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MODERN GEOGRAPHY

BOOK II

THE BRITISH ISLES

Judges, Ltd

THE HELFORD RIVER, CORNWALL.

This is an example of a " na " or drowned river valley. The picture was taken at low tide so that the course of the stream, meandering over the alluvial flats, is revealed. At high tide the estuary is full of water from bank to bank, and the course of the stream is hidden.

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BOOK II

THE BRITISH ISLES

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MODERN GEOGRAPHY

A course in general and regional geography for schools.

By D. M. PREECE and H. R. B. WOOD, M.A.

BOOK I. FOUNDATIONS OF GEOGRAPHY.

BOOK IL THE BRITISH ISLES.

BOOK III. EUROPE.

Three other volumes in preparation.

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PREFACE

The British Isles is the second of a series of six books issued under the general title "Modern Geography" which have been written to meet the needs of pupils preparing for the School Certificate Examination and others of similar standard.

The subject is treated in its regional aspects, and an attempt has been made to preserve a balance in the consideration of the physical, human and economic aspects of each region. In a book dealing with a country such as ours where industrialism is of paramount importance, it is natural that much space should be devoted to the manufacturing areas, and to our overseas trade. The fundamental changes which have taken place in our trading relations since the War are noted.

As in the case of the preceding volume, *Foundations of Geography*, the numerous illustrations and diagrams will prove to be a valuable and attractive feature of the book. Many of the illustrations should provide suitable subjects for discussion and form the basis of other appropriate exercises.

The authors are particularly indebted to Mr. W. Hannah of Crewe Secondary School for the great help which he has given at all stages during the preparation of this book. They also offer their thanks to the Geological Survey, the L.M.S.,

G.W., L. & N.E., and S. Railway Companies, the Manchester Ship Canal Company, Lever Bros., Ltd., Imperial Chemical Industries, Ltd., the North British Aluminium Co., Ltd., the Herring Industry Board, *The Farmer and Stockbreeder*, Stewarts and Lloyds, Ltd., *The Luton Evening Telegraph*, William Denny and Bros., Ltd., and the City of Wakefield Corporation for kindly lending the photographs from which some of the illustrations have been prepared.

D. M. P.
H. R. B. W.

CONTENTS

THE BRITISH ISLES

CHAPTER I

INTRODUCTORY

The Position of the British Isles

The British Isles are situated between latitudes 50° N. and 60° N. off the north-west coast of Europe. This position has had a number of direct results on the development and progress of these islands.

Firstly, a study of the globe will reveal the fact that Britain is situated in the centre of the " land hemisphere," so that she has easy contact for commercial and other purposes with the leading industrial and most densely peopled countries of the world. Whereas Britain, during the Middle Ages, was on the edge of the known world far from the principal trade-routes, to-day she stands on the seaward margin of the densely peopled industrial region of Western Europe whence radiate the principal maritime trade-routes to all parts of the world, notably to the eastern United States and the Far East.

The climate is neither so hot nor so cold as to prevent people from working either in field or factory throughout the year, and the proverbial variableness of the weather from day to day helps to provide that incentive to work without which progress is impossible. It has been suggested that the British capacity for regular routine work, so necessary in the manufacturing industries, is partly the result of climatic conditions.

Another important feature of the position of the British Isles is that they stand on the Continental Shelf (Fig. 2). The floor of the shallow seas around Britain was once an extension of the great plains of Northern Europe. These plains were submerged in past ages, probably during the Ice Age, and the line which now marks the depth of 100 fathoms was formerly the edge of the continent. One result of the submergence was to produce an indented coastline with deep inlets, thus providing good natural harbours. The continental

shelf has also served to increase the tidal range and to produce strong tidal currents which have kept the estuaries free from silt and prevented the formation of deltas. The shallow

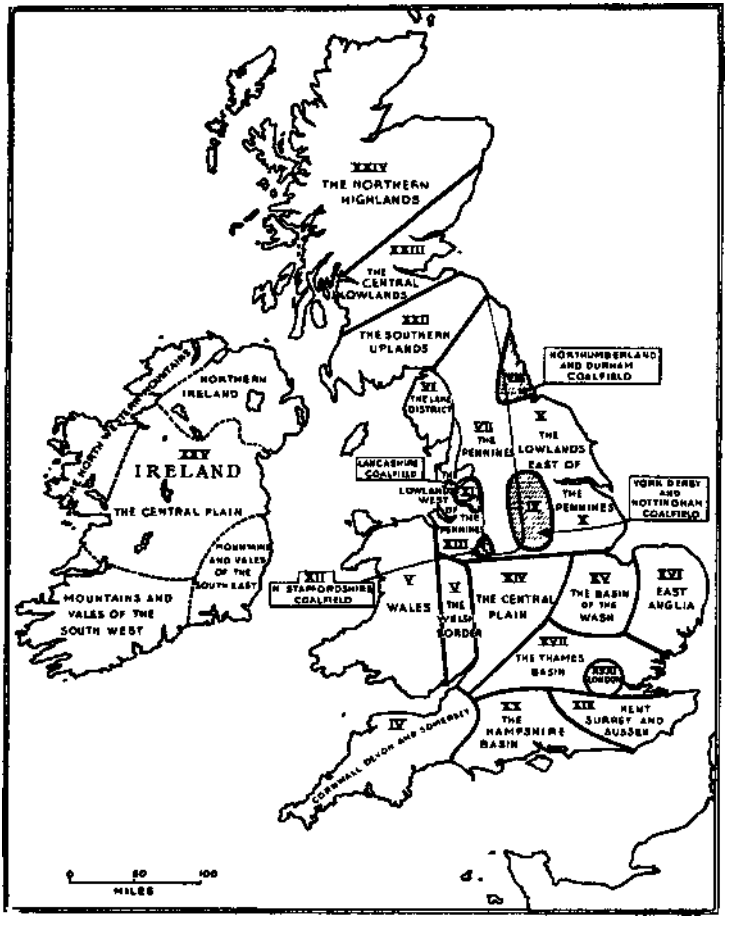


Fig. 1. THE DIVISIONS OF GREAT BRITAIN AND IRELAND.—The numbers correspond to the chapters dealing with each section.

waters of the continental shelf are the feeding grounds of a great variety of fishes, so that the fishing industry has prospered.

The island environment, the good harbours, and the familiarity with the sea fostered by the fishing industry, have resulted in the growth of a seafaring nation, whose peoples have spread to the ends of the earth. Nor must it be forgotten that the sea frontiers of Britain have allowed her to develop her industries and resources, undisturbed by invasions for many centuries. On the other hand, the early invasions of Romans, Jutes, Angles, Saxons, and Danes during the period before the Norman Conquest, served to introduce a variety of racial elements which have been an important factor in the development of the modern British " type."

The Build of the British Isles

Since the British Isles were once joined to the European mainland, it will be expected that there should be some similarity between the rocks and structure of Britain and that of the Continent (Fig. 3).

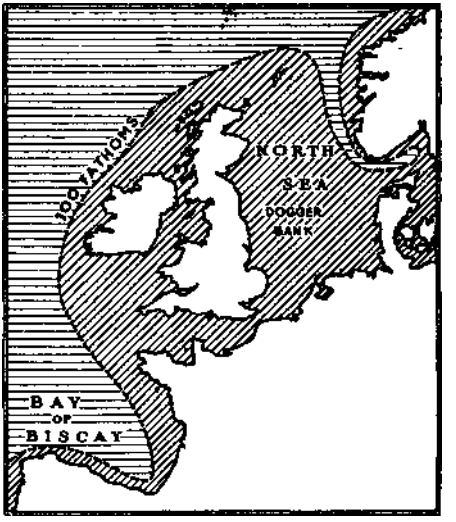


Fig. 2. THE CONTINENTAL SHELF.
***Horizontal shading* = More than 100 fathoms.**
***Inclined shading* = Less than 100 fathoms.**

(1) The old hard rocks, *e.g.* the granites, schists, and gneisses of the Scottish Highlands, are repeated in the Scandinavian Highlands.

(2) The lowlying plains of Eastern England have their counterpart in the plains of the Netherlands and North Germany.

(3) Chalk and limestone escarpments with the intervening clay vales similar to those of South-East England are to be seen in Northern France. Both the south coast of England and the north coast of France have bold headlands of chalk.

(4) The structure and scenery of Cornwall is very similar to that of Brittany.

Not only are there striking similarities between the rocks of the British Isles and those of the European mainland, but there is also strong evidence of the former connection of Great Britain and Ireland (see page 253).

A study of the physical map of Britain shows that all the mountainous areas lie in the north and west, and that in the

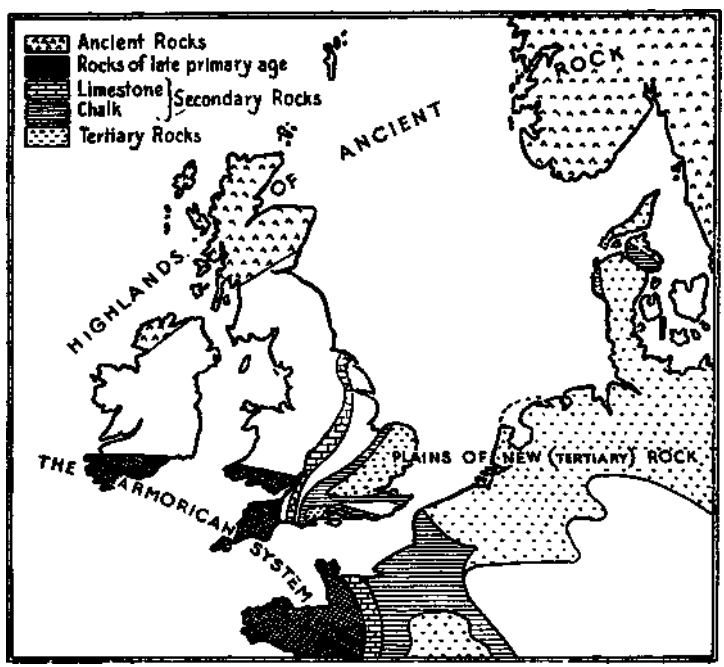


Fig. 3. To SHOW THE SIMILARITY OF STRUCTURE BETWEEN THE BRITISH ISLES AND THE NEIGHBOURING COASTAL AREA OF EUROPE.

south-east there is a plain crossed by low ridges of hills. The reason for this is apparent if the physical and geological maps are compared. Such a comparison shows that the mountainous areas correspond to regions of rock geologically old, which have resisted the various forces of denudation and remain as high mountainous or plateau regions. The south-east of England in contrast is composed of newer and less

resistant rocks of the Secondary and Tertiary geological ages. The mountains of the north and west, too, are the old denuded remnants of ancient mountain systems; but the rocks of the

mm

south-east have only been subjected to very slight " folding " during more recent geological times.

The contrasts between the north-west and south-east of the British Isles are best understood if a line is drawn from the

mouth of the River Tees to the mouth of the River Exe. Such a line divides the British Isles into two sharply contrasted regions. To the north-west of this line lie most of the British coalfields, and also the highest and most extensive areas of highland. In the north-western area the geographical development depends mainly on the rocks. Where the rocks are old and hard there are extensive plateau areas, unproductive because of their thin, infertile soil, their damp chilly climate, their difficult communications, and their lack of valuable minerals. Such areas are the Highlands of Scotland, the Southern Uplands of Scotland, the Lake District, the Pennine Chain, the Welsh mountains, the moorlands of Cornwall and Devon, and the Irish mountains.

Where, however, the rocks, while still old, are somewhat newer than those referred to above, minerals, particularly coal and iron, are found. This has led to the growth of densely-populated manufacturing regions. Such areas are:—

(A) On the flanks of the Pennine Chain.
(B) On the slopes of the Welsh Mountains.
(C) In the Midland Plain of England.
(D) In the Midland Valley of Scotland.

The chief coalfields of the British Isles are (Fig. 4):—

On the Pennine slopes:

1. Northumberland and Durham. **3. Cumberland.**
2. York, Derby, and Nottingham. **4. South Lancashire.**
5. North Staffordshire.

On the slopes of the Welsh mountains :

6. North Wales (Flint and Denbigh). **7. South Wales**
8. Forest of Dean. * **(Glamorgan).**

In the Midland Plain:

9. East Shropshire. **11. Warwickshire.**
10. South Staffordshire. **12. Leicestershire.**

In addition to the English coalfields mentioned above, there are two small ones S.E. of the Tees-Exe line:
13. Bristol. **14. Dover.**

In the Midland Valley of Scotland:

15. Ayrshire.
16. Glasgow or Clyde.
17. Fife.
18. Midlothian or Edinburgh.

Ireland:

In Ireland there are small and relatively unimportant coal deposits in Kilkenny and at Dungannon.

In addition to coal there are also deposits of *iron ore,* such as those of Furness in North Lancashire. Many of the coalfields such as the Clyde Basin, North Staffordshire, and South Wales also have deposits of iron ore, but these are not as important as they were formerly, and they now provide only 3½ per cent, of the British supplies. The iron ore deposits of northern Britain have played a great part in the industrial development. The mountainous areas of the north-west also yield small amounts of lead, zinc, and copper ores. The chief districts are the Pennines, North Wales, and the Lake District. A small amount of tin ore is obtained from the south-west of Cornwall (Camborne).

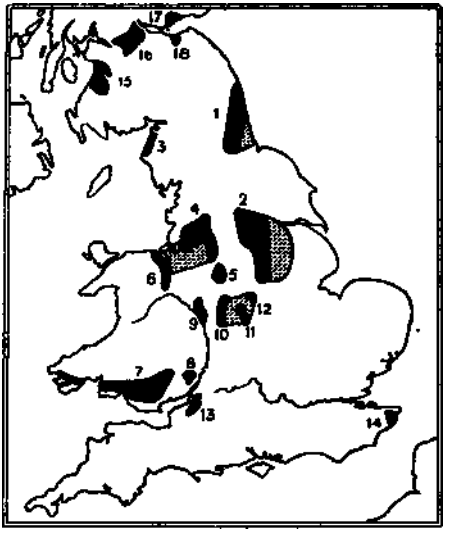


Fig. 4. THE COALFIELDS OF BRITAIN.—Coalfields marked in black. The dotted areas show concealed fields. The numbers correspond to the list in the text.

In addition to the mining of coal and metal ores, quarrying is also important in the north-west. There are the building granites of Aberdeen and Cornwall, the road metal granites of North Wales (Penmaenmawr) and Leicestershire, the slates of North Wales (Festiniog and Penrhyn), Westmorland,

(Shap), and Cornwall (Delabole), and the china clay and china stone of Cornwall and Devon. Salt, too, plays an important part in the chemical industries. It is found mainly in the New Red Sandstones as in the Weaver Valley of East Cheshire. There are also deposits of salt near Droitwich (Worcestershire) and near Greatham at the mouth of the River Tees.

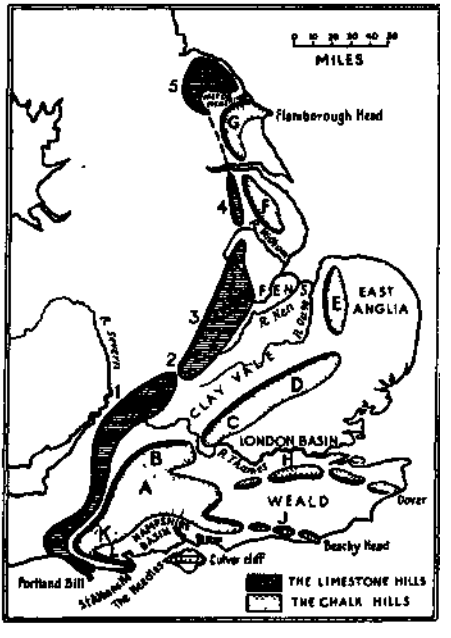
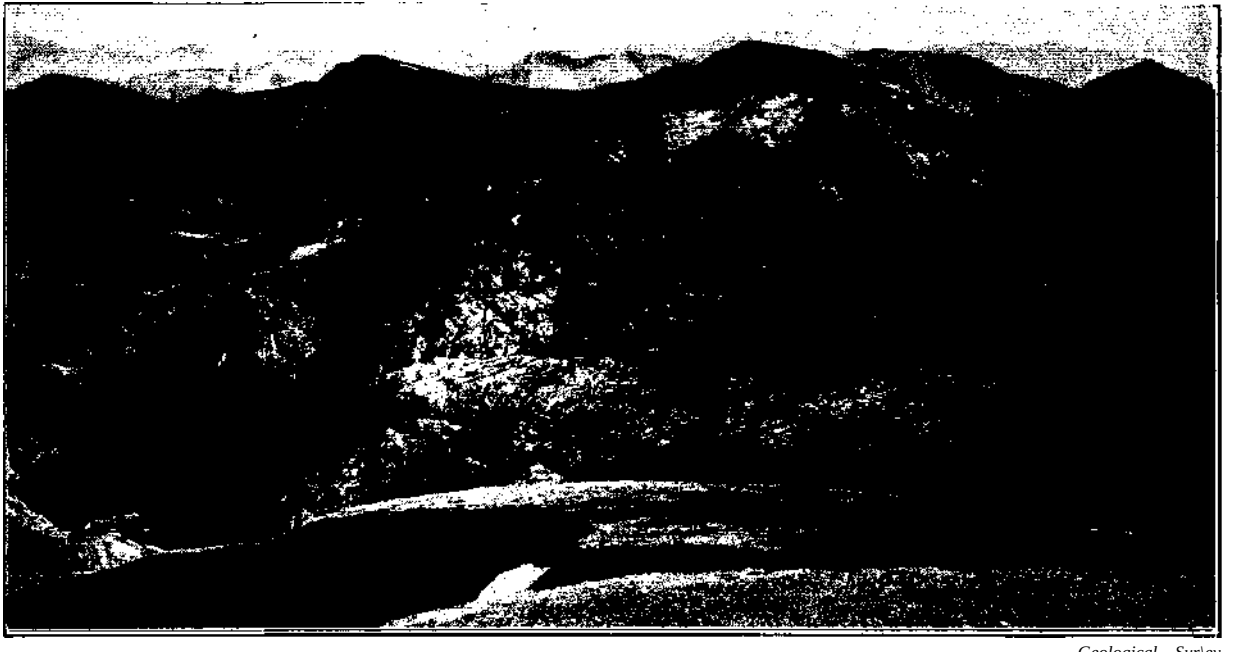


Fig. 5. LIMESTONE.—1. Cotswold Hills. 2. Edge Hill. 3. Northampton Uplands. 4. Lincoln Edge. 5. North York Moors. CHALK.—A. Salisbury Plain. B. White Horse Hills. C. Chiltern Hills. D. East Anglian Ridge. E. Norfolk Edge. F. Lincoln Wolds. G. Yorkshire Wolds. H. North Downs. J. South Downs. K. Western Downs. L. Purbeck Downs.

The portion of Britain which lies to the south-east of the Tees-Exe line is very different from the north - western area which has just been described.

A physical map shows that the south-east is mainly a plain, and that relatively little of the land rises above 600ft., whereas the highlands of the north-west average 2000 ft., and rise to 4000 ft. in Scotland (Ben Nevis). In the south-east only in two places do the Cotswolds rise to 1000 ft. In spite of its general low level this area has a clear arrangement of hills and plains. The hills are arranged in lines which run, approximately, from north-east to south-west. A comparison of the relief map with a simple geological map will show that the ridges of hills correspond to belts of limestone and chalk, and that the intervening plains are composed of clays (Fig. 5).



Geological Survey.

MAMORE FOREST IN THE SCOTTISH HIGHLANDS; A VIEW LOOKING E.S.E. FROM BEN NEVIS.

This picture illustrates the features of a heavily glaciated and deeply dissected plateau. Notice the bareness of the scene; the absence of vegetation; the exposed rocks and the scarcity of soil; and finally the even level of the mountain tops.

The clay round London is known as the London clay, and is quite different from the Oxford clay in the Cherwell Valley.

The ridges of chalk and limestone are steeper on one side than the other, and the steep side is (with the exception of the North Downs) always on the northern or western side. Such ridges of hills are called *escarpments,* the steep slope being known as the *scarp slope,* and the gentle slope as the *dip slope* or counter scarp. The limestone escarpment begins at St. Alban's Head and runs eastwards to Lyme Regis, thence northwards, keeping to the east of the Mendip Hills and through the Cotswolds, Edge Hill, the Northampton Heights, Lincoln Edge, to the North York Moors which terminate seawards in a rugged coast with limestone cliffs such as can be seen at Whitby.

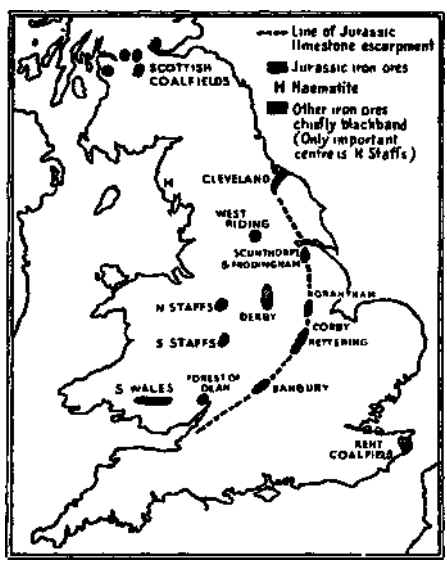


Fig. 6. SOURCES OF IRON ORE IN GREAT BRITAIN.

The system of chalk escarpments is not quite so simple. It consists of four branches, all radiating from Salisbury Plain (really a chalk plateau). These branches run—

(1) Through the Marlborough Downs, Chiltern Hills, East Anglian Heights, Norfolk Edge, Lincoln Wolds, to the Yorkshire Wolds, where the chalk ends in a bold headland, Flamborough Head.

(2) From Salisbury Plain through the North Hampshire Downs, and the North Downs to the chalk cliffs of Dover.

(3) From Salisbury Plain south-eastward through the South Hampshire Downs and the South Downs to Beachy Head.

(4) From Salisbury Plain south-westwards through the Dorset Heights and then turning abruptly eastward through the Purbeck Downs and the central ridge of the Isle of Wight.

The rocks of the south-eastern area yield neither the variety nor the quantity of valuable minerals as are found to the north-west of the Tees-Exeline. There are two small coal-fields, viz. the Bristol coalfield and the Dover coalfield in Kent. The latter is of recent develop-ment and has not yet given rise to any important industry.

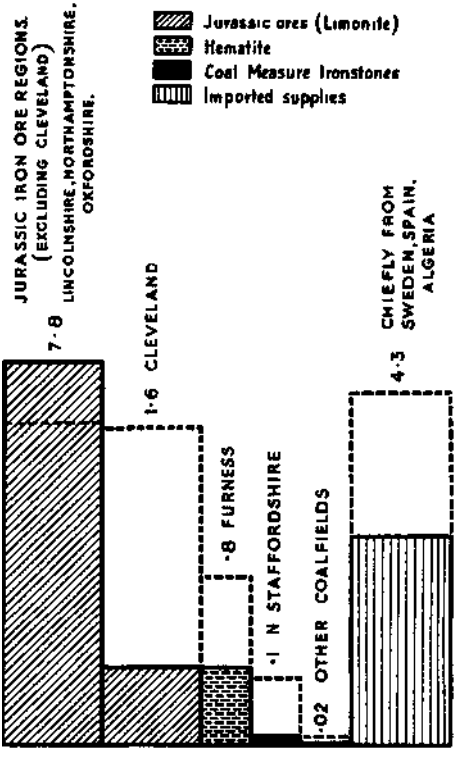


Fig. 7. SOURCES OF IRON ORE USED IN THE UNITED KINGDOM IN MILLIONS OF TONS, 1934. —Broken lines refer .to 1913 production.

By far the most important mineral of south-east England is iron ore. Jurassic iron ores are found along the north-western edge of the limestone escarp-ment from the Cleveland Hills of north Yorkshire to Oxfordshire (Fig. 6). They are quarried in a number of places, viz. (1) in the Cleve-land Hills; (2) at Scunthorpe and Frodingham in Lincolnshire; (3) at Corby and Kettering in Northamptonshire; and (4) near Banbury in north Oxfordshire. These are acid ores, and they could not be used until the invention, early last century, of the Thomas-Gilchrist process. To-day these iron mines supply about 85 per cent, of the iron of Great Britain (Fig. 7).

Some of the limestone is used for building purposes *(e.g.* Portland stone), and chalk is quarried and mixed with river mud to make cement *(e.g.* Rochester).

Thus minerals do not determine the development of this portion of England. The whole of the south-east is mainly agricultural, and the distribution of its occupations is primarily dependent on climate and on the fertility of the soil. The only areas of infertile soil are the narrow ridges of porous limestone and chalk, hence there are, in the south-east no large unproductive areas of scanty population comparable with the Highlands of Scotland.

In the south, the towns are mainly picturesque old market towns of moderate size, many with very beautiful old churches or cathedrals, *e.g.* Salisbury, Norwich, etc. In this area, too, are the old universities of Oxford and Cambridge. In the North, on the other hand, there are many very large industrial towns of recent growth. The newer universities are in these large cities, viz. Leeds, Manchester, Sheffield, etc.

In recent years, some changes have taken place. Industrial areas like South Wales and Durham show a decreasing population due to trade depression and consequent unemployment, while places in the south-east, where the costs of production are lower, are increasing in size, and industries are developing in them. This is also partly due to the rapid rise of road transport, for most of the southern towns are good road centres. Other factors which have helped to attract industry to Southern England are the increasing use of electricity, which is easily distributed by the 'grid' system, and the easy access to raw materials imported at London or Southampton. Examples of the recent rise of industry in the south are the Morris Motor Works at Cowley, near Oxford, the Ford works at Dagenham, and the concentration of a variety of manufacturing industries in such towns as Luton, Slough, etc.

CHAPTER II

CLIMATE

Winds, Cyclones, and Anticyclones

The climate of the British Isles is determined by their position on the western margin of a land mass in the cool temperate zone. The islands therefore lie in the track of the westerly winds from the Atlantic throughout the year. Records show that, on an average, the wind blows from a westerly quarter *(i.e.* N.N.W. to S.S.W.) on two days out of

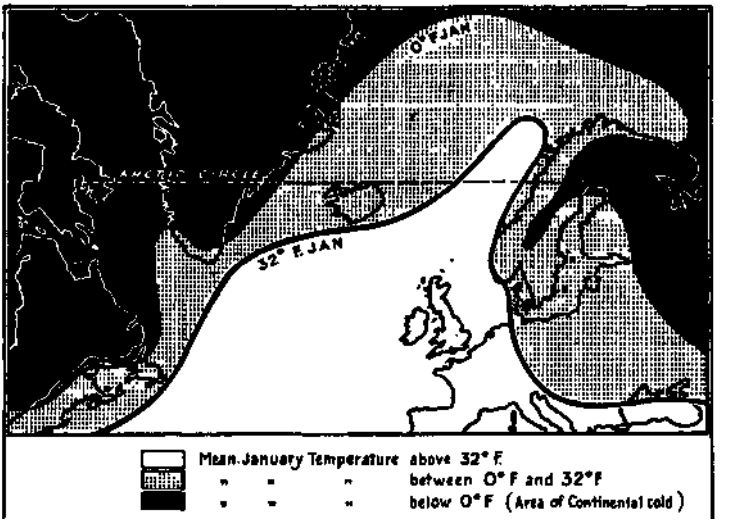


Fig. 8. To SHOW THE POSITION OF THE BRITISH ISLES WITHIN THE "GULF OF WINTER WARMTH."

every three. These winds not only modify the temperature and cause rainfall, but bring in their track those cyclones (" depressions") and anticyclones which account for the variability of British weather from day to day.

The characteristic features of the British climate are its warm winter [30° F. to 40° F. higher than the average for the latitude (Fig. 8)], its dampness, and its variability.

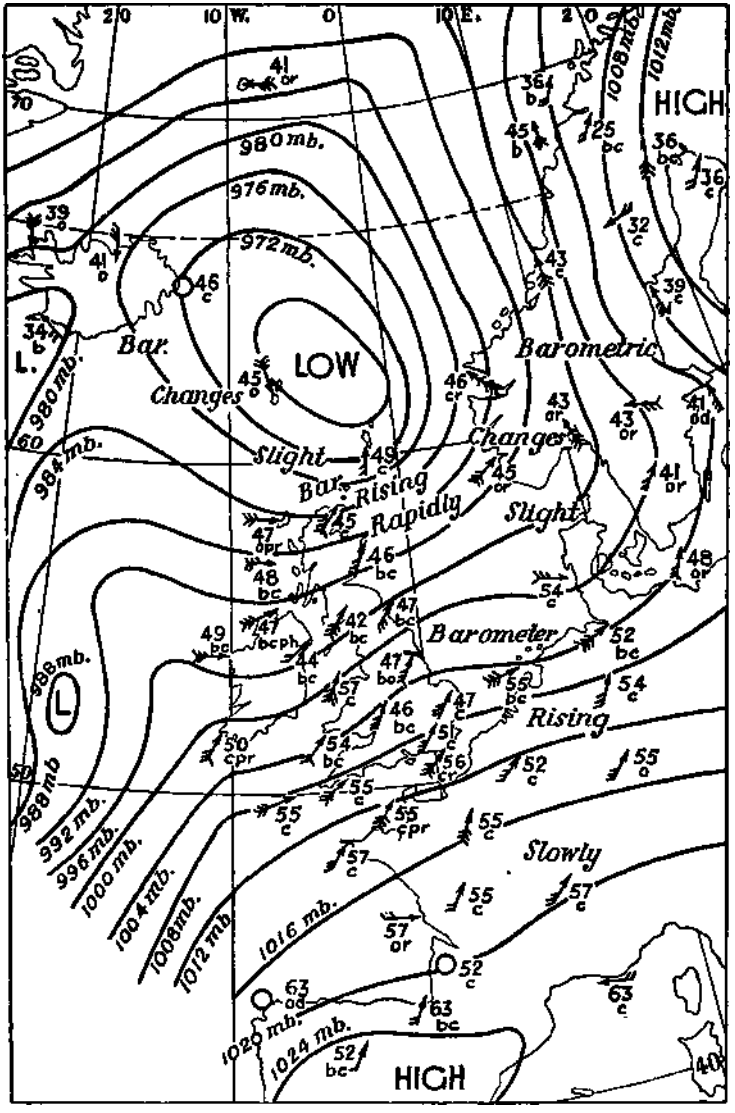


Fig. 9. CYCLONIC CONDITIONS.—19th **October, 7 h. A depression over the Atlantic. In Eastern England and Eastern Scotland strong winds from the south were expected, with cloud followed by rain. Rain would occur in Ireland followed by bright intervals, with cooler weather later. These conditions are typical of cyclonic weather.**

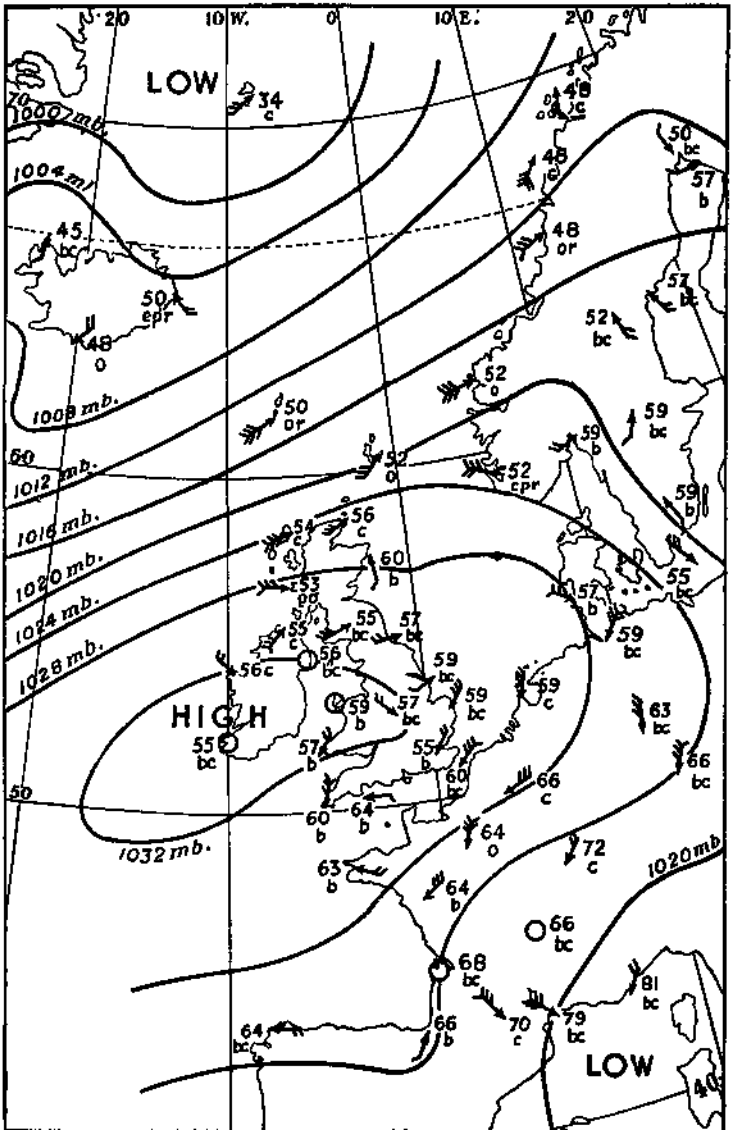


Fig. 10. ANTICYCLONIC CONDITIONS.—17th **July, 7h. Forecast of several days' fine weather.**

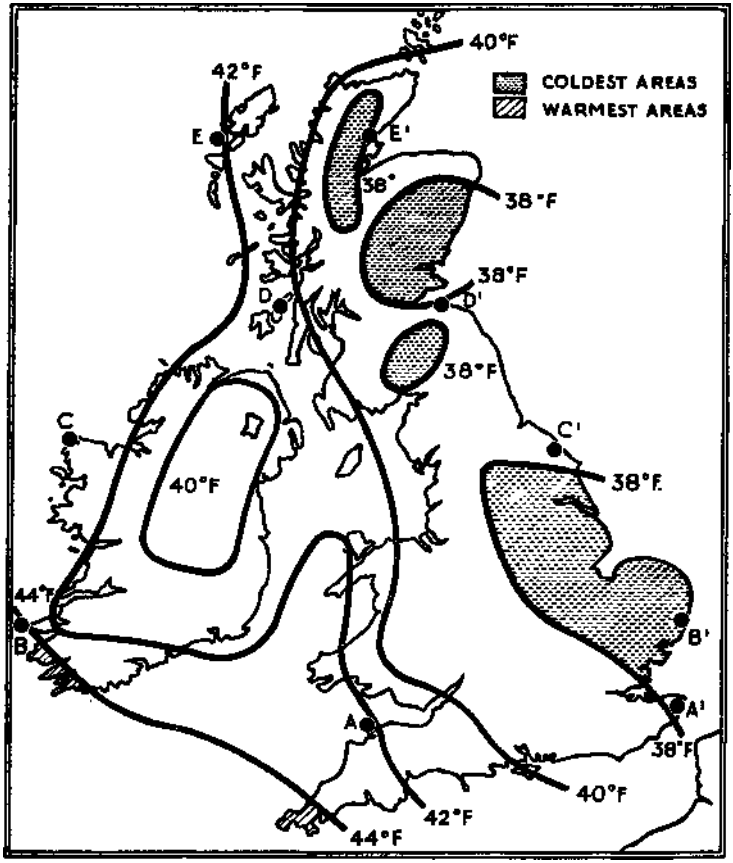


Fig. 11. JANUARY ISOTHERMS.

