the west of the island, where the soil seems to be peculiarly adapted to the cultivation of certain varieties held in high repute. Iron ore is worked in the Sierra Maestra and elsewhere, and copper and manganese are also mined. Sugar comes first among the exports of the country, and tobacco, much of which is made into cigars at Havana, second. The external trade is mainly with the United States. Havana is the chief port.

JAMAICA

Jamaica, which has an area of over 4,000 square miles, is the largest of the British possessions in the West Indies. Sugar was

¹ At present the output is restricted by Executive Decree.

formerly the chief product of the island, but owing to the collapse of the market, largely as a result, it is said, of the extension of the Cuban plantations beyond the limits of actual requirements, the output of Jamaica has declined greatly in value, and bananas now account for more than one half of the total exports of the island. These find their chief markets in the United States, Great Britain, and Canada. Other exports include pimento, coffee, logwood and logwood extract, rum, and cocoa. The population, which numbers 858,000, consists mainly of negroes and mulattos. Kingston is the chief port, but much of the banana trade is carried on through Port Antonio.

HISPANIOLA

Hispaniola is divided between the two mulatto republics of Haiti and Santo Domingo. Both are in an undeveloped condition. Sugar, coffee, and cocoa are among the chief exports.

PORTO Rico

Porto Rico belongs to the United States, and considerable attention is being paid to its development. Irrigation has been introduced where necessary, and the island appears to have been in a prosperous condition until it was devastated by a hurricane in 1928. Sugar-cane, tobacco, and coffee are all exported, mainly to the United States.

LESSER ANTILLES

The Lesser Antilles are divided among Britain, France, Holland, and the United States. The British possess Barbados, the Windward Islands, the Leeward Islands, Trinidad, and Tobago. From Barbados the principal exports are sugar and molasses. In the Leeward Islands, Dominica and Montserrat produce limes, and Antigua and St. Kitts sugar. St. Vincent, in the Windward group, exports the best sea-island cotton grown in the West Indies. Cacao is cultivated in St. Lucia and Grenada, and sugar in St. Lucia. Trinidad, in addition to the usual tropical products, exports petroleum and asphalt, the latter obtained from a pitch lake found in the island. Of the French possessions, Martinique, the most important, is actively engaged in the cultivation of sugar. The Bahamas, also a British possession, export tomatoes, sponges, and sisal hemp.

SOUTH AMERICA

CHAPTER XL1

SOUTH AMERICA

SOUTH AMERICA,¹ with an area of over 7,200,000 square miles, comes fourth in size among the continents, being somewhat smaller than North America. It may, in a preliminary survey, be divided into three great physical regions: the Eastern Highlands of Guiana and Brazil, the Central Lowlands, and the Western Cordilleras. The Eastern Highlands, which are cut in two by the valley of the Amazon, constitute the oldest part of the continent. They are the remains of a great mountain system which was worn down and covered, over large areas, with sandstone of different ages. These sandstones lie in horizontal strata, and the land has the general appearance of a plateau in which the rivers have cut deep valleys. The whole region, therefore, is divided up into a number of tablelands, the steep escarpments of which, when seen from below, present the appearance of mountain ranges; but the only highlands to which that term can properly be applied lie in the east, where in a region of ancient rock the Serra do Mar, the Serra da Mantiqueira, and the Serra do Espinhaco rise to heights considerably above the general level of the massif. These vary in elevation from 1,000 to 4,000 feet, the average altitude probably approaching 3,000 feet. The Guiana massif is also divided into two parts by the Essequibo, the eastern one being an Archaean peneplane, while the western one is covered with sandstone in the more elevated districts.

The Central Lowlands may be divided into two regions, the first lying in the basins of the great rivers and the second being the Pampa-Patagonian area. The land surface of the former is generally flat and low, and is largely composed of sediment deposited by the rivers in the great arms of the sea, which, at one time or another, covered much of the area now occupied by the Central Lowlands. The basin of the Orinoco was formerly occupied

¹ Important recent works on South America include: *South America*, E. W. Shanahan (London, Methuen, 1927); *Amrique du Sud*, Pierre Denis (Paris, Libraire Armand Colin, 1927). *South America*, C. F. Jones (London, 1931), deals mainly with economic aspects.

by a sea, which was gradually filled up during Tertiary and Quaternary times; and the land formed in this way constitutes the llanos, or great plains, which lie to the north and west of the Orinoco. These llanos, which are cut up into mesas or tablelands, slope down gently towards the river and have nowhere a height of over 800 feet. The Carboniferous sea covered the whole of the lowlands from the mouth of the Amazon to that of La Plata, and during Tertiary times the valley of the Amazon was also under water, Tertiary rocks being found in different parts of it. Since then, the remainder of the depression has been filled up by more recent deposits, and the slope of the river is now so gradual that, at a distance of 1,250 miles from its mouth, its level is only 260 feet above that of the sea. The lowland in the basin of La Plata was within quite recent geological times occupied by the Pampean Sea. It extends southwards from the Madeira-Paraguay divide in the Llanos de Chiquitos, and includes the Gran Chaco, an immense lowland plain. Farther south, the plains on the right bank of the River Salado and around the lower courses of the Parana and Uruguay also fall within the lowlands of La Plata.

The Pampa, which reaches to the Colorado, forms a plain sloping down gently towards the east, and consists of recent materials, such as loams, loess, and volcanic rock. Only a small part of the drainage of this region reaches the sea, the river basins being generally closed. Farther south lies the Patagonian plateau, which has a height in the west of over 2,000 feet, and slopes gently towards the Atlantic. It consists of crystalline rock overlaid by sedimentary formations, and covered with soils derived from these, from glacial debris, and from volcanic ash.

The Western Cordilleras form the third great physical region into which the continent may be divided, and south of about the thirty-second parallel its formation is comparatively simple. Along the coast runs a range with a lower elevation than the main Cordillera farther inland, while between the two there is a great valley. The coastal range is represented south of latitude 42° by a chain of islands, the trend of which is parallel to the mainland, while the central valley, which has been subject to great glaciation, is submerged. North of Aconcagua, the main Cordillera begins to broaden out, and from about the twenty-eighth parallel consists of two ranges, an eastern and a western, between which lie elevated

plateaus. These ranges run more or less in the same direction as the meridian as far north as the nineteenth parallel, where they turn towards the north-west, and coalesce in the Vilcanota knot north of Lake Titicaca. From that knot three ranges strike to the north-west; the most easterly declines in height and eventually disappears, while the other two combine in the Cerro de Pasco knot in central Peru. The plateau enclosed by these various ranges falls into three divisions: that of the Argentine, which belongs to the Pampa area of inland drainage; that of Bolivia, whose waters make their way to Lake Titicaca; and that of Peru, which is in the basin of the Amazon. The desert of Atacama, between the western and the coastal ranges, continues to the north the central valley of Chile. Beyond the Cerro de Pasco knot three ranges run in a north-westerly direction; two of these, the central and the western, meet at Loja, south-east of the Gulf of Guayaquil, where the Northern Andes begin. Between Loja, and Pasto in the south of Colombia, two ranges enclose the elevated plateau of Ecuador, which is much broken up by transverse ridges. From the knot at Pasto three ranges diverge and traverse Colombia, the most easterly entering Venezuela and finally running eastward along the coast of the Caribbean Sea.

The geological structure of the whole Cordilleran system varies greatly and is still very imperfectly known. South of the fortieth parallel granitic rocks prevail, and the coast ranges are believed to be Archaean; north of the latitude mentioned, the western range of the Cordilleras consists chiefly of rocks of Jurassic and Cretaceous age on an Archaean base, with eruptive materials interbedded, while the eastern range is built up of Archaean and Palaeozoic rocks with Cretaceous deposits in places. Volcanic rocks lie between the eastern and western ranges. The Northern Andes consist chiefly of Archaean and Cretaceous rocks.

CLIMATE OF SOUTH AMERICA. For various reasons the climate of South America differs greatly from that of North America. Both continents taper to the south, with the result that of the latter only a small part lies within the tropics, while of the former less than one-fifth falls beyond them. North America, moreover, extends well within the Arctic Circle, while the extreme point of South America is distant by almost eight hundred miles from the Antarctic Circle. The result is that, whereas in the northern

continent only a small area has a mean temperature above 60° F. during the coldest months of the year, the mean temperature of more than two-thirds of the southern continent does not fall below that point during the corresponding season. The range of temperature is, therefore, much less in South America than in North America, and the typical continental climate is developed to a much less extent.

During the southern summer the region of highest temperature lies in the north-eastern part of the continent, south of the Equator, and the isotherms over the greater part of north-eastern South America are therefore convex to the south. Over the remainder of the continent, they run from north-west to south-east as the result of the cold current along the Pacific coast, winds from which tend to lower the temperature of the adjacent lands. During the northern summer, when the region of greatest heat lies north of the Equator and east of the Andes, the isotherms run from north-west to south-east in the north of the continent, but to the south they run from east to west, except on the Pacific coast, where for the same reasons as before they bend towards the north. Over the greater part of South America the heaviest rainfall takes place during the warmest months of the year. During the southern summer, when the equatorial belt of low pressure has moved southwards, there is heavy rainfall over the whole of the Amazon basin. At the same time, winds from the south-east are drawn into the Paraguay-Parana basin, so that the whole of the lowland area from the mouth of the Amazon to that of La Plata, and westward towards the Andes, has a heavy precipitation. In the north-east of the Brazilian highland the rainfall is less, for reasons which have not yet been satisfactorily explained; while along the south-east coast of the upland it is heavier, but does not extend far inland. The west coast of the continent is without rainfall from the Equator as far south as Valdivia, beyond which point much moisture is brought to the coast by the westerly winds. The greater part of South America, north of the Equator, receives its heaviest rainfall during the northern summer, the winter precipitation of that region being reduced by the fact that the trade winds from the North Atlantic are pulled onwards to the area of low pressure south of the Equator. South of the Equator, where winter conditions prevail, the amount of moisture deposited is generally much less than during the summer

months. The south-eastern trade winds are drawn northwards, and, except along the coast, more especially between Rio de Janeiro and Buenos Aires, the rainfall is low. On the west coast, the strip which now receives rain extends almost as far north as La Serena.

To sum up, the greater part of the Amazon lowlands has a mean annual rainfall of over 80 inches, and this amount is also received along part of the north-east coast north of the mouth of the Amazon. The remainder of that region which, roughly speaking, lies east of a line drawn from Quito to Buenos Aires, has between 40 and 80 inches, with the exception of the north-east of the Brazilian highland, where, as already stated, it is much less. To the south-west of the line already indicated, precipitation rapidly decreases and a dry belt stretches across the continent from Peru to south-east Patagonia. South of Concepcion the rainfall along the west is heavy, rising in places to over 80 inches.

VEGETATION. The lorest vegetation of a great part of South America is extremely rich and varied, and this is accounted for by the high temperature of the intertropical region, the abundance of moisture resulting from large areas having either no dry season or but a short one, and the fact that many of the rivers overflow their banks during a considerable part of the year.

-The most luxuriant hot and wet equatorial forest covers a great part of the Andes in Colombia and Venezuela, and stretches along the north-east coast of the continent to beyond the mouth of the Amazon ; it extends up that river and its tributaries, and southward along the eastern slope of the Cordillera for a considerable distance. Although this forest varies from place to place according to the amount of moisture which it receives, its general characteristics remain the same. There is great variety and constant intermixture of species, and the various trees are bound together by lianas and covered with epiphytes. Hence the forest is gloomy, and in the constant struggle for light all plants grow to a great height. This type of vegetation is continued, but in a gradually reduced form, along the south-east coast of Brazil between the tenth and thirtieth parallels, where, as already mentioned, there is considerable rainfall. Among the more important economic products of the equatorial forest are rubber, dyewoods, cabinet woods, medicinal plants, and fruit trees.

The greater part of the Guiana Highland and of the llanos which lie to the west and north of the Orinoco, is typical savanna—grassland scantily dotted with trees. The Brazilian upland also, with the exception of the valleys of the larger rivers and the coast regions, is to a large extent covered with savanna. The dry season lasts for over three months, and it is only in districts where a supply of water can be obtained during that period that trees are found. Elsewhere grass, shrubs, and arboreal cacti cover the ground, and this intermixture of woodland and grassland is characteristic of the Matto Grosso.

In the north of eastern Brazil, where the rainfall is low, occur the caatingas, which are light forests consisting of thorny shrubs, while in the south the campos are covered with grass intermingled with araucaria thickets. To the south of Matto Grosso the greater part of the lowlands drained by the Alto Parana and the Paraguay is covered with a warm temperate forest from which valuable timber and yerba mate (or Paraguayan tea) are obtained. The Gran Chaco, a region of summer rainfall lying to the west of Paraguay, is characterized by thorny scrub, palm groves, and in places even by dense arboreal vegetation.

Farther south, in the Argentine, especially around La Plata estuary, come the great undulating grassy plains called the pampas. Here the rainfall is well distributed throughout the year, the vegetative season warm, and the desiccating winds unfavourable to tree growth. In the slight depressions or canados, where water tends to collect, the grass grows in close formation, but on the intervening ridges an open formation prevails. West of the pampas there stretches towards the Andes a scrubland region, the trees of which are very varied, but, with few exceptions, are characterized by "stunted growth, scraggy ramification, light crowns, and rich formation of thorns." In the west and in the south of Patagonia this thorn forest passes into poor steppe.

Along the west coast of the continent from about the thirtieth parallel southward, the lower slopes of the mountains are covered in the north, where Mediterranean conditions prevail, with sclerophyllous woodland, in the centre with temperate rain forest, of which laurels and beeches and a very dense undergrowth are the characteristic features, and in the south with summer forest, consisting largely of beech.

The desert regions of South America extend along the western coast from the Gulf of Guayaquil to Northern Chile, the vegetation everywhere being exceedingly poor. On the Cordilleran Plateau, within the tropics, is the puna, covered with a stiff xerophilous grass; farther south Alpine plants and shrubs prevail.

CHAPTER XLII
THE CORDILLERAN STATES
VENEZUELA

VENEZUELA, with an area of about 394,000 square miles, is the sixth in size among the states of South America. The country falls naturally into four physical regions. The eastern range of the Colombian Cordilleras enters Venezuela as the Cordillera de Merida, and is continued eastward by the Caribbean coast ranges. To the north lies a lowland region made up in the west of debris brought down by the rivers into Lake Maracaibo, which is gradually being filled up. Between the mountains and the Orinoco lie the great plains known as llanos, also built up by the denudation of the surrounding mountains, and cut up by the rivers into tablelands called mesas. Lastly, beyond the Orinoco lies the Guiana Highland.

The whole country falls within the isothermal line of 80° F. of mean annual temperature, but actual temperature of course varies with altitude. The rainfall is heaviest on the slopes of the Cordillera de Merida and on the Guiana Highland, where it ranges from 40 to 80 inches, and even more in the south. Elsewhere it is from 30 to 50 inches, except along the coast, where it is less than 20 inches.

THE TROPICAL LOWLANDS. The coastal districts and the lower slopes of the mountains, to a height of about 1,500 feet, yield tropical products, and may be considered together. Cocoa is one of the principal crops, as it thrives with a temperature of about 80° F. for a considerable part of the year and a moist humid climate. Much of it is grown in the vicinity of navigable rivers, which can be used for irrigation when necessary. Cocoa is, next to coffee, the most valuable export crop of Venezuela, and La Guaira is the principal seat of the trade. Sugar is grown in the same region, but more especially round Lake Maracaibo. The exports are, however, inconsiderable. Tobacco is cultivated in various places, and a small amount is exported.

THE SUB-TROPICAL UPLANDS. Coffee, which is the chief export of the country, and on which most of its prosperity depends, is grown

mainly in the sub-tropical uplands, which lie between 1,500 and 6,000 feet above sea-level, the most suitable districts being between 1,500 and 3,000 feet. In these regions the Sierra Nevada de Merida and the basin of Lake Valencia have the largest output. Cotton is cultivated on a small scale in the district round Valencia; most of it is consumed in the locality, where it is manufactured into a coarse cloth. Maize, which is grown in many parts of Venezuela, thrives best in this region.

In the lower part of the sub-tropical region is settled the greater part of the population, which is largely derived from an intermixture of Spanish and Indian blood. On the coastal plains much of the work is done by negroes, while, in the upper parts of the sub-tropical zone, Indians form the bulk of the inhabitants.

THE LLANOS, which are great savanna regions, are devoted chiefly to stock-raising, and it is estimated that Venezuela has over 3,000,000 cattle. At present they are generally allowed to run wild, and little has been done to improve the native breed by the importation of pedigreed stock. Moreover, the land is alternately subject to flood and to drought, the native grasses are poor, and the means of transport inadequate. In addition to stock-raising, there appear to be considerable areas capable of cultivation.

THE GUIANA HIGHLAND. Lastly, on the Guiana Highland there are forest and savanna, the former mainly on the crystalline areas and the latter on the sandstone. In the forest, balata (gutta-percha) is obtained from *Mimusops balata*, which grows in the valleys of the Orinoco and its tributaries. Rubber is also found, but the output is decreasing. Valuable timbers exist in the forests, but are as yet little worked, and the region as a whole is still undeveloped.

MINERALS. The mineral wealth of the country is but vaguely known. Gold occurs in many places but is mainly worked in the territory of Yuruari, in the Guiana Highland. Iron is found in the Cordillera, but the most important deposits are believed to be in the Sierra de Imataca, south of the Orinoco delta; their value and extent are as yet unknown. Coal of varying character is reported from a number of places along the Caribbean coast and elsewhere, but the deposits do not seem to possess much value except, perhaps, in the neighbourhood of Barcelona, where the Naricual mines are worked, mainly for the benefit of the Government. Within recent

years Venezuela has become the third oil-producing country in the world. The most valuable deposits yet discovered are situated in the region of Lake Maracaibo, where the fields of Lagunillas and La Rosa have the largest yield. The average output for the years 1930-31 was 126 million barrels or 9 per cent of the world's production.

COMMUNICATIONS. The communications of the country are very poor, partly as a result of its generally backward condition, and partly because of the serious physical obstacles which exist. There are not 650 miles of railway in the state, and their small importance may be illustrated by the fact that in 1929 their total earnings did not exceed £800,000. The chief line is that which runs from Caracas to Valencia; others connect these two towns with their respective ports—La Guaira and Puerto Cabello. In the llanos and the forest region, the Orinoco with its tributaries forms the only highway; and of this part of the country Ciudad Bolivar, situated about 370 miles from the mouth of the river, is the principal port. Mineral oil is the leading export, but some coffee and cocoa are also sent abroad. Manufactured goods are imported. In 1930 the exports were valued at 762,000,000 bolivares and the imports at 364,000,000 (par rate of exchange 25-25 bolivares to the £).

COLOMBIA

Colombia, with an area of 447,000 square miles, comes fifth in size among the states of South America. The country belongs partly to the Cordilleran upland, partly to the lowlands of the Orinoco and Amazon. From the knot of Pasto three great ranges diverge and traverse Colombia, while a fourth runs along the west coast, and is separated from the Cordilleras proper by the Rio San Juan and the Atrato. The western and central ranges are separated by the valley of the Cauca, and the central and eastern by that of the Magdalena.