Cyclones, or regions of low pressure (Fig. 9), occur when a stream of warm air from the south or south-west meets a stream of cold polar air from the north or north-east. The lighter warm air rises over the heavier cold air, and, as a result, condensation takes place and rain falls. Cyclones are therefore associated with rainy weather. It is estimated that, on an average, about forty depressions pass over these islands each year, but their frequency varies from month to month, being greatest from November to January and least from May to July.

Anticyclones, or regions of high pressure (Fig. 10), are associated with periods of bright sunny weather in summer, and in winter with rainless weather (sometimes cloudy), and with fogs and frosts. Anticyclones are of less frequent occurrence than cyclones, about twelve passing over the British Isles each year. Nor do they travel so quickly as cyclones, and sometimes remain stationary for days and even weeks, giving long periods of dry weather.

Temperature

Figs. 11 and 12 show the isotherms of the British Isles for January and July.

If, in January, two places are taken in the same latitude, one on the west coast and one on the east coast, *e.g.* A and A' (Fig. 11), and their temperatures estimated it will be found that the western place is always warmer than the eastern one.

For example, five pairs of stations are marked on Fig. 11. A comparison of their temperatures is shown below:—

WEST COAST		EAST COAST		WEST IS WARMER THAN THE EAST BY
A	42° F.	A'	38° F.	4°F.
B	44° F.	B'	37° F.	7°F.
C	43° F.	C	39° F.	4°F.
D	40° F.	D'	38° F.	2°F.
E	42° F.	E'	38° F.	4°F.

The average of the last column is about 4° F., so that, from the figures it would appear that the west coast is, on an average, 4° F. warmer than the east coast in January. Any number of pairs of stations may be taken and in each case similar results will be obtained, *i.e.* the station on the west coast will be warmer than the corresponding station on the east coast and in the same latitude. In the above table the greatest difference is between B and B\ This is because B is open to maximum sea influence and B' is very near to the influence of the continental heat.

If the same stations are taken for July (Fig. 12) and their temperatures estimated, the following results are obtained:—

WEST COAST		EAST COAST		WEST IS COLDER THAN THE EAST BY
A	62° F.	A'	63° F.	1°F.
B	59° F.	B'	61° F.	2°F.
C	58° F.	*a*	59° F.	1°F.
D	57° F.	D'	59° F.	2°F.
E	55° F.	E'	57° F.	2°F.

The average of the last column is less than 2° F., so that the east coast appears to be about 2° F. warmer than the west coast in July.

The foregoing examples show that the warming influence of the sea in winter is greater than the cooling influence of the sea in summer. In *winter* the source of warmth is the *sea,* so that temperatures decrease from west to east and the isotherms run roughly north to south (N.N.W. to S.S.E.). For instance, the 40° F. isotherm passes through the north of Scotland and the Isle of Wight *(Le.* the north of Scotland is as warm as the Isle of Wight in winter). In *summer* the influence of *latitude* is stronger than that of the sea. While the latter does have a cooling effect on the west, the temperatures, generally, decrease northwards and the isotherms run from west to east (S.S.W. to N.N.E.).

Because the sea is warmer than the land in winter, isotherms trend northward where they cross the sea, *e.g.* 42° F. over the Irish Sea. In summer the land is warmer than the sea, and isotherms trend southwards over the sea, *e.g.* 60° F. over the Irish Sea.

The January 40° F. and the July 60° F. isotherms divide the British Isles into four quadrants (Fig. 13), of which the N.W. quadrant is the most equable *(i.e.* has the smallest ranges of temperature), and the S.E. quadrant is the most extreme *(i.e.* has the largest ranges of temperature). It must be remembered that temperature decreases with elevation at an average rate of 1° F. for 300 ft., so that the actual temperatures experienced in the highlands of Scotland or Wales are lower than those shown on isotherm maps when the isotherms have been calculated for sea-level.

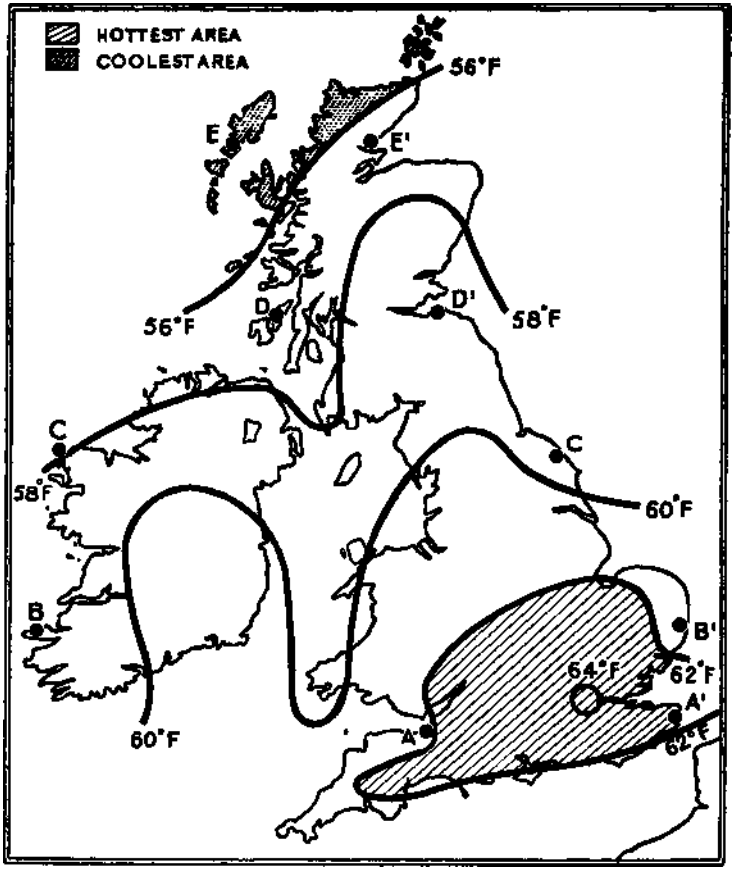


Fig. 12. JULY ISOTHERMS.

Rainfall

The rainfall of the British Isles is due, in part, to the effect of relief on the prevailing winds, and in part to the passage of cyclones or depressions.

There are marked differences in the rainfall of the western and eastern sides of the islands, both in *(a)* the amount received and *(b)* in its distribution throughout the year.

The westerly winds coming from the Atlantic are, for their temperature, heavily laden with water vapour. The highest mountains and plateaux of the British Isles lie near the west

coast. On reaching these mountains the winds are forced to rise, and the resultant cooling by expansion produces heavy rain. The winds pass on, but as they have already lost much of their moisture and also because they are descending to the

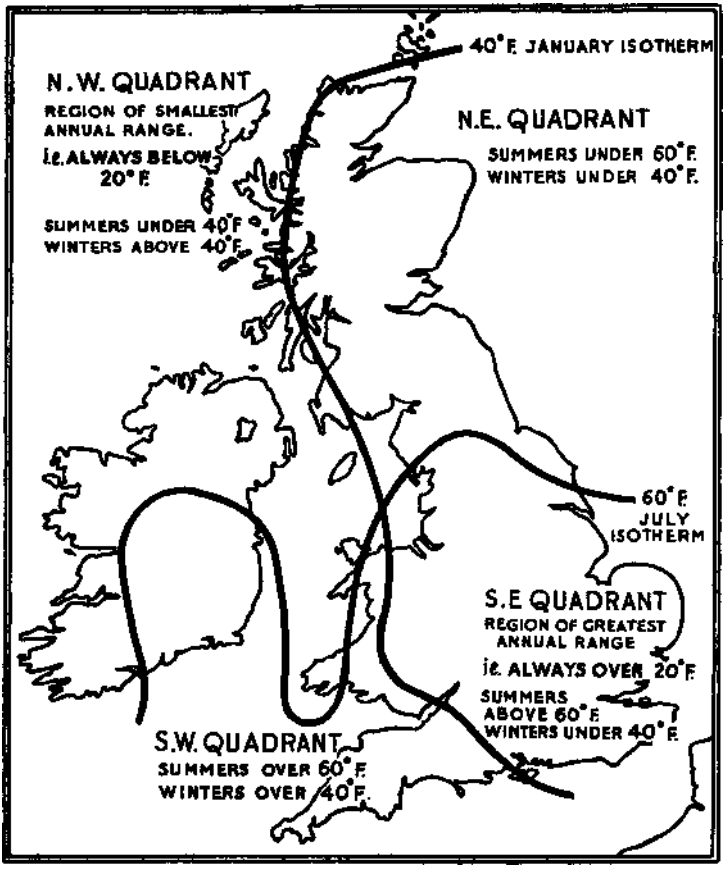


Fig. 13. TEMPERATURE REGIONS OF THE BRITISH ISLES.

plains and becoming warmer, less rain falls. (Such areas on the leeside of mountains are known as " *rain shadow* " areas.) However, if the winds should be forced to rise again over hills, however low *{e.g.* Cotswolds, N. Downs, Yorkshire Wolds, etc.), the rainfall again increases.

A rainfall map of the British Isles shows that most rain falls on the western mountains and least on the eastern plains (Fig. 14). The areas of heaviest rainfall (over 80 in.) are—

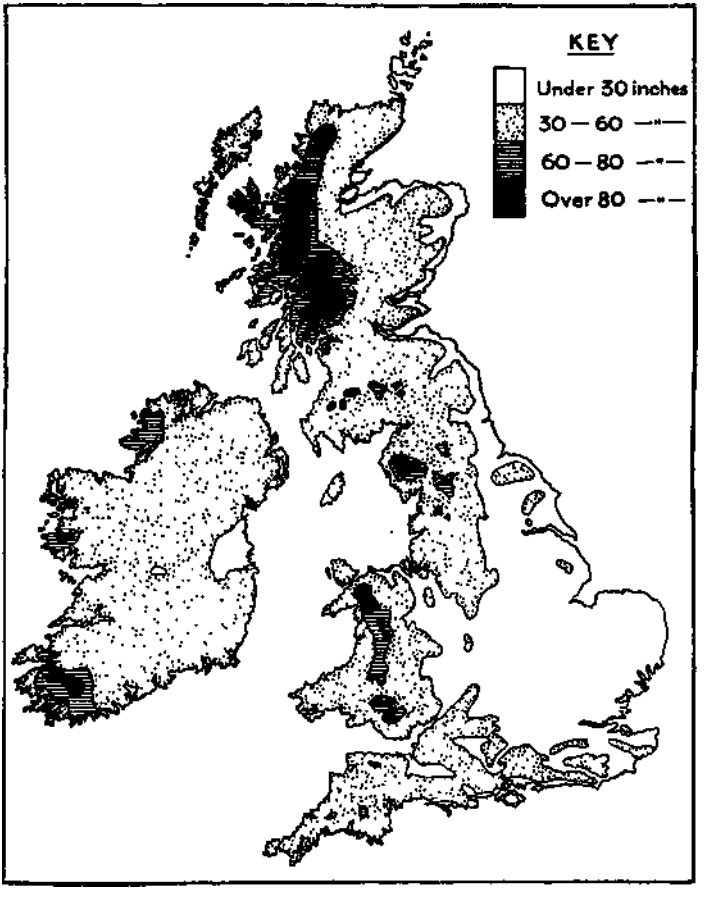


Fig. 14. RAINFALL OF THE BRITISH ISLES.—Note carefully the distribution in relation to the Highland areas. Locate the six areas of heavy rainfall enumerated on pages 21 and 22.

(1) The Western Highlands of Scotland around Ben Nevis and including the mountains of Skye.

(2) The Lake District. (3) Snowdonia.

(4) The Brecknock Beacons in S. Wales.

(5) The Kerry Mountains in S.W. Ireland.

(6) The Connemara Mountains in Western Ireland.

The heaviest annual rainfall so far recorded is over 200 in. in Snowdonia.

The areas of least rainfall (under 30 in.) are the plains to the east of the mountains:—

(1) The narrow east coast plain of Scotland.

(2) The English plain to the east of Wales with the exception of most of the chalk and limestone hills.

(3) Mid-Somerset.

The lowest average annual rainfall recorded is 19-3 in. at Shoeburyness, on the north shore of the Thames estuary.

While, broadly speaking, it is true that the west of Britain has heavy rainfall, it should be noted that three regions on the west coast have light rainfall (under 30 in.). These are:—

(a) the Cheshire Plain;

(b) the plains around the lower Severn;

(c) the plain of Mid-Somerset.

They are all lowland areas, and all lie in the " rain shadow" of mountains to the west or south-west.

The Irish plains have heavier rainfall than the English plains, for Ireland receives the full force of the rain-bearing westerlies, and her western mountains are not so continuous as those of Britain, so that the winds penetrate inland more easily.

The lightest rainfall in Ireland occurs over a small portion of the plain around Dublin.

Depressions are largely responsible for the seasonal distribution of rainfall in the British Isles. In *winter* (Fig. 15) depressions cross the Atlantic from the south-west, and, as Europe is covered with a mass of cold dense air (high pressure) they usually pass either to the north or south of it, *i.e.* in the directions indicated by AB, A'B', EF, and CD. As a rule depressions follow the track AB and A'B' more frequently than they follow the tracks CD or EF. As they pass westward of the British Isles on their journey north-eastwards it follows

that, *in winter,* the west will receive far more cyclonic rain than the east. Thus the western portions of the British Isles have a marked winter maximum of rainfall.

The kind of weather experienced by a place during the passage of a depression depends upon the relation of that place to the path of the depression. A place situated immediately in the track of the depression experiences different

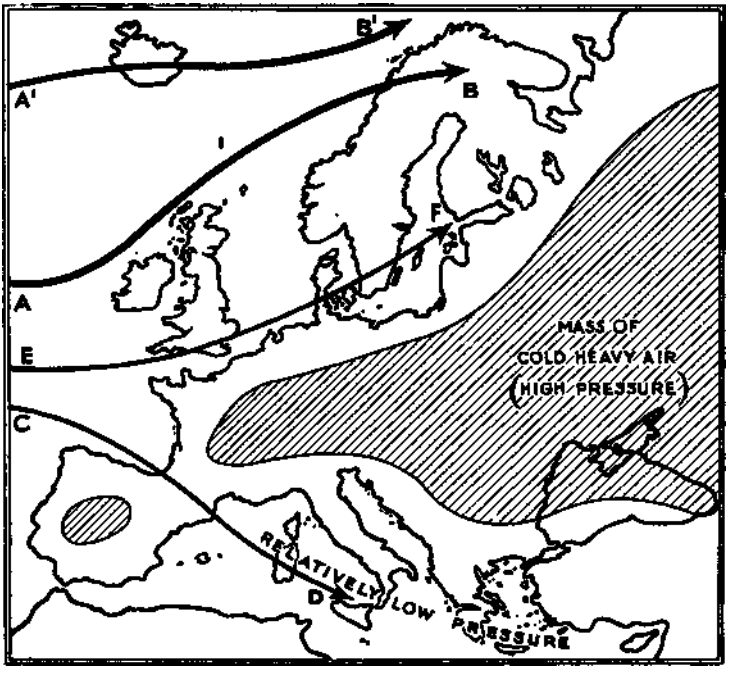


Fig. 15. WINTER CONDITIONS IN EUROPE.

weather conditions from one on the northern or southern edge of the depression. Thus when a depression follows a path such as AB, the British Isles experience rainy weather with mild winds veering from south-east to south and south-west. Whereas, when depressions pass along the track EF cold north winds, often accompanied by snow, are experienced.

. In *summer* Europe is a region of low pressure to which depressions are attracted (Fig. 16), following such tracks as

PQ, RS, TX. As they often pass eastward over England along such a track as TX they are intensified and secondary depressions frequently develop. Secondary depressions are small areas of low pressure, usually on the margin of a main depression, and are frequently associated with thunderstorms accompanied by heavy downpours of rain and possibly hail. Since the secondaries develop as the depressions pass eastward it follows that the frequency of thunderstorms increases eastward also. It is for this reason that eastern England has more rain in summer than in winter.

The amount and seasonal distribution of rainfall in the east and in the west is illustrated by the rainfall diagrams for London and Valencia (Fig. 17).

From these it is clear that:—

(1) Valencia has more rainfall than London.

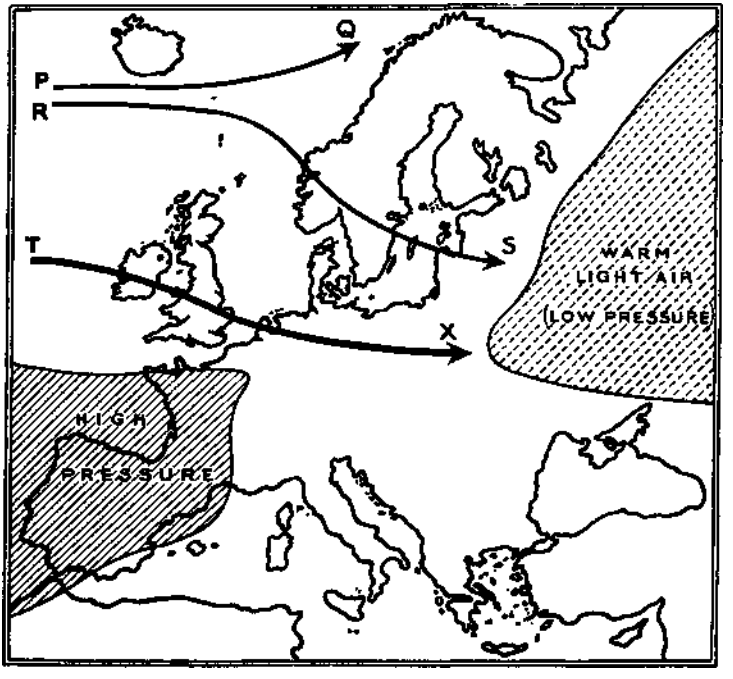


Fig. 16. SUMMER CONDITIONS IN EUROPE.

(2) Valencia has most rain in the winter months, and that London has most rain in the summer months.

(3) Although London has a summer maximum of rainfall, the total summer rainfall in London is less than the summer rainfall of Valencia.

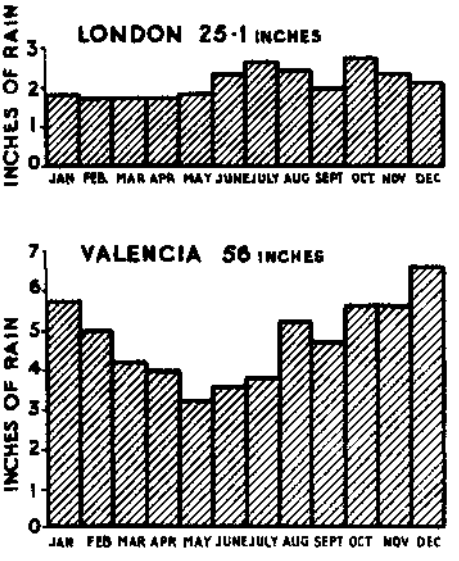


Fig. 17.
RAINFALL FOR LONDON AND VALENCIA.

Summary of the Differences between the Climates of the West and East Sides of the British Isles

(1) The west is warmer than the east in winter.

(2) The west is cooler than the east in summer.

(3) The west has heavier rainfall than the east.

(4) The west has most rain in the winter months.

(5) The east has most rain in the summer months (with a second maximum in October as a rule).

The west with its equable temperatures, heavy rain, and winter maximum of rainfall has a typical *insular or maritime* climate.

The east, with its greater range of temperature, lighter rain, and summer maximum of rainfall has a climate less insular, and approaches nearer to that of continental areas. It must, however, be remembered that, compared with places in central Eurasia, the climate of eastern England must still **be** considered insular, even though it differs from that of the western coastal areas.

CHAPTER III

THE FARMING ACTIVITIES OF THE BRITISH ISLES

Introductory

In the British Isles, 11 per cent, of the total population is engaged in agricultural occupations. But, whereas 53 per cent, is engaged in agriculture in Ireland, only 3 per cent, is so occupied in Scotland, and 2 per cent, in England.

Farming is largely influenced by climatic and soil conditions. The thin and poor soils of mountainous areas such as the Scottish Highlands are only suitable for rough pasture. Heavy clays such as are found in parts of Cheshire are unsuitable for ploughing, and are used as permanent pasture land for cattle rearing. Where, however, the soil is suitable for tilling, the crops grown are largely determined by the climate.

Throughout the British Isles, the type of farming is of the kind referred to as *mixed farming, i.e.* the farmer grows a variety of crops and rears cows, horses, sheep, pigs, and chickens. In some districts farmers may have more ploughed land than pasture land, while in others farmers may concentrate on the rearing of animals and grow fewer crops. Wheat, for example, is grown in every county in England, but partly because of climatic conditions, some counties grow far more wheat than others.

Because of the dense population, the price of land in Britain is high, and therefore farmers must get as large a return as possible from their land. This is done by " intensive " farming, *Le.* by the application of up-to-date methods, by scientific manuring, by careful choice of seeds and breeds of animals, and by the rotation of crops so that the land is not unduly exhausted by bearing the same crop year after year. There are many systems of crop rotation, but a common form is to grow wheat the first year; followed by root crops (turnips, mangolds, potatoes, or sugar beet) in the second year; oats or barley in the third year; and clover, peas or beans in the fourth year, after which wheat is again

grown. It is because of the system of crop rotation that the British farmer has such a variety of crops and animal products. Many of the crops grown in rotation are used for feeding animals, so that farmers with a high percentage of arable land also rear animals, and have some fields of permanent pasture.

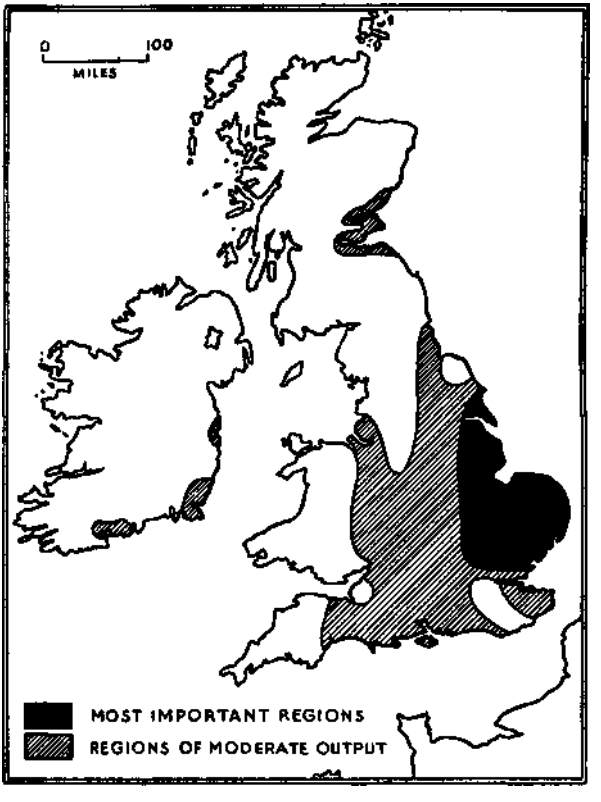


Fig. 18. DISTRIBUTION OF WHEAT.

Wheat

Wheat is grown throughout Britain south of the Scottish Highlands, for in the northern counties of Scotland the summer temperature is not high enough to ripen the grain. The climate of Britain is not ideal for wheat growing, as the summer weather conditions are too uncertain. Extensive

wheat growing is therefore confined to that part of England which has the most suitable climate, viz. eastern England (Fig. 18).

Wheat requires the following conditions for a satisfactory harvest:—

(a) Moisture in the growing season.

(b) Warm, sunny weather for ripening and harvesting.

(c) Rainfall that is not too heavy, *Le.* about 20-30 in.

(d) Land that is flat enough for the use of large machines.

(e) A well drained light, clay soil.

Now in eastern England are found the areas with the hottest summers, and the rainfall is about 25 in. Moreover, although these regions have slightly more rain in summer than in winter, the summer rain is of the thunderstorm type, and is soon over. The area is also a plain, and the soil is mainly a fertile boulder clay deposited during the Ice Age.

The principal wheat-growing districts are Lincoln, Norfolk, Suffolk, Essex, Cambridge, Huntingdon, and Bedfordshire, the Vale of York and Holderness. In Scotland, the chief wheat region is in the east of the Central Lowlands in the Lothians, Fife, and the east coast plains nearly as far north as Aberdeen. Wheat is also cultivated on the rich sandstone plains round Moray Firth. In Ireland wheat is not an important crop because of the dampness of the climate, but a little is cultivated in the drier eastern areas between County Down and County Wexford.

Barley

Barley grows under conditions similar to those for wheat, so that like wheat, its cultivation is largely practised on the drier eastern plains (Fig. 19). It can, however, ripen at lower temperatures than wheat, so that it is cultivated further north and at higher altitudes. The distribution of barley is almost identical with that of wheat, and the two crops play a great part in the rotation system. The east coast plain of Scotland grows more barley than wheat, and barley is more important than wheat in Ireland, where it is one of the principal grain crops of the south-eastern quadrant, roughly throughout Leinster.

Oats

Oats grow well under damper and cooler conditions than wheat. Because of this their cultivation is widespread, since they will flourish not only in the damper areas of western Britain and Ireland, but also in the arable lands of the eastern plains, where they enter into crop rotation with wheat and

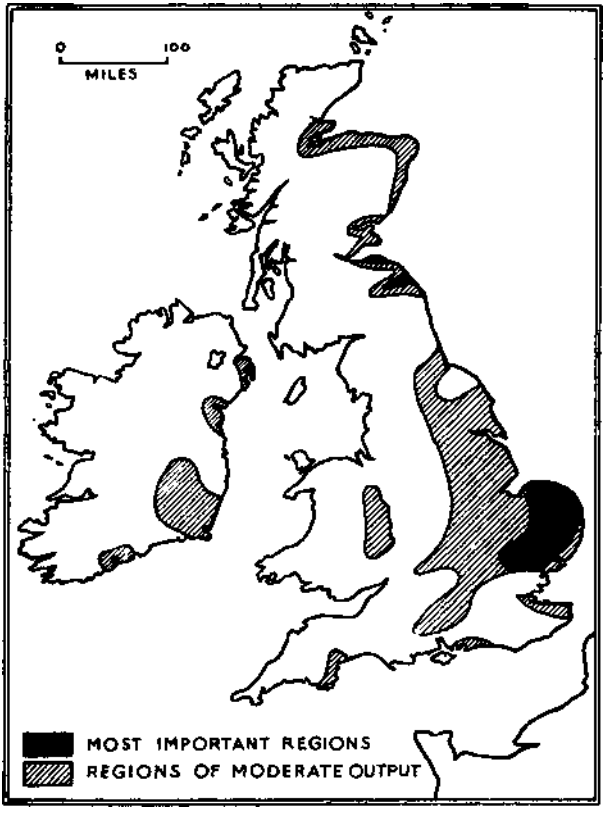


Fig. 19. DISTRIBUTION OF BARLEY.

barley. Except on high mountain areas oats are cultivated throughout the British Isles, but special note may be taken of their importance in the eastern plains of Scotland as far north as Caithness, and their widespread distribution in Ireland, particularly in the lowland areas of Northern Ireland (Fig. 20).

Sugar Beet

Until recently the root crops grown in rotation with wheat were mainly turnips and mangolds, which were used for winter stock feeding. Now, however, sugar beet is grown,

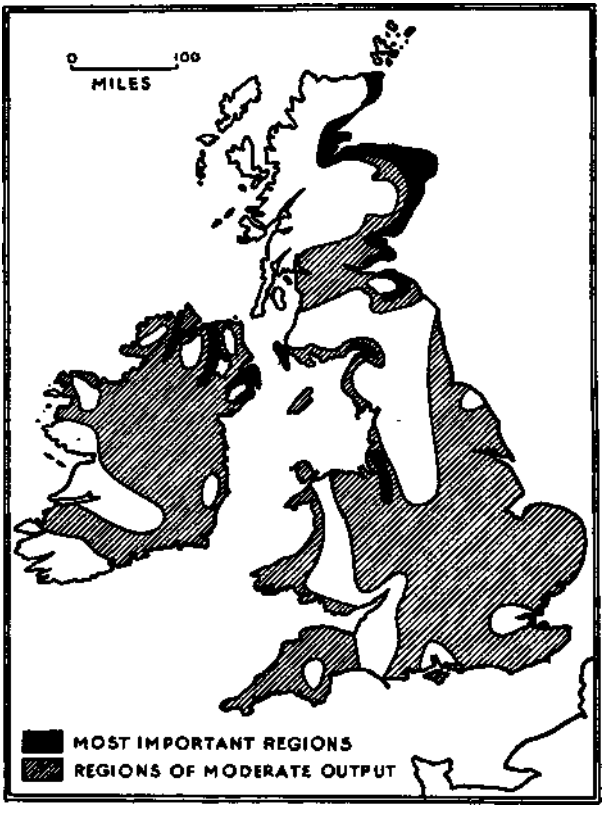
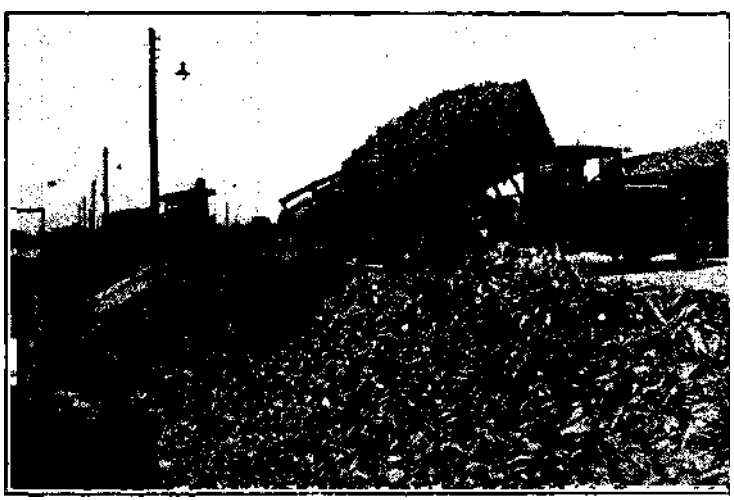


Fig. 20. DISTRIBUTION OF OATS.

particularly since the Great War, and many large sugar factories have been established.

The sugar beet needs a good deep soil, with rain from June to August, and a dry harvesting period later in the year. These conditions of soil and climate are satisfied in the plains of Eastern England.

Sugar beet also has certain advantages from the farmers' point of view. It plays its part in crop rotation, and provides, in its green tops, good animal fodder. The farmer gets an immediate cash return for his beet, and after the sugar has **been** extracted, the pulp can be used for winter feeding of cattle. Beet, however, needs very careful cultivation, especially in the thinning, which is done in spring. The yield of sugar depends on the thinning being done at the right time.



Farmer and Stockbreeder

UNLOADING SUGAR BEET AT BVRDNEY.

As shown in Fig. 21, sugar beet is cultivated in:—

(1) The wheat lands of Eastern England.

(2) North Shropshire and the neighbouring counties.

(3) Fifeshire.

(4) In the valley of the River Barrow in S.E. Ireland.

The first sugar beet factory was built at Cantley, near Norwich, by a Dutch firm in 1912. It was closed, and reopened by an English firm in 1920. Fifteen of the eighteen sugar beet factories of Britain are in the eastern counties, and

of these factories, those at Cantley and Ely are the largest. All the sugar beet factories were all opened between 1920 and 1928. As financial assistance has been given by the Government to encourage the industry, it is impossible, as yet, to regard the development as permanent.

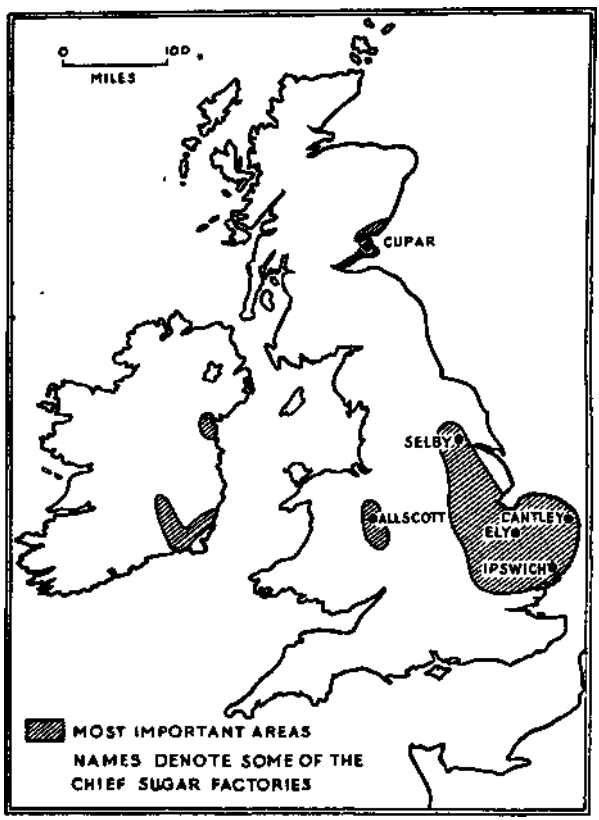


Fig. 21. DISTRIBUTION OF SUGAR BEET.

Fruit

Another group of agricultural products characteristic of S.E. England is fruit and hops, but it is difficult to draw hard and fast lines, because fruit growing is widely distributed all over Great Britain. For example, there must be very few parishes that do not contain an apple tree, but some

areas grow more fruit than others (Fig. 22). Fruit grown in the British Isles is of various types:—

(a) Small, soft fruits, such as strawberries, cherries, raspberries, gooseberries, currants, etc.

(b) Larger fruits, such as apples and pears.

(c) Stone fruits, such as plums and damsons.

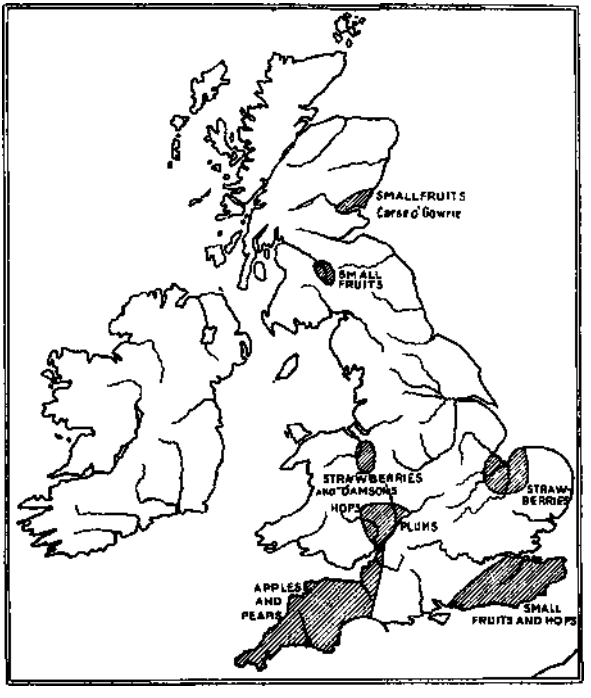


Fig. 22. THE DISTRIBUTION OF FRUIT (CHIEF AREAS ONLY).

(d) Uncultivated fruits, *e.g.* bilberries of the moorlands, which have a definite value for dyeing purposes.

Since the small fruits are quickly perishable, it is clear that a dry, sunny period for picking is of more importance than in the case of apples and pears. Hence the most important areas for strawberries, etc., are found in the east of England, where the summer temperature is highest and the rain least.

The principal regions for small fruits are:—

(1) Kent, Surrey, Sussex, and Hampshire.

(2) In the Basin of the Wash near Wisbech.

(3) The Carse o' Gowrie—the fertile, sunny plain between the Firth of Tay and the Sidlaw Hills, with Dundee as a centre.

(4) The Clyde Valley, north of Lanark.

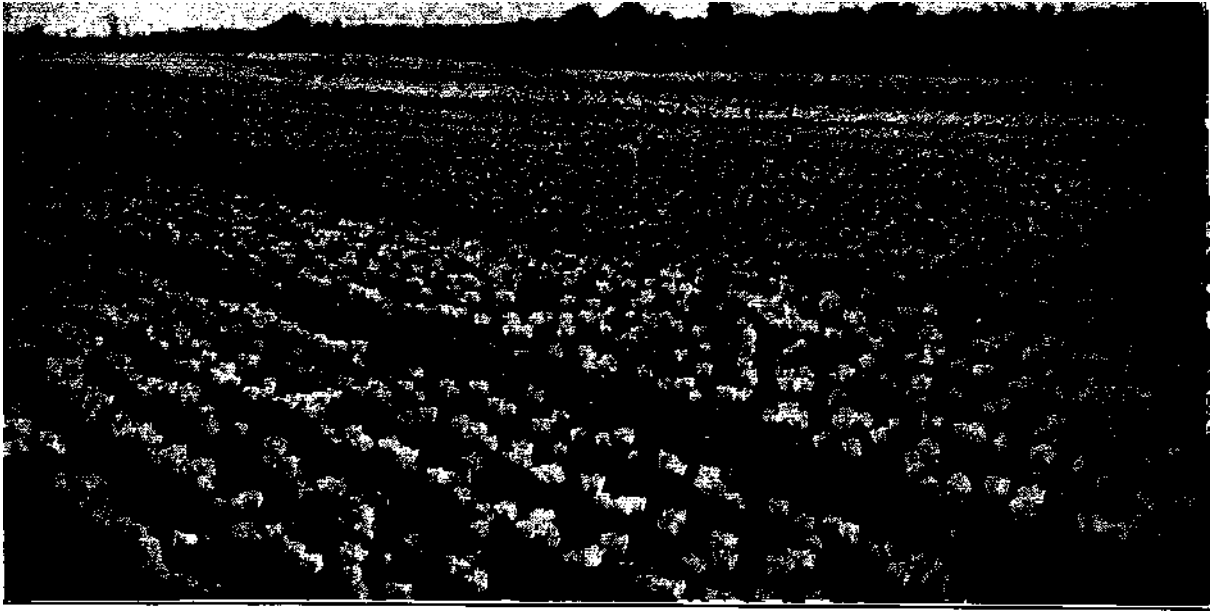
(5) Western Cheshire in the Dee Valley around Farndon. This area is in the rain shadow of the Welsh Hills.

Nearness to markets where the fruit can be sold, and quick transport to those markets, are very necessary when dealing with soft fruits that do not carry well. The nearness of the south-eastern counties to the great population of London is very important. The East Anglian area has quick communication with London and with the Midland coalfield areas; the Carse o' Gowrie and the Clyde Valley with the industrial areas of Central Scotland; and West Cheshire with South Lancashire and North Staffordshire.

The large fruits, such as apples and pears, while having a very wide distribution, are most important in the western counties, particularly in Cornwall, Devon, Somerset, Herefordshire, and Worcestershire. The climate on the west is milder and wetter. Rain is needed to " swell" the fruit, and long, dry spells usually result in the apples falling from the trees. Apples are used for the manufacture of cider, both in the south-western counties and in Herefordshire.

Stone fruits are grown to a great extent in the Vale of Evesham. Damsons are the speciality of Shropshire and S.W. Cheshire, where they are rarely found in orchards, but grow in the hedgerows of the cottage gardens.

In recent years there has been a marked change in the activities of the fruit growing regions, particularly in the centralisation of marketing, in the manufacture of jam, and the bottling and canning of fruits. Almost every year there are two or three weeks during which there is a great surplus of fruit. Instead of this being sold at very low prices, as formerly, it is now used in the jam and bottling factories



. „ Will *F. Taylor*

A BULB FARM NEAR SPALDING, LINCOLNSHIRE.

This district illustrates the flatness of the Fen country. The scene is reminiscent of the bulb fields of Holland, but contrasts strongly with the flower-growing districts of Cornwall, where the flower fields lie in small valleys.

in the fruit districts. Some of such centres are Histon (Cambridge), Tiptree (Essex), Wye Valley factories (Herefordshire), Dundee, York, and Carluke (Lanarkshire).

Hops

Hops require a rich soil and hot summers. They are grown on poles in fields much after the manner of runner beans. Many hop growers now have permanent wire frameworks to support the hops. Much labour is required during the picking season, and the fact that large numbers of people from the East End of London go to Kent to pick hops during the harvest is one of the factors which has contributed to the importance of hop production in Kent.

Hops are grown in the valleys of the Weald in Kent and Sussex. The only other important district is Herefordshire and the neighbouring areas of Worcestershire. Kentish farms often include the characteristic " oast house"—a round building in which the hops are roasted before being dispatched to the brewing centres.

Flowers

Although flowers are grown in every British garden, there is a great demand for early flowers grown under glass or in specially favourable areas. The trade in flowers is of relatively recent origin. Two districts are of major importance.

(1) The Holland district of Lincolnshire, where not only flowers are grown, but there is also an important bulb growing industry.

(2) Cornwall and the Scilly Isles, where the extremely mild winters and absence of late spring frosts enable flower growers to send daffodils, narcissi, etc., to the London markets very early in the year.

Market Gardening

Market gardening is the large scale production of vegetables and salad crops. Such cultivation demands much more labour and care than ordinary farming, and can be carried on profitably on high-priced land near to industrial centres. Moreover, owing to limited garden space in urban areas, it is

the large towns that consume the produce. Quick transport, ensuring the freshness of the produce when it reaches the shops, is essential. The distribution of market gardeners is determined mainly by nearness to large industrial areas.

Some of the most important areas are:—

(1) The counties bordering London both on the north and south *(i.e.* the Home Counties), which supply the Metropolis.

(2) The Vale of Evesham, which supplies the Midland industrial areas.

(3) The Vale of York, which supplies the Yorkshire woollen towns, etc.

(4) North Shropshire, Cheshire, and West Lancashire, which supply the industrial areas of Lancashire and N. Staffordshire.

(5) Cornwall and Devon.

The last-named region is far removed from the industrial centres, but it has a very special climatic advantage. Its winters are the mildest in the British Isles, and there is little danger of damage being done to the crops by late frosts. Consequently vegetables can be produced much earlier than in other parts of the country.

In the last ten years there has been an enormous increase in the large-scale production of fresh vegetables, and one of the results of this has been the establishment of factories for the canning of such vegetables as peas, beans, carrots, new potatoes, and tomatoes. The output of tinned fruit and vegetables in Britain increased from 7,000,000 tins in 1926 to 100,000,000 tins in 1932.

Cattle Rearing

Cattle are reared in every county in the British Isles, but some districts, because of their soil and climate, are much more important than others for cattle rearing.

Cattle are reared for their milk, meat, and hides. Dairy cattle are those reared primarily for their milk, and they require an abundance of rich, juicy grass. For this **the** following conditions are necessary:—

(a) A good average rainfall of thirty inches or over, well distributed throughout the year. Dry periods hinder the growth of grass in the meadows.

(b) Cool summers, so that the grass is not parched.

Fig. 23. DISTRIBUTION OF DAIRY CATTLE.

(c) Mild winters, delaying the frosts, so that the cattle can be fed out of doors over a longer period. Grass stops growing when the temperature falls to about 42° F., hence the districts with the mildest winters, such as Cornwall and Devon and S.W. Ireland, offer the most favourable conditions for the growth of grass.

(d) While not absolutely necessary, a clay soil is an advantage, since clay does not allow the rain to sink quickly into the ground.

The climatic conditions outlined above are clearly those of the west of the British Isles (Fig. 23). The most important dairying regions are—

(1) CORNWALL, DEVON, AND SOMERSET. Cornwall and Devon are noted for their cream, and Somerset for Cheddar and St. Ivel cheese.

(2) WELSH LOWLANDS. The Plains of Gwent, Pembroke, and Anglesey are the only extensive lowlands in Wales. The Plain of Gwent is noted for Caerphilly cheese, and supplies milk and dairy produce to the dense population of the South Wales coalfield.

(3) CHESHIRE. This is one of the best-known dairying counties, and has more cattle per 100 acres than any other county. Its sandstones are largely covered with layers of boulder clay, often of a type much too heavy for ploughing. Cheshire is particularly famous for its cheese, but it also produces large quantities of milk for dispatch to large towns and creameries.

(4) SOLWAY FIRTH AREA. The plains around the Solway Firth, both on the Scottish and English sides, form another important dairying region. Carlisle, Dumfries, Wigtown, and Kircudbright are the chief market centres. Much of the dairy produce from this region is sent, via the Tyne Gap, to the North-eastern industrial area.

(5) AYRSHIRE. Milk and dairy produce to the industrial districts of Central Scotland are supplied by Ayrshire.

(6) THE VALES OF OXFORD AND AYLESBURY. In these areas, and in the Lower Thames Basin, the enormous demand of London for milk is one of the chief causes of the great importance of cattle rearing. Some fifty milk trains enter London daily, bringing milk from Oxfordshire, Buckinghamshire, Bedfordshire, Berkshire, etc.

(7) THE IRISH PLAINS. The chief dairying regions of Ireland are:—

***(a)* In the South-west, in the lowlands of Limerick, Cork, and Tipperary, Kerry, Waterford, and Kilkenny.**

***(b)* To the north of the Central Plain, in the counties of Sligo, Leitrim, Cavan, and Monaghan. The great area of lowland which extends between the two regions outlined above is not primarily a dairying region, but engaged in the rearing of cattle for beef (see page 270).**

Changes are taking place in the dairying regions similar to those in the fruit and market gardening areas. Whereas in times past farmers' wives used to make most of the butter and cheese in their own dairies, to-day, factories are being established for this purpose in all the principal dairying areas. These factories make butter, cheese, and patent foods.

The " Little Wilts " dairies of Trowbridge (Wiltshire) are well known. " Ovaltine " is made in Hertfordshire, and "Trufood " in Cheshire. In Cheshire, too, there is a large collecting centre for the United Dairies, and on the Cheshire-Staffordshire border Cadbury's have a large milk collecting centre. Huntingdonshire is noted for its Stilton Cheese, and the dales of Yorkshire for Wensleydale cheese.

Before leaving the study of dairying we must notice that very often pig-rearing and bacon-curing are associated with it, much of the skimmed milk being used to feed the pigs. Bacon production is particularly important in Wiltshire and Berkshire, in the Irish Plains, and in the Vale of York.

Cattle reared as beef or store cattle are found more especially on the Midland Plains (Fig. 24). The climate here is slightly more extreme than in the west. The New Red Sandstones of Warwickshire and the middle Trent Basin produce good pastures, and so these areas supply meat to the Midlands. The Vale of York is also important for cattle rearing. In Scotland three regions are of prime importance, and are all plains of Old Red Sandstone. The first is the triangular lowland of north-east Aberdeenshire; the second the plains around Moray Firth; and the third is the Vale of Strathmore, the long, narrow plain lying between the Highlands on the north, and the Ochils and Sidlaws on the south. This latter district is near to the industrial areas of Central Scotland.

The Central Plain of Ireland is an outstanding area for the rearing of beef cattle, particularly in the region immediately to the north-west of Dublin (Baileatha Cliath). Live cattle are exported to England. The greatest difficulty of Central Ireland is that of communication, which makes the regular

Fig. 24. DISTRIBUTION OF BEEF CATTLE.

collection of milk a difficult problem, hence the excellent damp pastures are used for beef production rather than dairy cattle.

In olden days, cattle rearing gave rise to leather industries in the market towns. Many of the old tanyards have now disappeared, but some still exist, as at Shrewsbury and Nantwich. In the Midlands, particularly at Northampton,

Leicester, and Kettering, there are important manufactures of boots and shoes, but little of the leather is actually tanned in these towns. Stafford also makes footwear.

Glove-making is another branch of the leather industry. Worcester, Yeovil (Somerset), and Woodstock (Oxfordshire) are among the chief centres. At Hyde and neighbouring towns in North Cheshire, hat and upholstery leathers are manufactured. Thus the chief leather manufacturing towns are never very far removed from the cattle-rearing areas. This is because the original industries used local supplies of hides. Since the bulk of hides and skins used to-day are imported, tanning centres tend to develop in or near the great ports, *e.g.* around the Mersey estuary, at Runcorn, and in London and Bristol.

Sheep

In the Middle Ages, England was a very important wool producer, and exported much wool to Europe. In fact, wool was England's main source of wealth, and sheep were reared on all the fertile plains of the south-east. To-day, however, the population is much greater than formerly, and land has to be used more profitably and cultivated extensively. Sheep are now only reared on areas that are unsuitable for industry, cattle pasture, or agriculture (Fig. 25). The highland areas of Great Britain make good sheep pastures. Excessive dampness of the ground is a disadvantage to sheep rearing, because on damp soils sheep develop "foot rot." The western mountains, however, though wet, are well drained. Light sandy soils near the coasts with their rather stiff, dry grass, also provide good sheep pastures, since the sandy nature of the soil allows the water to sink freely into the ground, leaving the surface dry.

The principal sheep-rearing areas of Britain are enumerated below:—

(a) **THE SCARPLANDS OF SOUTH-EASTERN ENGLAND (particularly the North and South Downs). Chalk and limestone are porous rocks, so that rain quickly sinks below the surface. The result is that the top soil is very dry, and often the only vegetation of these hills is short grass except where layers of glacial clay have given rise to woods, as on some parts of the**

Chiltern Hills. Kent has more sheep per acre than any other English county, and this is partly because the chalk hills (N. Downs) can be used for sheep rearing, and partly because of its nearness to London and the consequent great demand for meat. In Kent, sheep are also reared on the salt marshes

Fig. 25. DISTRIBUTION OF SHEEP.

near Dungeness (Romney Marsh), but these sheep are removed to drier downlands during the winter.

Sheep rearing is also important on the scarplands of Leicestershire and Lincolnshire.

(2) THE PENNINES (and the Cumberland and Westmorland Fells). The limestone districts, being composed of a porous

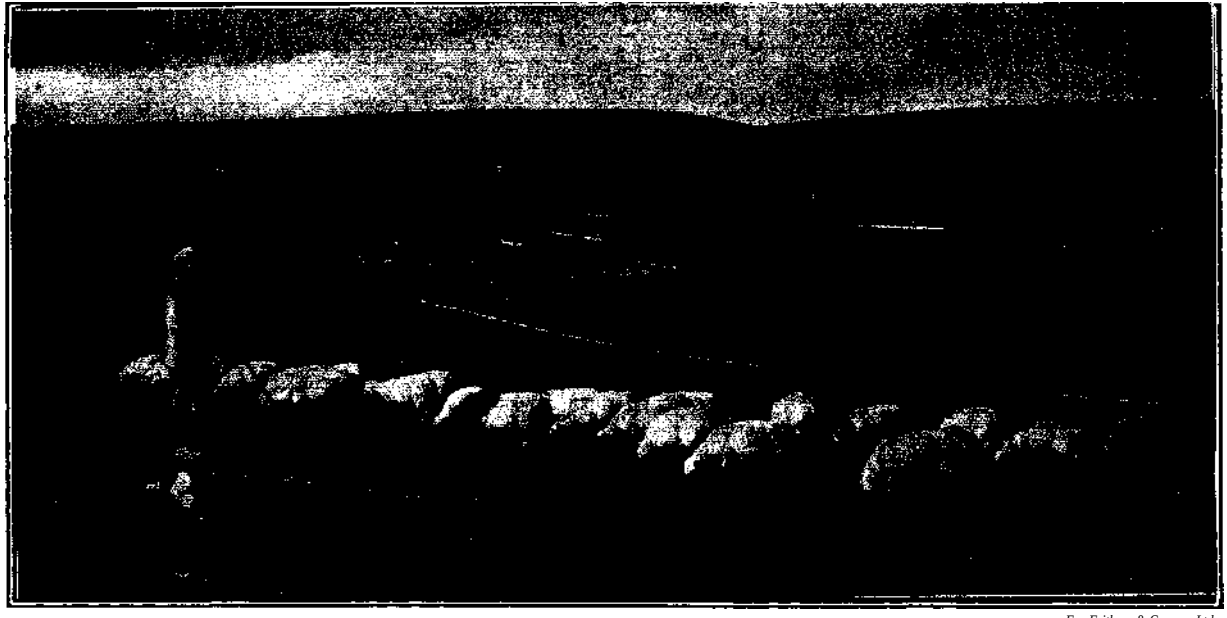
rock, have a dry surface and produce short grass suitable for sheep rearing. Other areas of grassy fells and open moorland are similarly useful.

(3) THE WELSH MOUNTAINS. **These mountains are mainly covered with moorland vegetation, and sheep rearing is very important in every county, for Wales contains very little fertile lowland. Radnorshire, with most highland and least lowland, has more sheep per acre than any other county in Wales.**

(4) THE SOUTHERN UPLANDS OF SCOTLAND AND THE CHEVIOTS. **This is a region very similar to Wales, both in the type of rocks of which it is composed and in the nature of the scenery. There are the same wide, open moorlands separated by fertile valleys. This is quite the most important sheep-rearing area in the British Isles, and Roxburgh has more sheep per acre than any other county in Great Britain.**

(5) THE HIGHLANDS OF SCOTLAND. **This is the mountainous district lying north of a line from Helensburgh to Stonehaven. This area, useless for cultivation and covered with moorland vegetation, would appear to be ideal for sheep rearing. Such, however, is not the case. In the southern areas, which are drained southwards by the River Tay and its tributaries, there is certainly a great deal of sheep rearing, and Perth has a very important sheep market. North and west of the Tay basin, however, the area is very bleak and wet, and transport difficult. The northern areas are at a great distance from markets, and so there is less sheep rearing than one would expect, and large areas are preserved as grouse moors and deer forests.**

(6) IRELAND. **In Ireland there are only about one-quarter the number of sheep that there are in England and Wales, and they are reared principally in two areas:—*(a)* in the Wicklow Mountains, in the south-east, an area with rocks very similar to those of Wales, and *(b)* in County Galway and parts of Roscommon, where the land surface is composed of limestone, and not covered with glacial soils as in other parts of the Central Plain. Sheep are also reared in smaller numbers on the other highland areas of Ireland, as on the Mountains of Donegal and the Mourne Mountains.**



F Frith & Co, Ltd

WEST DEAN, NEAR SEAFORD.

This view is typical of the chalk country. The village is situated in a sheltered valley. There, ground water is nearer the surface. This ensures a water supply for the villagers and makes possible the growth of trees. Notice the smooth contour of the hills; the absence of trees on the higher levels; the unfenced roads; the number of corn stacks which testify to the importance of cereal cultivation on the lower ground; the shortness of the grass and the resultant occupation of sheep rearing.

It must not be forgotten that the British Isles rank as one of the most important sheep rearing countries of the world. There are more sheep in the British Isles than there are in New Zealand, but British wool and mutton are used at home and do not enter into world trade as do the New Zealand products. British breeds of sheep are the basis of the great flocks of sheep-rearing countries in the Southern Hemisphere, and there is a constant export of British pedigree animals to these countries.

Poultry

The most important poultry rearing districts in order of importance are:—Lancashire, West Riding of Yorkshire, Cheshire, Surrey, and Essex. It is obvious that the supply of poultry and eggs to large industrial areas is an important factor in determining the distribution of these districts.

Ireland produces large quantities of poultry and eggs for export, and has a particularly important trade in Christmas turkeys. The great increase in poultry rearing in the past few years has led to the canning of cooked chickens, etc., which is a growing industry.

CHAPTER IV

THE WESTERN PENINSULAS

(1) THE SOUTH-WEST PENINSULA

On the west of Great Britain are three peninsulas:—

(a) Cornwall, Devon, and Somerset.

***(b)* Wales.**

***(c)* The Cumbrian peninsula.**

These three peninsulas have many points in common, for they all contain high moorland areas, experience heavy rainfall, and enjoy equable climates. As they are on the west they are regions to which the early inhabitants of Britain were driven by the successive invaders in the early days of British history from pre-Roman times onwards. They all contain interesting historical monuments, such as stone circles and monuments. Often a similarity in place-names can be seen, *e.g. PenrIth* (Cumberland), Penmaenmawr (Wales), and Penzance (Cornwall), and in all these regions there are interesting survivals of ancient customs.

DEVON AND CORNWALL

This part of England is bounded on the east by the line of the Jurassic limestone escarpment which passes east of the Mendips southwards to the coast of Dorset at Lyme Regis on the Devon-Dorset boundary.

Although the climate and products of Somerset are very similar to those of Cornwall and Devon as a result of similar climatic conditions, the former county is so different in structure that it will be described separately. The eastern boundary of Devon is a N.W. to S.E. line running from a point just east of the Foreland to Lyme Regis. The River Tamar may be taken as the dividing line between Cornwall and Devon.

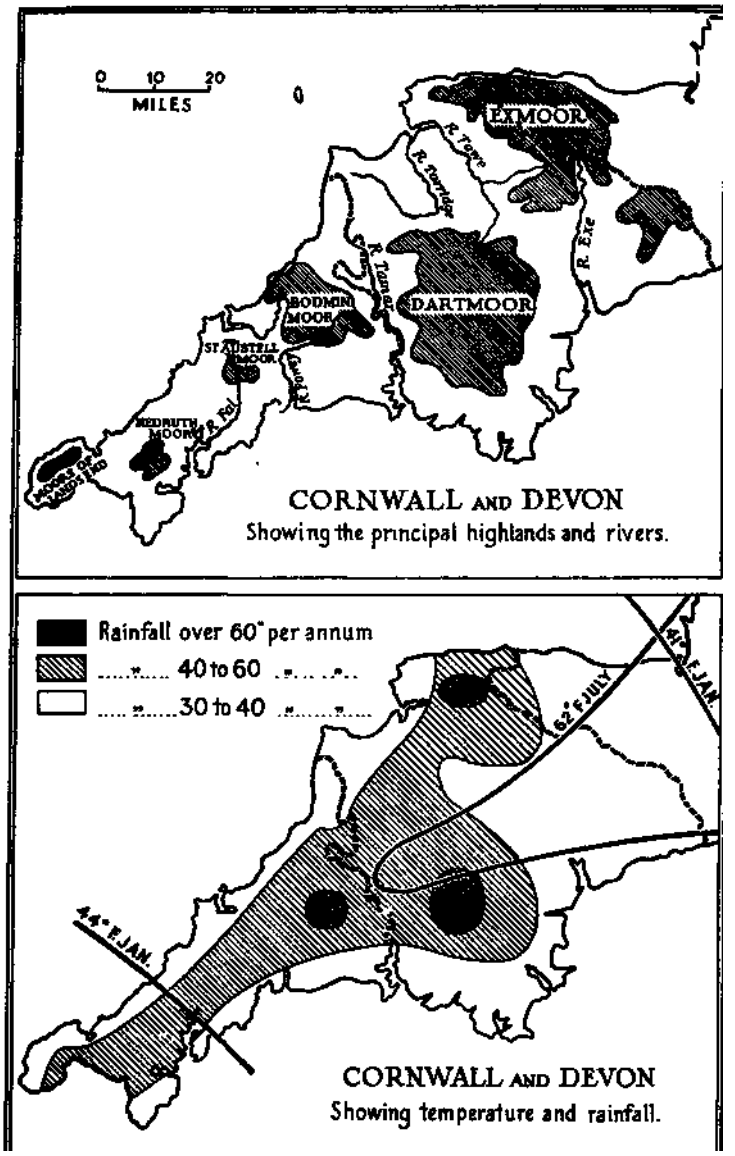

0 10 20
MILES
EXMOOR
R. Taw
R. Torridge
R. Exe
R. Tamar
BODMIN MOOR
DARTMOOR
ST AUSTELL MOOR
R. Fowey
REDRUTH MOOR
R. Fal
MOORS OF PENWITH AND LAND'S END
CORNWALL AND DEVON
Showing the principal highlands and rivers.
Rainfall over 60" per annum
40 to 60
30 to 40
44° F JAN.
42° F JULY
CORNWALL AND DEVON
Showing temperature and rainfall.

Fig. 26 *(a)*.