Temperature varies with altitude; along the west and north-west coasts, in the river valleys, and on the eastern plains, tropical conditions prevail. The precipitation is heavy, especially on the Pacific coast, where a monsoon rainfall occurs in the valleys of the Cauca and Magdalena, which are open to the north-east winds, and south of the Guaviare where much moisture is brought by the winds which blow over the Amazonian lowlands. Below an altitude

of about 3,000 feet the products are of a purely tropical nature. On the Pacific lowland and in the valley of the Atrato, with their high temperature, heavy rainfall, and dense forest, organized agriculture hardly exists; some food crops are grown, but forest products, such as tagua nuts (from *Phytelephas macrocarpa*, and used in the manufacture of vegetable ivory), rubber, and balata are the chief exports. In the Caribbean region the banana is extensively cultivated around the lower slopes of the Sierra Nevada de Santa Marta, where the temperature is high and where the rainfall can be supplemented by mountain streams. Santa Marta may export over 10,000,000 bunches in one year. On the Sierra Nevada itself, at an elevation of between 3,000 and 6,000 feet, there are numerous coffee plantations. Sugar and cotton are among the chief crops of the lower Magdalena, but the output of both is small; the greater part of the cotton is consumed in local mills at Barranquilla and elsewhere. There are rich cattle-raising districts along the Caribbean coast, in the valleys of the lower Magdalena and Sinu rivers, and in the llanos of the Orinoco basin. This last region is, however, handicapped by want of good communications.

The sub-tropical and warm temperate regions lying on the slopes of the central and eastern mountains at an elevation of between 3,000 and 6,500 feet above sea-level, grow coffee, sugar, and maize. The first is the main agricultural export of the country, and the best quality generally commands a ready market in the United States, where it is preferred to that from Brazil. The cool temperate region, which extends to a height of about 10,000 feet, produces wheat and other cereals for home consumption. Pasture lands, natural and artificial, afford good grazing for cattle in the valleys of the Cauca and upper Magdalena. Higher up lie the bleak, uninhabited regions called the *paramos*.

THE MINERAL RESOURCES of Colombia are known to be extensive, and in Spanish times great quantities of gold and silver were obtained from the country. The present production is small. Gold and silver are generally found in the central and western ranges of the Cordilleras, where volcanic rocks have forced their way through the crystalline schists of which the ranges are composed; the eastern range, formed mainly of Cretaceous and Tertiary strata, is much poorer in these minerals. The department of Antioquia in the central and western Cordilleras, and the *intendencia* of Choco

in the coastal range, are the chief districts producing gold, which exists both in quartz lodes and in alluvial deposits, but is worked mainly in the latter. Platinum is obtained from the gravels of the Atrato, "San Juan, and other rivers of the Pacific margin, and in 1929 Colombia produced 18 per cent of the world's supply. Emeralds are found at Muzo, north of Bogota. Iron and coal occur in many parts of the country, frequently in close proximity to one another, but in neither case is the output of much importance. There appear to be large supplies of petroleum in various parts of Colombia, but the only productive wells at the present time are those in the basin of the middle Magdalena, not far from Barranca Bermeja. A pipe line connects them with the coast near Cartagena. The rapid increase in the output of this region has made Colombia the second oil-producing country in South America.

COMMUNICATIONS. The means of communication are exceedingly bad. More money is now being spent on roads, but many of them are still little better than mule-tracks, and much of the trade of the country has to be carried on over them. The great highway is the Magdalena, which is navigable as far as La Dorada, nearly 600 miles from the coast, and again from above the rapids at Honda to Girardot, 100 miles, and sometimes to Neiva, 200 miles farther up. The Cauca is navigable to Caceres, about 200 miles above its confluence with the Magdalena. As the mouth of the latter river is obstructed by a sandbank, two railways connect it with the coast, one running from Barranquilla to Puerto Colombia, the other from Calamar to Cartagena. Another line runs from La Dorada below to Beltran above the Honda rapids. The railway which connects Bogota, the capital, with Girardot on the Magdalena, will eventually join the line which follows the valley of the Cauca from Manizales to Popayan, and has a branch to Buenaventura on the Pacific.

COMMERCE. The export and import trade of Colombia is carried on chiefly through its Caribbean ports—Puerto Colombia, the port of Barranquilla, Cartagena and Santa Marta. Most of the export trade is with the United States, while cotton goods, mining machinery, and rails are supplied by Great Britain, agricultural machinery and locomotives by the United States, and, before the War, many miscellaneous articles by Germany. In 1931 the exports were valued at 98,000,000 gold pesos and the imports at 41,000,000 (par rate of exchange, 5 pesos to the £).

Although the geographical conditions of Colombia in some ways favour economic development, in others they retard it. The obstacles to communication between different parts of the country have not only hindered the exploitation of its resources, but they have led to the growth of particularism, and so encouraged those revolutionary movements which have been the curse of the nation. Climatic conditions have tended to concentrate population in the upper valleys of the rivers, away from the coast, and out of touch with the world. Within recent years the government seems to have been more stable and somewhat more energetic than usual, and attempts are being made to open up the country, but the scarcity of labour will prevent rapid progress being made.

ECUADOR

Ecuador, with an estimated area of 116,000 square miles, is one of the smallest South American republics. Physically the country may be divided into three regions: the west coast plains and the lower mountain slopes, the main Cordilleras, and the Montana. From Loja, south of the Gulf of Guayaquil, to the knot of Pasto, the Cordillera forms two distinct chains connected by mountain knots which cut the high and narrow plateau between the chains into a number of basins. The coast region, about eighty miles wide, contains numerous spurs from the Andes, and an isolated range running parallel to the coast for about sixty miles. The Montana, known in Ecuador as the Oriente, consists of the forested lands in the basin of the Amazon.

Ecuador, lying across the Equator, has a warm tropical climate in the lowlands, modified by altitude at higher levels. Thus, while Guayaquil has a mean annual temperature of about 82° F., that of Quito, on the plateau, 9,000 feet above sea-level, is only 55° F. During the early part of the year, the rainfall is heavy on the western slopes except in the south, while the Oriente is watered by the winds which blow over the basin of the Amazon.

The population is probably about 2,000,000. Of these the greater number are Indians, or people of mixed Indian and Spanish blood. The inhabitants of pure European descent, though not numerous, form the governing class. The mestizos are, as a rule, backward, and, some of the Indians are, as yet, quite uncivilized.

THE WEST COAST REGION has products of a tropical character. Of these, cocoa was formerly more important than it now is. In 1920 and 1921 about 12 per cent of the world's production was exported from Ecuador to the United States and to European markets. Since then "witch-broom" disease has attacked the plantations, and the exports of 1929 were less than 4 per cent of the world's production. Vegetable ivory, derived from *Phytelephas macrocarpa*, a species of palm also grown in Peru and Colombia and used in the manufacture of buttons and various kinds of electrical apparatus, forms an important export of this region. Among other crops coffee is exported, but not to a great extent, and some cotton and tropical fruits are grown.

Ecuador is the chief producer of "Panama" hats. The toquilla straw, from which they are made, is obtained from the shrub *Carludovica palmata*, which grows wild in the hot and humid regions of the Pacific coast up to a height of about 5,000 feet. The weaving of the hats is a domestic industry carried on in various parts of this region, but mainly in the south-west.

THE CORDILLERAS. On the higher slopes of the Andes and in the inter-montane regions, cereals are grown for home consumption. Cattle and sheep are raised, and hides are exported. Hand-weaving is of some importance as a domestic industry throughout the region, and there are textile factories at Quito and elsewhere.

THE ORIENTE produces rubber and various kinds of hardwood, but the development of the region progresses very slowly, owing to the undeveloped state of communications.

Ecuador seems to contain considerable mineral resources, but so far mining operations have not met with much success. Important deposits of petroleum have, however, been discovered in the Santa Elena peninsula in the province of Guayas, and there is now a small output.

The railway from Guayaquil, the port of Ecuador, to Quito, its capital, is the most important in the country. It has made it possible to send cereals from the inter-Andine regions to the coast lands, and there has been a considerable increase in the cultivation of grain in the region served by it. At the same time it has rendered possible the distribution of imports at a much lower rate than formerly. Cocoa, mineral oil, and coffee are the principal exports; and cotton goods, metals, and foodstuffs the principal imports.

In 1931 exports were valued at 56,000,000 sucres and imports at 44,000,000 (par rate of exchange, 24.33 sucres to the £).

BOLIVIA

Bolivia, one of the largest and least developed of South American States, has an estimated area of 514,000 square miles, and therefore comes next to Brazil, the Argentine, and Peru. Its southwestern part belongs to the Cordilleras, where, between the eastern and western Andean chains, lies the Bolivian tableland, which has an elevation of over 12,000 feet, and on which are the two large connected lakes, Titicaca and Poopo. Many of the surrounding mountains are covered with perpetual snow. On the north-east the land falls to the basin of the Amazon, and on the south-east to the ancient bed of the Pampean Sea where, in the Chaco, the frontier with Paraguay is still undetermined. These lowland areas are separated from one another by a spur of the Brazilian massif.

THE PUNA. At an elevation of 10,000 feet and over, climatic conditions restrict agriculture to the cultivation of potatoes, barley, and *quinoa*; and stock-raising and mining are the main pursuits of the Puna region. Large numbers of sheep, alpacas, and llamas are raised, while the vicuna, in its wild state, is also found. More important, however, is the mineral production of the region. Tin, which is found in large quantities along the eastern margin of the plateau from Lake Titicaca to the southern frontier, is the principal export of the country. With the development of communications, more especially of the Antofagasta-Oruro line and its branches, the output has greatly increased within recent years, and now amounts to over 20 per cent of the world's production. Silver is produced mainly as a by-product of the tin mines. Copper is widely distributed, but the difficulties of transport and the want of fuel practically restrict its exploitation to the district of Corocoro on the Arica-La Paz railway south of La Paz. Coal has been found in the vicinity of Lake Titicaca and elsewhere; and deposits of oil are known to exist on the eastern slopes of the Cordillera at Yacuiba, but cannot be developed for want of transport.

THE EASTERN SLOPES. On the east of the Cordilleras, the land in the north of Bolivia consists of wide river valleys draining to the Amazon, and in the south, of great rolling plain, broken up by isolated remnants of the Brazilian massif and draining partly to inland

basins and partly to the Paraguay. The districts with an elevation of less than 5,000 feet are known as the yungas (or hot valleys), and possess a tropical climate. In the deep inner valleys, cocoa is the chief product. The hardwoods of the Amazon forest extend into the lowlands of the yungas; while in the higher parts excellent coffee and cocoa, as well as rice, maize, sugar, and tobacco, can be grown. The upper belt of the yungas, and the lower belt of the next region, known as the valles (from 5,000 to 9,000 feet above sea-level), are the most fertile in Bolivia, and only require cultivation to enable them to carry a large population. On the upper parts of the valles cereals are grown for home consumption, and sheep and llamas are reared. Some rubber is obtained from the *Eastern Lowlands*, but the remoteness of this region will long retard economic progress.

The economic development of Bolivia has been, and is likely to continue to be, slow. The total population is less than 3,000,000, of whom about one-half are Indians, and over one-fourth mestizos. In a country nearly five times the size of the British Isles there are only about 350,000 people of unmixed European descent. The mining industry is handicapped by the difficulty of obtaining labour. Immigration presents no remedy, as the altitude at which work is carried on is frequently so great that only the native-born can undertake it.

The difficulties of communication are also very great, and they are increased by the fact that Bolivia has now no port of its own. The railway which runs from the Peruvian port of Mollendo to Lake Titicaca is connected by ferry with, and will eventually be linked up to, the line from Guaqui, on the other side of the lake, to La Paz. From Viacha, near La Paz, a line with a branch to Potosi runs by Oruro to Antofagasta. Mollendo and Antofagasta formerly had the bulk of Bolivia's foreign trade, but a third line from Viacha to Arica now enables that port to participate in it. Among other routes is one from La Quiaca on the Argentine frontier to Uyuni on the Antofagasta-Oruro line, which has made Buenos Aires one of the ports of Bolivia. A line is projected from Embarcaci'n, on the North Central Argentine Railway, to Santa Cruz, and, if constructed, it will join the railway from there to Oruro. Lastly, the Brazilian railway which has been made from Puerto Velho, at the lower end of the series of falls on the Madeira, to Guajara-Mirim,

on the Mamore, may also be mentioned here. Good river navigation exists both below and above the rapids on these rivers, which affect a stretch of water 229 miles long; and it was hoped that the railway would tend to develop the yungas and plains of Bolivia, some parts of which both imported and exported goods across the trans-Andean routes. Partly owing to the decreased output of rubber, the railway has failed to prove a success.

Tin is the principal export; while foodstuffs, iron and steel, and machinery are imported. In 1931 exports were valued at 60,000,000 bolivianos and imports at 30,000,000 bolivianos (par rate of exchange, 13.33 bolivianos to the £).

PERU

Peru, the third in size among the states of South America, has an area of 532,000 square miles. In it three natural regions stand out in marked contrast to one another. The first of these is the COASTAL REGION. Between the sea and the foothills of the Andes, there stretches for 1,400 miles a belt of lowland with a breadth which is generally considerably less than 100 miles. Here, little or no rain falls, as the winds over the southern Pacific either blow parallel to the coast, or are drawn inland without precipitating moisture until they reach the mountain slopes. This region is, therefore, without vegetation, except in the vicinity of the rivers which rush down from the Andes. The temperature is not extreme, the mean for Lima being 66° F. with a maximum of 74° F. in February and a minimum of 60° F. in August. Hence tropical and sub-tropical products can be grown with the aid of irrigation from the mountain streams, and over 650,000 acres are cultivated in this way. Sugar is grown chiefly in the north, where the land is flatter than in the south, water more abundant, and the heat greater. Cotton, which is now the principal crop, is cultivated on various parts of the coastal plain, but the greatest production takes place in the central districts, where climate and soil are particularly favourable. Tanguis, a cross between "smooth" Peruvian, which resembles American Upland, and "rough" Peruvian, an indigenous perennial, provides the greater part of the crop, but Egyptian cotton has also been introduced and is proving successful. Among other products of this region are maize, rice, vines, and tobacco, which are generally grown for home consumption.

Notwithstanding the disadvantages under which it labours, the coastal region is at the present time the most highly developed in Peru. This is largely the result of the proximity of the sea, which provides the one good highway that the country possesses. The governing classes, either of pure European—chiefly Spanish—stock, or with only a very slight intermixture of Indian blood, are almost exclusively settled here, but most of the labour on the sugar and cotton plantations is performed by mestizos, although Indians, negroes, and Chinese are also employed. Here, too, are the principal towns, in which is centred the commercial, intellectual, and social activity of the country. There are few manufactures, but within recent years the textile industries have made some progress, and although economic development has been much retarded by bad government in the past, present conditions seem somewhat more hopeful. Petroleum appears to be well distributed, but the fields near the coast in the extreme north are the chief source of supply at the present time. The output of guano from the desert islands of the coast is less important than formerly.

THE ANJDEAM ZONE forms the second great natural region of Peru. On the western slopes of the Cordilleras, the rainfall becomes greater, and up to a point the vegetation improves with increasing altitude. Wheat, maize, and barley, together with fruits and vegetables, are cultivated in the more sheltered valleys between 8,500 and 11,000 feet, both on the western slopes of the mountains and on the tablelands between the Cordilleran ranges. Above 12,000 feet, the quinoa (the grain of which is about the size of mustard seed) is the staple food of man, and the land is generally covered with coarse, high grass. Throughout the whole of this region crops are grown chiefly to meet local needs, and stock-raising and mining are the two pursuits of more general importance. On the alfalfa pastures of the valleys and lower slopes, grazing is subsidiary to cultivation; while on the tablelands, frequently at an elevation of 13,000 feet, there are great herds of cattle and sheep, llamas, alpacas, and vicunas. The llama is prized both for its wool and as a means of transport; the alpaca for its wool alone. Of the Peruvian exports of wool, that obtained from the alpaca is by far the most valuable, and Peru contributes three-fourths of the world's supply of this commodity.

The Andean region is still more noted for its mineral wealth.

Copper has replaced the precious metals in importance, and along with silver and vanadium accounts for over four-fifths of the mineral output of the country. The chief copper-producing districts lie on the eastern side of the western Cordillera, where a United States Company is operating at Cerro de Pasco and Morococha, respectively 14,400 and 14,800 feet above sea-level. Silver is chiefly produced in the Cerro de Pasco district, where it is associated with copper; while a little to the west, at an elevation of 16,500 feet, are the most important vanadium mines in the world. Most of the copper and much of the silver are smelted at Oroya. Quicksilver is worked, as it has been for over three centuries, at Huancavelica in the western Cordillera. Lead, zinc, and iron are found in various places. Coal is widely distributed, but much of that used in the country is imported from abroad. The difficulties in the way of good communications by which machinery and fuel may be brought to the mines, the want of capital, and the long unsettled political conditions have all contributed to retard the development of the mineral industry in Peru. The mestizo, who is the chief inhabitant of the Andean zone, makes a good miner, but it is very doubtful whether sufficient labour is obtainable to allow of a rapid expansion.

THE MONTANA, the third natural region of Peru, occupies about two-thirds of the whole country. It consists of the lower slopes and foothills on the east of the Andes—great open valleys free of timber and covered with grass, and wide areas of virgin forest. The rainfall is much greater than in either of the two preceding regions and the temperature is higher. The chief inhabitants are Indians, although there are a number of mestizos and a few white men. Economic development is just beginning; the chief exports include cotton and coffee, rubber (of declining importance), balata, and timber (mahogany and cedar). Iquitos, situated on the River Marañon below its confluence with the Ucayali, is the commercial centre and port of the region. It is accessible to ocean-going steamers, though 2,500 miles from the ocean.

COMMUNICATIONS. The lack of good means of communication is a great hindrance to the economic development of Peru. In the whole country there are not 3,000 miles of railroad, and most of the lines are short, running from the coast inland to the foot of the Andes. Only two penetrate the mountains—the Central

which has a maximum elevation of 15,645 feet, and runs from Callao on the coast to Huancayo, by way of Oroya, where it joins a line to Cerro de Pasco; and the Southern from Mollendo to Puno, on Lake Titicaca, with a maximum elevation of 14,660 feet. Near Puno a branch breaks off and runs to Cuzco. Extensions from Huancayo to Ayacucho and from Cuzco to Santa Ana are making slow progress. With these exceptions, the only means of transport on the Sierra is by mules or llamas, as good roads can hardly be said to exist. In the Montana, the rivers provide from 5,000 to 10,000 miles of navigable waterway, according to the season, but the communications between these and their hinterlands are exceedingly bad.

The chief exports, as already indicated, are oil, copper, cotton, sugar, and silver; while the chief imports are food-stuffs, textiles, and machinery. The value of the imports in the year 1930 was estimated at £P13,000,000, of which 17 per cent was from the United Kingdom, 38 per cent from the United States, and 11 per cent from Germany. Of the exports, valued at £P24,500,000 in 1930, 18 per cent went to Great Britain, 39 per cent to the United States, and 7 per cent to Argentina.¹

The chief port is Callao; it is one of the most important on the whole Pacific coast, and is the port of Lima and the maritime centre of Peru. Mollendo, through which much of the Bolivian trade is carried on by the Southern railway, takes second place. Talara, in the north, exports oil.

CHILE

The Republic of Chile, which extends from the eighteenth parallel of south latitude along the west coast of South America to the extremity of the continent, has a length of 2,625 miles, a breadth varying from 65 to about 200 miles, and an area of 292,500 square miles. It therefore occupies about one twenty-fifth of the southern part of the New World, and ranks seventh in size among its States. Its population is estimated at 4,287,000.