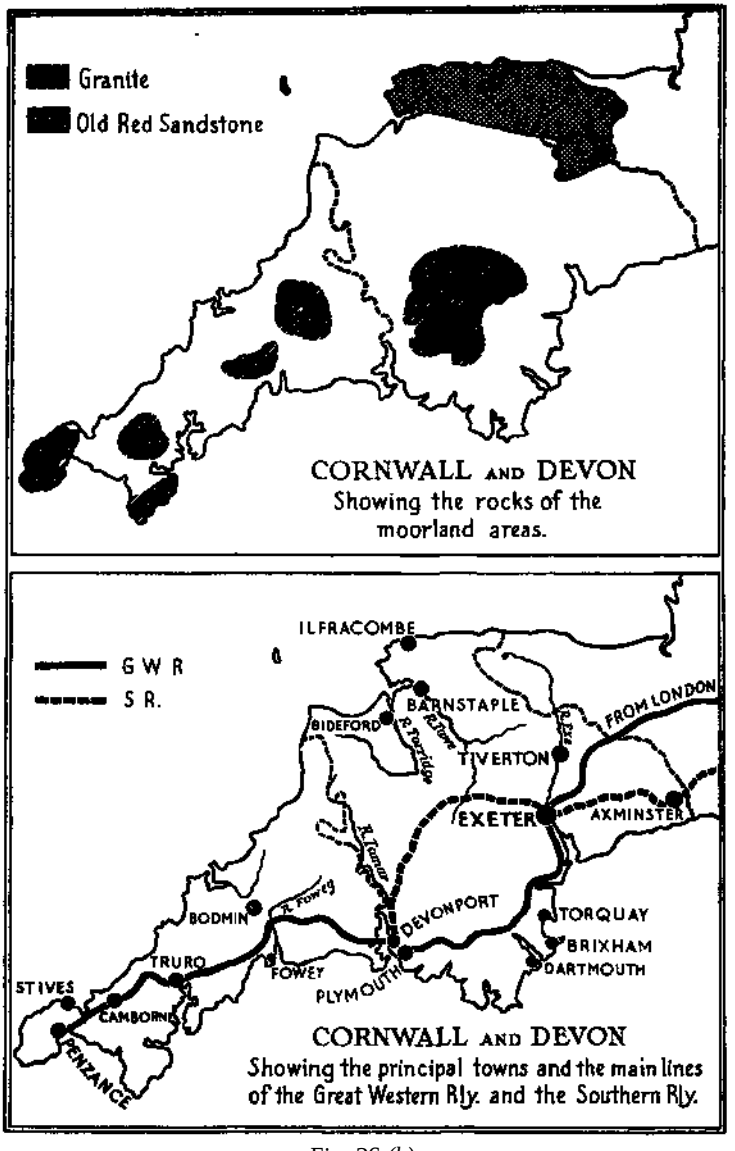

Granite
Old Red Sandstone
CORNWALL AND DEVON
Showing the rocks of the
moorland areas.
G W R
S R.
ILFRACOMBE
BARNSTAPLE
BIDEFORD
TIVERTON
EXETER
AXMINSTER
FROM LONDON
BODMIN
TRURO
FOWEY
PLYMOUTH
DEVONPORT
TORQUAY
BRIXHAM
DARTMOUTH
ST IVES
CAMBORNE
PENZANCE
CORNWALL AND DEVON
Showing the principal towns and the main lines
of the Great Western Rly. and the Southern Rly.

Fig. 26 *(b).*

Physical Features

In the north of Devon is the western portion of Exmoor, a plateau of rounded moorlands composed of Old Red Sandstone. Exmoor drops steeply to the north Devon coast, but falls more gently southwards to the plain of Devon. This plain is drained by the Rivers Taw and Torridge northwards to Barnstaple Bay, and by the River Exe (which rises in Exmoor) southwards to Exeter.

In the southern " bulge " of Devonshire a great mass of granite rises to form the extensive moorlands known as Dartmoor, a wild, bleak, rainy, heather-clad region, which is very attractive to tourists. From it the River Dart and tributaries of the other Devonshire streams drain rapidly. Rising above the general level (2000 ft.) of the moorlands are huge masses of bare granite known as " tors," the chief of which are Yes Tor and Great Links Tor. Large areas of Dartmoor are occupied by bogs due to the clay formed by the decomposition of granite under the action of rain.

Dartmoor is a good illustration of the scenery of a granite region which is characterised by:—

(a) Wide open valleys.

(b) The marshy valley bottoms which when drained form rich cattle pastures.

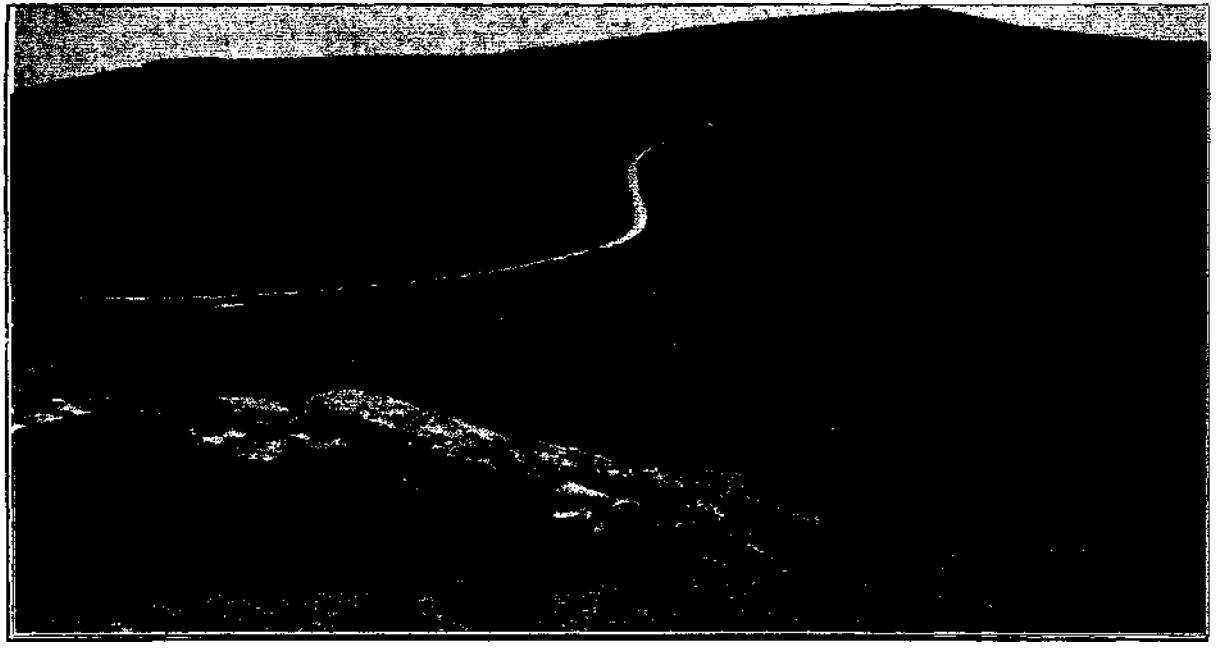
(c) Rounded hills with smooth outlines.

(d) The thin infertile soils of the moorlands, sandy and gritty in texture.

(e) " Tors " of bare granite crowning the uplands.

(/) Many springs and streams due to the impermeability of the rock.

West and south-west of Dartmoor are four similar granite moorlands of smaller area. They are the Bodmin Moors, culminating in Brown Willy (1375 ft.), the St. Austell moors, the Redruth moors, and the low moorlands near Land's End. Thirty miles beyond Land's End are the Scilly Isles, also composed of granite. The Cornish plains surrounding the granite moorlands are of Old Red Sandstone which weathers into a rich red soil. The chief rivers of Cornwall are the Fal,



G.WR.

DARTMOOR.

Dartmoor is a granite moorland. Notice the rounded outlines; the exposures of bare rock; the " tor " in the top right-hand corner; the unfenced roads; **the** almost complete absence of trees, cultivation, and habitation.

Camel, and Fowey. On the low watershed separating the last two is Bodmin, the county town.

An important characteristic of the coast is the large number of drowned valleys or " rias," which provide good harbours. The most notable is the large branching estuary of the Tamar known as Plymouth Sound. Similar in shape and size is Falmouth Harbour. Other large estuaries are those of the Dart, Exe, and Taw. Elsewhere the quaint little coves and harbours and the impressive grandeur of the rugged,cliffs have made the coastal scenery of Cornwall and Devon famous for its beauty, and in the past renowned for its " sea dogs " and smugglers.

Climate

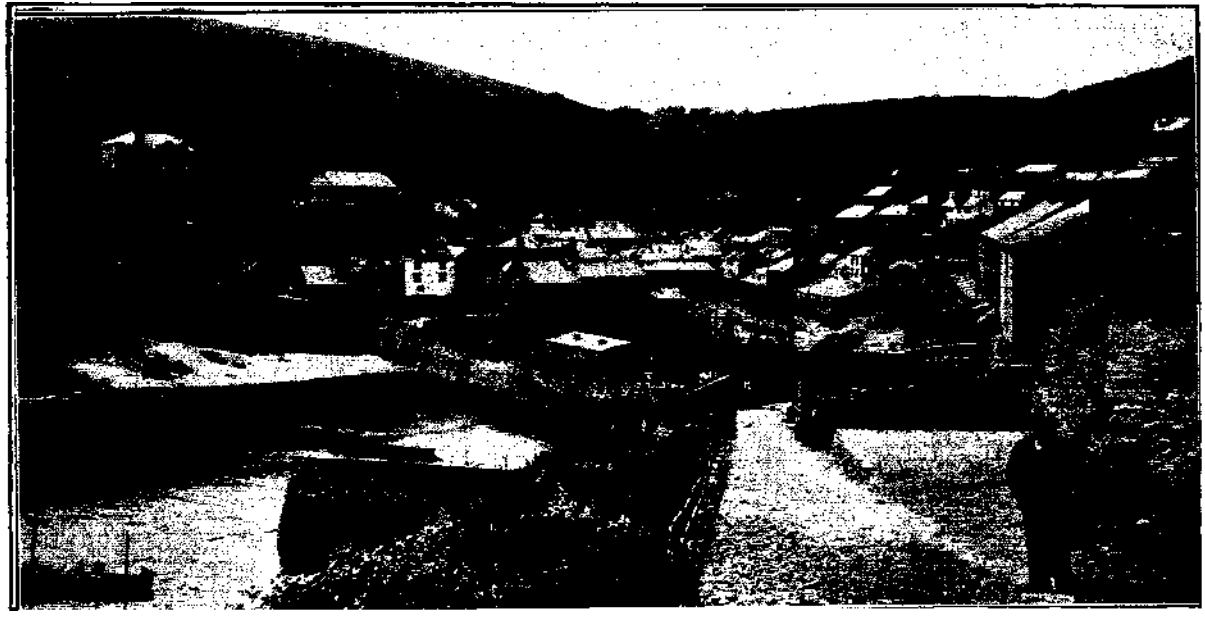
Because Cornwall and Devon is a peninsula open to the south-west winds from the Atlantic it is characterised by warm winters (42°-45° F.), cool summers (60°-62° F.), and a good average rainfall. An isotherm map of Europe reveals the fact that its winter temperatures are practically the same as those of the French Riviera. This will serve to emphasise the extreme mildness of the Cornish winters, but it must be remembered that Cornwall is much cloudier than the south of France, and also that in the south of France the insolation is greater and the winter days longer. Because of the mild winters, palms, aloes, and other semi-tropical plants are to be seen growing out of doors.

Occupations

Most of the people in Cornwall and Devon are engaged in some kind of agriculture, and the type of farming is largely determined by the climatic conditions.

The rich pastures, resulting from the fertile soils of the lowlands, the equable temperatures, and the rainfall, have given rise to cattle rearing and an important dairying industry. Because these regions are so remote from densely populated industrial areas they specialise in the production of butter, cheese, and preserved cream rather than in the sale of milk. There is, however, a condensing dep6t at Lostwithiel to which the farmers of that, district sell their milk direct.

Another industry which owes its importance to the mildness of the winters is the growing of early vegetables such as



A CORNISH FISHING VILLAGE, POLPERRO.

Polperro is situated where a small valley reaches the sea. At the seaward end a strong wall has been built almost across the river enclosing the harbour. The picture was taken at low tide and the fishing boats can be seen resting on the muds of the harbour bottom. The small amount of flat land available in the valley has caused the village to straggle up the hillsides.

broccoli^ peas, and beans for the northern markets. The growing of early flowers, both in Cornwall and the Scilly Isles, is due to the same cause, for frosts rarely occur. In Cornwall the flower fields are mostly to be found in sheltered valleys, while in the Scilly Isles stone walls surround the fields and serve as a protection against the wind.

Fruit-growing, too, is largely the result of the warm winters and sunny summers. Both Devon and Cornwall produce large quantities of " cider " apples, and cider is manufactured, *e.g.* at Whimple.

The variety of the scenery, the wide open moorlands, the winding Devon lanes and pleasant villages, the rugged grandeur of the coast, and the luxuriant vegetation all add to the attractions of the peninsula. Thus Cornwall and Devon is a popular holiday centre, and there is a flourishing " Tourist Industry." All around the coast are famous resorts such as Torquay, Looe, Newquay, and Ilfracombe. Because of the warm winter climate tourists visit Cornwall and Devon almost as much in winter as in summer, and for this reason it is known as the " English Riviera."

The close association of all parts of the peninsula with the sea has also had a great influence on the lives of the people. Standing on Bodmin moor it is possible, on a clear day, to see the sea both to the north and south of Cornwall. There is, here, a familiarity with the ocean in all its moods, and the people have developed a natural love of the sea. The sheltered harbours each have a fishing fleet. A great variety of fish is caught (notably pilchards). The most important fishing centres are Brixham, Looe, Fowey, Newlyn (near Penzance), and St. Ives. The fisheries of the south-west are not as important as those of the east of England, partly because both the fleets and harbours are small, partly because the region is so distant from the centres of dense population, and partly because the fishing grounds are not as productive as those of the North Sea.

Because of their close association with the sea, large numbers of men join the Navy, and Devonport on Plymouth Sound is a naval centre.

Quarrying and mining must also be included in the list of occupations. Granite is quarried in many localities for building purposes; slates are quarried at Penryn; and

limestone near Torquay. The most important mineral is kaolin or china clay, which is formed by the decomposition of granite. The chief source of kaolin is the St. Austell moorland. The clay is shipped from Fowey and Par, and is taken to the Mersey, whence it is dispatched to North Staffordshire for the manufacture of pottery, and to Lancashire for use in paper making, and also for "dressing" cotton fabrics. Tin ore has been mined in Cornwall for over 2000 years, since the time when Phoenician traders sought it in exchange for purple cloth. To-day the tin mines of Camborne are almost exhausted, and Britain obtains her supplies from Malay and the East Indies, Nigeria, and Bolivia, where the easier mining] conditions result in cheaper production.

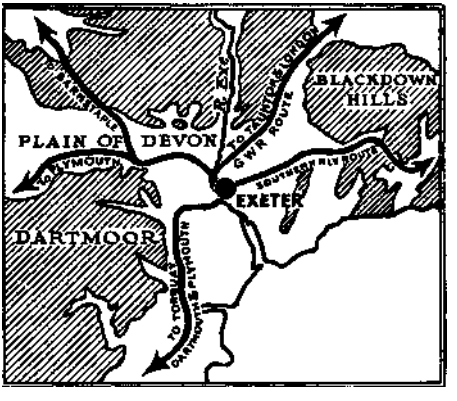


fig.27. THE POSITION OF EXETER.

Communications

The peninsula is served by two main railway lines, the Great Western Railway and the Southern Railway. Their routes well illustrate the nature of Dartmoor as a barrier to communication. The Southern Railway approaches Exeter from Axminster, and then strikes round the north of Dartmoor and so to Plymouth. The G.W.R. approaches Exeter from Taunton by a more northerly route than the S.R., and then follows the southern coastal plain to Plymouth, whence the line proceeds to Penzance (Fig. 26). There is a summer air service between South Wales and Torquay. This gives very quick transport as compared with the longer and slower railway route via the Severn Tunnel and Bristol.

Chief Towns

Exeter (Fig. 27), the county town of Devonshire, is an **old** Roman station, situated at the lowest p.

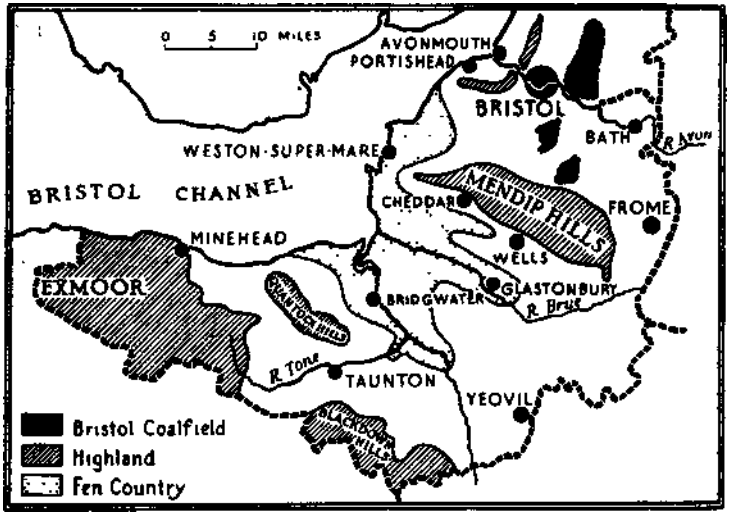


Fig. 28. THE NATURAL DIVISIONS OF SOMERSET.

river Exe. From here the famous Roman Road, the Fosse Way, struck north-eastward. It is a great market centre for east Devon. -

Torquay is the most famous of the sea-side resorts. It is situated on a sheltered bay on the " lee " side of Dartmoor, so that it is well sheltered from westerly gales and has a maximum of sunshine.

Plymouth, at the mouth of the R. Plym, stands at the entrance to a fine natural harbour known as Plymouth Sound. This position, and the fact that it is at the western end of the English Channel guarding the approach to the " Narrow Seas " from the west, made it an important naval station in Elizabethan days (see Fig. 97). Devonport, on the opposite shore of the Sound, is the modern naval centre. The main G.W.R. from Plymouth to Penzance crosses the Sound by Saltash Bridge. Plymouth is the natural focus of routes from both Devon and Cornwall.

Barnstaple, at the lowest bridging point of the R. Taw, is the market centre for the north-western portion of the plain of Devon. Another market centre is Bideford, near the mouth of the R. Torridge.

SOMERSET

Somerset may be divided into four distinct areas (Fig. 28):—

(1) The highland areas of the south-west, including most of Exmoor, the Quantock Hills, and the Blackdown Hills.

(2) An extensive lowland drained by the rivers Parret, Axe, and Brue.

(3) The Mendip Hills.

(4) The lowland between the Mendips and the R. Avon.

The Highland Areas of the South-West

This division includes part of Exmoor, the Blackdown Hills, and the Quantocks. The latter, like Exmoor, are composed of Old Red Sandstone. Between the Quantock Hills and the Blackdown Hills is the valley of the R. Tone, a tributary of the R. Parret.

Taunton, on the Tone (Fig. 29), situated about midway between the Bristol Channel and the English Channel, and controlling the route to the south-west, is one of the chief railroad foci of the western peninsula.

The Plain of Somerset

A careful comparison of the physical and geological maps shows that the plain of Somerset is composed of very new rocks. The plain is covered partly by alluvial and partly by peaty soils. It is uniformly low and flat except where " islands " of harder rock rise slightly above the general level. **As** in the Fens of eastern England, this region has been

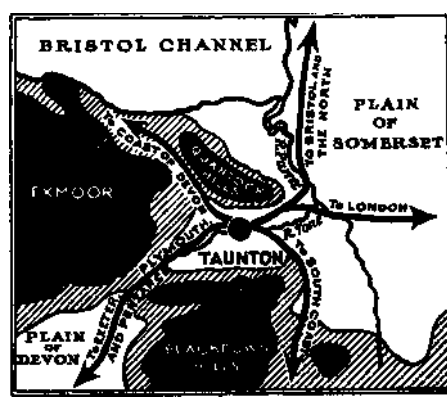


Fig. 29. TAUNTON, THE " GATEWAY " TO THE SOUTH-WEST PENINSULA.

drained by the cutting of innumerable ditches, and rivers have been straightened in order to increase their rate of flow, so that they can more easily drain away the surplus water. In olden days the firm islands within the marsh were refuges, *e.g.* King Alfred took refuge on the " Isle " of Athelney, and on these " islands," too, settlements grew up, *e.g.* Glastonbury. The coastline of this part of Somerset is straight, being composed of sand dunes 20-30 ft. high, which rise above the level of the plain behind them. The plain is drained by sluggish streams, such as the Parret, Axe, and Brue.

Like Cornwall and Devon, Somerset is open to the influence of the westerly winds, which moderate the temperature and bring an ample, well-distributed rainfall. Because of the climatic conditions the reclaimed and drained land is used for rearing dairy cattle and for apple orchards. Cheddar, in the north of the plain, and Yeovil, in the south, are both noted for cheese. Bridgwater, at the lowest point of bridging of the Parret, has a famous cattle market. On the east the plain is bounded by the low limestone hills of the Devon-Somerset border, part of the main limestone escarpment.

The Mendip Hills

The Mendips are really a limestone plateau nearly 1000 ft. in average elevation. The limestone is an older type than the Oolitic Limestone, and is similar to that found in the Pennines. The scenery is of the " karst " type with caverns, and steep-sided gorges *(e.g.* Cheddar). As the limestone only supports short grass, sheep rearing is important, whilst here and there small pockets of lead ore occur which were formerly mined.

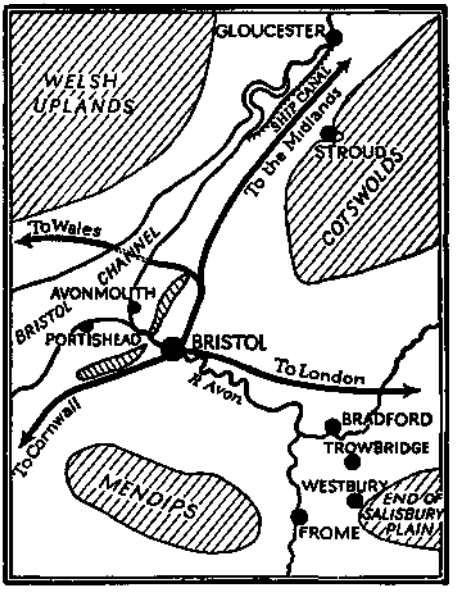
To the east of the Mendips, and extending over the Wiltshire border, is a region famous for its woollen industry. The chief towns are Bradford-on-Avon, Frome, Trowbridge, and Westbury. Before the Industrial Revolution this region, with the Cotswold area to the north, was the most important woollen manufacturing region in England, and is known as the " West of England woollen region " (Fig. 30). It originated because:—

(1) Sheep were reared on the limestone hills.

(2) There were good supplies of water.

(3) Because of the presence in the limestone rocks of supplies of fullers' earth, a soapy clay which was used to remove grease from the wool.

The competition of the woollen manufacturers of the West Riding of Yorkshire led to a decline in the West of England woollen industry. Though less important than formerly, it has survived because it has specialised in the manufacture of materials such as broadcloth, whipcords, and blankets. These woollen towns



originally with Ireland, but, with the colonisation of America and the growth of settlements on the west coast of Africa, its trade rapidly increased. Slaves obtained from Africa were exchanged for typical West Indian products, such as sugar, cocoa, tobacco, formed the return cargo. To-day it imports similar West Indian products as well as large quantities of fruit, such as bananas and pineapples. The fruit is taken by quick train to London and the northern cities, but it is noteworthy that in recent years Manchester has encroached on Bristol's banana trade. As the *Bristol coalfield* is near, the city has a number of industries based on its characteristic imports, viz. sugar refining, cigarette manufacture, and cocoa and chocolate works.

A relatively easy route connects Bristol with London. This route follows the Avon valley at first, then goes through the chalk uplands and follows the river Kennet to its junction with the Thames at Reading, and so along the Thames to London. The Thames and Avon canal, following this route, gives cheap water connection between Bristol and London.

Two hundred years ago, Bristol was the great port of the west coast, while Liverpool was only a fishing village. To-day, Bristol is certainly larger than formerly, but Liverpool is twice as large as Bristol. This is primarily due to industrialisation of northern England. Boats, too, have grown larger, and Bristol now has two outports, Avonmouth and Portishead, at the mouth of the Avon. West Indian steamers sail regularly from Avonmouth.

CHAPTER V

THE WESTERN PENINSULAS

(2) WALES AND THE WELSH BORDERLANDS

The boundary between England and Wales is a north to south line which deviates little from longitude 3° W. Except in south Shropshire, where part of the plateau extends eastward into England, the boundary of Wales approximates very closely to the edge of the highland.

Physical Features

The greater part of Wales is composed of a plateau of old rocks, surrounded by narrow plains. This plateau has been deeply dissected by rivers such as the Dee, Severn, Wye, Teifi, Tawe, Conway, etc.

The mountains of Wales may be considered in three sections:—(1) North Wales; (2) Central Wales; (3) South Wales.

(1) NORTH WALES. This northern mountainous region, lying north of the valleys of the upper Severn and the Dovey, is divided into two sections by the valleys of the Dee and and Mawddach. The southern portion is known as the Berwyn mountains, and the mass culminates westward in Cader Idris (2927 ft.). The mountain block north of the Dee is deeply dissected by the northward-flowing rivers, Conway and Clwyd. The highest peaks are in Snowdonia in the north-west, Snowdon (3571 ft.) being the highest mountain in England and Wales. The whole of the mountains of North Wales have been heavily glaciated. The hills are rounded, the rocks polished, and there are deep, steep-sided valleys *(e.g.* the lower Conway and Glaslyn), cirques, mountain tarns, and waterfalls.

(2) CENTRAL WALES. The region lying south of the upper Severn valley and north of the Usk valley consists of a series of north-east to south-west mountain ridges, Mynedd Bach, Mynedd Epynt, etc., whose western slopes are steeper than

their eastern slopes. Between these ridges flow the rivers Teifi and Towy. The river Wye (rising in Plynlimmon, 2485 ft.) cuts south-eastwards across these ridges by a series of picturesque transverse valleys.

(3) SOUTH WALES. South of the R. Usk are the Brecknock Beacons, steep on the north and dropping more gently southwards to the coastal plains. The Brecknock Beacons consist of Old Red Sandstone, but the mountains to the south of them are composed of the carboniferous rocks of the South Wales coalfield. The mountains of South Wales are drained by two sets of rivers: *(a)* the Tawe and Neath which flow S.W. towards Swansea, and *(b)* the Taff, Rhymney, and Ebbw which flow S.E. towards Cardiff and Newport.

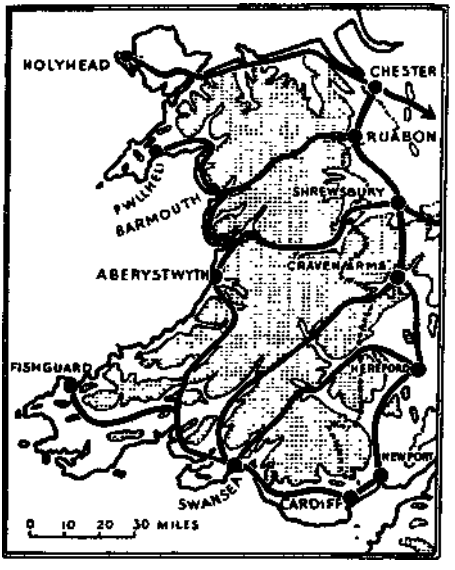


Fig. 31. To SHOW THE CONTROL OF RELIEF ON RAILWAY ROUTES IN WALES.—Note: *(a)* the coastal routes; *(b)* the east to west routes of N. Wales; *(c)* the parallel N.E. to S.W. routes of Central Wales; *(d)* the " border " junctions; *(e)* the accessibility of Shrewsbury from North, Central, and South Wales.

Wales has little lowland. Apart from the river valleys, the chief lowlands are the plains of Gwent and Pembroke in the south, and the lowlands of Anglesey and the Lleyn Peninsula in the N.W.

The Influence of Relief on Communications

The large areas of highland and the steep gradients limit the railways of Wales to the coastal plains and river valleys (Fig. 31). The two most important railway routes follow the coastal plains, viz.:—

(1) The L.M.S. route from Chester to Holyhead.

(2) The G.W.R. route from Cardiff to Fishguard.

Holyhead and Fishguard are packet stations from which steamers sail to Kingstown and Rosslare. In North Wales other railway routes are those following the Dee and Mawddach valleys from Ruabon to Barmouth (G.W.R.), and the route from Shrewsbury to Aberystwyth following the Severn and Dovey valleys. A single line coastal route follows the coast from Aberystwyth northwards to Pwlhelli. In Central Wales there are four parallel N.E. to S.W. routes following the valleys between the scarped ridges. From west to east they are:—

(1) An unimportant route between Aberystwyth and Carmarthen following the Teifi valley.

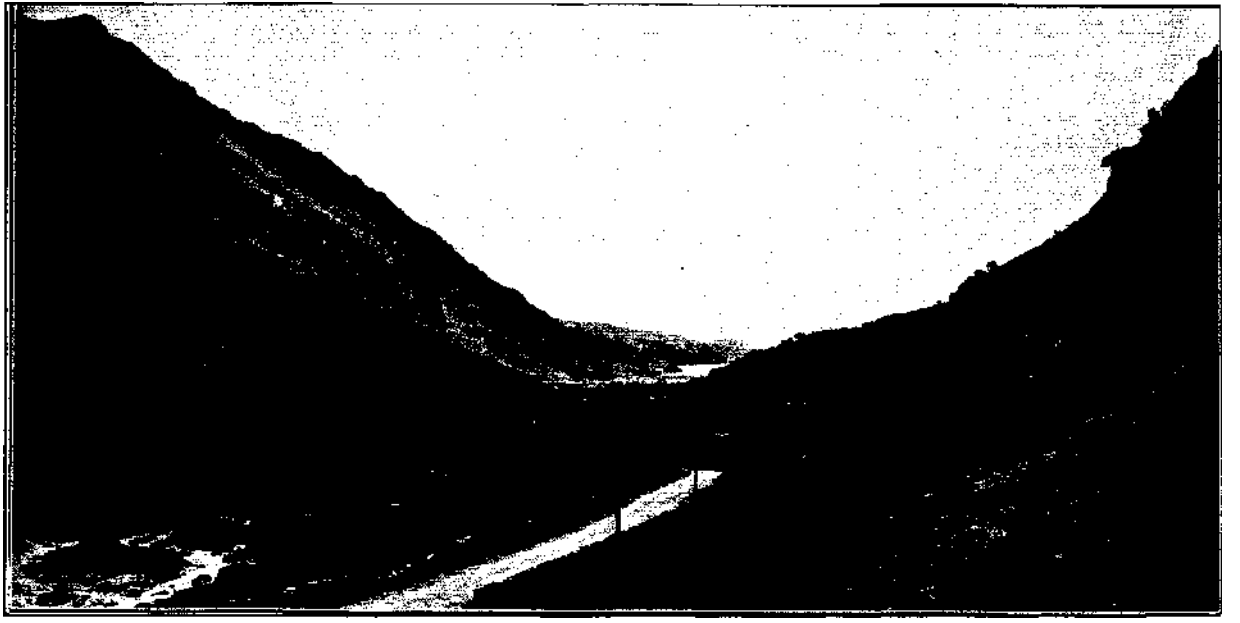
(2) A route from the north of England, which from Craven Arms in Shropshire, strikes S.W. along the valleys of tributaries of the Wye, and the valley of the Towy to Swansea.

(3) A route from Hereford through Brecon to Swansea. This follows part of the Wye valley, and, passing north of the Brecknock Beacons, follows the Tawe valley to Swansea.

(4) An important line from Hereford to Newport and Cardiff.

In the South Wales coalfield there are numerous railways serving the villages of the mining valleys. Each valley has its own railway, and sometimes two lines, one on each side of the stream. These are engaged mainly in the transport of goods, especially coal.

Because of the mountainous nature of Wales and the consequent difficulty of communication between various parts of the country, there is no one centre which is easily accessible from all parts. It is for this reason that so many Welsh meetings are held in Shrewsbury, which is more accessible to the people of North, Central, and South Wales than is the capital of the country, Cardiff.'



THE PASS OF LLANBERIS.

This valley is typical of the passes of Snowdonia. In the distance is Llanberis Lake on the right side of which are the slate quarries shown on page 67. Notice the swiftly-flowing stream in the bottom left-hand corner; the stone walls; the boulder-strewn hillsides; and the scantiness of the vegetation except in the valley bottoms.

Distribution of Population and Industries

The distribution of population in Wales (Fig. 32), according to density per square mile, may best be considered in four sections:—

(1) The almost uninhabited area of the mountain plateau with less than 1 person per square mile.

(2) The river valleys and agricultural lowlands with a population up to 200 per square mile.

(3) The narrow northern coastal plain and the plain of Gwent, with a population density up to 500 per square mile.

(4) The densely populated regions of the North Wales and South Wales coalfields.

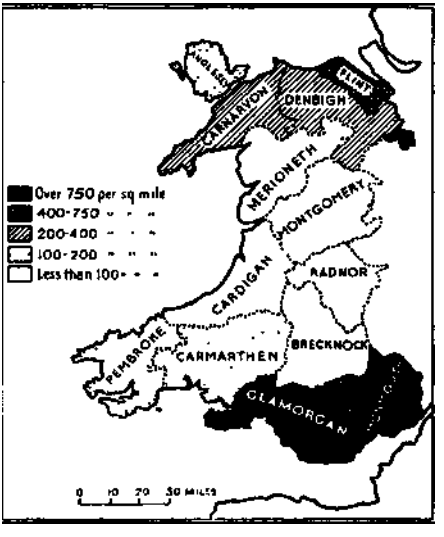


Fig. 32. THE DISTRIBUTION OF POPULATION IN WALES AND MONMOUTHSHIRE ACCORDING TO COUNTIES IN 1931.

(1) THE MOUNTAIN REGION. On the highest parts of the Welsh uplands there are few people because the resources are meagre. The damp climate, the low temperatures due to altitude, the thin soil and the difficulty of access make sheep rearing the chief occupation. It is possible to travel several miles over the Central Welsh uplands without seeing a single inhabited house. Ruined cottages there are, evidence of the movement of people from these " poverty spots " to the cities of England and Wales. There are more Welsh people in London than Cardiff, an appreciable percentage of the dairymen and drapers of the capital city being of Welsh descent.

Owing to the post-war depression in the S. Wales coalfield this movement of Welsh people to England has been accelerated.

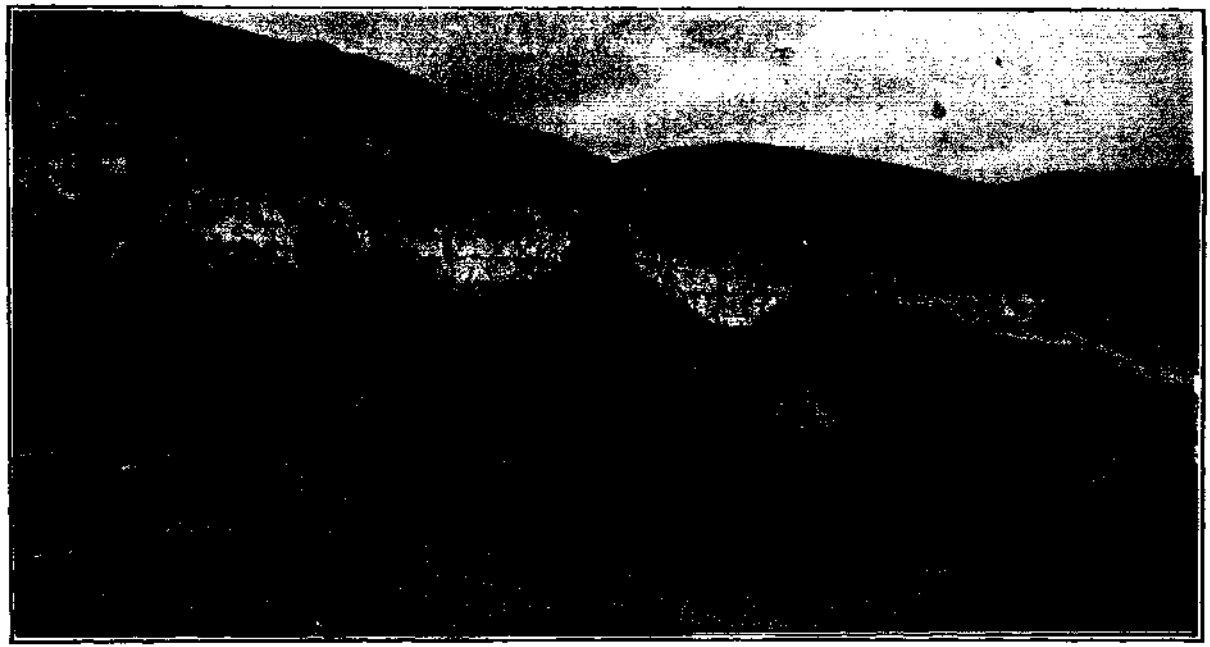
(2) THE RIVER VALLEYS AND LOWLANDS. In the more accessible river valleys, where soils are deeper and richer, and the temperatures higher, mixed farming is practised, and this supports more people in scattered farms and villages.

In the upper Severn valley there was formerly a flourishing woollen industry at Newtown and Welshpool. This has suffered through the lack of coal and the competition of such areas as the West Riding of Yorkshire. To-day, this industry is confined to Newtown, and the output is small. There are, however, a few small isolated woollen mills in some of the valleys of Central Wales, *e.g.* at Tal-y-Bont, near Aberyst* wyth, where Welsh " homespuns " are manufactured.

(3) THE NORTHERN PLAIN AND PLAIN OF GWENT. On the plains of Pembroke, Lleyn, and Anglesey, important for cattle rearing, the density of population is greater than in the river valleys, partly because of the greater accessibility.

The Plain of Gwent, with its rich red soils, is a region of intensive farming, for it supplies the industrial areas of the coalfield. Dairying is important, and there are a number of larger market towns such as Cowbridge, Landaff, and Bridgend.

On the coast' of N. Wales the density of population is increased by the presence of a large number of holiday resorts, such as Llandudno, Rhyl, Colwyn Bay, etc. The combination of sea and mountain scenery, and the ease of accessibility from the English industrial areas, make this a popular holiday region, and many Lancashire business people reside there permanently. The opening of the Mersey Tunnel is likely to increase the importance of North Wales in this respect. In the north-west of Wales, too, quarrying is an important occupation. There are many large quarries for road metal (granite) at Penmaenmawr. At Bethesda, Festiniog, and Llanberis and Nantlle there are slate quarries. The slates of Festiniog are exported to all parts of the world, for they can be split into thinner sections than other types of slates so that a ton will provide a greater area of roofing. Numbers of small ports such as Portmadoc and Port Dinorwic (near Bangor) have large slate storage wharves.



THE SLATE QUARRIES, LLANBERIS.

The hillside is cut into a series of galleries, along which slate is worked. The size of the galleries can be estimated by comparison with the houses and sheds on the left of **the** picture.

(4) THE COALFIELDS. The population is concentrated around the two coalfield areas in the north and south.

(a) The North Wales Coalfield. **In the north-east of Wales, in the counties of Flint and Denbigh, is the North Wales coalfield (Fig. 33). It is neither so large nor important as the South Wales coalfield, but the mining of coal and the industries of the coalfield provide occupation for more people than any other part of Wales except the south. The coalfield extends from the Point of Air at the north of the Dee estuary, along the hill slopes through Flint and Mold southwards to Wrexham and Ruabon. The greatest output of coal comes from the district around Gresford. There are a large variety of industries connected with this coalfield, viz. iron works as at Brymbo and Mostyn; chemical works in the neighbourhood of Flint; silk works and paper mills at Flint; engineering works and brick kilns at Ruabon. The coalfield has the advantage of direct sea communication through the small Deeside ports of Connah's Quay and Queensferry. Iron ore for the iron industry is found in the limestones of the Flintshire hills, and the limestone itself is used in the chemical industries. At one time the lead mines of Flintshire were the most productive in Britain, but there is little output to-day because of the amount of water**

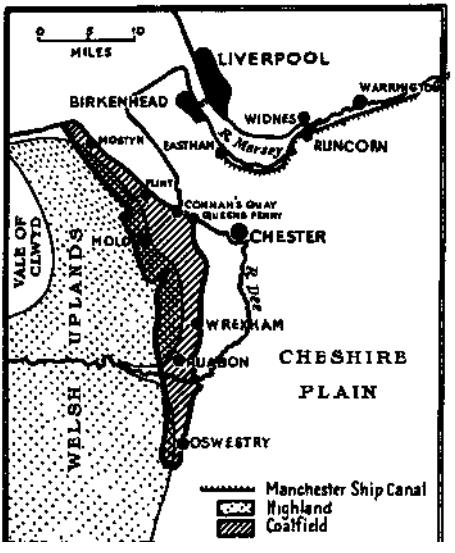


Fig. 33. THE NORTH WALES COALFIELD AND THE MERSEY ESTUARY.—Warrington—the original lowest point of bridging; Runcorn-Widnes connected by transporter bridge; Liverpool-Birkenhead connected by tunnels and ferries. Note the effect of the Mersey road tunnel on communication between Liverpool and N. Wales.

in the mines, and the lack of capital to provide efficient pumping apparatus.

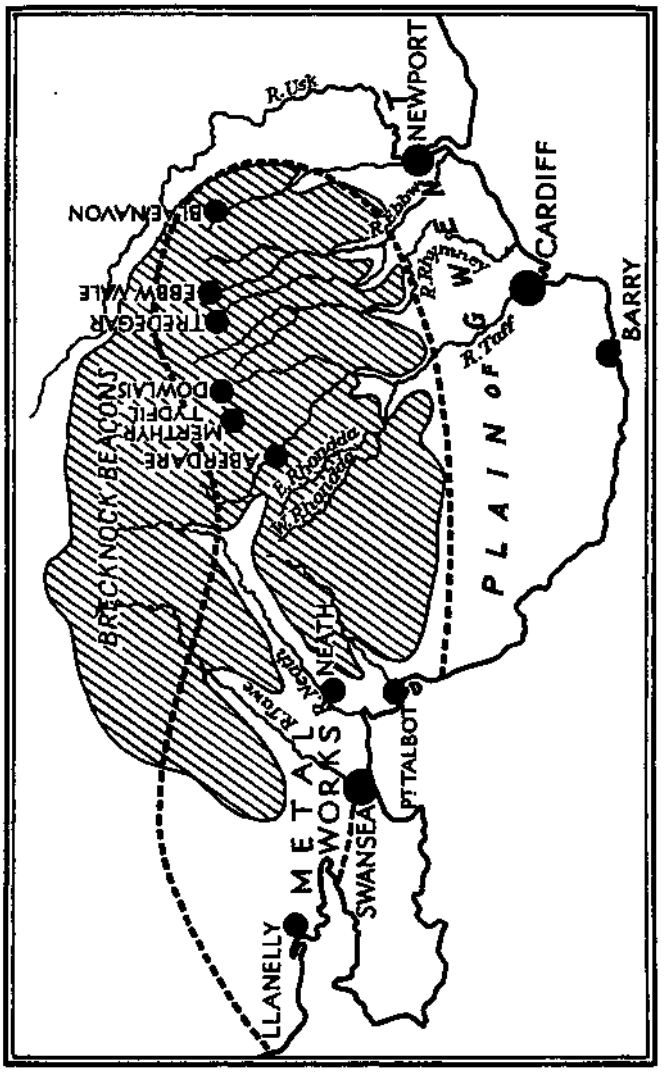


Fig. 34. South Wales Industrial Area.—Note how one group of rivers drains S.W. to the Swansea area, and the other group to the Cardiff and Newport area. The valleys lying east of the Rhondda Valley all contain a railway—sometimes two. The heavy dotted line encloses the coal measures.

(b) The South *Coalfield.* The South Wales coalfield extends from the R. Usk in Monmouthshire westward through

northern Glamorganshire to Llanelly (Fig. 34). There is also a narrow western extension of this coalfield in the neighbourhood of St. Brides Bay in Pembroke. Except for the western portion in Pembroke, this coalfield is a highland area for it lies entirely in the mountainous country south of the Brecknock Beacons. Structurally the coalfield is a basin or syncline (see Fig. 35). The geological map shows a large area of coal measures surrounded by narrow rims of grit and limestone. The south-flowing rivers Tawe, Neath, Taff, Rhymney, Ebbw, and their tributaries have cut deep valleys into the coal measures thus facilitating the mining of the coal. In some valleys coal is obtained by boring tunnels or adits into the valley sides, as well as by sinking shafts. While these valleys have been a great advantage in the opening up of the coalfield,

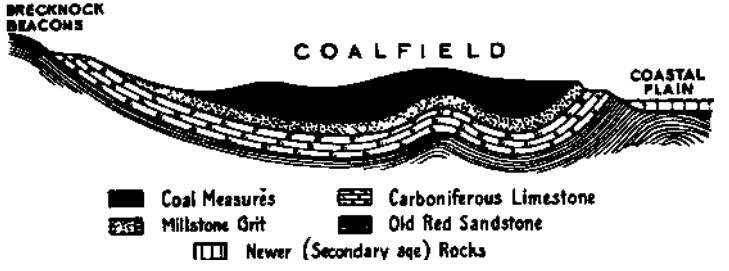
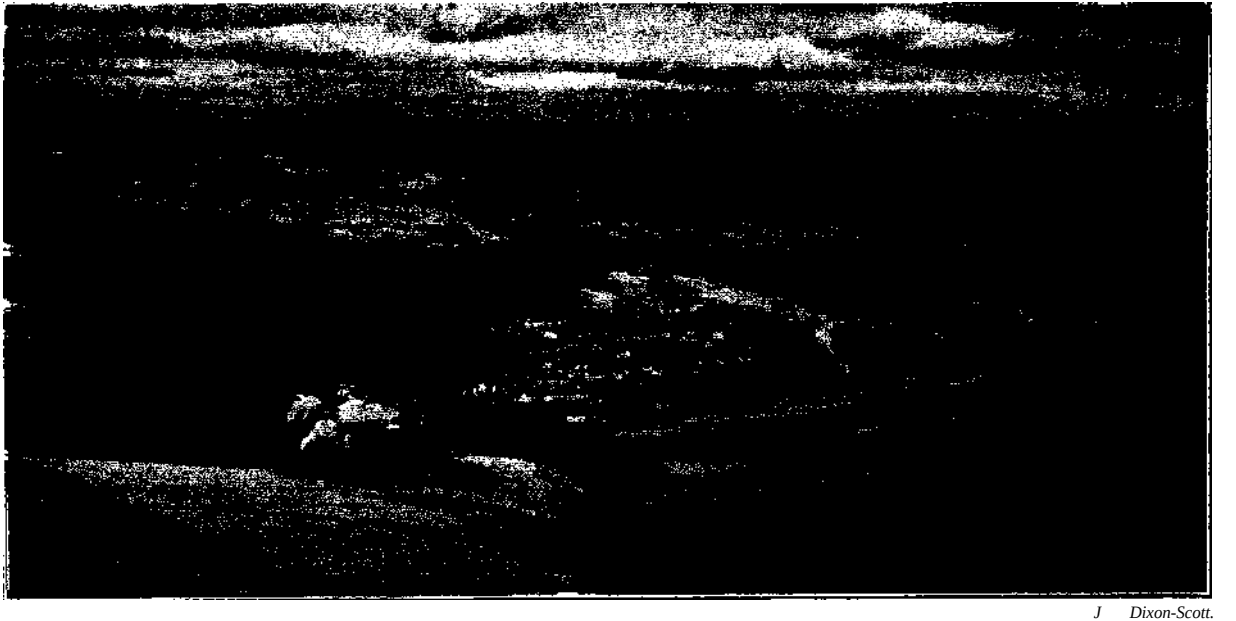


Fig. 35. SECTION FROM NORTH TO SOUTH ACROSS THE S. WALES COALFIELD.

the high mountain ridges which separate them have made east to west communication across the coalfield extremely difficult. Hence the routes all converge southwards on either Cardiff or Swansea.

Industries in South Wales

(i) COAL MINING. The South Wales coalfield is famous for the quantity, quality and variety of its coals. On the east and south edges bituminous or ordinary household coal is mined. Further west the coal is known as " steam coal," for, while it bums with little flame or smoke, it gives great heat, and so is valuable for steamships. North of Swansea, and over the western half of the coalfield, the coal mined is an extremely hard coal known as anthracite. The relative importance of the leading British coalfields in 1934 is shown in Fig. 36.



J Dixon-Scott.

CWMPARC, SOUTH WALES.

An industrial landscape in the South Wales coalfield, which shows how the mining villages are isolated by the intervening mountain ridges. The valley in the middle distance is the Rhondda, and twenty-five miles away the faint outline of the Brecknock Beacons may be seen. Notice the parallel rows of cottages along the hill slopes; the chimney stacks of the collieries; and the scanty vegetation on the hills.

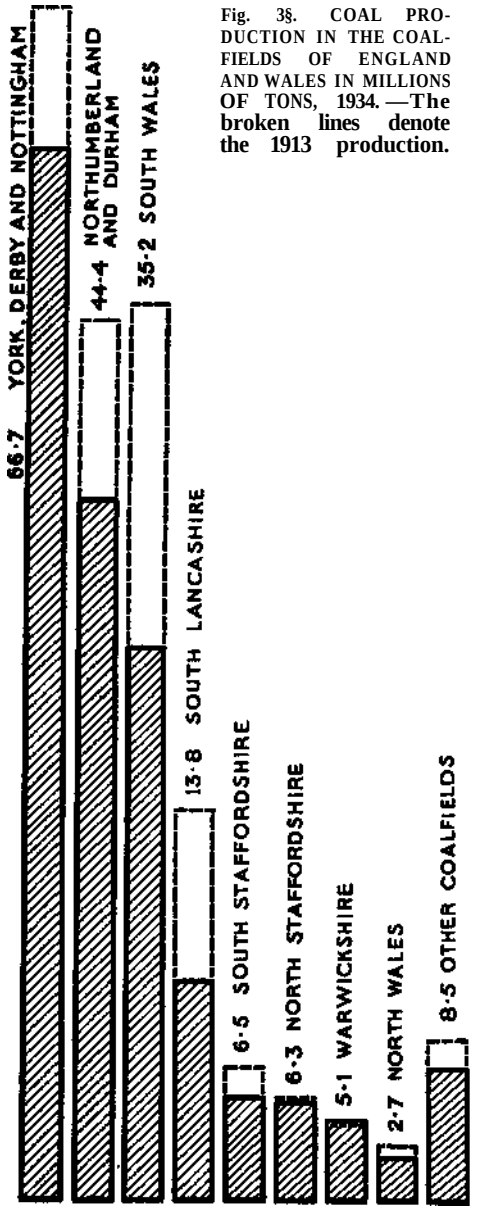


Fig. 38. COAL PRODUCTION IN THE COALFIELDS OF ENGLAND AND WALES IN MILLIONS OF TONS, 1934.—The broken lines denote the 1913 production.

Before 1914, South Wales was the largest coal-exporting area in the world, and Cardiff was the greatest coal port. This was primarily due to the great demand for the excellent steam coal in the coaling stations on the great ocean trade routes. To-day, British coal exports have fallen (Fig. 37), especially from South Wales, with resultant unemployment, poverty, and industrial unrest.

The decrease in the export of coal is due to a variety of causes. Firstly, during the period of the Great War, the price of British coal rose to a high level, and many of our best customers, such as Argentina and Italy, preferred to buy cheaper coal from other countries, such as the United States of America. Thus we lost

certain of our markets, and markers once lost, or partly lost, are extremely difficult to regain.

Secondly, many countries, such as Sweden and Italy, are developing hydro-electric power very rapidly, and so need less coal than formerly.

Thirdly, during and since the War, coal resources in other parts of the world have been developed, and many former customers are now not only self-supporting, but even have a surplus for export. Australia was once a large importer of British coal, but she has developed her coalfields in New South Wales. To-day her imports are negligible, and she exports large quantities to countries bordering the Pacific Ocean and to islands in that ocean. Likewise, Natal now helps to supply East African ports, and Nigeria the West African ports, whilst Norway is developing the coal resources of Spitzbergen.

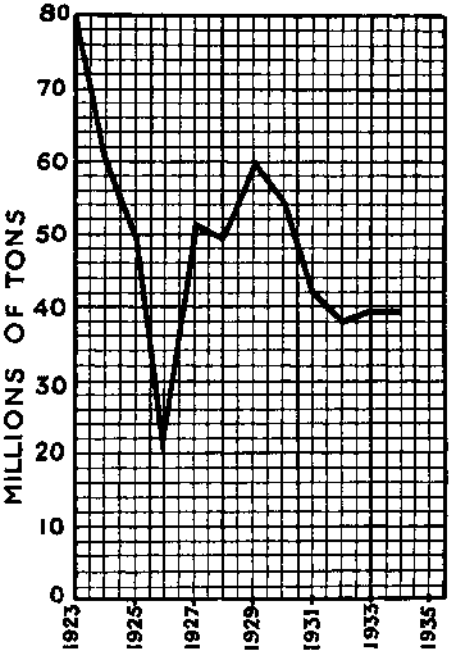


Fig. 37. EXPORT OF COAL FROM UNITED KINGDOM (ALL PORTS) IN MILLIONS OF TONS. —N.B. 1926 was a year of industrial unrest.

France, Italy, and Germany are Britain's principal customers to-day, and the two latter both show a serious decrease in the amount of coal they purchase from us. England's coal trade with the Pacific countries is also decreasing rapidly. In Europe, Germany and Poland have captured a share of our former markets, particularly in Italy and Sweden.

(ii) THE IRON AND STEEL INDUSTRIES. **Along the northern edge of the South Wales coalfield near to the rim of limestone (see Fig. 35) iron ores were found. These ores, coupled with the available coal and limestone, gave rise to an iron smelting industry in a line of towns extending from Aberdare, through Merthyr Tydvil, Dowlais, Tredegar, and Ebbw Vale to Blaenavon. To-day, these supplies of ore are nearly exhausted, but the smelting industry continues by obtaining ores from Banbury and from Northern Spain.**

The easy transport of coal downhill has led to the development of a second group of smelting centres along the coast at Cardiff, Port Talbot, Swansea, and Llanelly, and these use iron ore imported from Northern Spain (Bilbao). The output of pig-iron from the northern centres has decreased considerably since the beginning of the century.

(iii) OTHER METAL INDUSTRIES. **The district around Swansea and Llanelly is one of the greatest metal smelting centres in the world, particularly of tin, zinc, nickel, and copper.**

The tin plating industry (i.e. the covering of sheets of iron with a thin layer of tin to prevent rusting) is the most famous of the metal industries of this district. Originally tin ore was sent from Cornwall, but it is now imported from Malaya, the East Indies, Nigeria, and Bolivia. The importance of tin plating industry of South Wales is partly due to the early start of the industry at Pontypool, and partly to the presence of coal, iron, and skilled labour. Palm oil, into which the sheets are dipped to spread the tin evenly over the surface, is imported both at Liverpool aud Swansea. The increase in the canning of food products is causing a great demand for tin plate which South Wales exports to almost all countries of the world with the exception of U.S.A. and Germany.

Near Swansea, also, are the Mond Nickel Works, the greatest nickel works in the world. • Zinc ores are smelted and iron sheets coated with a thin layer of zinc to form " galvanised iron," which as " corrugated iron " is exported in immense quantities for building purposes in hot countries, where it is more durable than wood. Swansea is also important for the smelting of copper ores and the refining of oil. It should be noted that South Wales is generally more important for

the smelting of ores than for the manufacture of metal articles. Much of the refined copper, nickel, zinc, and tin is despatched to Birmingham, Sheffield, and Northamptonshire for manufacture.

(iv) OTHER INDUSTRIES. Other industries and occupations in South Wales are:—

(1) Sheep rearing on the highlands.

(2) Dairying and mixed farming on the coastal plains.

(3) Fishing, *e.g. dit* Milford, Cardiff, and Swansea.

(4) Some ship building and ship repairing at Cardiff and Swansea.

There are a number of well known seaside resorts on the coast, *e.g.* Tenby.

Links with Industrial England

Wales has three very important links with the industrial districts of England. Firstly, South Wales supplies much of the refined metals for the English metallurgical centres. Secondly, it provides a " playground " for the holiday-makers from industrial areas. Thirdly, it helps to supply some of our large cities with water. Owing to the heavy rainfall and large catchment areas of rivers, reservoirs have been constructed in the remote highland districts. Lake Vyrnwy in the Berwyn Mountains is a reservoir which supplies Liverpool with water, and the Birmingham Corporation have constructed three reservoirs in Central Wales, near Rhayader in the valley of the R. Elan, a tributary of the Upper Wye.

The Welsh Borderlands

The English borderlands of Wales fall naturally into four divisions:—

(a) The plains of Cheshire and North Shropshire, which are rich agricultural areas (see Chapter XIII.).

(b) The hills of south Shropshire, including the Longmynd, Wenlock Edge, the Clee Hills, and the Wrekin. This district is structurally an eastward extension of the Welsh Uplands. The chief occupations are sheep rearing on the hills and

mixed farming in the valleys. The Clee Hills yield good road metal, and limestone is quarried along Wenlock Edge. The western half of this upland area is very picturesque, with large areas of open moorland. Still relatively remote and unspoiled, it is a region rich in traditions, folk lore, and the survival of quaint customs.

(c) The Plain of Hereford, composed of Old Red Sandstone and drained by the River Wye. On its eastern side the high granite Malvern Hills, crowned by the remains of a British Camp, separate this lowland from the plains of the Lower Severn. The rich sandstone soils give rise to excellent pasture, and Hereford is famous for its cattle. Sheltered by the Welsh Mountains on the west, Herefordshire does not have excessive rainfall, and for Britain, has a relatively high average of sunshine. It is therefore important for the growing of fruit, especially apples and pears, in fact, Herefordshire has a greater percentage of its area devoted to orchards than any other county. Like Devonshire, it specialises in the manufacture of cider and perry. It is the second English county for hop production, though the total yield is only about one-third that of Kent.

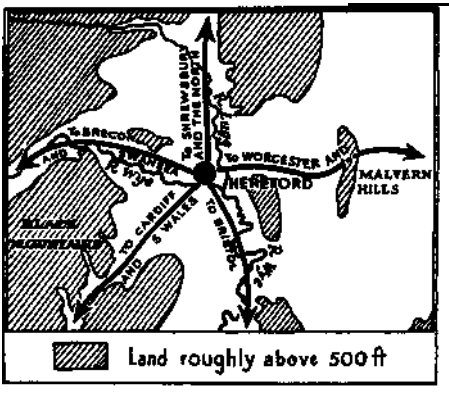


Fig. 38. HEREFORD, TO SHOW ITS CENTRAL POSITION IN THE HEREFORD PLAIN AND ITS IMPORTANCE AS A ROUTE CENTRE.

The chief town and market centre is Hereford (Fig. 38), which controls routes:—

(1) westwards via the Wye valley into Wales.

(2) northwards via a gap ill the South Shropshire Hills to Shrewsbury and the north.

(3) eastwards via tunnels through the Malverns to Worcester and London.

(4) southwards via the Wye valley and the Severn Tunnel to Bristol, and via the Usk valley to Newport and Cardiff.

(d) **Monmouthshire, which is divided into two very different sections by the north to south valley of the R. Usk. West of the river is a coal-mining region (part of the S. Wales coal-field), characteristically Welsh in outlook and relief. In contrast, between the Usk and the Wye on the eastern border of the county, is a region of lower land devoted to agriculture, and more similar to the English plains in its development.**

The Welsh border is crossed by a number of rivers which, rising in Wales and flowing east, provide valleys through which run the main roads and railways into Wales. From north to south these are the Dee, Severn, Teme, Wye, and Usk.

The Welsh border, too, is noted for its wealth of castles, which, in past history, guarded the valley routes into Wales. Some of the best known are at Chester, Chirk, Shrewsbury, Stokesay, Bishop's Castle, Clun, Ludlow, Wigmore, and Chepstow.

CHAPTER VI

THE WESTERN PENINSULAS

(3) THE LAKE DISTRICT

The third of the western peninsulas is the Lake District, lying between Morecambe Bay and Solway Firth. It extends through the counties of Cumberland, Westmorland, and a detached northern portion of Lancashire known as Furness.

It consists of (a) the Cumbrian Mountains, a central mass of granite and old hard rocks, surrounded on all sides, except the S.E., by *(b)* lowlands of newer rocks (Fig. 39). On the S.E. the Lake District is linked with the Pennines by the highland known as Shap Fell, the chief physical obstacle of the west coast route to Carlisle. The highest peaks of the Lake District are Scawfell (3210 ft.), Helvellyn (3118 ft.), and Skiddaw (3054 ft.).

The Cumbrian Mountains

The central mountain mass is a dome-shaped highland from which the rivers drain radially like the spokes of a wheel. The river valleys were deepened considerably during the Ice Age, and now contain beautiful long, narrow lakes. Sometimes these lie in hollows eroded by the glaciers, and sometimes they have been formed by morainic deposits acting as dams across the river valleys, as in the case of Windermere. In some valleys the lakes have been split into two parts by the silt carried into the lake by lateral mountain streams. For instance, Derwentwater and Bassenthwaite are separated by a " deltaic " lowland, and so are Buttermere and Crummock Water. As a result of the radial arrangement of the valleys communications in the Lake District are very difficult, there being only one railway and few good motor roads. Many of the valleys are connected by high and difficult passes along which wind narrow footpaths. Thus, it is only by walking

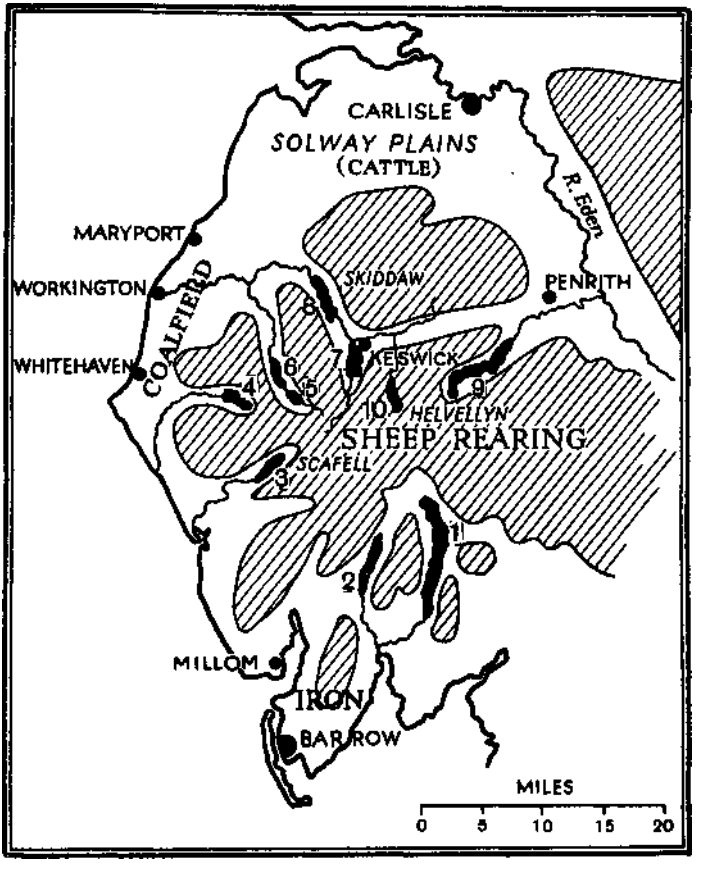


Fig. 39. THE LAKE DISTRICT.—1. **Windermere. 2. Coniston. 3. Wastwater. 4. Ennerdale. 5. Buttermere. 6. Crummock Water. 7. Derwentwater. 8. Bassenthwaite. 9. Ullswater. 10. Thirlmere.**

that the beauties of the wildest and most remote parts of the " Lakes " may be enjoyed. There are two important routes, viz.:—

(1) A first class road running northwards from Windermere over a low pass to Keswick via Thirlmere;

(2) A railway running westward from Whitehaven to Keswick and Penrith.