The physical features, climate, and, to some extent, the vegetation of the country, mark out distinctly its major natural regions. To

¹ For the first quarter of 1930 the rate of exchange was English to Peruvian 19¹/₃ ⁹/₂ premium; thereafter exchange was quoted in Soles to £ 14-08⁷/₁₆

the north of the twenty-seventh parallel, the coastal range is separated from the Andes by a great desert region of considerable altitude, in many places traversed by mountain ridges. Here, there is practically no rainfall, the valleys are narrow, and few rivers reach the sea. Desert conditions prevail and, except in the immediate vicinity of the streams, the land is without vegetation. Farther south, between the twenty-seventh and thirty-third parallels, the land lying between the coastal range and the Andes, which in this region approach more closely to one another, is more mountainous in character; the rainfall increases beyond the twenty-eighth parallel, and in the south it exceeds 10 inches; the rivers are more numerous; the valleys in which they flow are wider; and the vegetation, though scanty and generally confined to the water-courses, is of a sclerophyllous type. From the thirty-third parallel, the great Central Valley of Chile runs south between the coast range and the main axis of the Cordillera, the valley itself being submerged and the coast range broken up into a series of islands beyond latitude 42° S. This last region may be further subdivided. As far south as about 37° S, the Mediterranean type of climate and vegetation is found. Beyond this, the country lies within the westerly belt all the year round; and the heavy precipitation, combined with a fairly high temperature, induces the growth of a warm temperate rain forest, which gradually passes into the cool temperate forest of Southern Chile.

THE NORTHERN DESERT OF CHILE, which extends as far south as latitude 30° , is the scene of considerable economic activity. Great deposits of nitrate of soda lie in a narrow strip of land, running from north to south along the western edge of the interior plateau between the parallels of 19° and 26° . The origin of these deposits has not yet been finally determined, but they appear to be due to the chemical combination of nitric acid, derived from great quantities of decaying seaweed in a basin frequently refilled by the tide, with the sodium salts which remained after the evaporation of the water from the basin. The aridity of the climate has been the all-important factor in the preservation of the nitrate, as even a moderate rainfall would have led to its destruction. The exports of nitrate of soda, mainly for use as a fertilizer, but also for the manufacture of nitric acid and other substances, have been one of the chief sources of Chilean

revenue for a number of years, but the position is now less stable than formerly. Before the War the chief purchasers of Chilean nitrate were Germany, which used it largely in the cultivation of beet, Britain, the United States, and France; and it was exported to these countries mainly through the ports of Iquique, Caleta Buena, Tocopilla, Antofagasta, and Taltal. These countries now depend largely upon synthetic nitrates, with the result that the demand for the natural product has fluctuated greatly within recent years. In order to meet this competition, the Government of Chile has decided to concentrate into one concern the whole of the plant, machinery, and other resources of the companies engaged in the industry. It is hoped by this means to introduce considerable improvements and economies in the production of natural nitrate; the export tax has also been repealed.

The metalliferous deposits of the country are chiefly found in this arid northern region, and in the less arid one immediately to the south, which lies between the thirtieth and thirty-third parallels, and may be called the SEMI-DESERT REGION. In the past, gold, silver, and copper have been worked in the Coastal Range and elsewhere, but at present the mining industry is mainly concerned with the exploitation of the huge deposits of low grade copper ores which occur in the Western Andes at Chuquicamata and Potrerillos, the one about 14 miles north of Calama and the other 75 miles east of Chanaral. Large-scale methods of handling the ore and modern processes for recovering the copper have made possible the development of these districts. Copper is, after nitrate, the most valuable export of Chile. The average output is about 15 per cent of the world's production, and of that about three-fifths is obtained in this northern region. Iron ore of good quality is mined at Tofo, near La Serena, and exported to the United States.

Agriculture is all but impossible in the Northern Desert, but in the Semi-desert Region it is carried-on to a considerable extent in those districts in which the land can be made productive by irrigation. The provinces of Coquimbo and Aconcagua are able to supply their own needs, and even to export a certain amount to the north, where everything required by the great mining population has to be imported. Formerly, even water had to be brought by ship, but now most of the mining towns are supplied from the Andes.

CENTRAL CHILE. The third region of Chile, that part of the Great Valley with a Mediterranean type of climate, is the most important from an agricultural point of view. On the coastal range and on the slopes of the Andes, there is much good grazing ground, while on the fertile alluvial soils of the valley vines and wheat are grown, generally under irrigation, the water being supplied by streams from the mountains. It is only in the extreme south of this part of the country that irrigation is unnecessary, and there the vine ceases to grow. The existence of the large mining population in northern Chile creates a considerable demand for agricultural produce, and only a small amount of wheat is exported. The manufacture of wine is also an important national industry, and Chilean wines are much in demand both at home and in the neighbouring States; some are also exported to Central Europe. Among other products of this region are all varieties of warm temperate and sub-tropical fruits.

Industrial development, apart from mining, has in the past been slow in Chile, and manufacturing pursuits were not developed to any great extent. The population of the country was small, and mainly occupied in mining and agriculture; and there was a want both of the capital and labour necessary for manufactures. But within recent years the industrialization of the Central Valley, based largely upon raw materials derived from agricultural and forest lands, has made considerable progress. In and around Valparaiso and Santiago, there are numerous establishments engaged in weaving, tanning, brewing, sugar refining, etc. Water-power is abundant, and coal is obtained from the province of Concepcion—chiefly from the districts around Lota and Coronel. The output of coal, however, is small, and only amounts to about 1,500,000 tons per year. As much of it is lignitic and not suited for all purposes, British and Australian coal was formerly imported very cheaply by nitrate ships, but increased use of Chilean coal since the War, the electrification of the railways which has now begun, and the adoption of oil on the nitrate fields, have led to a very considerable reduction in the use of foreign coal. In the mountains behind Rancagua lie the Teniente mines, the third of the great copper-producing regions in the country.

This part of Chile is the most highly developed and the most densely populated. Along the valley lie a series of towns, of

which Santiago is the most important; while along the coast, opposite gaps in the coastal range, are such ports as Valparaiso, Constitucion, Talcahuano, and Coronel.

SOUTHERN CHILE. The last of the natural regions of Chile, that which lies within the belt of westerly winds, is unfavourable to the cultivation of cereals, except in the north where oats are grown. The heavily forested slopes facing the Pacific contain much timber which has as yet been little exploited, while many of the sheltered valleys and inland districts are suitable for grazing cattle and sheep. The territory of Magallanes has several millions of sheep, the wool and mutton of which are exported from Magallanes (Punta Arenas), the most southerly town of the world. Valdivia is the port for the agricultural and pastoral products of the northern part of this region.

COMMUNICATIONS. In Chile there are over 5,600 miles of railway, partly owned by the State, partly by private companies. Of the former, the most important is that which runs from Puerto Montt, by Santiago, along the Great Valley to Tacna in the extreme north. Branch lines connect it with the various ports on the coast. The trans-Andean line from Valparaiso by Uspallata has been constructed partly by the Government, partly by private enterprise. The most important of the wholly private lines is that from Antofagasta to Oruro in Bolivia; but the chief railways connecting the mining districts of northern Chile with the coast are also owned by private companies.

COMMERCE. The principal exports of the country have already been indicated. In 1930 they were valued at £33,000,000. In the same year the imports were estimated at £35,000,000. The United States supplied about one-third of the imports and took two-fifths of the exports. The British Empire followed with one-fifth of each.

CHAPTER XLIII

BRAZIL

THE United States of Brazil, which have an area over two-fifths that of the whole continent of South America, include the greater part of the Amazonian lowlands and the Brazilian massif, as well as adjacent portions of the Guiana Highland and the plains of the Paraguay-Parana basin. The knowledge at present existing regarding the geology, climate, and economic potentialities of these different areas is not sufficient to permit of a final division into natural regions, and the one attempted here must be regarded as provisional.

THE AMAZONIAN LOWLANDS, which comprise the states of Amazonas, Para, and part of Maranhao, consist in the main of Tertiary and Quaternary material. The rainfall is heavy, and the rivers overflow their banks and flood the surrounding country for a considerable period each year. Owing to the great precipitation (80 to 100 inches) and subsequent evaporation, the heat never becomes excessive, the means for the hottest and coldest months at Manaus being 82° F. and 80° F. respectively. The soil of the whole region is generally fertile, and the surface is covered by a dense forest except, perhaps, on the low watersheds in the north and south, where probably there are considerable areas of parkland.

Under such conditions agriculture is very difficult, and the chief products are those of the tropical forest. Rubber, which holds the first place, is obtained from several varieties of *Hevea*, *Hevea brasiliensis* producing the best quality when it is grown under the most favourable conditions, that is on the rich alluvial soil of the moist lowlands. As rubber trees do not grow in close formation, but are scattered throughout the forest, there were until recently no plantations in the proper care and development of which the owners took a genuine interest. The result was that reckless destruction was indulged in by the *seringueiros*, whose sole object was to obtain the maximum amount of rubber; and every year they were compelled to go farther and farther from the main streams, where the trees had ceased to be productive, and

to enter the smaller tributaries, where the rubber was obtained at greater cost and greater risk. There followed a decreased output which was not compensated by an increased price, as there was severe competition from the plantations in Malaya where labour was plentiful and cheap. To meet this competition plantations have been established in various states, but, with the present over-production in the East, it is unlikely that they will serve to replace Brazil in the position which it has lost. Moreover, the men, capital, and organized transport required for effective competition are all lacking. In addition to *Hevea brasiliensis*, the product of which is known on the market as Para rubber, there are several other trees in the Amazon basin from which rubber is extracted. Of these, the most important is *Castilloa elastica*, which grows on the drier uplands; the rubber obtained from it is of inferior quality.

Manaos, at the confluence of the Amazon and the Rio Negro, is the collecting point for rubber in the interior, and Para, on the Tocantins, the port from which it is sent abroad. The production of rubber in Brazil during the years 1907-8-9-10 averaged 35,000 metric tons per year, or over 55 per cent of the world's supply. In 1914 Brazil produced 33,500 tons, or 28 per cent of the world's supply and, in 1920, 23,000 tons, or 6 per cent. Since then production has still further declined, and in 1930 did not exceed 14,000 tons.

Among other important products of the forest are Brazil nuts, cocoa, and timber. Cocoa declined with the development of the rubber industry, and is of less importance than formerly. The trees grow wild, only a few plantations exist, and less than one-tenth of the whole Brazilian crop of cocoa now comes from this region. It is remarkable that towns like Manaos and Para, situated in the great selvas of South America, should formerly have imported more timber than they exported, but it is explained by the great diversity of trees in the forest, the enormous amount of undergrowth, the scarcity of labour, and the hardness of the wood, which renders it unsuitable for many purposes. As foreign supplies of timber and coal failed during the War there was increased activity in the forests, and the amount exported is steadily increasing; it consists mainly of cedar and freijo, the latter a substitute for oak.

THE ATLANTIC MARGINS. The coastal regions of the Brazilian massif, from the State of San Maranhao to that of Rio de Janeiro, may be considered under this title, although several subdivisions

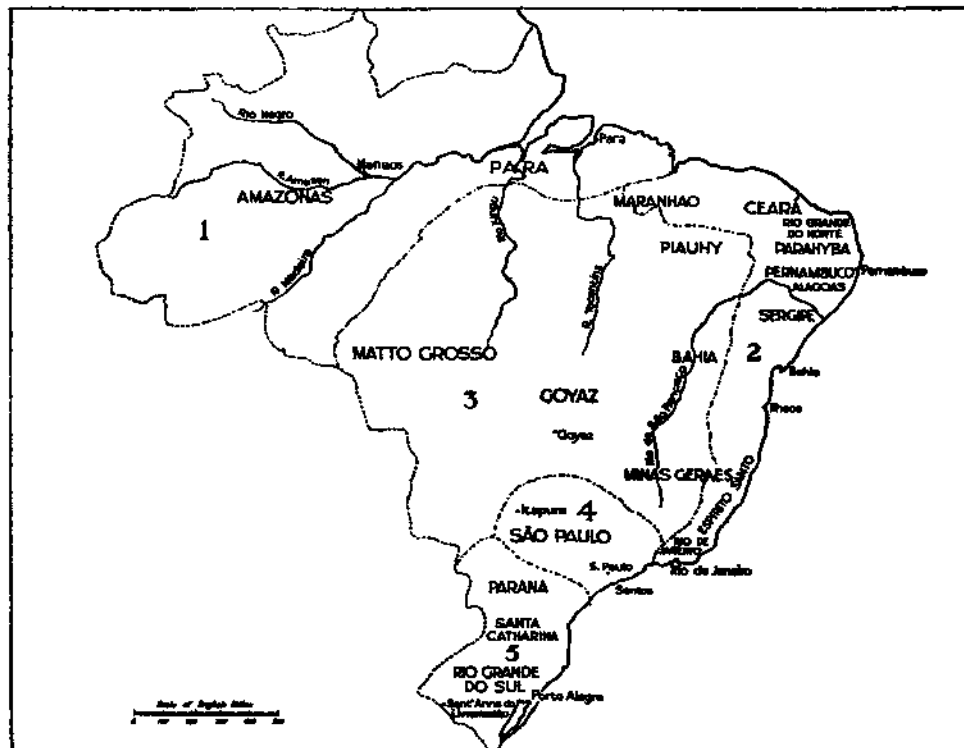
must be recognized. The north-eastern part, as far as the mouth of the Sao Francisco, consists of a number of river basins, which have the same general character as regards slope and soil, and, to some extent, climate. The temperature throughout is tropical, but the rainfall of Ceara ranges from about 20 to 60 inches, while farther west it increases to 80 inches and over. From the mouth of the Sao Francisco southwards, the slope from the massif to the coastland is steeper; the rivers are shorter; the temperature is generally tropical on the lowlands (except in the south where it is sub-tropical), but somewhat cooler on the uplands; and the rainfall is heavy. Throughout the whole area the products are similar, but the north-eastern states are the most fertile, and yield large quantities of cotton, sugar, and cocoa. To the world's supply of raw cotton, Brazil probably contributes over 500,000 bales, and of that the greater part is produced in the region under consideration, more especially in the states of Pernambuco, Rio Grande do Norte, Parahyba, and Ceara. The plant is grown both in its herbaceous and arborescent forms—the former mainly on the *matta*, mostly rich alluvial lowlands formerly covered with tropical rain-forest; and the latter mainly on the *sertao*, parched uplands of brushwood and grasses. The fibre of the arborescent varieties is longer than that of the herbaceous plant; the latter is, however, generally cultivated in regions of heavier rainfall, the yield is larger, and consequently it predominates. Recent investigations have indicated the possibility of a great extension of the cotton-growing area in this region. But, while the conditions of soil and temperature are conducive to a large yield per acre, the necessity for irrigation in the drier *sertaos*, the undeveloped state of communications, the relative scarcity and inefficiency of labour, and the want of the commercial organization necessary for the production and marketing of a large crop, are all likely to prevent a rapid expansion of the cotton-growing industry. The cultivation of cocoa is of increasing importance in this region, where Bahia produces practically the whole of the Brazilian crop. In that state it is grown on the alluvial plains and up the steep slopes of the eastern highlands south of the town of Bahia. There the temperature is still high, while the rainfall from the south-east trades (40–80 inches) is heavier than farther north. But though the conditions of climate and soil appear to be particularly favourable, the methods of

cultivation are generally primitive in the extreme, and the product is of somewhat inferior quality. Brazil produces altogether about one-seventh of the world's supply of cocoa, over one-half of which is shipped from the port of Ilheos. Coffee is grown throughout the greater part of this area, but not extensively, except in the south, where the country north and west of Rio de Janeiro produces a considerable amount. Among other plants cultivated are the sugarcane, which flourishes on the moist and warm plains of Pernambuco, tobacco, and oranges. Rubber obtained from the manicoba (*Manihot glaziovii*) and the mangabeira (*Hancornia speciosa*) is also collected.

The most important mineral deposits of this region are monazite sands, from which thorium, used in the manufacture of gas mantles, is obtained. These sands occur along the coast of Bahia and Espiritu Santo, and, in the interior, on lands formerly occupied by the sea, or even upon the banks of rivers.

Manufactures are as yet of little importance in the region, except in the extreme south, where the State, and more especially the Federal District, of Rio de Janeiro, is the seat of considerable industrial activity. Encouraged by a high protective tariff, the cotton industry has assumed considerable proportions in and around the capital, where there are also numerous woollen, jute, and felt factories, establishments for the preparation of food-stuffs, sugar refineries, iron foundries, boot and shoe factories, etc. Cheap water-power derived from the falls of the Parahyba is the chief geographical advantage of the region round the capital. Elsewhere on the coastal margins, the extraction of sugar at Bahia, and some spinning and weaving at Recife and Bahia, are among the chief non-agricultural pursuits of the people.

THE VOLCANIC SOILS OF SAO PAULO. From the state of Sio Paulo southwards, the escarpment becomes much steeper, and separates a narrow strip of coast from the plateau regions behind. In the east the rocks are Archaean, while, farther west, sandstones, associated in many places with eruptive rocks probably of Tertiary age, prevail. These eruptive rocks are rich in potash and iron, and weather down into a dark-red clay soil, which is peculiarly adapted to the growth of the coffee plant when climatic conditions are favourable, as is the case in the southern part of Minas Geraes, and in at least the central part of Sao Paulo. Although there are occasional frosts, winter mean temperatures are



NATURAL REGIONS OF BRAZIL

generally between 60° and 65° F., and summer mean temperatures between 70° and 75° F., while the rainfall is over 50 inches at least. In these districts, at an altitude varying from 1,500 or 1,800 feet to 2,500 feet, has been concentrated within recent years about 70 per cent of the Brazilian coffee industry, which now provides about three fifths of the world's supply. But the rapid development of coffee-planting in this region, largely by means of imported Italian labour, has not been without its drawbacks. On the one hand, there has been the neglect of various crops for which the country is suitable, and, on the other, there has been over-production of coffee to such an extent that the government of Sao Paulo has been compelled, in years of abundant crop, to buy and withhold from sale, or to destroy, no inconsiderable part of the output, in order to prevent too great a depression of price on the world's markets. This policy, the cost of which is met by an export duty on coffee, has had varying success, but although on occasion it was unavoidable if the planters were not to be ruined, it has failed to discourage planting or to encourage the cultivation of other crops. More recently, however, it has been decided to levy a heavy tax on all future planting, except for replacement.¹

During the American Civil War cotton was extensively grown in Sao Paulo. After that its cultivation was neglected until the decline in the price of coffee led to new attempts being made to grow it on a large scale. These attempts have apparently been successful, and the state now supplies the cotton industry of Sao Paulo with much of its raw material. Maize, rice, and beans—the principal food-crops—are also more extensively cultivated than in pre-war days; sugar-cane grows well on lands abandoned by coffee.

The town of Sao Paulo, situated on the route from the coast to the plateau, is the centre of an important industrial region which has of recent years made rapid progress. In addition to cotton, silk, clothing, leather, and food-stuffs, machinery employed in the preparation of coffee is manufactured on a considerable scale.

THE TEMPERATE SOUTH. Climatic conditions, more temperate

¹ An *Overseas Trade Report* (1933) states that exemptions for replacement are now removed and "the prohibition of planting has to all intents and purposes become obsolete."

than farther north, mark off the country south of the state of Sao Paulo as a separate region. On the upland the annual range is from about 55° F. to about 70° F., while the rainfall, which exceeds 60 inches over the greater part of the region, is fairly evenly distributed throughout the year. The land is generally fertile, and in the north and east is covered with forests which in the south and north-west merge into grasslands. For long the region was neglected and the chief pursuits were stock-raising on the grasslands, the collection of yerba mate, which grows wild in the forests of Parani, and a somewhat improvident agriculture which was carried on in forest clearings by colonies of Germans, Italians, Poles, and others.

But within recent years there has been a marked development, especially on the grasslands of Rio Grande do Sul. Stock-raising has suddenly become of much greater importance. The native cattle, which were of poor quality and fit only to be used for *xarque* or dried beef, have been crossed with pedigreed strains, and the exportation of frozen meat is now an established industry. Agriculture has also made a considerable advance near the eastern margin of the plateau and in the south. Maize, beans, rice, and sugar-cane are important food crops, and practically the whole of Brazil's home supply of wheat comes from Rio Grande do Sul, the country farther north being too hot. The forests of Parana pine (*Araucaria brasiliiana*) in Western Parana and Santa Catharina have given rise to a lumber industry, which, though poorly organized at present, may yet become important. Another forest product of even greater value under existing conditions is yerba mate, both in its wild and cultivated form.