The combination of beautiful lake and mountain scenery attracts many holiday-makers, so that the towns of the highland area are tourist centres, viz. Keswick, Ambleside, and Penrith.

Apart from the tourist industry the chief occupation is sheep-rearing. .The mountain " fells " are used as sheep runs by the farmers of the valleys. In these valleys mixed farming and dairying are practised.

There is also some quarrying and mining. The rocks of the Lake District yield slate, granite, lead, and graphite. The green slates of Westmorland are well known. Graphite is a form of carbon, the " black lead " used for pencils. At Keswick there is a small pencil-making industry which began because of the local supplies of graphite in Borrowdale, the valley to the south of Derwentwater. These local supplies are nearly exhausted, but the industry continues (an example of " industrial inertia ") using supplies of graphite imported from Japan, Madagascar, and Ceylon.

Thirlmere is used as a reservoir to supply Manchester with water, and a new reservoir for the same purpose is being constructed at Mardale.

The importance of the Lake District, with its glorious scenery and unpolluted atmosphere, as a holiday centre cannot be over-estimated, and already many large areas are in the hands of the National Trust, safeguarded for ever from the encroachments of ever-expanding industrialism.

The Surrounding Plains

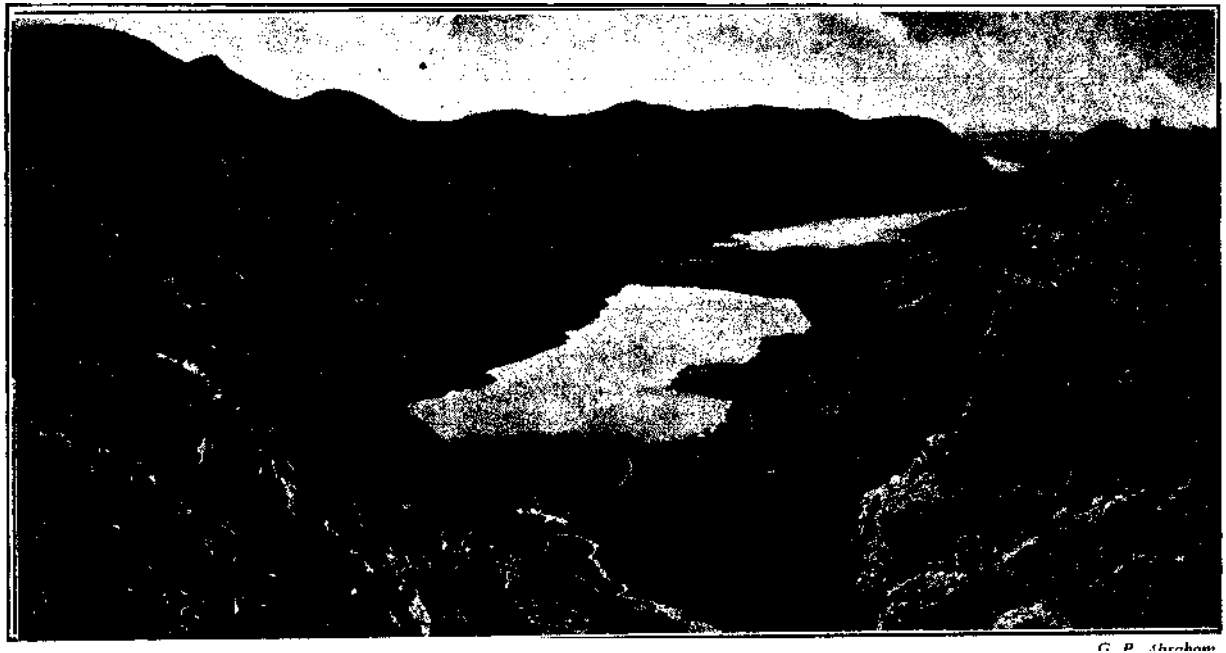
The plains surrounding the Cumbrian Mountains fall into three economic divisions (see Fig. 39), viz.:—

(1) The north Cumberland plain and the valley of the R. Eden.

(2) The Cumberland coalfield.

(3) Furness and the Kent valley.

(1) NORTH CUMBERLAND. The plain of North Cumberland extends along the north of the mountain core and southeastward along the Eden valley, which is bounded on the eastern side by the very steep mountain wall of the western



THE UPPER VALLEY OF THE RIVER COCKER IN THE LAKE DISTRICT.

The lakes are Buttermere, Crummock Water, and Loweswater. This is a gradated region with rounded hills and steep-sided, flat-bottomed valleys. The fertile valley bottom is used for mixed farming and the hillsides for sheep rearing.

Pennines. This escarpment occurs along a fault-line known as the Eden Fault (a continuation of this fault can be traced along practically the whole of the western Pennines as far south as Cheshire).

These northern lowlands are composed of New Red Sandstone, overlain everywhere by glacial clays and sands. In the southern half of the Eden valley these glacial deposits are in the form of drumlins, long hogback-shaped mounds of glacial debris, which, lying parallel to one another, give the plain a " rippled " appearance.

As these plains lie on the west of England they have the characteristic equable and damp climate similar to that of the other western plains. Hence they are cattle-rearing regions and milk is sent as far as Newcastle and Liverpool. The arable farming is also that typical of the western plains; oats, root crops and clover being grown and used for the feeding of animals.

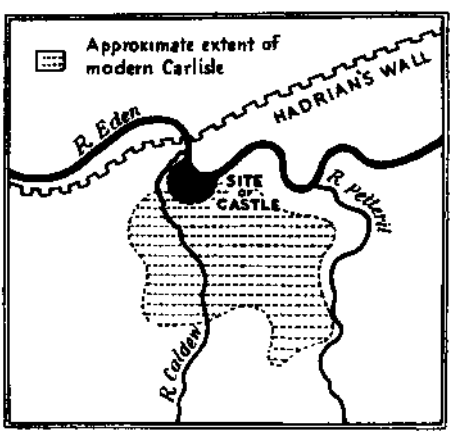


Fig. 40 *(a).* THE *Site* OF CARLISLE TO SHOW How IT WAS SUITABLE FOR DEFENCE AS A BORDER FORTRESS IN EARLY HISTORY.

The sandy grass-covered flats bordering Sol way Firth are used as winter pastures for the sheep from the mountain fells. This movement of sheep from summer to winter pastures is known as " transhumance." Transhumance is also practised in North Wales and in Kent, but in the latter county the sheep are moved from Romney Marsh inland and uphill to the Downs in winter.

The chief towns of the plain, such as Cockermouth, Appleby, and Carlisle, are all market towns.

Carlisle [Fig. 40(a)], however, has become a great railway centre, and has a number of industries, viz. biscuit-making

and engineering. Its importance dates from Roman times, when it was a fortress at the western end of Hadrian's Wall, which runs along the northern side of the Tyne valley to Wallsend, near Newcastle. The strength of its position was due to the fact that it was guarded on the west, north, and east by the streams Caldew, Eden and Petteril, and that within this " moat," facing the Eden, was a steep and high river bank suitable for defence. It is the lowest point of bridging of the Eden. To-day its importance is as a great border railway junction, " the Gateway to Scotland." The routes it controls are shown on Fig. 40(6).

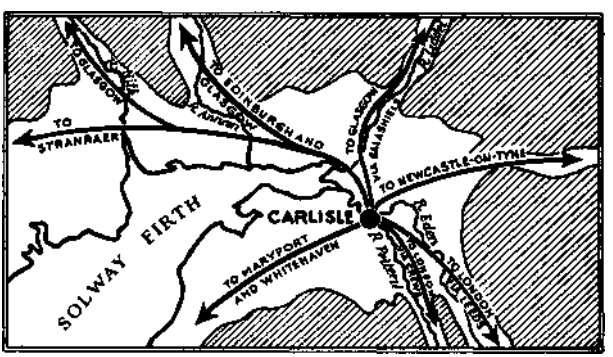


Fig. 40 *(b)* THE *Situation* OF CARLISLE IN RELATION TO THE SURROUNDING REGIONS.—To show its position in the centre of a plain and its control of natural routes.

(2) THE CUMBERLAND COALFIELD. This small coalfield lies on the coastal plain north of St. Bees' Head. The workings extend for some miles under the sea. The bulk of the coal is exported through the ports of Maryport, Workington, and Whitehaven to Ireland. The importance of the coal export is due to three major factors :—

(a) The coalfield is on the coast, and so expensive land carriage is eliminated.

(b) It has few industries, and therefore there is relatively a large surplus of coal.

(c) Ireland, with few coal resources, is a ready market.

A small amount of iron ore is obtained at Egremont and Cleator Moor, and this, together with available limestone for use as a " flux," has given rise to a small iron-smelting industry at Workington. Many of the furnaces of this coalfield have been closed owing to industrial depression.

(3) FURNESS AND THE KENT VALLEY. **The most important feature of the southern plains, is the occurrence of rich deposits of hematite iron ore. This ore has a higher content of iron than any other mined in Britain, viz. up to 50 per cent, (cf. the 20 per cent, of iron in the Lincolnshire ores). Although there is no coal in Furness, and the coal of Cumberland is not suitable for smelting, yet an important iron-smelting industry has grown up at Barrow-in-Furness, Millom, and Askam. Barrow is sheltered by Walney Island, and has an important ship-building industry, but only a small proportion of the local iron is consumed here, large quantities being exported to S. Wales and Scotland.**

Apart from the iron-mining, agriculture, similar in type to that of the Solway plains, is the most important occupation of the southern plains. Kendal, in Westmorland, manufactures leather goods and has a small woollen industry which dates back many centuries, and owes its existence to the supplies of wool from the mountain sheep and the supplies of soft water. The pure water supply has also given rise to paper mills in the Kent valley.

THE ISLE OF MAN

The Isle of Man, situated in the middle of the Irish Sea, is composed of rocks similar to those of the Lake District. The chief occupations of the island are agriculture and fishing. It is also a popular holiday centre, the chief resorts being Douglas, Ramsey, and Peel. The island is administered in accordance with its own laws by the Court of Tynwald, and it has its own parliament, known as the " House of Keys."

CHAPTER VII

NORTHERN ENGLAND

(1) THE PENNINES

Divisions of Northern England

The Pennines and their surrounding lowlands together cover most of Northern England. The whole region of Northern England may be divided into a number of smaller regions, viz. (Fig. 41):—

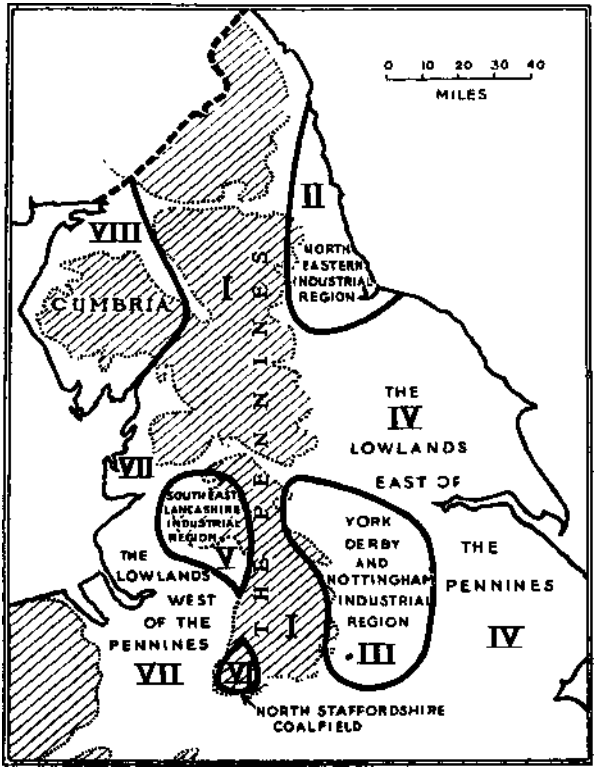


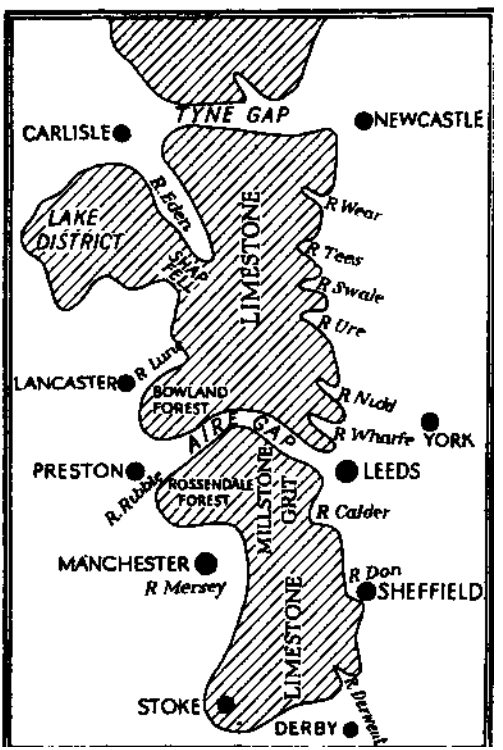
Fig. 41. NORTHERN ENGLAND TO SHOW THE SUB-DIVISIONS (NUMBERED I. TO VII.) DESCRIBED IN CHAPTERS VII. to XIII.—Note that Cumbria was described in a preceding chapter.

(1) The Pennines.

(2) The Northumberland and Durham coalfield.

(3) The York, Derby, and Nottingham coalfield.

(4) The lowlands east of the Pennines.



(5) TheSouth-East Lancashire coalfield.

(6) The North Staffordshire coalfield.

(7) The lowlands west of the Pennines.

(8) The north-western region of Cumbria, which was described in Chapter VI.

The Pennines: General

The Pennine Chain is not a range of mountains, but a dissected plateau with an average elevation approaching 2000-3000 ft., and with steep slopes on the east and west. It extends from the valley of the Tyne southwards to the Trent Valley in Derbyshire. Thus it is about one hundred and fifty miles long, but varies in width from twenty to forty miles. On the east side the 500 ft. contour makes a fairly straight north to south line, **broken** only by the re-entrants of the river valleys (Fig. 42). From north to south these east-flowing rivers are:—

(1) Tyne, Wear, Tees, draining Northumberland and Durham.

(2) Swale, Ure, Nidd, Wharfe, Aire, Calder, and Don, which unite in the Vale of York to form the Yorkshire Ouse.

The western edge of the Pennines offers a strong contrast to the east. It consists of four " bulges," viz:—

(1) The Cumbrian Mountains, joined to the Pennines by Shap Fell.

(2) Bowland Forest, which is mainly in Yorkshire as that county here approaches closely to the west coast.

(3) Rossendale Forest, between the valleys of the Ribble and Mersey in South Lancashire.

(4) A south-western spur, including part of North Staffordshire, where the Pennines gradually sink to the plains of Cheshire and North Shropshire.

The chief west-flowing streams, usually shorter than those flowing east, are the Kent, Lune, Ribble, Mersey, and the tributaries of the R. Weaver.

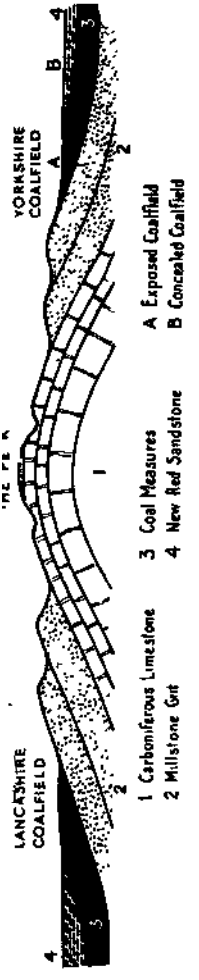


Fig. 43. A Section Across the South Pennines.

The Pennine Gaps

Owing to its plateau character and the steep slopes on either side, the Pennine Chain is difficult to cross, and has always been a barrier between Yorkshire and Lancashire until the tunnelling for railways during the last century. There are three valley routes across the Pennines from east to west. These are:

(a) The Tyne Gap, between Newcastle-on-Tyne and Carlisle.

(b) The Stainmore Gap between the upper Tees and the upper Eden valley, the most difficult and highest of the three.

(c) The Aire Gap, which links industrial Yorkshire with industrial Lancashire.

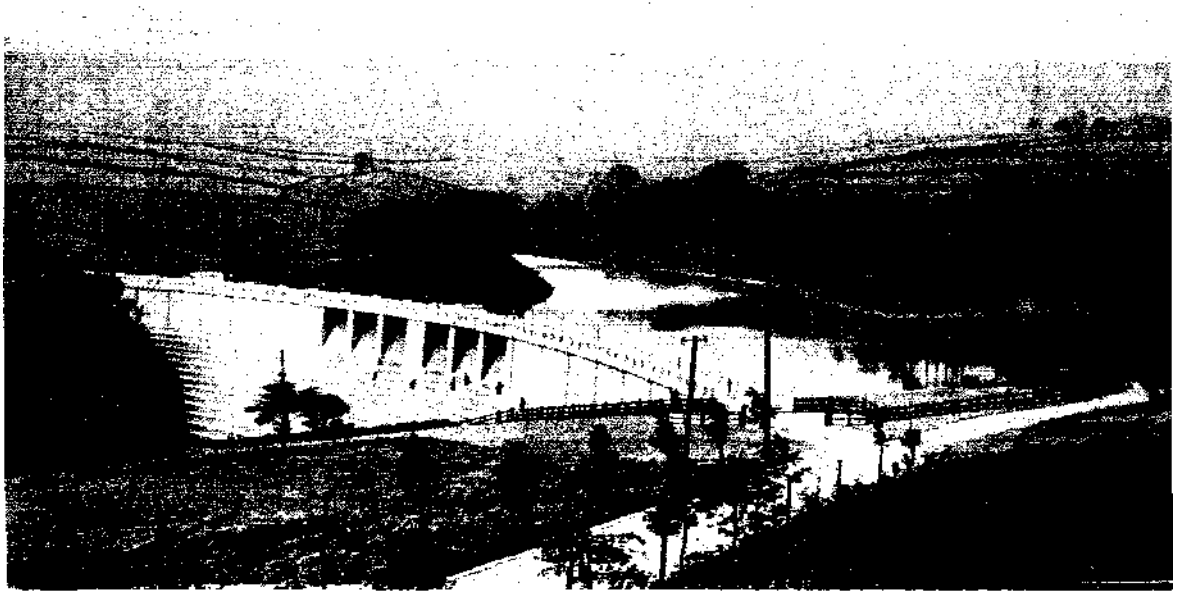
All are followed by road and railway, and in addition the Aire Gap accommodates the Leeds-Liverpool canal.

Scenery **and** Occupations

The Pennine Chain was formed by the folding of the rocks of Northern England at the end of the Carboniferous Period. The top layers have been removed by various erosive agents, so that the Coal Measures, which once covered the Pennine upland, have been removed, and now only exist on the eastern and western flanks (Fig. 43).

In the Northern and Southern Pennines the Millstone Grit has also been removed, leaving large areas of Carboniferous Limestone exposed; but in the Central Pennines between Leeds and Manchester, Millstone Grit extends across the uplands from east to west. Millstone Grit is a coarse resistant sandstone which becomes black when exposed to the atmosphere, thus the central Pennine moorlands have a very dreary and bleak appearance. Wherever Millstone Grit is the surface rock the vegetation is of the moorland type, with bracken, cotton grass, heather, bilberries, and stiff grass. In these regions, too, are many peat moors and bogs. These moors are of little agricultural value, but the streams give an abundant supply of soft water (in contrast to the hard water of the limestone regions), and in the Central Pennines there are numbers of large reservoirs constructed to supply the industrial towns of Lancashire and Yorkshire with water. Many of the hills on the " Grit" areas have sharp ridges and steep sides, and are known locally as " Edges." There are few trees, and walls of blackened grit replace the hedges of the lowlands.

The limestone areas of the North and South Pennines differ in many ways from the Grit regions of the Central Pennines. Many of the highest " peaks " of the limestone country are flat-topped, being capped with a residual layer of Millstone Grit (Fig. 43). These flat-topped hills of the " mesa " type are a characteristic feature of the Pennine scenery. The so-called " Peak " of Derbyshire is a high and relatively level grit moorland. The same flat tops can be seen in Ingleborough and Penyghent.



Wakefield Corporation.

RYBURN RESERVOIR.

This reservoir is situated in the Millstone Grit region of the eastern Pennines. It is one of a group constructed to supply Wakefield with water. Although relatively small in area the reservoir has a large storage capacity because of the depth of the valley. Notice the levelness of the plateau; the stone walls separating the fields; the absence of trees on the higher ground.

The porous nature of the limestone gives rise to all the characteristics of " Karst " scenery, viz. caverns, steep-sided valleys, dry valleys, disappearing streams, etc. The most famous of these underground is the Aire which now emerges at the foot of Malham Cove. There are famous caves at

Photochrom Co , Ltd

PEN-Y-GHENT.-

Pen-y-ghent is a summit rising above the general level of the Pennine plateau. It is composed of Carboniferous Limestone surmounted by a " cap " of Millstone Grit, which can be detected by the change of slope near the top. Notice the bareness of the limestone plateau; the limestone walls between the fields; the limestone cottages. The fields are not cultivated but used almost entirely for the rearing of sheep.

Ingleton in N.W. Yorkshire and at Castleton in N. Derbyshire. One of the latter is the famous " Blue John " mine, worked in the days of the Romans for its beautiful blue stone.

The limestone areas do not produce the same type of vegetation as the Grit, but are usually grass-covered and used extensively for sheep rearing. There are few people living in

these regions. The scattered houses are built of Umestone, as are the walls dividing the fields. The villages are situated in the more fertile valleys.

Apart from sheep rearing and mixed agriculture in the valleys, the Pennines are of little economic importance. Lead is mined in a few places, principally on Alston moor on the Cumberland-Northumberland borders, and in N. Derbyshire. Some of these mines were probably worked in Roman times.

On the flanks of the Central and Southern Pennines are coalfields which, in contrast to the other portions of the Pennines, Support a large industrial population. These coalfields will be considered in the following chapters.

CHAPTER VIII

NORTHERN ENGLAND

(2) THE NORTHUMBERLAND AND DURHAM COALFIELD

Position

This coalfield lies in the counties of Northumberland and Durham, but a small portion of N.E. Yorkshire must be included because of its economic relations with the region to the north.

The north-west of Northumberland and the west of County Durham are occupied by high moorlands (the Cheviot Hills and a portion of the Eastern Pennines). These areas are of little economic importance, and support only a scanty population. Between the mountains and the coast are lowlands drained by the rivers Coquet, Wansbeck, Tyne, Wear, and Tees. The R. Tees is the boundary-bet ween Durham and Yorkshire.

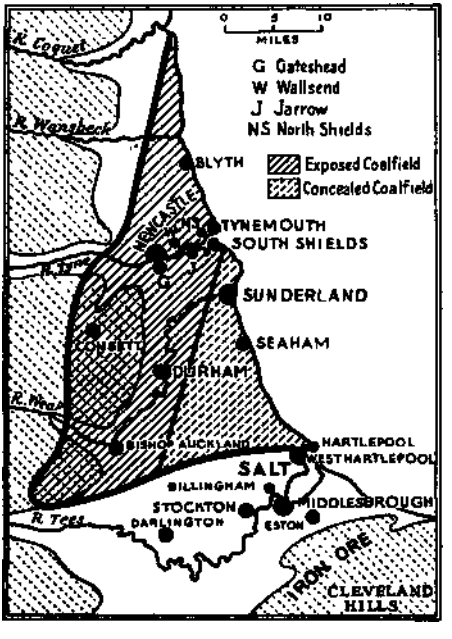


Fig. 44. THE NORTHUMBERLAND AND DURHAM COALFIELD.

On the lowland to the east of the Pennines is the Northumberland and Durham coalfield. The exposed coalfield (see Fig. 44) extends from the hills eastward to a line from South

Shields to Bishop Auckland. It reaches the coast from the mouth of the R. Tyne northwards to the mouth of the R. Coquet. South-east of the South Shields-Bishop Auckland line coal measures lie under the surface rocks of MagAesian Limestone. This is a " concealed coalfield." Borings show the concealed coal measures do not extend south of a line from Bishop Auckland to Hartlepool. The lower valley of the R. Tees is composed of New Red Sandstone, in which there are salt deposits (cf. Cheshire, page 132). To the 'south of the R. Tees along the northern edge of the Cleveland hills are abundant deposits of Jurassic iron ores.

Development of the Coal and Shipbuilding Industries

The importance of this coalfield dates back to the fourteenth century, when coal was exported by sea to London for domestic use. This coal was known as " Sea coal." At first coal was only exported from the seams which came to the surface near the coast. As these supplies were worked out coal was carried from the inland areas on pack horse to the coast, and also by coal barges along the rivers, but this mode of transport was expensive and difficult. Later, wooden tracks were laid and rails were used, down which the wagons travelled by gravity. Wooden staithes were built jutting out over the banks of the river, so that these wagons could be unloaded directly into the sea-going vessels.

With the railway-building era the Stockton and Darlington railway was constructed in 1825 for the primary purpose of carrying coal to the coast. Thus developed the great coal-exporting trade of the North-East. Nearly all the ports of the region share the trade in coal, viz. Blyth, the Tyne ports, Seaham, Sunderland, and the Hartlepools. The coalfield has a variety of good quality coals. North of the Tyne are seams of hard steam coal, while the coals of the south of the coalfield are among the best coking coals in Great Britain. The need for vessels to carry the coal gave rise to a ship-building industry. At first the vessels were made of wood, and, as English sources of the timber were exhausted, supplies were imported from Scandinavia. To-day the shipbuilding industries of this north-eastern region rank next to those of the Clyde.

Iron, Steel, and Chemical Industries

In 1850 deposits of iron ore were discovered at Eston Moor, and later the abundant deposits a few miles further south in the Cleveland hills.

Teeside has a unique position as an iron-smelting and manufacturing region due to:—

(1) the nearness of iron ore,

(2) the excellent coking coal of S. Durham.

(3) the supplies of limestone in the Pennines and the Wear valley.

(4) the nearness to the sea, which facilitates the export of bulky goods.

(5) the possibility of importing high grade ores cheaply from Sweden and Spain.

Middlesbrough, on the Tees estuary, is remarkable for its rapid growth, due to the discovery of the Cleveland ores, and the development of the smelting and engineering industries. In 1830 it was a small village, and to-day its population is nearly 140,000. In common with all the industrial towns of the north-east Middlesbrough has suffered a great deal through post-war trade depression, and its smelting industry is much less important than formerly. Teeside does not now use such a high percentage of Cleveland ores as formerly (see Fig. 7), but imports from Sweden, North Africa, and Spain, and also obtains supplies from Cumberland and Northamptonshire. Much of the iron and steel produced is used in the shipbuilding industries, and some is exported to the Continent.

In the Tees valley the salt deposits of the New Red Sandstones are worked, and have given rise to a chemical industry at Billingham. Other important towns of the Tees valley are Darlington, with its railway engineering works; Stockton, an iron smelting centre; and the Hartlepools. Hartlepool is the old port, and West Hartlepool is the much newer industrial port. The latter is the main exporting centre for the coal of South Durham, and also imports large quantities of timber.

L.N .E.R

STAITHES, NEAR BLYTH, NORTHUMBERLAND.

Staithes are long pier-like structures by means of which the transport of "export" coal is facilitated. Trucks of coal, direct from the mines, are carried along the staithes and emptied into the colliers anchored alongside.

Shipbuilding along the Tyneside

The estuaries of the Tyne and Wear are the great centres of the shipbuilding industry, and vessels of all sizes, ranging from Transatlantic liners to small coasting vessels, are built there.

From Newcastle to the sea, a distance of about 14 miles, the banks of the Tyne are lined with shipbuilding yards. The towns occur in pairs (see Fig. 45), one on the north and one on the south bank. Travelling seawards three pairs of towns are Newcastle and Gateshead; Wallsend and Jarrow; Tynemouth and South Shields.

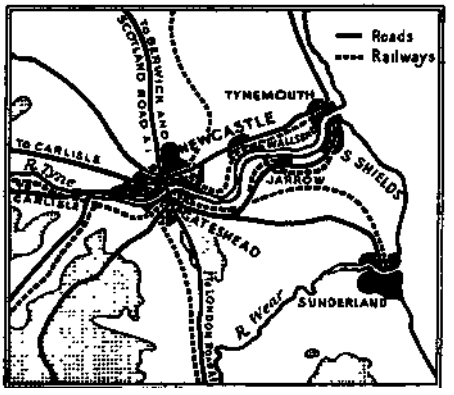


Fig. 45. NEWCASTLE-ON-TYNE, SHOWING HOW THE ROUTES CONVERGE ON THE LowrsT BRIDGING POINT OF THE RIVER.

Newcastle is at the lowest bridging point of the Tyne, and is the premier city and port of the whole region. In addition to shipbuilding there are many other industries including various kinds of marine engineering, the construction of bridges, as well as the manufacture of ropes, glass, paper, chemicals, the refining of sugar, the milling of flour, and the smelting of lead.

DURHAM. In this great industrial area one city stands apart, viz. Durham, which was originally a border stronghold, built on a hill within a meander of the R. Wear. Thus its position was ideal for defence. It has a famous cathedral and a university, and, with a population of less than 20,000 and its old traditions, is a great contrast to the newer, larger, and busier cities of the region.

Communications

Tyneside has direct communication with the west coast by the Tyne gap, and the Tees basin has a route to the west via

the Tees valley and the Stainmore gap. The main route of the area is the railway route running north from Darlington to Durham, Newcastle, Berwick-on-Tweed, and Scotland.

This route, which is also the route of the Great North Road, is controlled by the Ferryhill gap to the south of Durham, the north-south section of the valley of the Wear, the lowest bridging point of the Tyne at Newcastle, and the narrow coastal plain between the Cheviots and the sea.

CHAPTER IX

NORTHERN ENGLAND

(3) THE YORK, DERBY, AND NOTTINGHAM COALFIELD

Position

On the eastern flanks of the South Pennines and partly on the eastern lowlands, is the largest British coalfield, raising, at the moment, more coal than any other in the country. It extends from the Aire valley near Leeds and Bradford southwards almost to the Trent. Thus the northern half of the coalfield *(i.e.* north of Sheffield) is in the West Riding of Yorkshire, and the southern half occupies the eastern portion of Derbyshire and almost the whole of Nottinghamshire.

The Coal Mining Industry

The coalfield is about 70 miles long, and varies in width from ten to twenty miles. Eastward of the exposed coalfield the coal measures dip gently below layers of Magnesian Limestone and New Red Sandstones (see Fig. 43). Borings have been made through the overlying rocks, and coal is mined over a vast concealed coalfield which extends eastward almost to the Trent. The most easterly working is at Thorne, where coal is mined at a depth of 2670 ft. The concealed coalfield is of greater extent than the exposed field (Fig. 46), so that the whole region is by far the most productive coal mining region in Britain (see Fig. 36), yielding nearly one-third of the total coal output of the country. The thick and unbroken seams make coal mining profitable even at the greater depth. The collieries are larger, as a rule, than those of the exposed coalfield. Peaceful agricultural villages of eastern Nottinghamshire are rapidly becoming mining centres. The most important development of the concealed coalfield has taken place around Doncaster. The eastward extension of coal mining is causing a great increase in the coal exports of this region, because the coal is now raised nearer to the Humber,

and the heavy costs of land carriage are eliminated. Goole, at the head of the Humber, is rapidly increasing its exports. Coal is also exported through Hull, Immingham, and Grimsby, mainly to Scandinavia, Denmark, and the Baltic countries, the return imports being timber, wood pulp, iron ore, and dairy produce.

The eastward extension of coal-working has another aspect in that the coal supplies are within easy reach of the iron ore

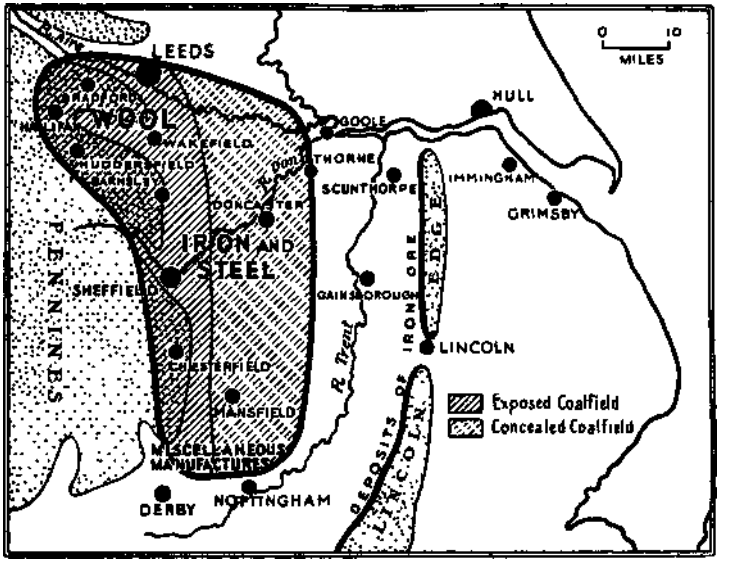


Fig. 46. THE YORK, DERBY, AND NOTTINGHAM COALFIELD. Showing: *(a)* The principal Industries and Towns, *(b)* Its relation to the Jurassic Iron Ores, (c) Its relation to the Coast and Sea Ports.

deposits along the western edge of the limestone escarpment (Lincoln Edge). The ores are mined at *(a)* Scunthorpe, *(b)* south of Lincoln, and (c) in the neighbourhood of Grantham. Because of the nearness of the coal supplies and the low percentage of iron in these Jurassic ores, the coal is being carried to the iron mines instead of vice versa as formerly. Scunthorpe is therefore an important iron-smelting area away from the actual coalfield. The population of Scunthorpe increased by more than 23% between 1921 and 1931.

There is a large variety of other industries associated with this vast coalfield, but three areas stand out for special consideration. They are:—

(1) The West Riding Woollen industry in the north of the coalfield.

(2) The Iron and Steel industries of the Sheffield region in the centre of the coalfield.

(3) The miscellaneous industries of the Derby-Nottingham region in the south of the coalfield.

The West Riding Woollen Industry

The West Riding woollen industry is centred round the valleys of the Rivers Aire, Calder, and Colne in the north of the York, Derby, and Nottingham coalfield, and its output of woollen goods is greater than that of all the other woollen manufacturing regions added together.

The weaving and spinning of wool is an old industry which was practised in Britain before the Norman Conquest. After 1066 it increased in importance, and weaving guilds were formed in many towns, such as Lincoln. Then came a period when most of the English wool was exported to Europe, and the English people imported cloth from Flanders in return.

Thus there was a danger of the English weaving industry falling into decay. Edward III. encouraged Flemish weavers to settle in England, and in 1331 John Kempe, a weaver, settled in Norwich and later went to Kendal in Westmorland, where he manufactured cloth called "Kendal Green." Gradually more foreign weavers settled, until England became famous all over Europe for the quality of her woollen cloths. Woollen goods were manufactured in numbers of market towns in the southern portion of England, but some districts were more important than others, viz.:—

(1) The East Anglian area with woollen industries at Lincoln, Norwich, and Ipswich.

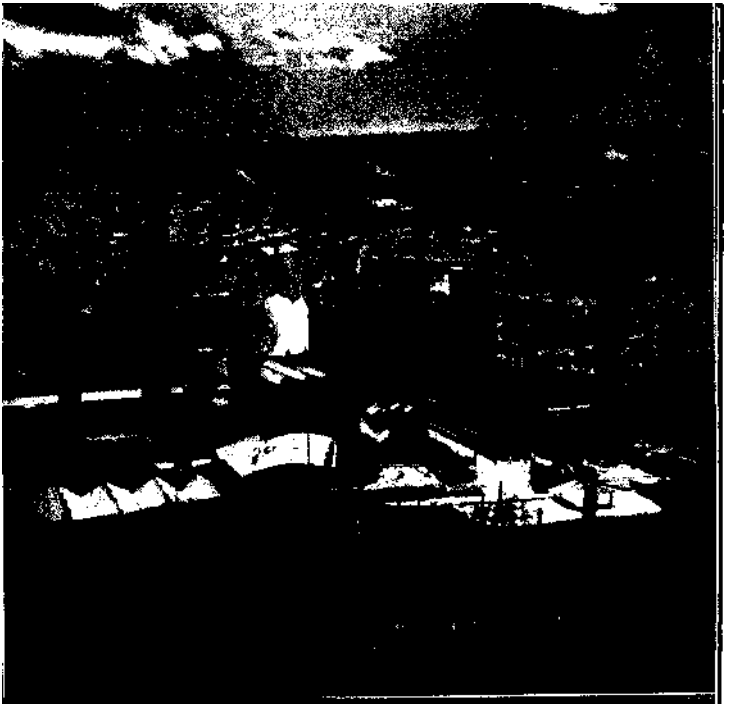
(2) The "West of England," an area including the southern Cotswolds and the western slopes of Salisbury Plain.

(3) East Devonshire, around Exeter and Tiverton.

(4) South Lancashire. (5) West Riding of Yorkshire.

(6) The Tweed Valley of the southern Uplands.

With the Industrial Revolution, the discovery of the use of coal, and the invention of machinery, dating from about 1760, a great change took place in the woollen industry. Large factories were built, and one or two of the woollen areas, particularly the West Riding of Yorkshire, gained rapidly in importance. In some of the old woollen areas, which were



Yorkshire Post

HALIFAX.
The forest of chimney stacks bears witness to the industrial activity of this busy woollen town in the West Riding of Yorkshire.

remote from the newly-developed coalfields, the industry almost disappeared or only managed to survive in a small way by specialisation in a particular branch of the industry, *e.g.* blankets at Witney (Oxfordshire), whipcords at Chipping Norton, (Oxfordshire).

The most important woollen areas to-day are:

(1) The West Riding of Yorkshire.

(2) The Tweed Valley and Ayrshire in Scotland (see Fig. 101).

(3) The " West of England " (see Fig. 30).

(4) Leicestershire.

(5) Scattered areas mainly in the mountainous regions. The woollen industry of the eastern counties has virtually disappeared.

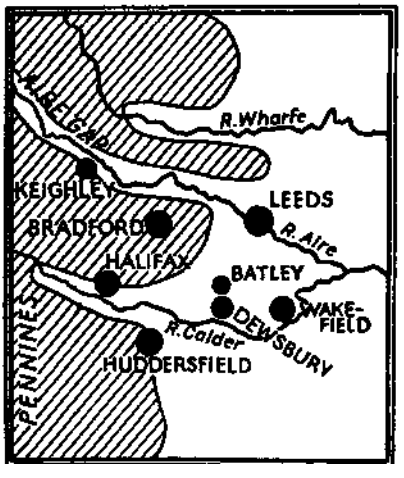


Fig. 47. THE WOOLLEN TOWNS OF YORKSHIRE. — **Notice the position of Leeds at the entrance to the Aire Gap.**

The early weavers first settled in the Aire and Calder valleys because of the abundant supplies of wool from the Pennine sheep. Wool is naturally greasy, and must be washed before it can be manufactured, hence good supplies of soft water are desirable. The streams of the Central Pennines drain from the Millstone Grit moorlands, and the water is soft in contrast to the waters of the streams from the limestone moorlands further north and further south. This is one of the principal reasons for the location of the woollen industry on the eastern slopes of the Central Pennines.

Many of the earlier mills were built well up in the dales in order to use the power of the swift Pennine streams. In journeying across the Pennines to-day these old mills can be seen standing derelict. With the increased use of steam power the new mills were built further down stream on the coalfield at the foot of the hills. The coalfield also used to yield good supplies of iron ore for the manufacture of machinery, but these are now exhausted (see Fig. 7).

The bulk of the wool used to-day is imported from Australia and Argentina, and it is imported principally at London, where the wool market, a heritage of the trade with Europe in the Middle Ages, is world-famous.

The chief city of the region is Leeds, which, situated on the Aire where it emerges from the hills, commands an easy route to the west coast, via the Aire Gap (Fig. 47). Leeds is the centre of the ready-made clothing industry, and also manufactures leather, glass, and soap.

Bradford, situated on a small south-bank tributary of the Aire, ranks as the second town in importance, and is the chief wool market of the district.

Other towns are Huddersfield, Halifax, Wakefield, Dewsbury, and Batley. Halifax specialises in the manufacture of carpets, and Dewsbury and Batley in " shoddy," *Le.* material made from waste woollen fabrics.

The towns of the north-western half of the woollen area manufacture worsteds, which are made from the finest wools, and are so called because they were first made at the village of Worstead near Norwich. The south-eastern towns make " woollens " from wool of somewhat coarser quality.

The area south of the woollen towns is a very important coal mining district, the chief centre being Barn$ley.

The Iron and Steel Industry of the Don Valley

Like the woollen industries of the West Riding, the iron and steel industries of the Sheffield region are old-established. Knives were made here as long ago as the fourteenth century. Local iron ore was smelted with charcoal obtained by burning wood from the forests of the Don valley. In order to secure a good " draught" most of the small furnaces were situated on the moors. Later the craftsmen moved to the valleys, where the streams were dammed to form small ponds (" hammer ponds "), the water from which was used to work bellows. This source of power was also used to turn the grindstones for sharpening the cutlery. To the west of Sheffield are five small streams all converging on the city, and to-day the ruins of many old mills and dams can be seen in these valleys. As the industry grew, foreign ore was imported from Sweden for special steels, but in those days the costs of importation were

very high. Eventually the timber reserves were seriously depleted. Coke replaced charcoal for smelting, and there were ample supplies of coking coal. The rocks of the Pennine chain provided not only the millstones for grinding, but also supplies of gannister, a hard rock used for lining the blast furnaces. Limestone, for use as a flux, was also obtained from the Pennines. The great factor in the pre-eminence of the Sheffield steel industry is the inherited skill of the local workpeople.

To-day the Don Valley between Sheffield and Doncaster is

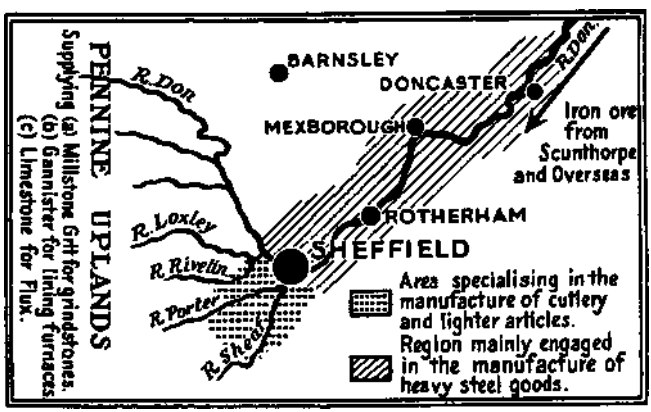


Fig. 48. THE IRON AND STEEL DISTRICT OF SOUTH YORKSHIRE.

a great steel-working region. In the plains to the east of Sheffield the manufactures are of the heavier type. Cutlery and light articles are made in Sheffield and to the west and south-west of the city (Fig. 48).

Steel is a combination of iron and carbon. In recent times there has been a great advance in the manufacture of " alloy steels." Various metals are mixed with ordinary steel to produce alloys possessing special qualities. Manganese is added to produce a tough non-magnetic steel, tungsten for hard tool steel, vanadium for spring steel, and chromium for stainless steel.

The Industries of the Derby and Nottingham Area

Near the southern end of the York, Derby, and Nottingham coalfield there is a miscellany of industries. The two great

centres are Derby and Nottingham, neither of which is actually on the coalfield, though one railway linking the two cities passes through a mining area around Ilkeston.

Most of the industries in this region are those which use cotton, wool, silk, linen, and artificial silk for the manufacture of a host of articles. The most important single manufacture is probably that of lace. Lace-making was originally a domestic industry, as it still is in Bedfordshire. It was not until the end of the eighteenth century that lace was produced by machinery, and then only plain net could be made.

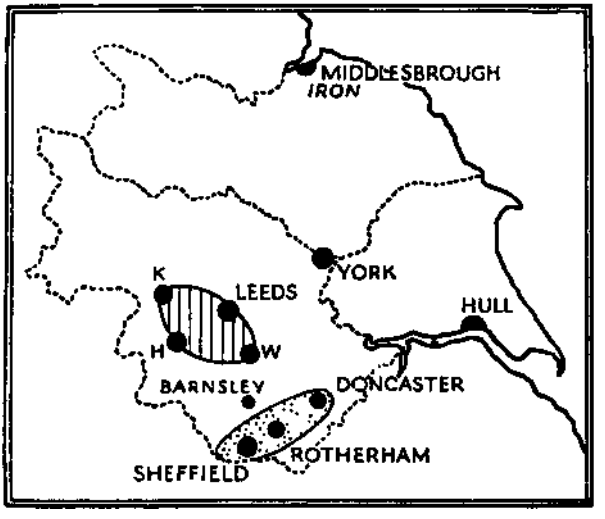


Fig. 49. YORKSHIRE.—Shows the areas engaged in the Woollen and Steel Industries. Note what a small area of the West Riding these areas occupy. *Vertical line shading* = Woollen Manufactures. *Dotted shading* — Steel Manufactures.

The invention of the Jacquard loom made it possible to weave patterns on net, and from 1834 onwards the lace-making industry extended rapidly. One-third of the lace-makers of Britain have their factories in Nottingham, but lace-making is important over the whole of the triangular area enclosed by lines joining Loughborough, Derby, and Southwell (Fig. 50).

Another very important industry is the manufacture of hosiery. This industry is distributed over the whole region

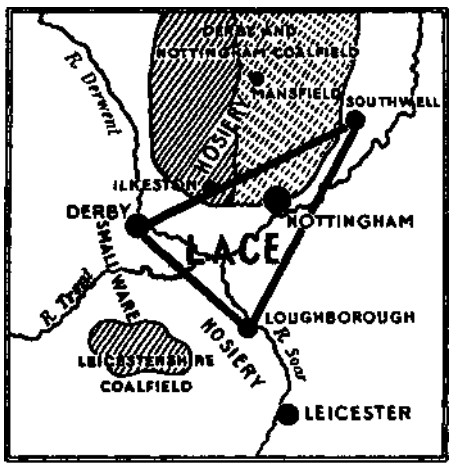


Fig. 50. THE LACE TRIANGLE OF THE EAST MIDLANDS.

from Leicester northwards to Mansfield. Hosiery includes not only stockings and socks, but all kinds of "knit wear": jumpers, bathing suits, knitted costumes, etc., and in this trade all types of fibres are used. Of special note is the increase in the use of artificial silk. Leicester is the largest centre, making every kind of knitted goods. Nottingham, Hinckley, Loughborough, and Mansfield are other hosiery centres.

The small ware industry is concerned with the manufacture of tapes, braids, shoe laces, elastic, fringes, and a vast range of other similar articles. Derby is one of the chief centres of this industry, but it is scattered throughout nearly all the towns and villages of the district.

Nottingham owes its origin to its defensible site. The Trent in this district meanders over flat plains liable to extensive flooding. By the side of the Trent, and rising above the flood plains, is a sandstone hill, close to a point where the river could

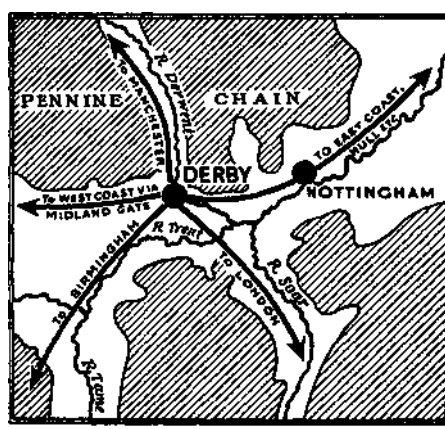


Fig. 51. THE POSITION OF DERBY.—(a) At the edge of the highland, *(b)* At the bend of the R. Derwent. *(c)* As a route centre.

be easily crossed. • This hill is the site of Nottingham Castle, around which the city has grown. Centuries ago the blacksmiths of Nottingham smelted ore with the charcoal from Sherwood Forest to the north. To-day Nottingham has important engineering industries, and is noted for the manufacture of cycles. The tobacco and drug manufactures are world-famous. Standing between the coalfield to the north and the agricultural lands of the Trent to the south, Nottingham is a great market centre, and the oaks of Sherwood forest and the hides of the cattle of the Midlands have given rise to a leather tanning industry.

Derby (Fig. 51) is situated at a sharp bend of the R. Derwent where it leaves the south Pennines for the Trent plains. Northward, via the Derwent valley, runs a picturesque route from the east Midlands to Manchester, the railway from London to Manchester via Derby being one of the main routes of the old Midland Railway (now part of the L.M.S.). The position of Derby was of great strategic importance during the struggle between the Danes and the English for mastery of the Midlands (note the Danish suffix " by," cf. Grimsby), and like many other old strategic towns it is now a great route centre. For this reason it became the headquarters of the Midland Railway engineering works, and it is also noted for the manufacture of motor cars. Up to 1800 silk manufacturing was the principal industry of Derby, but it is now unimportant, though the manufacture of artificial silk and of paper is noteworthy. Derby also has a famous, though small, pottery industry, the lead for glazing being obtained from the hills of North Derbyshire.

CHAPTER X

NORTHERN ENGLAND

(4) THE LOWLANDS EAST OF THE PENNINES

That part of England which lies between the Pennines and the North Sea falls into three natural divisions, viz. :—

(I) The Vale of York.

(II) The Scarplands and Vales of eastern Yorkshire.

(Ill) The Scarplands and Vales of Lincolnshire.

The Vale of York

Lying immediately to the east of the Pennines is a low plain never rising to 200 ft. above sea-level. It extends from north to south through Yorkshire, and varies in width from over 30 miles in the south to 10 miles in the north. It is the northward continuation of the Trent lowlands, and so is part of the route to Scotland, which has been important since the days when Roman legions marched northwards against the Picts. The foundation of the plain is New Red Sandstone, but this is covered almost everywhere by alluvium or by glacial deposits. Much of the alluvial land around the head of the Humber was once fen country, but it has been drained and is now rich agricultural land. The northern half of the vale is covered with morainic soils, and a terminal moraine, stretching across the vale from the Yorkshire Wolds to the Pennines, formed in early times an important east-west route slightly raised above the lower land.

Being on the sheltered lee side of the Pennines, and having a variety of rich soils, the Vale or York is an important agricultural area. It is the most northerly region of extensive wheat-farming in England. Barley, oats, and root crops are cultivated, and in addition there is much market gardening for the supply of vegetables, etc., to the towns of the Yorkshire coalfield. To the east of Leeds acres of rhubarb are a notable feature of the cultivation.

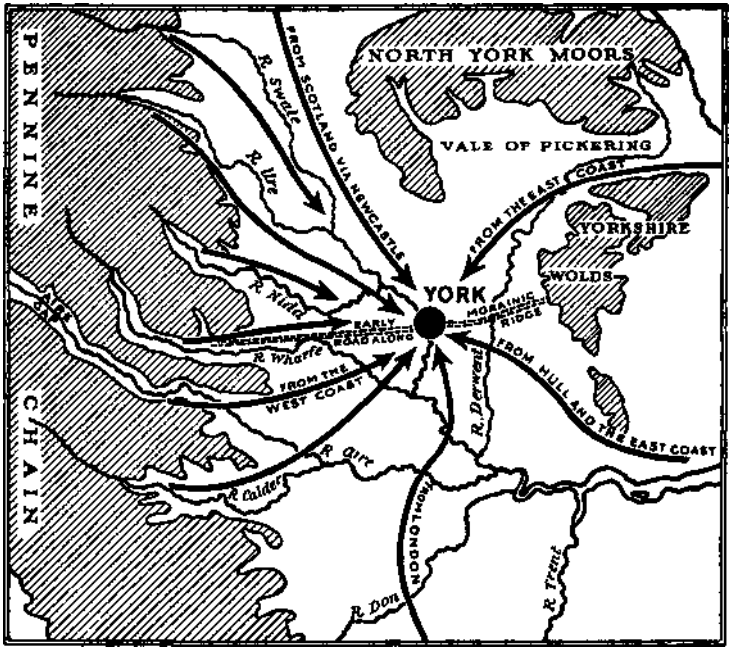


Fig. 52. THE POSITION OF YORK, SHOWING THE IMPORTANCE, AS A ROUTE CENTRE AND ITS RELATION TO THE OUSE BASIN.

The population is centred in villages and market towns. Many of the latter are situated where the Pennine tributaries of the Ouse leave the hills for the plains so that they act as market centres for both the people of the Yorkshire Dales and the Vale. Such are Richmond, Ripon, Knaresborough, and Wetherby.

The greatest centre of the vale is York, an ancient city dating back to Roman times (Fig. 52). It owes its importance to a number of factors, viz.:—

(1) It stands in the middle of the vale at the crossing of the north-south river route by the east-west road route along the morainic ridge.

(2) In olden days York was the limit of the tides, so that small sea-going vessels could reach York.

(3) York was the first point upstream at which there was firm ground raised above flood level.

(4) It is **a** great focus of natural routes, for not only does it stand on the north to south lowland " way," but on it converge routes from the dales to the west *(i.e.* of the Swale, Ure, Nidd, Wharfe, and Aire) and from the east coast via the Vale of Pickering.

(5) Its great historical importance is due primarily to its position on the great north route. Hence, as Eboracum, it was the principal Roman military station of northern England. It is still the ecclesiastical capital of northern England.

(6) To-day it is not only a great market centre, but, because of its historical remains, a great " show " city.

(7) It also has a number of important industries such as the manufacture of agricultural implements, leather, gloves, and chocolate.

York is no longer the largest city in Yorkshire, for to-day the newer industrial cities (Leeds, Bradford, Huddersfield, Sheffield, Middlesbrough, and Hull) have more numerous populations.

The Scarps and Vales of East Yorkshire

This region lies between the Vale of York and the east coast, and structurally is similar to the scarps and vales of south-east England. From the mouth of the Tees to the Humber there are four distinct regions, viz. *(a)* The North York Moors. *(b)* The Vale of Pickering, *(c)* The Yorkshire Wolds, *(d)* **The** plains of Holderness.

(a) THE NORTH YORK MOORS. These moors are composed of oolitic (Jurassic) limestone, the Cleveland and Hambleton Hills forming the steep northern and western edges. On **the** east there are picturesque cliffs *(e.g.* at Whitby and Robin Hood's Bay). On the south the moorland limestones dip gently under the clays of the Vale of Pickering.

The moorland is deeply dissected by such valleys as Eskdale and Newtondale. In the vales mixed agriculture is practised, but the high moorland is covered with heather and coarse grass suitable only for rough grazing. The importance of the iron ores of Cleveland on the northern edge of the moors has already been discussed (page 94).

Population is scanty on the moorlands, and there are no towns, the area being served by the market towns in the marginal lowlands. The largest town in the region is Whitby, market town, seaside resort, and fishing centre, with a population of only 12,000.

(b) THE VALE OF PICKERING. The flat-floored, poorly-drained Vale of Pickering lies between the Yorkshire Moors and the Yorkshire Wolds (Fig. 53). To-day it is drained by the westward-flowing Derwent, a tributary of the Yorkshire Ouse, but there is evidence that it was formerly drained by an east-flowing stream to Filey. During the Ice Age moraines were deposited near the coast, blocking the outlet of this old

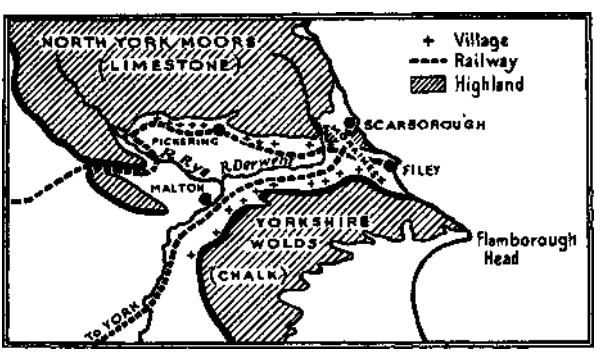


Fig. 53. THE VALE OF PICKERING.

river. The water rose, forming a great lake (known to geologists as Lake Pickering), which eventually overflowed south-westward across the low watershed near Malton. At this point the river cut a gorge, and gradually the lake was drained, leaving the muds of the lake bottom exposed. The flat lands of the centre of the vale are still liable to extensive flooding, and for this reason the villages are located around the edge of the vale on land above flood level. Thus there are two lines of villages linked by two east to west main roads, one along the northern side of the vale and one along the southern side. Parallel to these main roads are two railway routes which link the seaside resorts of Scarborough and Filey with the interior. Roads, railways, and villages have all avoided the riverine marshes.

The rich water meadows are famous for their cattle, while the better-drained lands away from the river are used for arable farming. There are no large towns in the vale, Pickering and Malton being small market towns.

(c) THE YORKSHIRE WOLDS. **These are the most northerly portion of the chalk escarpments. Never rising to more than 800 ft., the Wolds drop steeply to the Vale of Pickering on the north and gently to the plains of Holderness on the south. Eastwards they terminate in the bold promontory of Flamborough Head. Formerly they were wide expanses of unfenced grassland used as sheep runs, but to-day, although the wolds are still important for sheep-rearing, the method of farming has changed. Much of the land is now ploughed, barley and wheat being grown as well as root crops on which the sheep are fed. The relatively modern fertility of the wolds is the result of scientific farming and manuring.**

(d) HOLDERNESS. **The foundation of Holderness, a low plain lying between the Wolds and the Humber, is chalk, on top of which are deposits of glacial clays and alluvium. The river Hull flows southward over a flat badly drained area, noted for its cattle, but on account of its marshiness almost devoid of villages (cf. the Vale of Pickering).**

The coast between Flamborough Head and Spurn Head is crumbling very quickly, because the sea cliffs are composed of soft clays and loose sands. It is estimated that the coastline is receding at an average rate of 5 ft. to 7 ft. per year, and that a strip of land roughly two to three miles wide has been submerged since Roman times. This is the region of " drowned villages," and many farms and villages are to-day threatened with destruction. Much of the material worn from this coast is carried by tidal currents up the Humber where it is re-deposited, so that villages once situated on the sea coast are now some miles inland *(e.g.* Beverley). The towns of Holderness are either small market towns (Beverley, Driffield) or seaside resorts (Hornsea, Withernsea).

Hull alone, dominating the Humber, and the third port of the United Kingdom, stands out as a great city. More correctly designated Kingston-on-Hull, this port is situated on the north bank of the Humber, where a small river (the river Hull) enters the estuary (Fig. 54). The seaport originated

in the sheltered creek of the R. Hull, and for centuries served only its immediate hinterland. The prosperity of the port rapidly increased with the development of the wool and iron industries of the West Riding and the canalisation of the Aire, Calder, and Don. Thus Hull was linked by water with such centres as Leeds, Wakefield, and Sheffield. Though road and rail transport have replaced canal transport, there is still a

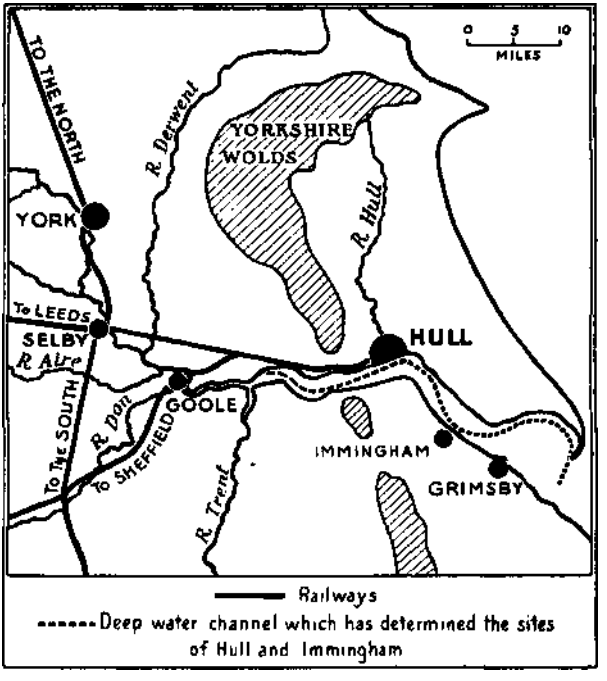


Fig. 54. THE POSITION OF HULL.

fair amount of barge traffic for bulky articles *(e.g.* coal). The great disadvantage of the position of Hull is the lack of direct easy communication southward. Railways strike westward to cross the river at Goole, but there is no road bridge between Selby and the sea.

Its chief imports are dairy produce and timber from the Baltic countries, iron ore from Sweden, wool from Australia, Argentina, and London, and large quantities of oil seeds, *e.g.*

soya beans from Manchukuo. The oil refineries express the oil **and** compress the residue of the seeds into " cake " for cattle feeding.

Its principal exports are woollen goods and iron and steel goods from the West Riding, but the hinterland of Hull includes also the cotton manufacturing region of South Lancashire and the industrial areas of North Staffordsliire and the Midlands (Fig. 55). There is an increasing coal export. Hull is an important fishing port, due to its nearness to the fishing grounds of the North Sea.

Goole, at the head of the Humber, is a smaller port than Hull, with similar imports and exports. Since the exploitation of the concealed coalfield in Nottinghamshire (see page 98) Goole is becoming increasingly important as a coal exporting town.

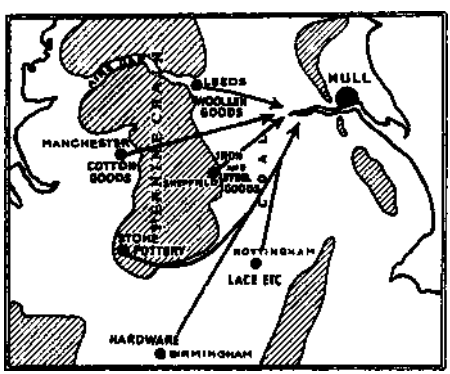


Fig. 55. THE HINTERLAND OF HULL.

The Scarps and Vales of Lincolnshire

Like East Yorkshire, Lincolnshire is structurally similar to south-east England, and consists of five regions which, from west to east, are:—

(1) A coastal plain known as the Lincoln marsh.

(2) A North-South belt of chalk downs.

(3) A clay vale.

(4) A North-South low and narrow ridge of oolitic limestone.

(5) Part of the Trent lowlands in the north-west.

(6) An extensive fenland area bordering the Wash in the south and south-east.

The east to west alternation of plains and scarped ridges is **due** to the tilting of the strata as shown in the section (Fig. 56), and to its subsequent erosion.

(1) The coastal plain is a flat region of silts and clays between the Lincoln Wolds and the sea. When drained these lowlands form excellent pasture land. The sandy shores of the coast have given rise to a number of seaside resorts, viz. Skegness, Mablethorpe, Cleethorpes.

(2) The chalk Wolds, averaging 300 to 500 ft. in height, are almost everywhere covered with glacial soils. Like the Yorkshire Wolds, they were once extensive sheep runs, but have been brought under cultivation by the adoption of scientific methods of farming. A fourfold system of crops is usually adopted, wheat or oats being followed by roots, barley, and clover in turn. Sheep are fed on the turnip fields by a system of " folding." By this method far more sheep can be grazed per acre, and the Lincolnshire breeds of sheep are world famous.