The principal coalfields of Brazil occur in the Permian rocks in the states of Santa Catharina and Rio Grande do Sul. The coal contains a large proportion of moisture and ash, and seems to be of most value when converted into gas for use in gas-engines. The annual production is as yet inconsiderable.

THE CENTRAL REGION lies on the Brazilian massif, and consists of the states of Matto Grosso, Goyaz, and Minas Geraes, together with parts of the adjacent states. Much of the region is still unexplored, and its geographical features are but imperfectly known. The nucleus consists of Archaean rocks, though over large areas these are covered by metamorphosed and unaltered

sedimentary rocks of Palaeozoic age. The temperature ranges from tropical in the valleys of the north to sub-tropical on the uplands of the centre and south. Over the greater part of the region there are wet summers and dry winters; the rainfall varies from 40 to 80 inches, but in the north-east it is considerably less. On the lower lands and in the river valleys there are forests; the uplands are generally covered with grass; and in the area of low rainfall, caatinga prevails. The population is small, and there is as yet little economic development. Matto Grosso is practically uninhabited; in Goyaz and Minas Geraes cattle are raised on the campos; and the south-east of Minas Geraes is devoted to agricultural and pastoral pursuits for the benefit of Rio de Janeiro. Mate grows extensively in the south of Goyaz.

When this region has been more fully developed, its chief source of wealth will probably be found in its great mineral deposits. Some gold is mined, and Brazil has a practical monopoly of the carbonados or black diamonds used in mining drills. Within recent years large deposits of iron have been located, but the difficulties of transport have hitherto prevented their proper exploitation. The best known deposit is in Minas Geraes, in that section of the Espinhaço range which forms the divide between the Rio Doce and the Sao Francisco. In the metamorphosed sedimentary beds, which here overlie the crystalline schists, occurs the iron-bearing quartzite known as "itabirite," the iron content of which is remarkably high. The total resources of Minas Geraes have been estimated at 12,000,000,000 tons of hematite ore, containing 50 per cent or more of iron. This would seem to indicate that Brazil may one day become one of the greatest producers of iron ore in the world; at present development is slow on account of the want of fuel and of good means of communication.

Among other minerals found in the Central region are manganese, platinum, copper, and graphite. Of the first of these Brazil is an important producer; large reserves are situated at Ouro Preto and elsewhere on the border of the iron ore region, and a considerable amount is exported, mainly to the United States; their full exploitation is hindered by the lack of adequate transport facilities.

COMMUNICATIONS are still in a very undeveloped state. The mountainous nature of much of the country, the steep escarpment

between the sea and the interior, the heavy rains, and the luxuriant vegetation, are all hostile to roads. In the north, the Amazon acts as a great highway, and is navigable to beyond Iquitos in Peru by ocean-going steamers. In the south, around Porto Alegre, there are also several navigable waterways, but elsewhere the rivers are obstructed by falls, and the traffic upon them is only of local importance.

Of railways, there are now about 20,000 miles, chiefly in the south, where they provide but an imperfect service. Rio de Janeiro is connected with Sao Paulo, and from the latter town a line runs through the states of Parana, Santa Catharina, and Rio Grande, to the frontier at Sant' Anna do Livramento, whence there is connection with the Uruguayan system and Montevideo. This line is linked up with the coast at Pelotas, Porto Alegre, and elsewhere. Another important railway route runs from Sao Paulo to Itapura on the Parana, whence it is continued to the Bolivian frontier at Porto Esperanca on the Paraguay. The states of Sao Paulo and Rio de Janeiro are well provided with railways as a result of the growth of the coffee industry, the most important being that from Santos to Sao Paulo. One line which goes north from the capital serves with its branches a great part of Minas Geraes, while another which runs north from Sao Paulo will eventually be carried to Goyaz in the state of that name. In the northern part of the country, the railways run directly inland from the coast, and are seldom connected with one another. One of the most important connects Bahia with the Sao Francisco. In the basin of the Amazon, the Madeira-Mamore railway, 229 miles in length, has been constructed round the cataracts and rapids of the Madeira and Mamore rivers.

FOREIGN TRADE. The following tables show the value of the foreign trade of Brazil for the three years 1929-31—

			Imports	Exports	Average rate of exchange
			(In thousand milreis)		
1929	..	..	3,527,738	3,860,482	$5\frac{15}{16}$ d. = 1 milreis
1930	..	..	2,343,705	2,907,354	$5\frac{27}{64}$ d. " "
1931	..	..	1,880,934	3,398,222	$3\frac{25}{32}$ d. " "

The principal imports and exports are as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Grain	14.0	Coffee	68.0
Machinery ..	13.6	Meat	4.2
Oils	8.7	Yerba mate ..	2.9
Iron and steel ..	8.6	Cocoa	2.8
Motor-cars ..	5.1	Hides	2.8
Coal	5.0		

The principal importing and exporting countries are as follows—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
United States ..	27.2	United States ..	41.2
United Kingdom	18.6	France	9.9
Argentine ..	12.5	Germany ..	9.0
Germany ..	11.7	United Kingdom	7.1

About half of the coffee exported makes its way to the United States; Germany also is a large purchaser. Great Britain takes most of the raw cotton, and yerba mate finds its chief markets in South America. Cocoa and hides are sent to the United States. Brazil obtains grain from Argentina and the United States. Textile machinery is provided by Great Britain, agricultural machinery by the United States, and other kinds by Great Britain, the United States, and Germany. Locomotives come from Great Britain and motor-cars from the United States. The United States is also the great source of mineral oil, and, along with Great Britain, Germany, and Belgium, supplies most of the iron and steel imported. Coal is imported from Great Britain.

CONCLUSION. Brazil, with its great natural resources—mineral wealth, water-power, productive climate, and valuable forests—would appear to have an assured future, but economic development will be slow. Tropical climate renders a great part of the country unsuitable for white labour, the topography of the land makes communication difficult, the population is small, and composed of

diverse elements, and unstable political conditions have affected the investment of capital. These are obstacles to progress which can only slowly be overcome.

THE GUIANA COLONIES

The Guiana Colonies lie upon the north-east slope of the Guiana Highland. Along the seaboard of British and Dutch Guiana, there is a low-lying coastal plain, which is subject to flooding, but parts of which have been embanked and converted into good agricultural land. The lower slopes of the Highland are covered by dense forests, which in the interior give place to savannas. The whole region is yet in a very undeveloped condition. British Guiana, which has a mixed population of about 300,000, grows sugar and rice; balata is obtained from forests, and gold and diamonds are found. The chief crops of Dutch Guiana are somewhat similar, but include cocoa and coffee; gold is also obtained. In French Guiana gold is the main object of economic activity.

CHAPTER XLIV
PARAGUAY AND URUGUAY
PARAGUAY

PARAGUAY, with an area of 172,000 square miles, belongs to two very different regions. EASTERN PARAGUAY, which lies between the Parani and Paraguay rivers, is part of the western slope of the Brazilian Highland, and the land sinks from the north-east and central parts of the area, where it sometimes attains a height of about 2,000 feet, towards the west and south, where it does not exceed 600 feet and is frequently considerably less. The climate has been described as three months of summer, during which the mean temperature is over 80° F., and nine months of spring, during which it is between 60° F. and 80° F. The rainfall occurs at all seasons of the year, but is heaviest in the summer months when the equatorial belt of low pressure has migrated southwards. In the north of the region over 60 inches of rain fall, and in the south and west over 40 inches. Much of the land is covered with dense forest, but in the west and south, where the rainfall is lower, there are extensive tracts of savanna. It is in this region that the majority of the 844,000 inhabitants of the country are found. These are generally people of mixed Indian and Spanish blood, the native Indians, who at the most number 100,000, being chiefly in the Chaco.

Cattle-raising is one of the most important industries in the country. The well-watered grassy plains of the west and south provide good pasture throughout the year, and the cattle, of which there are about 5,000,000, do not require to be artificially fed. But, notwithstanding efforts made to improve the herds by the importation of pedigree stock, the quality remains low, and although meat-packing plants have been established, hides still form the principal export. Sheep farming is also carried on, and a small amount of wool from Paraguay is exported each year through the Uruguayan port of Montevideo.

Although much of the land is fertile, cultivation is at present almost entirely confined to the region south-west of a line drawn

from Asuncion to Encarnacion. Within recent years cotton has been grown, apparently with beneficial results to the country as a whole, and tobacco is another important commercial crop. Large quantities of oranges are exported. Maize and cassava are cultivated for home consumption, and attempts to grow wheat are being made.

Yerba mate, or Paraguayan tea, is obtained by drying and grinding into a kind of coarse powder the leaves and twigs of an evergreen shrub known as *Ilex paraguensis*. When infused, it yields a drink which is used as a tonic and stimulant; it is much in request throughout South America, and is beginning to make its way into Europe. The yeiba plant is found in a wild condition throughout the region, but much of what is now consumed is a plantation product. With improved means of transport the forests might become an important source of revenue.

WESTERN PARAGUAY, which lies between the Paraguay and the Pilcomayo, belongs to the bed of the ancient Pampean Sea, and really forms part of the Gran Chaco. Much of the surface is covered with forest, jungle, and swamp, but there are considerable areas of good grassland. Quebracho, from which tannin is obtained, is found in the forests, especially in those along the west side of the Paraguay; factories have been erected for the extraction of the tannin, and logs are exported. On the grasslands some ranches have been established, and attempts at the cultivation of cotton and other crops have been made. The development of the region is greatly handicapped by the want of good means of communication.

The backward condition of Paraguay is due in part to the devastating wars waged against its neighbours, in part to its distance from the great lines of communication. A railway runs from Asuncion, the capital, to Villa Encarnacion, on the Parana. Opposite Villa Encarnacion is Posadas the terminus of the Argentine North-Eastern railway, so that Asuncion is now within fifty hours of Buenos Aires by rail instead of five days by boat, as formerly.

URUGUAY

Uruguay has an area of 72,000 square miles, and is the smallest of the South American states. Physically it belongs to the southern slope of the Brazilian Highland, but the relief of the country is slight, the hills are of low elevation, and wide rolling plains constitute

the greater part of the surface. In the south and south-east, river alluvium and wind-borne material have built up a fertile plain in close proximity to the sea. The climate is cooler than in Paraguay, the mean summer temperature being between 70° F. and 80° F. while the mean winter temperature over the greater part of the country is from 50° F. to 55° F. Rain falls at all seasons of the year, the mean annual precipitation being over 40 inches, except along the coast, where it is somewhat less. The prevailing type of vegetation is grassland, trees being found chiefly in the vicinity of the river courses. The population, which numbers 1,700,000, is mainly of European descent.

The land is pre-eminently suited for grazing purposes, and pastoral pursuits, and subsidiary industries connected with them, occupy the great majority of the people. A live-stock census in 1930 showed that there were 7,000,000 cattle, 20,000,000 sheep, and large numbers of horses and pigs in the country. The cattle and sheep form the basis of the export trade, in which Montevideo, Fray Bentos, and Paysandu are all largely interested. Frozen and chilled meat, hides, and wool are the principal exports, and find their chief market in Europe; while sun-dried and salted beef and meat extracts are declining in importance. As in the Argentine, pedigree stock is freely imported from England for the improvement of the native herds, but the increase in the number of sheep shown by the last census indicates that they are receiving more attention than cattle.

Arable farming is practically confined to the fertile alluvial soils in the south, where less than one-tenth of the whole population are engaged in it. Wheat, maize, and linseed are, however, produced in such quantities as to admit of occasional export, and viticulture and fruit-growing are beginning to receive attention. Handicapped by a lack of fuel and water-power, raw materials, and trained artisans, Uruguay has made little progress as a manufacturing country, and with a few exceptions (boots, textiles, etc.) industry is still in an initial stage. Various minerals are known to exist, including gold, coal, and manganese, and in some districts there are considerable quantities of good wood.

Montevideo is the centre of the railway system; the main lines run to Fray Bentos, to Paysandu, and to the Brazilian frontier, whence there is communication with Rio de Janeiro.

At present Great Britain, Germany, Argentina, and the United States are the chief purchasers of the produce of Uruguay (meat, wheat, wool, and hides). The United States, Great Britain, Germany, and the Argentine supply the bulk of the imports. In 1931 the imports were valued at 88 million pesos or gold dollars, and the exports at 78 million (average rate of exchange 28jHrd. to pesos).

CHAPTER XLV

THE ARGENTINE REPUBLIC

THE Argentine Republic has an area of 1,153,000 square miles, or a little less than one-sixth that of the continent of South America. The physical and climatic conditions of the country render much of it very suitable for economic development, and it is one of the largest, and certainly the most advanced, of South American States. It extends from the twenty-second to the fifty-fifth parallel of south latitude, and includes the eastern slope of the Andes, the bed of the ancient Pampean Sea, and the Patagonian Plateau. There are, therefore, well-marked differences in physical and geological structure, climate, and vegetation, and various geographical regions may be distinguished, of which the following are the more important.

THE CHACO REGION. In the north is the Chaco, which comprises the territories of Formosa and Chaco, along with the neighbouring parts of the provinces of Salta, Santiago del Estero, and Santa Fe. This region presents the appearance of a vast plain of low elevation, sloping on the whole from west to east and southeast, and still in the process of up-building through deposition by rivers. The mean summer temperature ranges from about 77° F. to 85° F., and that of winter does not fall below 55° F. The precipitation decreases from about 45 or 50 inches in the east to between 20 and 25 inches in the west. There is a well-defined minimum during the winter months.

The Chaco, with its low-lying and almost level surface, its badly developed river system, and its seasonal rainfall, is subject alternately to flood and drought. As a result, large swamps occur in some places, saline lands in others. The vegetation accordingly shows a lack of uniformity, and forest is interspersed with grassland and swamp. These conditions, combined with the inaccessibility of the region and a population almost entirely Indian, have limited economic development to certain areas, and quebracho, live stock, and cotton are at present the chief products of the Chaco.

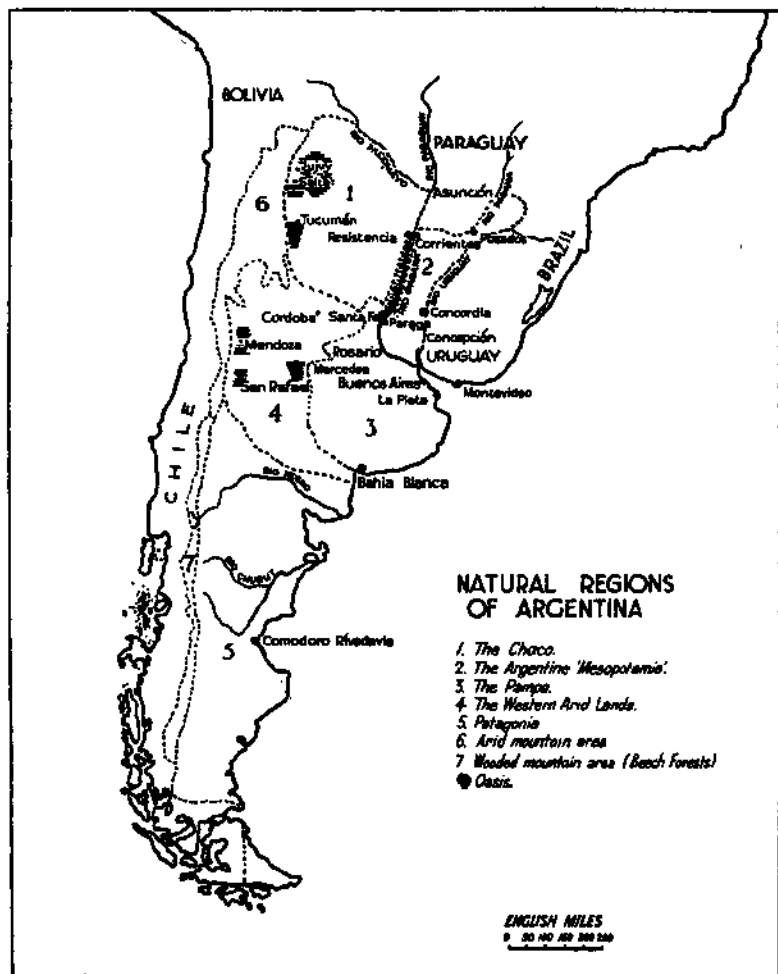
Throughout the forested areas several varieties of quebracho

occur, but the most important, *Quebracho lorentzii*, from which the largest quantities of tannin are obtained, is in the main confined to a belt of country lying to the west of the Paraguay-Parana river. In this region factories have been established in the vicinity of the rivers for the extraction of the tannin; logs are also exported for treatment elsewhere, but the former industry is now the more important. Over the remainder of the Chaco the forests contain *Quebracho aspidosperma*, which is cut for timber (railway sleepers, posts, etc.) mainly in the vicinity of the railways in the south.

For various reasons, some of which have already been indicated, agriculture in this region has made slow progress. In the east, on the alluvial soils of the Paraguay and Parana, food crops are grown to supply the quebracho workers; while in the southern Chaco, along the railway line from Resistencia westward, the cultivation of cotton is extending, and it is believed that very large areas are suitable for the cultivation of this plant. Here, the cost of production is less than in the United States, and the yield per acre higher. The total output does not yet exceed 150,000 bales, but it is much more than sufficient for local needs. In the drier regions of the west, watered by Andean streams, cattle-rearing has long been a pursuit of minor importance; it is also carried on in the east, partly to supply cattle for transport purposes in the quebracho region.

THE PAMPA includes the province of Buenos Aires and the neighbouring parts of Entre Rios, Santa Fe, Cordoba, and the territory of La Pampa. It has been formed within comparatively recent times by deposition in a shallow sea; in the centre and west it is generally flat, while in the north and south it tends to be undulating. The soil, which is probably derived from the debris of volcanic and other rocks in the Andes, is very fertile and easily tilled. The climate is temperate; summer temperatures are about 68° F. to 75° F. and winter temperatures about 45° F. to 55° F. The mean annual rainfall varies from about 15 inches in the west and south to over 40 inches in the north-east, with a tendency to winter minima and spring and autumn maxima. In the vicinity of the rivers, hygrophilous grasses grow on the river alluvium, but elsewhere the Pampas grasses constitute the natural vegetation of the greater part of the region.

On the whole these geographical conditions are favourable to agriculture, but other factors have contributed to the development



of this region. Its climate is extremely well suited to South European races, while the Indians are few, as the products of the region were never such as to encourage a great increase in their numbers. The rivers, the natural highways of the country, converge on the estuary of La Plata, to which the best agricultural lands are contiguous, and the progress of these has been rapid with the growing demand from Europe for wheat and meat. It is not surprising, therefore, that this region, which contains the greater part of the cultivable soil of the republic, has over two-thirds of its population and is the centre of its economic development.

Since the end of last century, the area under wheat has been trebled, and at the same time there has been a considerable movement southwards of the centre of production. In 1898, Santa Fe and Cordoba produced about two-thirds of the whole crop, while in 1925-6 the relative production was as follows : Buenos Aires, 36 per cent; Cordoba, 28 per cent; Santa Fe, 12 per cent; Entre Rios, 6 per cent; La Pampa, 14 per cent; other districts, 14 per cent.

The area, within which fertility of the soil, favourable climate, and facilities for cultivation render possible the growth of wheat, is limited on the north and north-west by increasing heat and moisture, and on the west and south by decreasing precipitation. These limits have not yet been exactly determined, but in the north little wheat is grown beyond the thirty-first parallel, and in the south beyond the thirty-ninth. The mean annual isohyet of 20 inches practically defines the western and south-western margins of the wheat area, although a little is grown with a rainfall of 16 to 20 inches. In eastern Buenos Aires the soil is too damp for arable farming. But within these limits the area devoted to wheat (19,500,000 acres in the years 1929-31) could, under favourable economic conditions, be greatly extended. Much of the land at present given up to cattle-raising is suitable for cultivation, and has in many cases grown wheat before it was laid down in alfalfa.

The average yield for recent years does not exceed 12 bushels per acre. Various circumstances tend to account for this. The region is yet in an early stage of agricultural development, and with its easily tilled soil is particularly adapted to extensive methods of cultivation. Moreover, many of the cultivators are immigrants from the south of Europe who are slovenly in their methods of agriculture, and do not realize the importance of deep ploughing

and careful selection of seed. Nor are they encouraged by the system of tenure which prevails. In many cases they are allowed to hold their land only for a few years ; after several crops of grain have been obtained from it they must sow it with alfalfa and return it to the large proprietor from whom it has been rented.

Maize, which has also made considerable progress within recent years, is grown chiefly to the east of the wheat region, on the rich black loams to the west of the Parana, where the rainfall is heavier than farther west (30 to 40 inches), and cultivation easier than in the north. In the years 1929-31, the area under this crop averaged over 14,000,000 acres, the greater part of it lying in the north-west of Buenos Aires, southern Santa Fe, and eastern Cordoba. Part of the product is used for feeding stock and the remainder is exported. Flax is grown for its seed in the same region as maize, but it does not occupy much more than half the area taken up by that cereal. Argentina is of flax-seed, as of maize, the largest exporter in the world.

Improved methods in breeding and in raising cattle, the increasing demand from foreign countries for meat, and the development of communications, including the use of refrigerating apparatus, have entirely altered the character of the stock-raising industry of the Argentine, and cattle are no longer reared for their hides and tallow alone. Of the 32,000,000, or thereabouts, in the Republic, more than three-fourths are found in this region, where climatic conditions allow them to live out of doors throughout the year. The carrying capacity of the land has been considerably raised, either by sowing alfalfa, the roots of which draw moisture from the subsoil, or by steady grazing, which has the effect of greatly improving the Pampa grasses. The native cattle have also been much improved within recent years by a careful and liberal importation by the Government of prize animals selected from the best of the British breeds, such as shorthorns and Herefords. The preparation for export of meat and hides, and the manufacture of various extracts of beef, are among the most important pursuits based upon the stock-raising industry, but a beginning has also been made in scientific dairying, and considerable quantities of butter are exported. The latter industry finds its most favourable environment in the east of the province of Buenos Aires, where on account of bad drainage, agriculture is still impossible, and where dry uplands

and wet valleys offer good pasture for the summer and winter months respectively.

Sheep-raising is not of the same importance as formerly in this region. This is due to the fact that in the state of Buenos Aires (in which a large proportion of the Argentine sheep were found as the moister lands farther north were unsuitable to them), the laying down of alfalfa, on which cattle pay better than sheep, has led to the expulsion of the latter from much of the more favoured land. At the same time, the production of mutton has become much more important than that of wool, and merino sheep have been replaced by Lincolns.

THE ARGENTINE MESOPOTAMIA. The region to which this name has been applied includes the greater part of Entre Rios and the whole of Corrientes and Misiones. The first two are, in the main, grass-covered lowlands, while the third is a forest-clad upland. On the lowlands cattle and sheep are reared, the latter mostly in the drier south-east; from the forests of the uplands, yerba mate is at present the principal export. Agriculture has not yet advanced beyond the stage of subsistence farming.

THE WESTERN ARID LANDS. Beyond the Pampa there lies to the north of the Rio Colorado a region of thorn scrub and semi-desert. The land, much of which is over 1,500 feet in height, is a confusion of mountain, plateau, and plain; in July it lies between the isotherms of 50° F. and 60° F., and in January between those of 75° F. and 80° F., the actual temperature varying with altitude; the rainfall, which occurs mainly in summer, is low, ranging from 30 inches in the north-east and 20 inches in the east to less than 10 inches in the west. Apart from the cultivated lands in the oases, stock-raising is practically the only occupation of the people. Goats, sheep, and cattle are reared, and goat skins, wool, and frozen meat of inferior quality are exported. Stretching from Jujuy in the north to the Rio Negro in the south, there is a line of oases, most of which are situated on great alluvial deposits formed where streams from the Andes and their outliers open on to the plains. In the north, Jujuy, Salta, and Tucuman are mainly engaged in the cultivation of sugar-cane; Tucuman, with a rainfall of nearly 40 inches as a result of its position at the foot of the Sierra de Aconquija, and well irrigated by the streams from these mountains, is the largest producer. Farther south, Mendoza is the

centre of a group of oases in which the vine is extensively cultivated. Both in regard to sugar and wine, the Argentine is in the main self-supporting. Other oasis products include tobacco, fruit, and alfalfa.

PATAGONIA lies to the south of the Rio Colorado. In the west the Andes fall to the sub-Andean depression, east of which the Patagonian plateaus attain in places a height of 5,000 feet and more. The rainfall is low—over a great part of the region it does not exceed 10 inches—and, except at the foot of the Andes and in the south, where steppe prevails as the result of a somewhat greater precipitation, the land is mainly either desert or semi-desert.

In some districts where irrigation is possible, as, for example, in the valleys of the Rio Chubut and Rio Negro, good crops of wheat have been grown, but throughout the region as a whole arable farming is subsidiary to stock-raising. Patagonia contains about one-fourth of the 44,000,000 sheep in Argentina, and of these one-half are found in the southern territory of Santa Cruz. Cattle are found chiefly in the west along the foothills of the Andes, where much good grazing land is believed to exist.

MANUFACTURES. So far, economic development has been of an agricultural rather than of an industrial nature. The most important manufactures are those which prepare for the market the raw material produced at home, flour-milling, sugar-refining, wine-making, meat-freezing, dairying, the extraction of quebracho, etc. But the manufacture of textiles, chemicals, metal goods, and various other commodities, for which raw materials are imported, either wholly or in part, has, since the War, made considerable progress in and around Buenos Aires. The extent of the mineral resources of the country are only partially known, but as yet they have proved of no great value. Petroleum occurs in various parts of the sub-Andean region, the most important deposits worked at the present time being those of Comodoro Rivadavia in the south of Chubut.

COMMUNICATIONS. The communications of the country are as yet only partially developed. The waterways are of considerable importance, more especially in the woodland region, where they still constitute the chief means of transport. The Paraguay and the Parana are navigable throughout the whole of their course within the Argentine, while the Uruguay may be ascended as far as Concordia. Santa Fe is the present head of navigation for

sea-going vessels on the Parana, and Concordia occupies a similar position on the Uruguay.

There are now in the Argentine over 25,000 miles of railway, constructed largely by British capital, and situated chiefly in the valley of the Parana and in the wheat-growing districts. Among the most important lines are the Buenos Aires Great Southern, which serves the province of Buenos Aires, and goes to Neuquen, on the Rio Negro, but has the greater part of its system within 200 miles of the capital or Bahia Blanca; the Central Argentine, which connects the capital with Rosario, Cordoba, Santa Fe, and Tucuman; a government line from Rosario by Tucuman and Jujuy to La Quiaca on the frontier of Bolivia, whence a line runs to La Paz; the Entre Rios and Argentine North Eastern, which serve the country to the east of the Parana, the main line running from Ibicuy on that river, by Concordia, to Monte Caseros, where it divides, one branch going to Corrientes and the other to Posadas, opposite Encarnacion on the Paraguayan system; the Buenos Aires Western, which brings the cattle and wheat of La Pampa and San Luis to the coast; and last, but not least, the Buenos Aires and Pacific, which connects with the Chilean railway to Valparaiso by means of the tunnel under the Uspallata Pass. The heavy gradients on the Andean sections of this line, the break of gauge at Mendoza and again at Los Andes on the Chilean side of the frontier, and the difficulty of keeping the line open in the mountains during the winter months, have all tended to prevent much heavy traffic on this route.

It will be noticed that thoe railways are all connected with one or other of the chief ports of the country : Buenos Aires and La Plata, Rosario and Bahia Blanca. Through the first of these pass the greater part of the imports and no inconsiderable share of the exports of the whole country. La Plata, connected by rail with the capital, is principally used by ships unable, on account of their size, to ascend higher up the river. Rosario, which comes second to Buenos Aires in respect to tonnage, is the agricultural port of the Parana valley and of all that northern region the trade of which is chiefly carried by the rivers. Bahia Blanca, in the south of the province of Buenos Aires, is the terminus of those lines which are opening up the southern Pampa. Much wool is exported here, as also is wheat from the central Pampa.

FOREIGN TRADE. The following figures show the value of the foreign trade of Argentina for the years 1929, 1930, and part of 1931—

	Imports (In thousands of gold pesos)	Exports	Average rate of exchange
1929	861,997	953,744	$47\frac{3}{32} = 1$ peso
1930	739,182	614,104	$41\frac{11}{32}$..
1931 (1st 9 months)	414,969	474,483	$35\frac{23}{64}$..

The principal importing and exporting countries were as follows for the three years 1928, 1929, and 1930—

Imports from	Percentage of total imports	Exports to	Percentage of total exports
United States ..	22-2	United Kingdom	35-3
United Kingdom	19-2	Belgium ..	9-8
Germany ..	11-5	Netherlands ..	9-7
Italy	9-0	Germany ..	9-1
France	6-2	United States ..	8-6
Belgium ..	4-4	France	74

Of the total imports for the years 1929-30-31, textiles, materials, and manufactures accounted for 21-5 per cent, machinery and vehicles for 14-7 per cent, food-stuffs for 10-1 per cent, fuel and lubricants for 13-3 per cent, and iron and steel goods for 9-4 per cent. Silk goods came mainly from France, and cotton and woollen piece goods mainly from Great Britain; the United States supply the bulk of the machinery and vehicles, but Great Britain and Germany also contribute; of the food-stuffs, there need only be mentioned rice from Italy and the United States, coffee from Brazil, tea from India, yerba mate from Brazil, edible oils from Italy, and fruit from the United States; iron and steel goods are supplied by the United States, Germany, and Great Britain; and mineral oils by the United States and Venezuela.

The more important exports include grain and linseed, meat, wool, hides, and dairy products. The United Kingdom is a large purchaser of wheat; linseed finds its markets both in Europe and

in North America. During the last few years Britain has taken all the chilled meat and most of the frozen mutton exported, as well as about half of the frozen beef and canned meat, the remainder being disposed of in Europe and the United States. The chief markets for wool and hides are Great Britain, western Europe, and the United States. Butter is sent mainly to Great Britain, and casein to the United States.

AUSTRALIA
AND
NEW ZEALAND

CHAPTER XLVI

AUSTRALIA

THE Commonwealth of Australia, which includes Tasmania, has an area of 2,974,581 square miles, and is just over three-fourths the size of Europe. In its general form the island continent consists of a plateau with an average elevation of about 1,000 feet, but a number of distinct physical regions may be recognized. The Eastern Highlands extend from Cape York southwards, and occupy the eastern parts of Queensland, New South Wales, and Victoria, and the whole of Tasmania. They do not form a true mountain range, but represent, over considerable areas at least, the dissected escarpment of a fractured peneplane, the eastern part of which has sunk below the level of the ocean. In the north there are great blocks of ancient granite and Tertiary basalt; in the centre, Carboniferous rocks predominate, though others, ranging from Archæan to Triassic, are also found; while in the south the strata belong to Lower Palæozoic times with granitic outcrops.

Between the Eastern Highlands and the sea, there stretches a series of coastal plains composed of materials washed down from the uplands and recently uplifted above sea-level. These plains vary in breadth, but seldom exceed fifty miles and are frequently much less.

The Eastern Highlands present their steep sides towards the east coast, and slope gently westwards towards the Great Plains, which form an area of depression stretching across Australia from the Gulf of Carpentaria to the west coast of Victoria. In the north and centre this region consists of Cretaceous rocks, but in the south it is covered with silt brought down by the Darling, Murrumbidgee, and other rivers during Tertiary times. Of the Cretaceous rocks the Rolling Downs formation, as will be shown later, is of great importance because of its influence upon the development of irrigation. The northern part of the Great Plains drains to the Gulf of Carpentaria, the southern part to the Murray, and the western, which is an area of inland drainage, to Lake Eyre. West of the Great Plains, and of the South Australian Highlands

which lie to the south of Lake Eyre, the Western Plateau covers the greater part of the remainder of the continent. It consists, in the main, of pre-Cambrian and Palaeozoic rocks, which do not appear to have been under water since early geological times. In the south the Nullarbor plains, which make a great indentation in the plateau, belong to the Tertiary period; and along the west and north-west coasts there are narrow plains, also of Tertiary formation.

CLIMATE. The climatic factor exercises a very important control upon the economic development of Australia. The continent lies between the tenth and the fortieth parallels, and from one-third to two-fifths of it falls within the tropics. During summer the heat of the continental interior is very great, and in some districts the maximum shade temperature may be above 100° F. for weeks, or even months together. In January, the hottest month, the isotherms range from 64° F., in the south, to over 90° F., in the north-west part of the Western Plateau. Variations of temperature are naturally greatest in the interior, and over a large part of the continent ground frosts often occur at night. On the lowlands, and more especially around the coast, these are less frequent, and snow, though it occasionally falls in the south-east, never lies. In the highlands it is otherwise, and in the Australian Alps of New South Wales and Victoria the ground is white for several months each year. In July, the coldest month, the continent lies between the isotherms of 45° F. and 80° F.

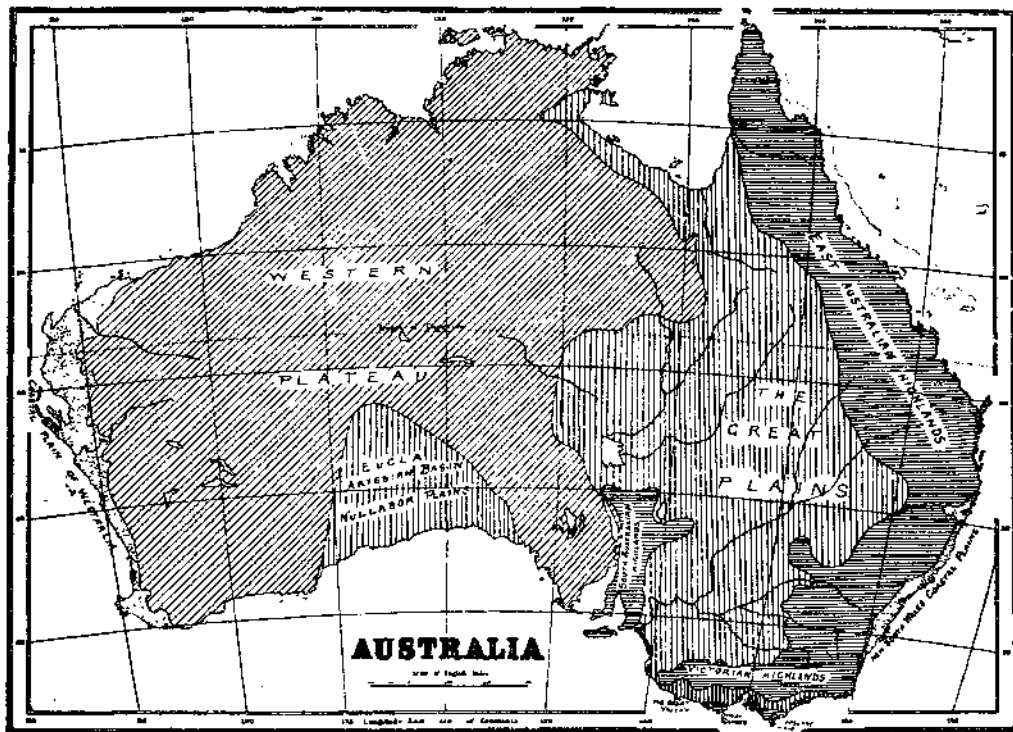
The distribution of rainfall is determined by several factors. In summer, when the equatorial low pressure belt has moved southwards, and when the area of minimum pressure lies over the northern part of the Western Plateau, the trade winds of the northern hemisphere are pulled across the Equator and blow as north and north-west monsoons. These bring much moisture, especially to the northern shores of the continent, though their influence is felt far to the south. At the same time, the east coast of Australia receives a considerable amount of rain from the south-east trade winds which blow upon it. On the west coast, on the other hand, the precipitation at this time of the year is very slight, as the winds, which blow towards it from the high-pressure area over the sea, are either turning round into the trade-wind system, and therefore away from the land, or, as they have previously crossed

the cold current flowing along the west coast of Australia, they are heated by their contact with the land, and therefore do not deposit the moisture they contain.

In the winter months conditions are greatly changed. There is no longer a heavy rainfall in the north, and, while the trade winds still blow towards the east coast, they do not penetrate far inland, nor do they lead to a heavy precipitation. But, as the whole wind system has moved northwards, the south-west of Western Australia, the south of South Australia, Victoria, and the south-east of New South Wales now lie on the margin of the belt of westerly winds, and receive rainfall from the cyclonic disturbances which originate in that belt and pass along the south coast from west to east. A line drawn from North-West Cape to Sydney roughly divides Australia into two parts, one with summer and the other with winter rainfall. The district comprising the south-east of New South Wales and the east of Victoria lies across the eastern extremity of this line, and as a consequence has its precipitation uniformly distributed throughout the year.

As a result of these conditions, the north and east coasts of Australia receive an average annual rainfall of at least 40 inches. This amount rapidly decreases inland, both towards the south and the west; and over part of the Great Plains and most of the Western Plateau the precipitation does not exceed 10 inches per year. In the region of winter rainfall, the south-west corner of Western Australia and part of Victoria have over 20 inches, but elsewhere less than that amount falls.

IRRIGATION. On considering these facts it is obvious that a large part of the continent is destitute of sufficient supplies of moisture to permit of its settlement, and that other parts, which receive in years of average rainfall the minimum amount necessary for this purpose, are in years of low rainfall subject to great disaster. Efforts have therefore been made to augment, by irrigation, the water supply of the marginal districts. The rivers offer no adequate means of so doing. On the north and east coasts they are perennial, but in the interior the only one which does not fail in times of drought is the Murray with its tributary the Murrumbidgee, which are snow-fed, and, although their waters are being utilized in various places to which reference will be made later, they can never provide for more than a mere fraction of the waterless area. Another



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Pro., J. W. Gregory, F.R.S.

THE MAIN GEOGRAPHICAL DIVISIONS OF AUSTRALIA

source of supply from which much has been hoped lies in the artesian basin of the Great Plains. In the Cretaceous system of that region an important series of rocks is composed of marine clays, and is known as the Rolling Downs formation. In the underlying sandstones, great supplies of water at high pressure are prevented from reaching the surface by the impermeable nature of the Rolling Downs, but when these are bored through, as has been done in Queensland, New South Wales, and South Australia, the water rises, sometimes with great force, either to the surface or within pumping distance of it. Concerning the origin of this water, there still is much dispute. Professor Gregory maintained " that much of this water is not rain-water which has worked its way downwards, but it is plutonic water, which has risen from the deeper layers of the earth's crust; and that the water rushes up the wells owing to the tension of its included gases and the pressure of the overlying sheets of rocks." This view is vigorously opposed by most Australian geologists, who hold that much of the rain which falls on the Queensland hills finds its way to the south coast of Australia by great subterranean channels, and that it is these channels which have been tapped by the artesian bores. But whatever be the truth, and it has not yet been finally determined, there would appear to be a diminution in the yield of many of the wells, and it has been found necessary to take steps to restrict the outflow to actual needs. Unfortunately, owing to its mineralized character, the water obtained from most of the wells is unsuitable for the irrigation of crops, and its chief use is for the watering of stock, the keeping open of stock routes across the interior, wool-scouring, domestic purposes, and in some cases the cultivation of lucerne. In other parts of Australia smaller artesian basins are gradually being developed, and on the Western Plateau, many shallow wells which collect rain-water have proved of great value to the development of the pastoral industry.

VEGETATION. The distribution of plant life follows that of rainfall in a marked degree. On the exposed slopes of Victoria and New South Wales grows the temperate rain forest, among the most important trees of which are numerous species of the genus *Eucalyptus*, including iron-bark, black-butt, and various gums. Over the remainder of the north and east coasts of Australia and for a varying distance inland, the prevailing type of vegetation is savanna

forest, distinguished alike by the gigantic eucalypti of which it is composed, and by the rich growth of grass between the trunks of the open wood. In the north it contains, in addition to the eucalypti, various palms, bamboos, and other trees belonging to a more tropical climate. Farther inland, there is in the south-east a great steppe region which includes and extends beyond the area with a rainfall of 10 to 20 inches ; and in the north-east and north a savanna of considerable breadth. In these regions the trees generally occur only where there is underground water, while the grass is xerophytic in character. In some places the grass gives place to scrub, such as mallee and wattle, and in others to salt-bush, a herb on which sheep manage to thrive. Over a great part of the remainder of Australia, desert or semi-desert conditions prevail. The Western Plateau is covered in places with mulga scrub, but the characteristic vegetation over wide areas is spinifex: " Spinifex in low straggling tussocks, or in high round compact stools . . everywhere in loathsome profusion grows that most useless and unattractive plant." The region of winter rains in south-west Australia has an evergreen sclerophyllous forest, in which jarrah is an important tree, but from there eastwards to the similar forest in South Australia and Victoria the south coast is bordered by scrubland except on the Nullarbor plains where steppe prevails.

GENERAL CONSIDERATIONS. The economic development of Australia has been, and is likely to be, controlled in a remarkable degree by its geographical position and conditions. The great distance of the continent from Europe, and from lands occupied by people of European stock, naturally tended to restrict immigration, especially at a time when the fertile wheat-fields of North America offered superior advantages in virtue of their easy cultivation and quick returns. If it had not been for the discovery of gold, which to a certain extent acted as a corrective, the process of occupation would have been even slower than was the case. But the mineral wealth of Australia, besides attracting a considerable number of people to its shores, gave it a supply of capital which was of great advantage to its development, when, on the decline of gold production in the eastern states, the inhabitants began to settle down to agriculture and pastoral farming.

The remoteness of Australia, too, from the area of European conflicts has hitherto kept it untouched by the hand of war, the

aborigines never having proved more than a passing annoyance. On the other hand, the fact that some of its more fertile regions, lying well within the tropics, are still practically unoccupied, constitutes a serious menace in these days when many people in the East are beginning to look for new homes. The Australians are, no doubt, right in attempting to make the whole of their country a white man's land; but, if they eventually find the tropical districts incapable of close settlement by their own race, they would do well to consider either the suggestion once made by the late Professor Gregory that, in such a case, Indian immigration might be promoted under restrictions that would confine it to regions which would otherwise be vacant, or the recommendation of the Dominions Royal Commission (1914), that more attention might be given to the immigration of South Europeans, such as Italians and Maltese, who are already at least partly acclimatized. Australia, with its comparatively small population distributed along several thousand miles of coast, already has a strategic position sufficiently weak without offering to alien peoples the inducement of large and fertile unoccupied areas.

Arable and pastoral farming are the most important industries of Australia, and wool and wheat together constitute nearly 60 per cent of its total exports. But, owing to the uncertain rainfall of many parts of the country, the output of each of these commodities is liable to considerable variation from one year to another. Sheep, which had numbered 106,000,000 in 1891, fell to an average of 84,000,000 during the period 1905-19 (inclusive), the result of the abandonment of many runs in districts where climatic conditions were too uncertain, and of the substitution of arable for pastoral land necessitated by the growth of the population. The gradual return to 106,000,000 in 1930 was the result of a series of more favourable seasons, but if the dangers resulting from overstocking are to be avoided, more intensive methods, such as the fertilization and even the seeding of the pastures and the conservation of fodder, already practised to some extent in the south, will have to be more generally adopted. The wheat crop, also, may suffer from drought, and since 1900 the average yield per acre has been as high as 16.08 bushels and as low as 2.40, the average for the last ten years being about 12. The improved methods of cultivation now followed have given greater security to the farmer, and the area cultivated

rose from an average of 8,500,000 acres between 1917-18 and 1921-22 to one of 18,000,000 acres in 1930. For some time past economic conditions have been unfavourable alike to the pastoralist and the arable farmer. Rising wages and higher tariffs have combined to raise the cost of production, and have given the producers of wool and wheat an unfavourable position in the world's markets.

QUEENSLAND

Queensland, with an area of 670,500 square miles, ranks second in size among the states of the Commonwealth, but for several reasons it is less fully developed than the others, and its population is little over one to the square mile. Four distinct natural regions may be recognized: the agricultural coast lands, the mineral highlands (*a*) in the east, (*b*) in the west, and the pastoral plains.

THE WESTERN HIGHLANDS consist of an area of old rocks along the boundary between Queensland and the Northern Territory, where the Barklay Tableland and the surrounding country form an eastern extension of the Western Plateau. The economic importance of the region is due mainly to its mineral resources, of which copper is the most important. Over one-third of all the copper mined in Australia is obtained in Queensland, Cloncurry being the largest producer. From the copper ores a certain amount of gold is recovered.

THE WESTERN PLAINS may be divided into two parts, according to the amount of moisture which each receives. In the north, the country, owing to its heavier rainfall, is more suitable for cattle than for sheep, and the former are therefore much in excess of the latter. Farther south conditions are reversed, and sheep-rearing is the chief pastoral pursuit, except in the extreme west; there, in some districts at least, cattle are more numerous, as the distance from good lines of communication renders sheep-farming unprofitable. Queensland possesses over one-sixth of the Australian flocks, and it is mainly on the plains that her share is to be found. The whole of the region lies within the artesian basin, and water is obtained from over 3,000 wells, artesian or sub-artesian, but there is very little agriculture, and it is mostly used for stock.

THE EASTERN HIGHLANDS are important mainly because of the mineral wealth which they contain. There is a certain amount

of agriculture in the south, especially on the western slope, where within recent years the basaltic soils of the Darling Downs have become noted both for arable and pastoral farming. Wheat and maize are grown, and large numbers of sheep are grazed. Elsewhere in the Eastern Highlands, the conditions of climate and soil are more favourable to cattle than to sheep.

The mineral output includes gold, copper, coal, and tin. Within recent years the production of gold and copper has declined rapidly, partly, it is said, on account of obsolete plant and methods of treatment. Work ceased at Mount Morgan in 1927, although, unlike the once famous Charters Towers field, its resources are not yet exhausted. At present, Ravenswood, about sixty miles south of Townsville; Gympie, about 100 miles north of Brisbane; and Mount Coolon, about 100 miles south-west of Mackay, are the chief sources of gold. Tin is obtained at Herberton and Kangaroo Hills in the north and at Stanthorpe in the south-east.

Large deposits of coal are known to exist in various localities, but, as they are often at some distance from the coast, and do not have the facilities for export possessed by the fields of New South Wales, their development is comparatively slow. The chief mines worked at present are those round Ipswich, which is twenty-three miles south-west of Brisbane, and has the advantage of being connected with the coast by the river Bremer. The coal is largely used for railways, shipping, and manufacturing industry in the coast towns.

THE COASTAL PLAINS, with which may be included the lower valleys of the rivers, have a rich soil and a warm and moist climate, and are fertile and productive. Though cattle-raising and dairying are pursued to some extent, agriculture is the principal occupation of the people. Maize, the most important cereal of Queensland, is grown in the south. Farther north, where the mean annual temperature does not fall below 68° F. and where the annual rainfall exceeds 40 inches, sugar-cane is extensively cultivated. The chief producing areas lie between Bundaberg in the south (where irrigation is necessary) and Cairns in the north. Of these, the districts round Mackay and Cairns are at present the most important. Formerly, the plantations were worked mainly by Kanakas, but, in pursuance of the "White Australia" policy, these were repatriated, and the sugar crop of Queensland has since been produced by

white labour. On the other hand, a certain amount of financial assistance has been given to the industry by special fiscal arrangements. As the output of sugar has somewhat increased since these changes were inaugurated, they may reasonably be claimed to have been a success. Whether or not the tropical climate will permit the growth of a white agricultural population, not constantly recruited from temperate regions, is a more debatable matter, and the attempts in this direction must still be regarded as being in the nature of an experiment.

Both soil and climate appear to be well adapted to the cotton plant, but the want of a supply of cheap labour has prevented its extensive cultivation. The high price of cotton after the War, together with a Government guarantee of a minimum return, induced many farmers to devote more attention to it. From less than 10 acres in 1915, the area under cotton increased to 50,000 acres in 1924, but the average acreage since 1926 has fallen below 20,000. At present the industry would appear to depend for its existence on Government bounties paid on home-grown cotton and on home-spun yarn. Coffee and tobacco are cultivated, but in each case the industry is of little importance. Fruit-growing is more prosperous, and bananas, oranges, pineapples, mangoes, and plums are all raised.

TOWNS AND COMMUNICATIONS. The towns of the coastal plain are situated, either on the coast, or on navigable rivers ; and their main function is to act as collecting and distributing centres, though in some cases they prepare raw material for export. Brisbane, the capital, is situated in the more temperate south, on the Brisbane river, twenty-five miles from Moreton Bay and at the head of navigation for large vessels. It is connected with the interior by a railway which runs through Toowoomba (near the junction for Sydney) to Charleville and Cunnamulla. Thus it taps some of the trade of the Darling Downs (though much of this goes by Sydney), and of the great pastoral districts beyond. It also receives the products of the coastal plain by a line which runs northward, through the mining town of Gympie, to Rockhampton, Mackay, Townsville, and Cairns. Rockhampton is situated on the navigable Fitzroy river, forty-three miles from its mouth, and, besides being the port for a rich agricultural area along the coast, and the outlet of the Mount Morgan mining district, it is connected by rail with the pastoral

regions of central Queensland. Mackay is the centre and port of the chief sugar-producing district. Townsville is connected by rail with the mining areas of Charters Towers and Cloncurry, and serves as a port for a considerable part of northern Queensland. Cairns is surrounded by sugar plantations and orchards, and is connected by rail with Herberton and Charleston. Queensland railways have a 3 feet 6 inch gauge, but a line is being constructed from South Brisbane to Kyogle, which will link up with the New South Wales system and provide uninterrupted standard gauge (4 feet 8½ inches) communication with Sydney.

NEW SOUTH WALES

The main physical regions of Queensland—coastal plains, highlands, and western plains—are continued in New South Wales. The coastal plain, indeed, is more fully developed there than in any other part of the east coast, and has, as a rule, an average breadth of about 30 miles. The Eastern Highlands continue to present their steep escarpment to the Pacific, and for some purposes a distinction may be drawn between the tableland itself and the long gentle slope to the west. The Western Plains consist in the north of marine and lacustrine deposits, and in the south of alluvium brought down by the Murray, Murrumbidgee, and other rivers; while large areas of Lower Palaeozoic rock lie between the Darling and the Bogan and to the south of the Lachlan. In the extreme west a small region of Archaean rocks, including the Barrier range, falls within the state, and may be treated separately.

THE WESTERN ARCHAEOAN REGION contains in Broken Hill one of the most important silver-lead mines in the world. It produces the greater part of the silver-lead ore and zinc mined in Australia, the total value of the output up to the present time being estimated at over £140,000,000. The state of New South Wales derives comparatively little benefit from the exploitation of these mines, as they lie far from its coasts and the ores are treated at Port Pirie in South Australia, with which they are connected by rail.

THE WESTERN PLAINS really consist of two distinct regions. In the western two-thirds, the rainfall as a rule does not exceed 15 inches, and is often less than 10 inches, while in the eastern third it is generally above that amount. The difference between the two districts is indicated fairly well by the amount of stock carried by

each at the present time. In the occupied lands of the western division, the stock equivalent is one sheep to 12 acres; and in those of the eastern, one sheep to about two acres. In the western division, again, only an insignificant part of the land is under cultivation, while in the eastern, arable farming has made rapid progress, more especially in the Riverina (the district between the Murray and the Murrumbidgee), where the Tertiary soils are particularly fertile and the rainfall adequate. The eastern region, as a whole, contains nearly one-third of the sheep of New South Wales and over one-third of its wheatfields. In it also is to be found one of the most important irrigated areas in Australia. The waters of the Murrumbidgee until they are required are held back by a great dam which has been constructed across the river at Burrinjuck. When wanted they are allowed to flow downstream about 200 miles to Narrandera, where they are withdrawn and distributed by means of canals over the irrigation area to the north of that place. At present about 60,000 acres are irrigated, but it is estimated that at least 200,000 acres will eventually be brought under intensive cultivation. Lucerne, cereals (rice and wheat), and fruit are the chief crops. Minerals are found in those areas where the lower Palaeozoic rocks occur, but the Cobar gold and copper field is no longer productive, and the output of the region is insignificant.

THE EASTERN HIGHLANDS include two different agricultural regions—the tableland and the western slope. The latter is the more productive, especially in its central and southern parts, which along with the Riverina contain about four-fifths of the land under wheat in the state. In these districts the mean annual rainfall is from 15 to 25 inches, but there, as in other parts of New South Wales, the bulk of the wheat is produced where the mean precipitation of the growing season (April to October) does not fall below 10 or rise above 15 inches. Wheat, it is true, can be grown with a rainfall of less than 10 inches during these months, but only on ground which has lain fallow and been cultivated so as to conserve the moisture during part at least of the previous year. In the north of the region where the rainfall, much of which falls in summer, is less reliable, little wheat is grown. The highlands, as a whole, are extensively used for grazing purposes, and over one-half of the sheep and nearly one-third of the cattle of New South Wales are fed upon their pastures. The more favourable climatic

conditions of this region, as compared with those farther west, are shown by the fact that the occupied land has on an average one sheep to the acre.

Deposits of the precious metals are widespread. Gold is found in various places, copper in the north and in the south, and tin in the north. Iron ore occurs in the Blue Mountains and elsewhere, but the output is as yet small, although the proximity of the western coalfield, the chief mines of which are also in the Blue Mountains, has made possible a certain amount of iron smelting at Lithgow and other towns.

THE COASTAL REGION, with much fertile soil, favourable climate, great coal resources, valuable hinterland, and facilities for commerce, is one of the most important on the whole continent. The area under crops is not very great. Sugar-cane is cultivated in the valleys of the northern rivers, but the amount of sugar produced is much less than in Queensland. Maize is the chief cereal, especially in the north, as climatic conditions are unfavourable to wheat. The region is more suited to cattle than to sheep, and with over four-fifths of the milch cows in the state, it has become the chief dairying district in the Commonwealth. The mineral wealth of the region consists mainly of coal, and two important coalfields lie within it. The northern, or Hunter River district, of which Newcastle is the centre, produces about two-thirds of the total output of the state. The coal is of good quality, and the ease with which it can be exported from Newcastle makes the field of special value. The Illawarra field, some distance south of Sydney, has an output of over one-fourth that of the northern, but coal from it is much in demand for steam purposes, and a harbour has been built at Port Kembla to facilitate its export.

TOWNS AND COMMUNICATIONS. Sydney, with its magnificent harbour, is the largest town and chief port of New South Wales, and may also be regarded as the centre of its railway system. From it, a line runs along the coastal plain to Newcastle, and is continued by way of the northern tableland to the Queensland frontier, where it joins the line to Brisbane; a branch which breaks off at Werris Creek is connected with several points on the Darling river, thus serving the agricultural areas in the north-eastern part of the plains. On the south, Sydney is connected with the Victorian railway system at Albury, on the Murray, by a line which crosses the tableland and

runs along the south-western slope of the highlands. From this line there breaks off at Goulburn, the centre of an agricultural district on the southern tableland, another which runs southward by Queanbeyan to Nimmitabel, and serves the agricultural and mining districts of which these are the chief towns. Other branches go to Wyalong, engaged in gold mining, and to Hay, in the pastoral section of the Riverina. From Sydney, a railway runs by Bathurst, formerly a mining but now an agricultural centre on the tableland, to Bourke on the Darling, in the midst of a great pastoral region. Branches from this line go to the mining town of Cobar and various agricultural towns in the east central part of the great plains. The Murray, Darling, and Murrumbidgee, all afford navigable waterways, the only ones of importance in Australia.

VICTORIA

Victoria, with an area of almost 88,000 square miles, is the fifth in size among the states of the Commonwealth. It falls into several distinct physical regions. The highlands run from east to west, being much broader in the east than in the west, and are generally built up of older Palaeozoic and granitic rocks. To the north the land slopes down to the Great Plains, overlaid by silt deposited in Tertiary times ; and in the south to the Great Valley, covered by volcanic material in the west and by Tertiary soils in the east. Beyond the valley lie the Otway and Gippsland Hills, formed of Jurassic rocks, but of no great height or extent.

The distribution of moisture throughout the state is very irregular. In the highlands, and on the upper slopes of the Otway and Gippsland Hills, the mean annual rainfall is generally over 40, and in some places over 50 inches, while in the Great Valley it does not exceed 30 inches. On the plains, it has a range of from 10 to 20 inches, being as a rule over 15 inches, except in the Mallee country of the north-west, where it is below the latter amount. It ought to be noted, however, that the actual precipitation varies considerably from one year to another, and that, in districts where the average rainfall is just sufficient for successful cultivation, any reduction from it may entail disastrous consequences.

Physical and climatic conditions determine four main natural regions: the Great Plains, the Highlands, the Great Valley, and the Otway and Gippsland Hills.

THE GREAT PLAINS form an important agricultural and pastoral area, and contain, notwithstanding their relatively unfavourable climatic conditions, four-fifths of the cultivated land of Victoria. Wheat is the chief crop raised, and over nine-tenths of the total wheat production of the state is from the Wimmera, Mallee, and Northern districts of the Great Plains. The average rainfall for the wheat-growing season ranges from about 15 inches in the southern parts of the Wimmera and Northern districts to 8 inches or less in the Mallee. The crop is, therefore, somewhat uncertain, as is indicated by the fact that during the twelve years 1907-19 the average for the three best years was 15.5 and for the three worst years 5.5 bushels per acre. In some parts of the Mallee the yield is usually low, but improved agricultural methods, including the practice of fallowing and the use of superphosphates, have been adopted with beneficial results there and elsewhere throughout the region. The marginal position of the Mallee is evidenced by the average yield per acre, which for the three years 1926-7-8 was 7, 13, and 3.5 bushels respectively.

Pastoral pursuits are also extensively followed, and over one-third of the sheep in Victoria are in the region under consideration. These are generally found in the north and west of the plains, the Mallee country being as a rule unsuitable. Cattle are also reared in the north. The stock equivalent varies from one sheep to an acre in the northern districts to one sheep to three acres in the Mallee.

Victoria lies outside of the artesian basin proper, but, except in the Wimmera-Mallee district, where it has been necessary to construct storage works, sufficient water for stock and domestic purposes is usually found in the plains at shallow depths. In addition, irrigation works have been constructed, especially in the north, where water can be obtained from the Murray and its tributaries—the Goulburn and the Loddon. Among the most important of these irrigation settlements are the districts round Shepparton, Rodney, and Tragowel Plains, watered by the Goulburn; and the lands about Cohuna, Swan Hill, and Mildura, watered by the Murray. Mildura, in the north of the Mallee, has become an important fruit-producing region, and exports considerable quantities of raisins and tinned fruits. In all, over 477,000 acres can now be cultivated by means of irrigation in the Great Plains; cereals, lucerne, and fruits are the principal crops.

THE HIGHLANDS are as a rule unsuited for cultivation except in the river valleys, and pastoral rather than arable farming prevails. On the mountain slopes there are vast supplies of timber, which have as yet been exploited only to a limited extent. Mining was formerly the main industry of the region, and gold its most important product, but within recent years the output has dwindled to insignificance.

THE OTWAY AND GIPPSLAND HILLS lie to the south of the Great Valley. As a result of the heavy rainfall the slopes are covered with timber. In the Jurassic rocks of the Gippsland region the chief coal deposits of the state are found, but the amount produced is not large, and considerable quantities have to be imported.

THE GREAT VALLEY is primarily a pastoral and dairying country, and contains nearly two-fifths of the total number of cattle and sheep in the whole state. The western district, which consists largely of soils of volcanic origin, is in many places fertile and covered with rich grass. Formerly, it was almost entirely devoted to the raising of sheep, and it still contains over one-fourth of those in Victoria, although large areas have been diverted to arable farming and dairying. The rainfall is heavier than on the Great Plains, and the stock equivalent on the occupied lands is about one sheep to the acre. The central district has good soil and is well watered. Its position, round the most densely populated part of the state, has made it important for the cultivation of orchard and garden produce, and dairying is also carried on. The eastern district is in a much less developed condition, and stock-raising is the chief occupation of its inhabitants, though vigorous, and not unsuccessful, attempts are being made to revive and extend the cultivation of sugar-beet in the country round Maffra. In the Great Valley and to the south of the Gippsland Hills there appear to be great deposits of brown coal of which as yet very little is known.

Having access to the sea on the one hand, and lying between it and the interior regions on the other, the Great Valley contains the ports through which the trade of Victoria passes. Of these the first is Melbourne, the second largest city in Australia, occupying a central position on the Yarra-Yarra a few miles above the point at which it enters Port Phillip. To it ships drawing twenty-two feet of water can now make their way, but larger boats do not go

beyond Williamstown or Port Melbourne at the mouth of the river. Geelong, on a western extension of Port Phillip, is the port of the western district, and is noted for its manufactures of woollen goods. Among minor ports are Portland and Belfast in the west, and Cunninghame in the east.

RAILWAYS. As Melbourne is the chief outlet of the state, the more important lines of communication naturally converge upon it. In the south-east, the eastern district of the Great Valley and the coal mines of Gippsland are connected with the capital by the South-Eastern Railway. The North-Eastern runs north and north-east to Albury on the frontier of New South Wales, where it is connected with the line for Sydney, but unfortunately the two systems are not on the same gauge. Branches from the North-Eastern line reach the Murray at Yarrawonga, Echuca, and elsewhere. The Northern Railway runs north-west to Bendigo, from which point lines diverge to Echuca, Swan Hill, and other points on the Murray. It is through those river ports of the Murray, from Yarrawonga downwards, that most of the trade of the western Riverina passes, as that district is nearer to Melbourne than to Sydney. The North-Western line goes by Ballarat (where a branch diverges to Mildura) to Serviceton on the frontier of South Australia, where it connects with the railway for Adelaide. The ports in the south-west are connected by a line which runs from Melbourne by Geelong to Portland,

SOUTH AUSTRALIA

South Australia, from which the Northern Territory was finally separated in 1911, may be divided into two great climatic areas—the temperate south and the arid interior. In the former, where the average annual rainfall is at least 10 inches, several distinct physical regions may be recognized. The plains in the south-east occupy the site of the estuary into which the Murray, the Murrumbidgee, and the Darling probably once entered by separate mouths. To the north-west, the South Australian Highlands run from north to south and consist of numerous ranges separated from one another by undulating or nearly level plains. Running parallel to them is the Great Valley which includes Spencer and St. Vincent Gulfs, the coastal plains lying about these, and, in the arid area, the swampy country of Lake Torrens. That part of the Western Plateau, which has a rainfall of at least 10 inches, lies south of a

line drawn from Port Augusta along the Gawler Range to the shores of the Bight near Eucla.

THE MURRAY PLAINS may be subdivided. South of the thirty-sixth parallel, where the April to November rainfall is from 15 to 25 inches, little wheat is grown, and oats are relatively more important. Dairy farming is carried on, more especially in the south-eastern part of the region, where the rainfall is heavier and the volcanic soils around Mount Gambier more fertile; the chief potato-growing district in the state is also in the vicinity of Mount Gambier. Sheep are raised in large numbers, and the stock equivalent is one sheep to about four acres. North of the thirty-sixth parallel conditions are very different. To the south of the Murray, where the rainfall for the wheat-growing season is from 7 to 12 inches, wheat is an important crop, but the average yield, very bad years excepted, is just under 10 bushels. North of the Murray the rainfall is too low for wheat. Cattle and sheep are less numerous than in the previous region, and the stock equivalent is one sheep to thirteen acres. The first irrigation colony in South Australia was established at Renmark, on the Murray, about fifty miles below the point at which it enters the state, and here are grown the vines from which sultana raisins and Zante currants are obtained, while apricots, oranges, and various other fruits also flourish. Within recent years several new colonies have been settled lower down the river, and it is probable that the future will see a further development of irrigation works in this region.

THE HIGHLANDS are built up of late pre-Cambrian and lower Palaeozoic rocks, and form a plateau rather than a mountain system. In many places the soil is fertile; over the greater part of the centre and south of the region, where the April to November rainfall is approximately between 10 and 16 inches, wheat is an important crop, and the highlands as a whole contain about one-third of the wheat acreage of the state. In the more southerly parts, also, there are numerous districts suitable for the cultivation of the vine and the production of good wines. Sheep are reared throughout the highlands, which contain about one-third of the South Australian flocks. In the highlands, too, are situated the Kapunda and Burra-Burra copper districts, formerly the most productive in the state, but now lying idle. Gold is worked in various places, but the total output is small; considerable deposits of silver-lead are known to

exist. In the pre-Cambrian rocks of Yorke Peninsula, which may be considered as an outlying part of the Highland region, are the copper mines of Wallaroo and Moonta, which, for the present at least, have been closed down. There are large deposits of iron ore at Iron Knob, about 40 miles W.S.W. from Port Augusta. Owing to the want of coal it cannot be smelted in South Australia, but some of it is shipped to the iron-works at Newcastle.

THE GREAT VALLEY, which lies to the west of the Highlands, is a partly submerged rift-valley. In the south it contains fertile fields about Adelaide and Gawler ; farther north much of it is suitable only for pastoral purposes ; in the vicinity of Lake Torrens the land is generally useless. The Great Valley naturally contains the chief outlets of the state. Of these the most important are Port Adelaide, the port of the capital and of much of the agricultural region ; Port Pirie, which smelts and exports the products of the Broken Hill mining district of New South Wales ; and Port Augusta, which serves the northern part of South Australia.

THE WESTERN PLATEAU—EYRE PENINSULA. In the coastal districts considerable development has taken place within recent years. The cultivation of wheat is rapidly extending, and over one-fourth of the wheat acreage of the state lies within the region. As the mean rainfall for the growing period seldom exceeds 11 inches, the average yield is low, and for the five years 1923-8 was only a little over 8 bushels. Pastoral farms are also increasing in number, and on the occupied lands in the coastal districts of the Eyre Peninsula the stock equivalent at the present time is one sheep to nine acres; in the interior, however, the carrying capacity of the land appears to be considerably lower.

THE ARID INTERIOR can only be developed to a slight extent. In years of sufficient rainfall a certain amount of pastoral farming is possible, and in normal times at least one-sixth of the sheep in South Australia are found within the arid region. But in years of drought great loss can be avoided only by moving stock into the wetter districts, and for that reason the sheep stations of the area under consideration are usually found not far from one or other of the three railways by which it is traversed. Apart from gold-mining, which takes place at Tarcoola (on the Trans-continental Railway, nearly 400 miles north-west of Adelaide), there is no other industry of note.

COMMUNICATIONS. Adelaide may be regarded as the railway centre of South Australia. One line runs eastward from the capital across the highlands, and south-eastwards across the plains of the Murray Basin, to Serviceton, where it is connected with the Victorian railway system and sends off a branch to Mount Gambier. Another line going northwards from Adelaide has connections with Morgan, at the great bend of the Murray, Wallaroo, Port Pirie, Broken Hill, and Port Augusta, and finally comes to an end at Alice Springs, in Northern Territory. Port Augusta is the starting-point of the trans-continental line which runs to Kalgoorlie and connects eastern and western Australia.

WESTERN AUSTRALIA

Western Australia contains one-third of the area of the whole Commonwealth, and is the largest of the states of which it is composed. The country consists in the main of a plateau ranging in height from 1,000 to 2,000 feet. Over the southern part of this plateau pre-Cambrian rocks predominate, and pre-Cambrian and Palaeozoic formations cover considerable areas in the north. On the west there is a coastal plain built up of sandstones and shales of more recent origin, while in the south-east the greater part of the Nullarbor limestone plains are included within the limits of the state. Two natural regions are marked off by climatic conditions, one in the north within the summer monsoon area, and the other in the south-west within the belt of winter rains. The remainder of the state is less easy to divide, as its conditions and potentialities are as yet imperfectly known. To the east of long. 122° or 123° E., however, much of the land consists of sand dunes fixed by mulga scrub and spinifex, while to the west are considerable areas of scrub and some savanna, both of which are capable of a certain amount of development. In the latter region also are situated practically all the gold-producing districts which have as yet been discovered.

THE EASTERN DESERT, which also contains scrub-land in places, is inhabited only by a few aborigines, and the scarcity of water is so great that its future development is unlikely unless rich mineral areas are discovered within it.

THE WESTERN SCRUB-LAND REGION has made considerable progress in recent years, mainly as a result of the exploitation of its mineral wealth. This is obtained in the dioritic rocks, which

occur in more or less parallel belts generally running from north-west to south-east. Most of the fields possess other metals in addition to gold, but in all cases it is the chief product. The East Coolgardie, Mount Margaret, and Murchison fields are the most important at the present time. From the first of these fields, on which Kalgoorlie is situated, about three-fourths of the annual output of gold in Western Australia is now obtained, and from it has come more than half the total amount produced by that State. The annual output, which for the years 1901-6 averaged over £8,000,000, has lately fallen to less than £2,000,000, and, unless further discoveries are reported, it would appear that the best days of gold mining in Western Australia are past. In future the country will probably have to depend very largely upon the economical exploitation of deposits of lower grade than have hitherto been worked. Copper is found along with gold, more especially on the Phillips River, Mount Margaret, and West Pilbara fields, while tin occurs in the Marble Bar district of Pilbara. At present neither is worked to any extent.

The arid climate renders the land unsuitable for cultivation, but there has recently been a considerable extension of the pastoral area. This is in part due to the discovery that, underlying the sands and silts which have accumulated over the Archaean rocks, a sufficient supply of water may be obtained for stock and domestic purposes. About one-half of the sheep in the state are now grazed in this region, the more favourable districts of which are on the west and north-west coasts. The limestone region of the Nullarbor Plains contains large areas of pasture land suitable for sheep, but it is practically uninhabited, with the exception of a narrow strip along the coast, where water can easily be obtained.

THE NORTHERN DISTRICTS have a heavier rainfall (20 to 40 inches) than the previous regions, and are on the whole more suited to cattle than to sheep. Hence it is that most of the cattle of Western Australia, but very few of its sheep, are raised there. Arable farming is as yet of no importance. A little gold is obtained in places.

THE SOUTH-WEST REGION is agriculturally the most valuable in the state, and contains practically the whole of its cultivated land. The general trend of the isohyets is parallel to the coast, and in the extreme south-west, where the rainfall diminishes inland from

40 to 20 inches, there is a belt of well-wooded country in which the chief pursuits are fruit-growing, dairying, and mixed farming generally. Valuable hardwoods are provided by several varieties of eucalyptus, of which jarrah and karri are the most important. The next belt, with a rainfall decreasing from 20 to 12 inches, is the great wheat-producing area of the state, the largest proportion of land devoted to that crop being where the annual rainfall is about 15 inches. Sheep are found throughout the whole of the south-west region, but mainly in that part of it which has a rainfall of between 15 and 30 inches; they reach their maximum density—one sheep to two and a half acres—in those districts which have a rainfall of about 20 inches. The most important minerals are coal, which is found at Collie, in a shallow basin on the Archaean plateau; and tin, obtained mainly from alluvial deposits at Greenbushes, some distance farther south.

TOWNS AND COMMUNICATIONS. The capital of the state is Perth, which is situated on the Swan River, about twelve miles from its mouth at Fremantle, the leading port of Western Australia. From Perth, the Great Southern railway runs to Albany, the port of the south coast; while the South-Western railway connects the capital with the mining districts of Collie and Greenbushes, and with their port at Bunbury. The Eastern railway runs from Perth to Kalgoorlie, with one branch southwards by Norseman, in the Dundas mining district, to the coast at Esperance Bay, and another northwards to Laverton, on the Mount Margaret goldfields. From Kalgoorlie, the trans-continental railway runs eastward to Port Augusta in South Australia; it has a length of about 1,100 miles. Geraldton, the port of Murchison goldfields, is connected with them by the Northern railway, and with Perth by the Midland. Broome, on Roebuck Bay, is the chief port on the north-west coast.

THE NORTHERN TERRITORY

The Northern Territory has an area of 523,620 square miles. In the south there are great areas of desert and scrub, but as the isohyet of 20 inches is approached these are replaced by savanna, and along the coastal districts of the north by savanna forests. In the south a small part of the arid region lies within the artesian basin, and there a certain amount of pastoral farming is carried on with the aid of irrigation. Gold is found in the Arltunga district, situated

among the ancient rocks of the plateau crossed by the Macdonnell ranges. Farther north, there are stretches of grassland which may yet be utilized for pastoral purposes. If the railway from Darwin to Birdum (316 miles), which is to be continued to Daly Waters, were linked up with the line from Adelaide to Alice Springs, it might do much for the development of this region.

In the more humid area to the north two regions may be distinguished, the plateau and the coastal plain. On the first of these much of the land is suitable for cattle-raising, and that industry is the most important agricultural pursuit of the whole Territory. Attempts have been made to cultivate the coastal plain where climatic conditions would permit the growth of cotton, rice, sugarcane, and other tropical products, but without a large supply of labour, of which there is at present no prospect, such attempts can only prove of experimental value. Peanuts are at present the chief crop.

The total population of the Northern Territory, excluding aborigines, is about 4,000, and of these the majority are of European extraction. The aboriginal population is believed to number 20,000. The chief town is Darwin on Port Darwin, one of the best harbours in Australia. Large meat-preserving works, which were established there in order that cattle need not be sent overland into Queensland or Western Australia, have been closed down.

TASMANIA

Tasmania, an island lying to the south of Victoria, from which it is separated by Bass Strait, is the smallest of the Australian states. It consists in part of a much dissected plateau, the average height of which is about 3,500 feet, though in places it rises to over 5,000 feet; and in part of plains which surround the plateau and are broken up by numerous mountain ranges. The whole of the north and west of the island consists of Palaeozoic and older rocks; through those in the north various eruptive masses have in later times made their way and frequently weathered down into fertile soil. In the east and south-east, the rocks, mainly of igneous origin, belong to Permian and later times.

Tasmania, lying farther to the south than the continent to which it belongs, is exposed to the full force of the westerly winds. The west coast and the plateau, accordingly, have a heavy rainfall,

which varies from 40 to 60 inches and even more ; while in the more sheltered eastern part of the island the precipitation does not, as a rule, exceed 30 inches, except along the coast, where it is somewhat greater. In the wetter districts the land is covered with warm temperate rain-forest, but in the drier parts vegetation is of the savanna type.

Agriculture, pastoral farming, and mining are the chief occupations of the inhabitants. The most important agricultural areas lie either immediately to the east of the plateau or in the north-west, the former being more important for wheat and barley, and the latter for oats and potatoes. Fruit-growing is carried on mainly in the south and south-east. Sheep are pastured on the drier lands of the eastern half of the island, more especially in the midlands, while cattle are reared in all the settled districts.

Mining operations are carried on principally in the west. Copper is obtained at Mount Lyell, north of Macquarie Harbour, and elsewhere ; silver-lead ores at Zeehan and other places north of Mount Lyell; and tin at Mount Bischoff in the north-west, and at various districts in the north-east and east. The chief coal deposits are found in an outlier of Triassic rocks in the east, the most productive area at the present time being around Fingal, in the valley of the South Esk.

The two largest towns are Hobart, the capital, on the Derwent, twelve miles from its mouth, and Launceston, the chief commercial centre, on the Tamar, not far from the head of its estuary. These towns are connected by rail with one another, and with the coal-fields of the east and the mineral districts of the west and north-west.

FOREIGN TRADE

The value of the foreign trade of Australia for the three years 1929-31 was as follows—

	Imports	Exports
1929	£145,177,000	£123,562,000
1930	94,441,000	85,674,000
1931	43,457,000	70,930,000

The principal imports and exports for the same years were as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Textiles ..	17.7	Wool	38.7
Oil	7.6	Wheat and flour	18.9
Motor-cars, etc.	6.3	Butter	7.6
Machinery ..	5.8	Meat	6.0
Iron and steel ..	4.2	Hides	5.1
Paper	4.2	Metals	3.9
Tea	2.8	Fruit	3.7
Drugs	2.6	Sugar	2.2

The chief importing and exporting countries are as follows—

Imports from	Percentage of total imports		Exports to	Percentage of total exports	
	1928-9	1929-30		1928-9	1929-30
United Kingdom	39.76	41.88	United Kingdom	38.09	52.99 ¹
United States ..	24.58	23.40	Egypt -- ..	10.45	8.10
Netherlands E.			Japan	7.95	5.24
Indies	4.94	4.85	Germany	6.72	4.99
India	4.21	3.88	Belgium	6.24	4.42
Germany	3.13	3.35	Hong Kong ..	6.13	4.36

Of the more important imports into Australia, Great Britain supplies the largest quantities of textiles and wearing apparel, and of iron and steel goods and machinery. The United States and Germany also provide textile goods, and Japan is the chief source of silk and silk fabrics. Motor-cars come from the United States, and mineral oils from the United States and the Netherlands East Indies. Paper is imported from Great Britain and Canada, tea from India and the Netherlands East Indies, and chemicals and drugs from Great Britain and Germany.

Of the exports, wool is the most important, and of that Great Britain takes nearly one-third; France, Germany, Japan, Belgium, and the United States consume the greater part of the remainder.

¹ Includes heavy shipments of gold.

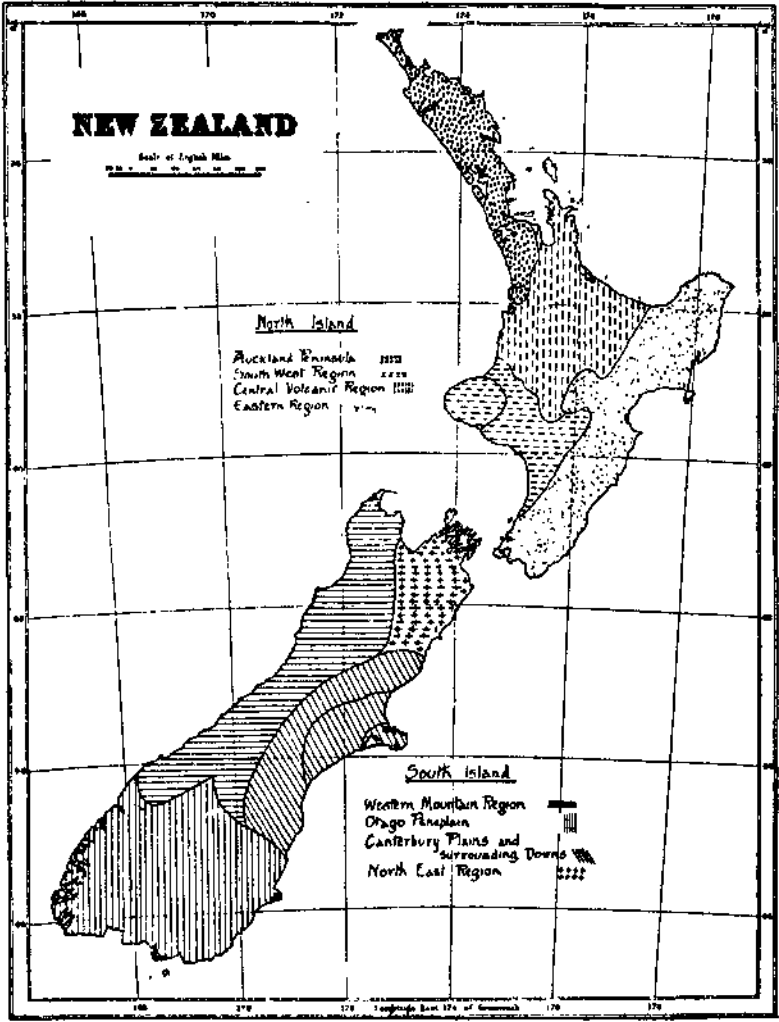
Of the wheat and wheat flour exported, Great Britain also takes one-third, other important purchasers being Italy, Japan, South Africa, and *Egypt*. Great Britain is likewise the chief purchaser of butter and meat, fruits and sugar. Hides and skins are sent mainly to the United States, but also to Great Britain, France, Germany, and Belgium. Great Britain, Japan, Germany, and Belgium are the chief markets for such metals as lead, tin, and zinc.

CHAPTER XLVII

NEW ZEALAND

THE Dominion of New Zealand includes North Island, South Island (sometimes called Middle Island), and Stewart Island, along with the Chatham Islands and several other groups in the surrounding seas. The total area amounts to 103,861 square miles, which is rather more than five-sixths of the area of the British Isles. New Zealand proper lies between the 34th and 48th parallels of south latitude, with a general trend from south-west to north-east. South Island, the largest of the group, contains the Southern Alps, which run parallel to the west coast from Cook Strait to about lat. $44^{\circ} 30' S$. These are fold mountains which separate a narrow west coast district traversed by spurs projecting from the main chain from a broader and much broken eastern district ; in the west, metamorphic and gneissic rocks with granitic intrusions are found, but in the east the prevailing formations are shales and greywacke probably belonging to the Secondary era. Lands of recent origin lie along the middle part of the east coast, and form the well-known Canterbury Plains. To the north of these, Mesozoic rocks reappear in the Kaikoura Range, which runs in a north-easterly direction parallel to the Southern Alps. The southern part of the island is an ancient and elevated peneplane which has been much dissected by rivers flowing in a southerly direction, and it therefore consists in part of valleys and in part of residual ranges, all having the same general trend. The Kaikoura mountains are continued along the east of North Island by the Ruahine Range. Between it and the coast is a belt of downs country of Tertiary age, while to the west is the extensive volcanic region of Lake Taupo with the volcanic cones of Tongariro and Ruapehu. The most westerly part of the island consists of another great volcanic cone, Mount Egmont ; while the north-west is built up of small ancient massifs surrounded by Tertiary deposits and volcanic outflows.

CLIMATE. The temperature and rainfall of New Zealand are mainly controlled by the fact that the greater part of the Dominion



NATURAL REGIONS OF NEW ZEALAND

lies within the influence of the strong westerly winds. Hence its temperature is lower than its latitude, when compared with corresponding latitudes in the northern hemisphere, would appear to warrant. On the other hand, the sea exercises a modifying influence, and the range of temperature between summer and winter, and between north and south, is never great. Auckland, for example, has a January mean of 66.5° R, and a July mean of 51.8° F., while Dunedin, over 600 miles farther south, has a January mean of 57.0° F. and a July mean of 41.5° F. .

The rainfall is on the whole well distributed, both with regard to time and place. In North Island, and more especially in the northern part of it, autumn and winter rains prevail, but, owing to the influence of the surrounding seas, summer droughts are not so marked as in other regions with a Mediterranean type of climate. Except in the more elevated districts where it is much heavier, and in sheltered localities where it is lower, the mean precipitation of North Island is generally between 50 and 70 inches. In South Island, the mountains of the west coast receive the full force of the westerly gales and obtain in consequence a rainfall of 100 inches and more. This gradually decreases eastwards, and over the Canterbury Plains it does not exceed 30 inches.

VEGETATION. A great part of New Zealand is, or has been, forested, but the higher hills frequently stand well above the tree line and are covered with grass, which is also the prevailing type of vegetation upon the Canterbury Plains and over much of the Otago peneplane. Among the trees of the warm temperate forest of North Island are the valuable kauri, which is, however, confined to the Auckland peninsula, and pines such as the totara and matai. These reappear in the mild temperate forest along the west coast of South Island, together with various other pines, cedars, and yews. On the east coast such trees as the beech and the birch are more abundant. The wiry native grass, known as "tussock," covers considerable areas, but in many places it has been supplanted or supplemented by various English grasses. *Phormium tenax*, or New Zealand flax, grows wild on river banks and in swamps all over the country, but especially in North Island. It is of little commercial value unless the lands on which it occurs have been drained.

POPULATION. The total population of the Dominion is estimated at 1,525,000, the majority being of British descent. The original

inhabitants of the land were the Maoris, a Polynesian race with a fairly high standard of development. During the period of warfare between the Maori and the white man, the number of the former rapidly decreased, but, since the adjustment of the existing relations between the two races, this movement has been first checked and then reversed. Since 1901 the Maoris, including half-castes, have increased in number from 43,000 to about 69,000. Considerable areas of land have been left in their possession, and they are represented in the Dominion Parliament by four of their number. The future of their race is, however, still somewhat uncertain. Although some of its members have adopted modern methods of agriculture, while others have engaged successfully in industry and trade, a great many either live in the same way as their fathers did, or depend upon rents derived from lands leased to Europeans. If they are to make secure their position in the future history of the state, it will be necessary for them to develop to a greater extent than at present the resources, and more especially the land, which they possess.

SOUTH ISLAND—NATURAL REGIONS. The west coast area with its high mountains, narrow coastal plain, heavy rainfall, and dense forests, stands by itself. In the east, the flat, generally treeless Canterbury Plains, with the rolling downs which surround them, may be marked off, alike from the more mountainous and wooded country in the north-east traversed by the Kaikoura and other ranges, and from the grass-covered Otago peneplane in the south.

THE CANTERBURY PLAINS, with the surrounding downs, contain considerable areas of fertile soil which constitute the chief agricultural districts of New Zealand. With the aid of irrigation from the rivers, large returns can be obtained, and the provincial district of Canterbury produces about four-fifths of the wheat and over two-thirds of the total grain crop of the Dominion. The wheat is softer than that of Australia, and not so suitable for milling purposes, but the yield per acre is much higher and averages about twenty-eight bushels, while it is said that one hundred bushels can sometimes be obtained under the most favourable conditions.

Pastoral farming is of great importance and large areas are kept under grass, but much of the native tussock has been mixed with, or replaced by, English forage plants. Until the early 'eighties,

the production of wool was here, as elsewhere in New Zealand, the chief object of the pastoralist, but about that time the development of refrigerating apparatus brought into existence the trade in frozen mutton. This has led to an important change in the character of the flocks. The merino sheep, which had hitherto been almost exclusively raised, proved unacceptable on the British market, and its place was taken on the richer low-lying hills and plains by crosses between it and Leicesters, Lincolns, Romney Marshes, and other breeds, to serve the double object of producing a good wool and providing fat mutton. On the higher lands, where the native grass is not suitable for fattening purposes, the merino is still supreme. Taken as a whole, the Canterbury region possesses about one-fifth of the flocks of the Dominion.

Banks Peninsula, a volcanic region with rich fertile soil, is devoted to dairy-farming, and produces large quantities of butter and cheese. Christchurch is the chief town on the Canterbury Plains, and Lyttelton, eight miles distant, is its port.

THE NORTH-EASTERN REGION does not possess much land suitable for cultivation. What there is occurs mainly in the Wairau Plain, in the lower part of the basin of the river of that name. Here stands Blenheim, the capital of Marlborough, and here live over one-half of the inhabitants of the whole region. Elsewhere, sheep farming is the principal occupation of the people. The tussock grass of the uplands carries less than one merino sheep to the acre, but where the forest has been cleared the land is richer and carries two to four cross breeds. Among other industries the most important is saw-milling.

THE OTAGO PENEPLANE is much dissected by rivers, and it is in the valleys of these rivers, and in the beds of old lakes which they have drained, that the best agricultural land occurs. Turnips and oats are the main crops cultivated; about one-third of the New Zealand crop of oats is raised in this region, which also comes next to, though a long way behind, the Canterbury Plains in the production of wheat. Pastoral farming is, however, a much more important pursuit at the present time, and in South Island the Otago peneplane ranks next to the Canterbury Plains in the size of its flocks. Sheep are fed upon the mountain pastures in summer, while in winter they are driven down to the lower slopes of the hills, sufficient fodder being grown in the flat valley bottoms to maintain

them in seasons of exceptional severity. A number of freezing establishments have been set up here and in the Canterbury Plains, and both wool and mutton are exported. Dairying is of growing importance in the lowland areas.

The chief minerals of the region are gold and coal. The former occurs mainly in the debris of the older rock, and is obtained either by sluicing or dredging; while the latter, which generally consists of brown coal and lignite, is found in various places. Other industries include the manufacture of woollen goods on a fairly large scale, the preparation of New Zealand flax, and saw-milling.

Dunedin is the principal town, and is situated upon Otago Harbour. Ocean-going steamers can reach its wharves, but the larger vessels are berthed at Port Chalmers. Invercargill is the chief town of the southerly districts along Foveaux Strait, and is situated on New River Harbour. The Bluff, the port of Invercargill for vessels too large to make their way up the estuary, is the most southerly in New Zealand.

THE WEST COAST, on account of its mountainous character and dense forest vegetation, is but slightly developed. A small proportion of the land is cultivated, especially in the country round Nelson, where fruit is extensively grown, and some cattle and sheep are reared; but the greater part of the region is as yet unoccupied, though large areas of fertile soil are believed to exist. The geological nature of the country accounts for the variety and extent of its mineral resources. Gold is obtained by the same means as in the Otago peneplane, from alluvial deposits along rivers and beaches, and the whole of Westland is a proclaimed goldfield, in which numerous quartz veins have also been discovered. Good bituminous coal is found along the northern part of the west coast, and is worked in the vicinity of Westport and Greymouth, from which places it is exported to other parts of New Zealand. At Parapara and Onakaka on Golden Bay, in the north, there are extensive deposits of limonite with an iron content of 90 per cent, and at Onakaka blast furnaces have been built. The chief towns are the ports of Nelson, Hokitika, Greymouth, and Westport, the last three of which serve the mineral industries of the region.

NORTH ISLAND. As a result of the geological formation of North Island there is much diversity in its soils, and it is impossible to give a systematic account of the country without entering

into great detail. Several distinct regions may, however, be recognized.

THE AUCKLAND PENINSULA stands by itself for several reasons. The proximity of the sea to every part of the land reduces the range of temperature between summer and winter, while the rainfall is of the Mediterranean type. The forests include the valuable kauri, and, in districts from which that tree itself has disappeared, a resinous gum, used as an ingredient in the manufacture of lac and varnish, is obtained in a fossil state. Mediterranean fruits, such as the vine, the orange, and the lemon, can be cultivated successfully where the soil is favourable ; but arable farming has made comparatively little progress, as is indeed the case in the whole of North Island, and pastoral farming is the more important pursuit, both sheep and cattle being raised. Rather more than half the gold produced by New Zealand is obtained from quartz veins found in a district which stretches from Great Barrier Island, north of Auckland, southwards for a distance of over 100 miles; in this district is situated the Waihi mine, hitherto the most productive in the country. Coal, the most of which is consumed locally, occurs in various places. The preparation of New Zealand flax is an important industry in this region.

The chief town is Auckland, the largest city in New Zealand. It owes its importance to the fact that it is situated upon a narrow isthmus, and is thus able to communicate by sea both with the east and west coasts of North Island. It is a calling place for vessels on the route from San Francisco to Sydney, and is the centre of the gum collecting and gold mining industries.

THE SOUTH WEST REGION differs in some respects from the Auckland Peninsula. About Mount Egmont the volcanic rocks have weathered down into rich fertile soils which, being well watered, constitute a valuable dairying district. Between Mount Egmont and the Ruahine range there is a large area covered with " papa " soils, derived from the decomposition of blue calcareous clays. These form good pasture lands, suitable for sheep rather than cattle, and, in the more sheltered districts away from the coasts, are of special value for rearing lambs for the frozen meat trade. South of the Rangitikei River, alluvial soils stretch in a gradually narrowing strip along the coast, and on them dairying is again the most important pursuit.

The mineral wealth of the region is uncertain. Brown coal, used for domestic and steam purposes, occurs along the Mokuau River, and iron-sands, which it has not proved profitable to work, lie on the coast south of New Plymouth. In this district, also, the prospects of finding oil appear to be more promising than elsewhere in New Zealand, though up to the present the yield has not come up to expectations.

THE VOLCANIC REGION occupies a large part of the centre of the island, and here again the soils vary greatly in quality. In many places heavy clays prevail, some of which can only be rendered fertile by much cultivation, while others are believed to be undrainable. On the other hand, around the Hot Lakes, considerable areas are covered with pumice sand which is too porous to be fertile. The population of the whole of this region is small, and the pastoral industry nowhere attains much importance.

THE EASTERN REGION, between the Ruahine range and the coast, contains over one-fourth of the sheep in New Zealand. Here, as elsewhere, the character of the land changes rapidly from place to place. The great alluvial plain in the Wairarapa Valley is suitable both for sheep and cattle. Elsewhere the land, consisting partly of rolling downs and partly of alluvial flats, is devoted almost exclusively to sheep. In the north the "papa" soils reappear, but are almost entirely in the possession of the Maoris.

Wellington, the principal town of the region and the capital of the Dominion, is situated on Port Nicholson, an inlet of Cook Strait, and is the meeting place of the coastal routes of both islands. Hence it is the most important collecting and distributing centre of the country, and transacts a great part of its trans-oceanic trade.

COMMUNICATIONS. New Zealand has over 3,000 miles of railway, much of which, owing to the physical structure of the country, has been laid down at great expense. In North Island, the main trunk line runs from Wellington to Auckland and beyond, with branches to Mount Egmont, Hawke Bay, and Coromandel districts. The principal line of South Island follows the east coast from Christchurch to Dunedin and from there goes to Invercargill; it has numerous branches across the Canterbury Plains and into the Otago peneplane. In the north-west of the island, the mineral districts are in railway communication with their ports, and Christchurch is

connected with the west coast at Greymouth by a line which crosses the Southern Alps.

FOREIGN TRADE. For the three years 1929-1931 the value of the imports and exports of New Zealand was as follows—

	Imports	Exports
1929	£48,727,000	£53,654,000
1930	42,660,000	43,614,000
1931	24,757,000	33,704,000

The principal items of the import and export trade for the same three years were as follows—

Imports	Percentage of total imports	Exports	Percentage of total exports
Mineral oil ..	6-8	Butter	27-2
Motor-cars, etc.	6-7	Meat	22-9
Machinery ..	5-1	Wool	21-7
Apparel ..	4-6	Cheese	13-6
Cotton piece goods	4-3	Skins	4-0
Iron and steel ..	4-2		
Tobacco ..	2-7		
Silk piece goods,	2-4		
Boots and shoes	2-1		
Tea	1-9		

The more important importing and exporting countries are these—

Imports from	Percentage of total imports		Exports to	Percentage of total exports	
	1929	1930		1929	1930
United Kingdom ..	46-2	47-2	United Kingdom ..	73-7	80-1
United States ..	19-1	17-6	Canada	6-0	5-6
Canada	9-8	8-8	United States ..	6-6	4-7
Australia	6-9	7-7	Australia	4-2	3-5
Netherlands E. Indies	2-3	1-9	France	3-2	1-1

Mineral oils are imported from the United States and the Netherlands East Indies, and motor-cars and lorries from Canada, the

United States, and Great Britain. Agricultural machinery is supplied by the United States, Great Britain, and Canada; dairying machinery by Sweden, Australia, and Great Britain; and electrical machinery by Great Britain and the United States. Great Britain is the chief source of clothing and cotton and woollen piece goods, but Japan supplies much of the silk imported. Iron and steel goods come mainly from Great Britain.

As is indicated above, over three-fourths of the exports go in the first instance to the United Kingdom, but of that one-fifth is shipped mainly to European countries. Great Britain is the largest consumer of all the principal exports already mentioned, with the exception of skins, which go mainly to the United States. Wool is also sent to various European countries and to America, while Canada and several Eastern countries take butter in varying amounts.

STATISTICAL ABSTRACT FOR AUSTRALIA AND NEW ZEALAND

	Area (Sq. miles).	Popula- tion (1932) (estimated).	Sheep (1931).	Cattle (1931).	Wheat 1931-32 (acres).	Gold (1932) (fine oz.).
Queensland	670,500	975,656	22,324,278	5,550,399	248,783	23,700
New South Wales .. .	310,372	2,548,861	53,180,000	2,998,981	3,684,678	27,880
Victoria	87,884	1,810,637	16,376,217	1,637,530	3,565,872	48,130
South Australia .. .	380,070	587,439	6,608,981	265,324	4,071,370	3,010
Western Australia .. .	975,920	423,192	10,098,104	826,532	3,158,888	604,480
Tasmania	26,215	225,110	2,012,055	232,444	11,722	5,900
Northern Territory .. .	523,620	4,360	18,867	749,745	—	600
Total for Australia .. .	2,974,581	6,575,255	110,618,502	12,260,955	14,741,313	713,700
New Zealand	103,861	1,524,921	28,606,219	4,072,383	268,756	140,000

ISLANDS IN THE PACIFIC

Of the islands in the Pacific only a few need be mentioned here. New Caledonia, which belongs to France, is noted for its supplies of nickel. The Fiji Islands are British, and export sugar, copra, and other tropical products. The Hawaiian group was annexed by the United States in 1898, and sends large quantities of cane-sugar to that country. The United States also possess the eastern islands of the Samoan group, including Tutuila with the naval and coaling station of Pago Pago; the western islands of the same group are administered by New Zealand under a mandate from the League of Nations, and export copra and cocoa. The small island of Nauru, which lies just south of the Equator in long. 166°55'E.,

¹ Including Federal Territory.

¹ Including a certain portion of Silver.

is administered by the governments of Great Britain, Australia, and New Zealand ; it is of value on account of the large deposits of phosphates which it contains. The western part of New Guinea is owned by the Dutch, but is as yet undeveloped. The south-eastern part of the island, known as Papua, is a dependency of Australia; its chief products are coco-nuts, rubber, and hemp, but the total output is still small. Among other exports are timber, gold, pearls, and *beche-de-mer*. The north-eastern part of the island, together with the Bismarck Archipelago and the Solomon Islands, constitutes the Territory of New Guinea administered by Australia under mandate from the League of Nations. The Territory is believed to possess great natural resources, but copra is at present the only export of importance.

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