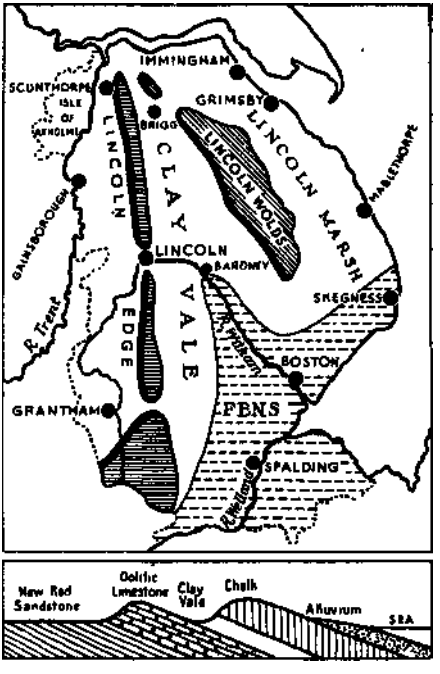


Fig. 56. SECTION SHOWING THE PRINCIPAL DIVISIONS OF LINCOLNSHIRE.

(3) The clay vale of Lincolnshire is narrow in the north and widens southwards, where it is drained to the Wash by the R. Witham. The farming of this lowland is partly pastoral and partly arable. The cultivation of sugar beet is becoming increasingly important, and there are sugar factories at Spalding, Bardney, and Brigg.

(4) The limestone ridge (Lincoln Heights or Edge) is both narrower and lower than the chalk upland. In the north of

the county it rises to less than 200 ft., but reaches 450 ft. in the south. Like the Wolds its surface is covered with glacial deposits, and agriculture is similar, sheep-rearing being important. Immediately to the west of the limestone ridge are deposits of Jurassic iron ore. These are worked extensively around Scunthorpe, where, because of the nearness of coal in Nottinghamshire, large blast furnaces have been established, making Scunthorpe one of the premier smelting centres in the kingdom.

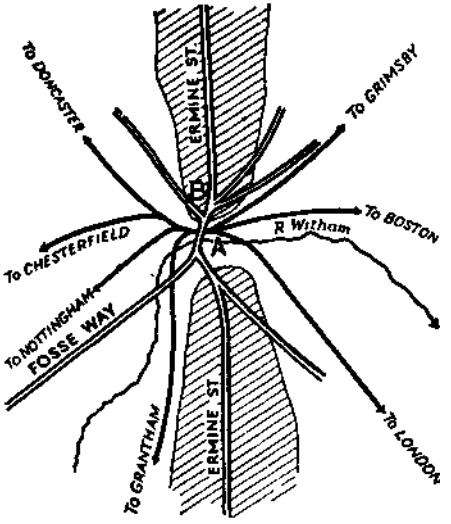


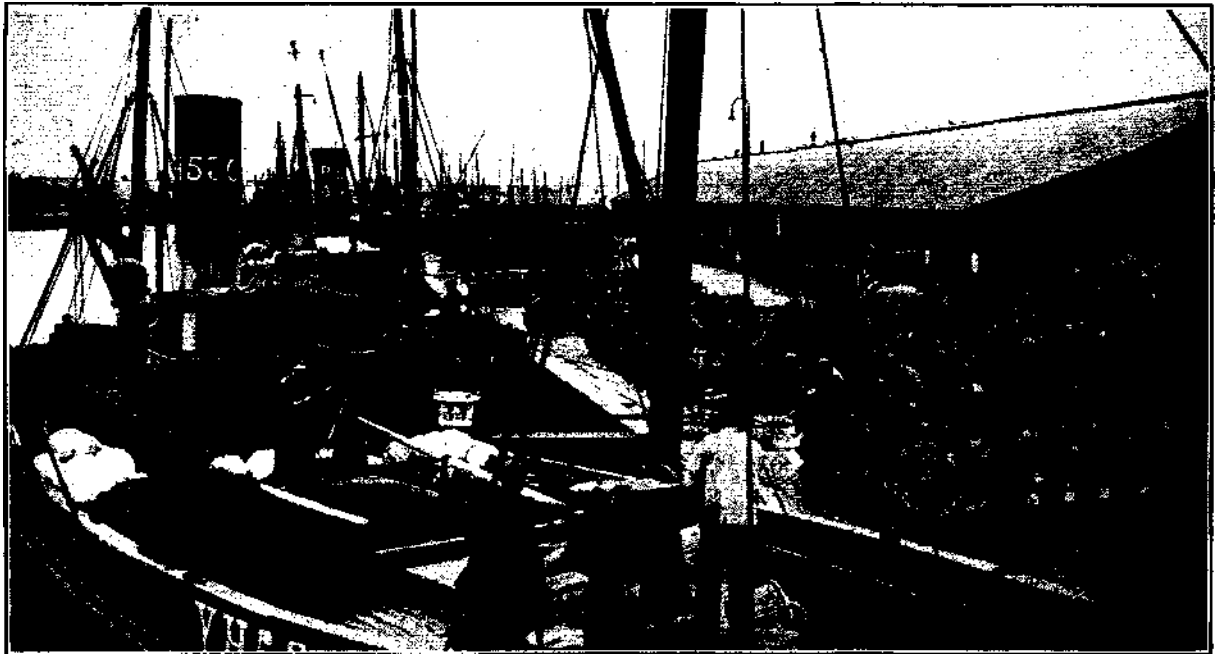
Fig. 57. LINCOLN.—The shaded portion is the Lincoln Edge (limestone) through which the R. Witham cuts a gap. Double lines are roads, and single lines are railways. Note how the old Roman road, Ermine Street, keeps to the unforested hill tops. The old part of Lincoln with its cathedral, markets, etc., are in the area B. Railway station and factories are in lower region A.

An interesting point about the limestone ridge is that an old Roman road, Ermine Street, follows its crest from the north to the south of the county.

(5) West of the limestone ridge extend the Trent plains, rich grazing lands for cattle. In the north-west of Lincolnshire is an isolated fenland area, the Isle of Axholme, so called because it is practically surrounded by the Rivers Trent, Don, and Idle. This land has been drained, and produces good crops of potatoes, turnips, etc.

(6) The fenland area is described in Chapter XV.

Lincoln (Fig. 56), the county town, stands in a water gap, where the Witham flows through the limestone ridge. The details of its position are shown in Fig. 57. Lincoln is the great market centre for the plains to the east and west. It



The Times.

HERRING DRIFTERS AT THE QUAYSIDE, YARMOUTH.

Compare the size of these drifters with that of the fishing boats in the picture of Polperro (page 53).

was originally a Roman colony (Lindum colonia) built on the **hill spur** overlooking the Witham lowlands, and also at a great crossroads (Ermine Street and Fosse Way).

Lincoln is famous for the manufacture of agricultural implements and, of more recent development, the manufacture of excavating apparatus. Iron was originally brought from the Sheffield region by canal, but now can be obtained more easily from Scunthorpe, The eastward extension of coal-mining in Nottinghamshire has lessened the cost of transport for fuel.

Gainsborough and Grantham, both to the east of the limestone ridge, manufacture agricultural implements. The importance of this industry is not surprising in view of the great agricultural development of Lincolnshire and the consequent demand for ploughs, harvesting machines, harrows, rakes, tractors, etc.

Grimsby, sheltered from north-easterly gales by Spurn Head, is a great fishing port, and from it there is a system of railways by which fish can be transported quickly to the industrial areas. Its export of coal is rapidly increasing, and it imports timber.

Immingham, a few miles to the north of Grimsby, was built in 1912 at a point where the swing of the current provided deeper water than at Grimsby (see Fig. 54). It is essentially a port developed by the railway, and is mainly concerned with the ever-growing exports of coal from the York, Derby, and Nottingham coalfield, and with imports of pit props.

A large scale map of Lincolnshire shows that a large number of towns end in the syllable " by." This is a Danish suffix (meaning village), and its prevalence indicates the extent to which the Danes settled in this area in the pre-Norman period.

CHAPTER XI

NORTHERN ENGLAND

(5) THE SOUTH-EAST LANCASHIRE COALFIELD

Position

The coalfield of south-east Lancashire lies between the Rivers Ribble and Mersey, and is partly on the flanks of the Pennines and the moorlands of Rossendale forest, and partly on the surrounding lowlands. There is no concealed coalfield as in the Northumberland and Durham and the York, Derby and Nottingham coalfields, for the western edge of the coalfield is limited by " faults," beyond which the coal measures are at too great a depth to be worked. To the south of this coalfield the coal measures dip steeply under the Cheshire plains, but they are again too deep to be worked.

Development of the Cotton Industry

The South Lancashire coalfield is primarily important for its cotton industry, which in spite of the post-war depression is still the greatest in the world.

South Lancashire was originally an important woollen industry area, dependent on the sheep of the Pennine moorlands and the soft water of the Central Pennines. Hence there arose in this area a population skilled in the art of spinning and weaving, not cotton, but wool. This is very important, because, when the new fibre, cotton, was first imported from the countries of the Eastern Mediterranean about the sixteenth century, it was taken to an area where the population knew how to spin and weave. At first the introduction of the new fibre into England was viewed with suspicion, for it was feared that it might have an adverse effect on the woollen and linen industries of the country. In South Lancashire, the woollen "guilds" were not as powerful as in other districts, and so there was less opposition to the introduction of cotton. Thus the manufacture of cotton

goods was established in Lancashire before the Industrial Revolution, and the woollen industry was gradually ousted.

It was not until about 1770 that the rapid growth of the cotton industry really began. One of the most important reasons for its immense growth was the number of inventions of machinery for cotton manufacture mainly by Lancashire men. Hargreave's spinning "jenny," Arkwright's spinning frame, and Crompton's mule, all invented during the eighteenth century, revolutionised the cotton manufacture and contributed enormously to its growth.

There are numerous swift streams flowing from the moorlands which, before the use of steam, were an important source of power for driving machinery, and the later development of the coalfield and of its deposits of iron ore was a great asset. The dampness of the Lancashire atmosphere, too, must be taken into account, for if cotton is spun in a dry atmosphere, the threads snap. To-day the air of factories can be moistened by artificial means, so that dryness of the atmosphere is no longer a serious drawback.

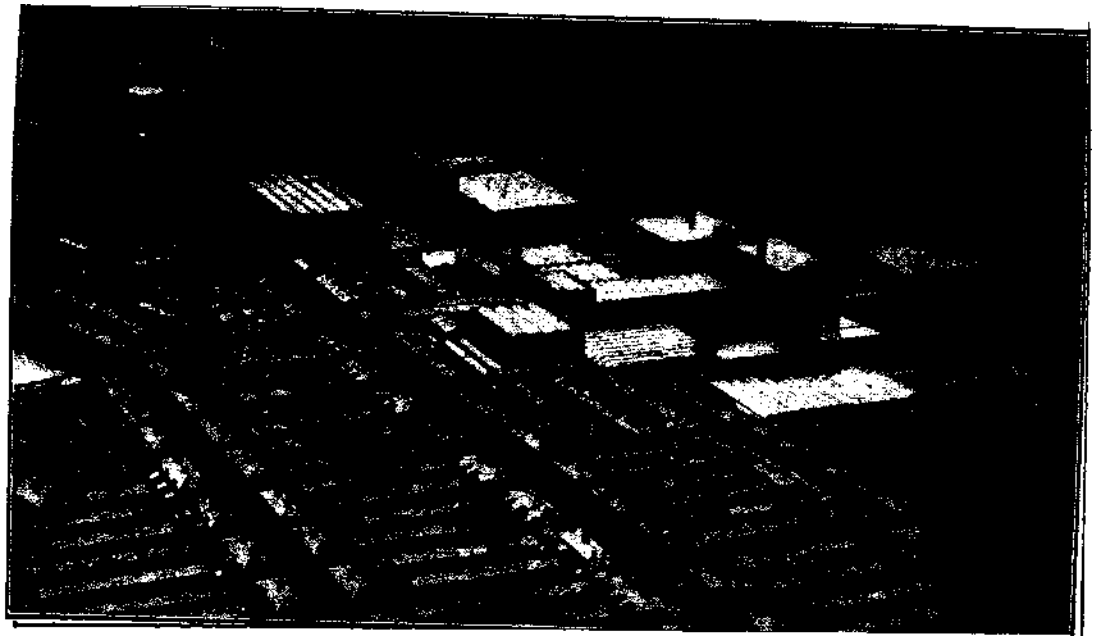
Finally, one must not forget the inborn perseverance and thriftiness of the Pennine peoples, and the foresight and initiative of those citizens who conceived and carried out the great schemes of Manchester Ship Canal, and the building of Lancashire's great port, Liverpool.

The Cotton Industry To-day

The cotton industry extends over the Lancashire boundary into Derbyshire (Glossop) and into Cheshire (Stockport, Stalybridge, and Hyde), and into Yorkshire (Todmorden and Skipton).

The cotton towns fall into two groups. Firstly, there is a northern group of weaving towns, including Preston, Blackburn, Accrington, and Burnley. These towns are all in the Ribble valley, and, with the exception of Preston, at the mouth of the river, are situated on the edge of the hills in the southern half of the valley.

Secondly, there is a southern group of towns engaged mainly in spinning, including Bolton, Bury, Rochdale, Oldham, Ashton, Stalybridge, Hyde, and Stockport. These towns form a semicircle around Manchester, the great cotton metropolis



Aeronims, Ltd

PRESTON.

This picture shows a cotton mill surrounded by the houses of the workers. Notice the crowding of the houses; the straight streets set at right angles; the lack of gardens. Compare this picture with those of Port Sunlight (page 134) and Shrewsbury (page 143).

(Fig. 58), and are situated at the foot of the moorland, usually at a point where a valley opens out and a stream leaves the hills for the plains *(e.g.* Rochdale on the River Roch).

Manchester, on the River Irwell, a tributary of the Mersey, is thus in a very central position, and all valley routes from the north, east, and south-east lead to it. Therefore it has become the collecting centre, not only for the raw cotton for

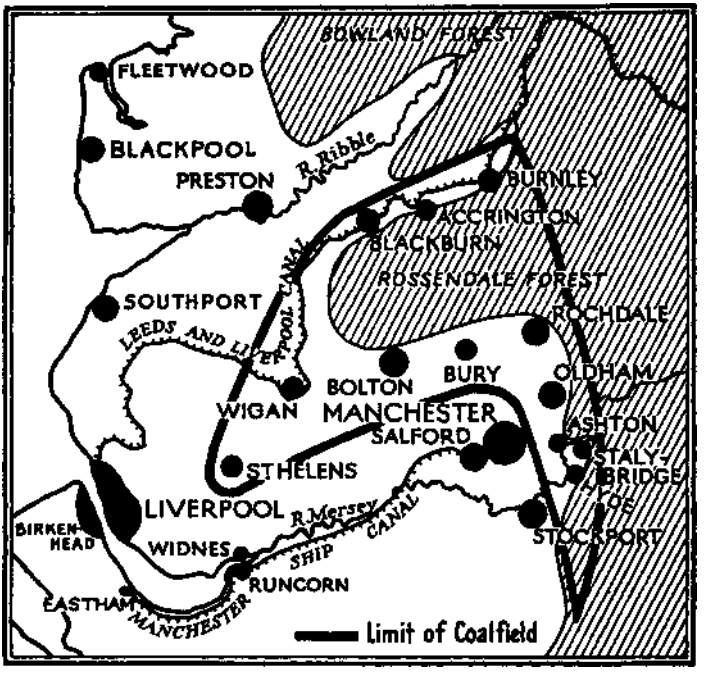


Fig. 58. THE TOWNS OF SOUTH LANCASHIRE.

dispatch to the various towns, but also for the finished goods which it exports either via the Ship Canal or Liverpool. Manchester is, by virtue of the Ship Canal, the fifth port in Great Britain (see Fig. 58).

Raw cotton is imported via Liverpool or Manchester. About two-thirds of the supply comes from the United States. The remainder is from Egypt, Brazil, Peru, the West Indies, and the British possessions in Africa.

Weaving and spinning are by no means the only processes of cotton manufacture. After the cloth has been woven it has to pass through many processes before it is finished, including bleaching, printing, and dyeing. In these processes the soft water of the Pennines is again valuable.

Since 1918 the cotton industry of South Lancashire has been passing through years of great difficulty (Fig. 59). Not only has there been a period of general industrial depression, but as a result of this depression many of the Lancashire cotton mills have been closed. To-day some are being re-opened for the manufacture of a variety of goods, such as felt slippers, gramophone records, etc., and many have been re-converted for the manufacture of artificial silk.

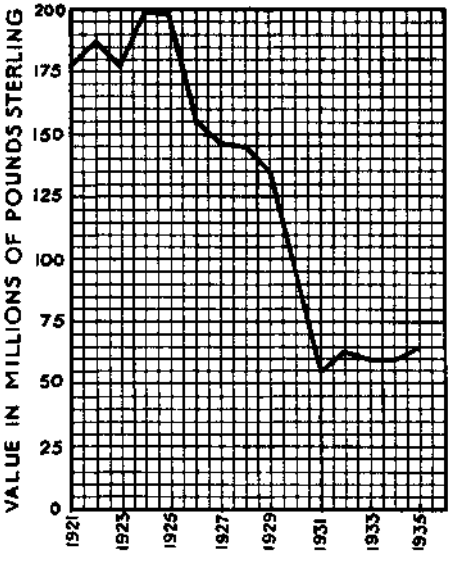


Fig. 59. THE EXPORT OF COTTON GOODS FROM THE UNITED KINGDOM, 1921-35.

The full effect of the rise of cotton manufacture in lands with cheap labour, such as Japan and India, yet remains to be seen (Fig. 60). In 1928 England exported nearly three times as much cotton cloth as Japan. In the first nine months of 1933 Japan's export of cotton goods exceeded that of Great Britain. The latter country thus lost her position as the leading exporter of cotton goods for the first time. Japanese cotton goods are finding an increasing market in India, once the greatest market for English cotton fabrics. This state of affairs is partly due to mass production; partly to keen and efficient salesmanship; and partly to the cheapness of labour which results from the lower standard of living in Eastern countries.

Other Industries

The greatness of the cotton industry has completely overshadowed the other industries of South-East Lancashire, which is also one of the most important engineering districts in the world. The manufacture of machinery for the textile industries takes first place, and dates back to the period of inventions at the end of the eighteenth century. Almost every large town of the coalfields is engaged in this branch of the iron industry, making machinery not only for the Lancashire mills, but for the ever-growing cotton industries in other parts of the world, viz. India, Japan, China, Brazil, etc. In this way Lancashire is directly helping those countries whose cotton manufactures and exports are adversely affecting her own cotton industry.

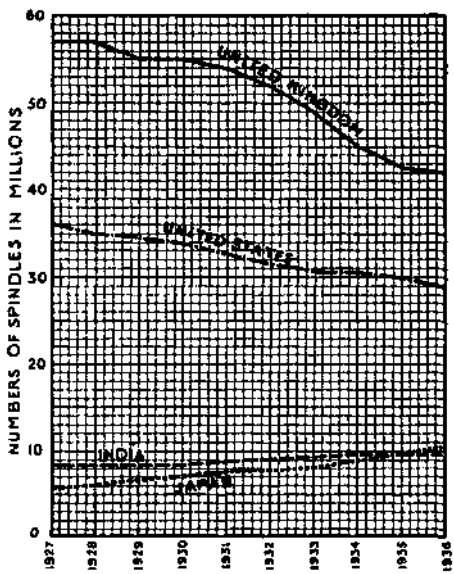


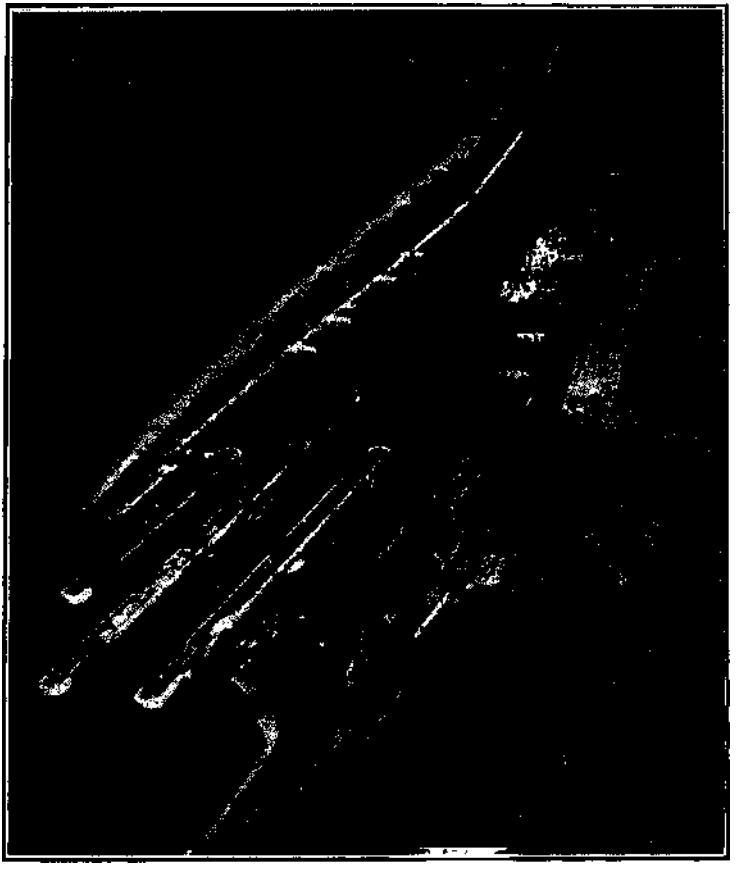
Fig. 60. NUMBER OF COTTON SPINDLES IN UNITED KINGDOM, UNITED STATES, JAPAN, AND INDIA.

South Lancashire is also famous for electrical engineering, and many world-famous firms have their works in this region. Other branches of engineering work include the manufacture of road vehicles, railway engines, gas and oil engines, steam hammers, and a vast range of machinery connected with industries such as flour milling, mining, paper-making, chemicals, etc.

Paper making is another of Lancashire's many activities. For this industry the following conditions are necessary:—

(1) An abundant supply of pure water.

(2) Fuel.



Aerofifms, Ltd *By* *courtesy the Manchester Ship Canal Co.*

EASTHAM LOCKS.

Eastham Locks are the entrance to the Manchester Ship Canal, and are situated on the south side of the Mersey estuary, part of which can be seen on the right-hand side of the picture. The locks vary in size, their use being determined by the size of the vessels entering or leaving.

(3) Easily imported supplies of wood pulp, esparto grass, or waste rags.

(4) A supply of chemicals, *e.g.* caustic soda (from Cheshire).

(5) A variety of substances for dressing paper, such as glue, china clay, resins, etc.

In Lancashire the streams from the great moorlands supply pure water; coal is at hand on the coalfield; raw materials are imported through Liverpool and Manchester; chemicals are easily obtained from the Cheshire salt district; and china clay comes into the Mersey ports primarily to supply the pottery industry of North Staffordshire, but some is diverted northwards into Lancashire. It must not be forgotten that Manchester is a great northern " news " centre, publishing well-known daily papers, and this, as well as business activities and the need for paper for packing, creates a great demand for paper. The paper-making centres are ranged round Rossendale Forest, and include such towns as Burnley, Chorley, and Darwen.

Manchester is also the centre of one of the greatest rubber manufacturing districts of Britain. The north-eastern suburbs of the city, *e.g.* Ancoats and Clayton, are specially important. Rubber manufacture is also carried on in other Lancashire towns, *e.g.* Leyland.

The manufacture of asbestos boarding is an industry of recent growth for which this district is becoming noted. Asbestos is imported from Quebec and Rhodesia, and the chemicals necessary for the industry are near at hand.

CHAPTER XII

NORTHERN ENGLAND

(6) THE NORTH STAFFORDSHIRE COALFIELD

Position

On the south-west corner of the Pennines, around the headstreams of the Trent, on the North Staffordshire coalfield is the industrial area known as " The Potteries " (Fig. 61).

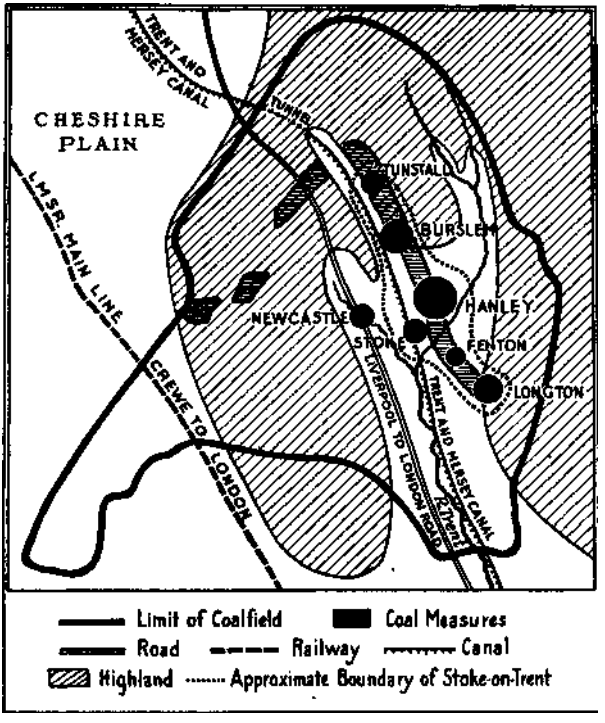


Fig. 61. THE NORTH STAFFORDSHIRE COALFIELD.

It is by nature a bleak, undulating upland, rising steeply from the Cheshire Plain on the west, whilst the Pennine folds sink more gradually southwards and eastwards beneath

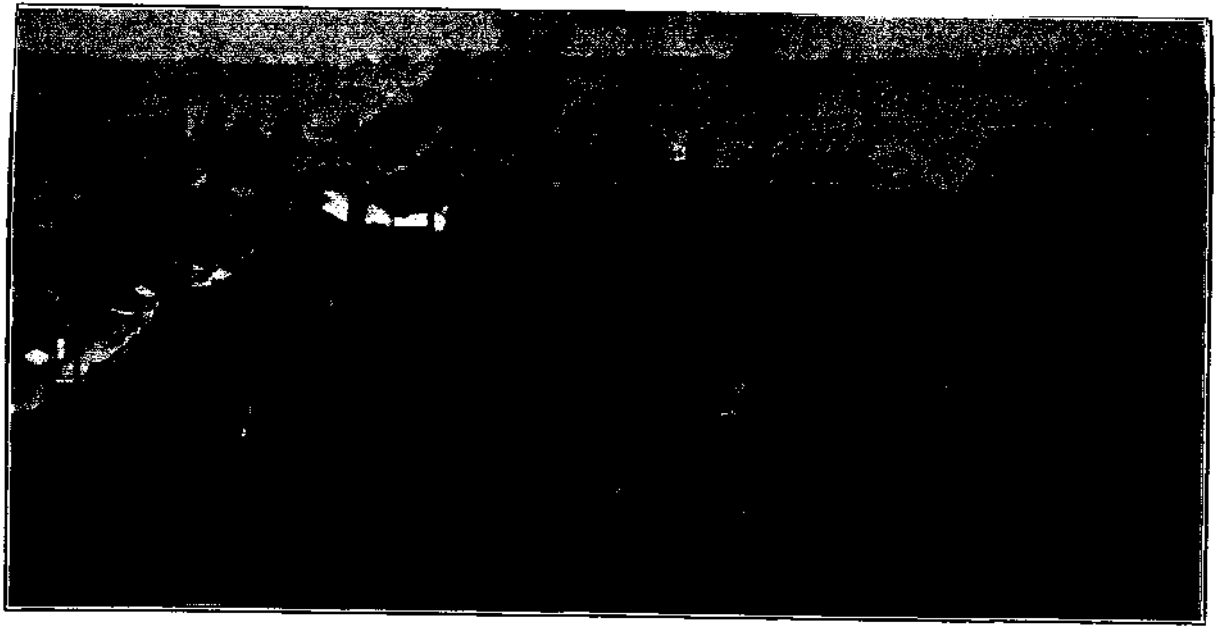
the sediments of the New Red Plain of Central England. Communication was therefore difficult westwards and easy towards the south and east, a fact which had a marked influence upon the development of communications in the days of turnpike roads, canals, and the early railways. The coalfield is triangular in shape, but the coal is worked only on the eastern and western sides. It is along the eastern limb of the coalfield that the pottery towns, Tunstall, Burslem, Hanley, Stoke, Fenton, and Longton, now federated into the city of Stoke-on-Trent, stand. To the west is Newcastle-under-Lyme, the ancient market town of the district, on a strip of agricultural land in the middle of the coalfield. It holds aloof from the neighbouring industries, and is important mainly as a residential area.

The Pottery Industry

The making of pottery is a very old industry, and in early times almost any district which had suitable clay manufactured pots of some kind. The North Staffordshire area, because of its altitude and poor soils, did not provide rich farming land, and many of the farmers using local clay and brushwood for firing, made pottery in their spare time for sale in the neighbouring market towns, *e.g.* Uttoxeter. Thus was developed the traditional skill which is the basis of the modern industry. The great variety of local clays and the easily won coal, especially in the eastern section of the coalfield, provided resources for the infant industry such as probably no other coalfield could offer. Whilst local clays have now largely been superseded by white clays obtained from southern England, there is still a very large quantity of this local clay used in the making of saggars, the vessels in which the fine ware is baked. Now large quantities of Cornish and Dorset clays, flint, and china stone are imported.

The Trent and Mersey Canal

The modern development of the industry, and the pre-eminence which it has attained are due in no small measure to the inventive skill and business ability of Josiah Wedgwood. He studied carefully the needs of the industry, imported china clay from Cornwall, and showed how good quality pottery



A VIEW OF THE "FIVE TOWNS."

W. J. B. Blake, Longton.

The bottle-shaped buildings are the ovens and kilns used for the firing of pottery. Notice the large number of factories and small shops; the lack of open spaces; the smokiness of the atmosphere. The "Potteries" are situated in the south-west of the Pennines, hence the hilly nature of the background.

could be made cheaply and in large quantities. Railways were not then built, and the clay was brought from small Cornish ports, such as Fowey, to the Mersey estuary, as it still is, because of the cheapness of water transport. The clay was then taken up the River Weaver to a point near Northwich, loaded on pack animals, and thus carried across Cheshire to the coalfield. This latter part of the journey was so tedious and expensive that it made the cheap production of pottery almost impossible. It also limited the amount of clay that could be obtained, and such a journey was obviously not suited to the export of fragile ware. Wedgwood realised these difficulties, and was the pioneer of the Trent and Mersey canal, which was cut about 1770. This canal crosses Cheshire and passes under the Pennine slopes by a tunnel near Kidsgrove. After reaching Stoke it continues eastwards down the Trent valley and joins the river near Nottingham, so that there is a continuous waterway from the Mersey to the Humber. Thus North Staffordshire was given cheap transport for the importation of kaolin and the exportation of pottery, and since it had already coal, coarse clay, apd a population of skilled potters, the area has grown to be one of great importance. To-day it is the chief pottery area in the world, and employs almost 50,000 operatives.

The Pottery Towns

It is interesting to note that with the passage of time the towns have tended to specialise on different types of ware. Thus white earthenware is manufactured in the northern towns from Stoke to Tunstall, whilst the production of china is centred chiefly in Longton, Fenton, and Stoke. Local clay is still used in Burslem and Tunstall for the manufacture of teapots, whilst the coarse wares, such as drain pipes and tiles, are the products chiefly of the western section of the coalfield.

CHAPTER XIII

NORTHERN ENGLAND

(7) THE LOWLANDS WEST OF THE PENNINES

To the west of the Pennine Chain lie the plains of Lancashire, viz. (1) the lowlands of Lancashire between the Pennines and the Irish Sea; and (2) the lowlands of Cheshire and North Shropshire between the Pennines and the Welsh Uplands (Fig. 62).

Structure and Soils

Structurally, the Lancashire plains are composed of New Red Sandstones and New Red Clays, but these are almost everywhere covered by glacial deposits, varying from clays too heavy to plough, as in south Cheshire where 95 per cent, of the land is permanent pasture, to light sandy soils *(e.g. Sandbach).* In a few elevated regions the sandstones rise above the glacial deposits of the lowlands. Where this occurs there are picturesque red scarps and pine-covered hills or heath lands as in

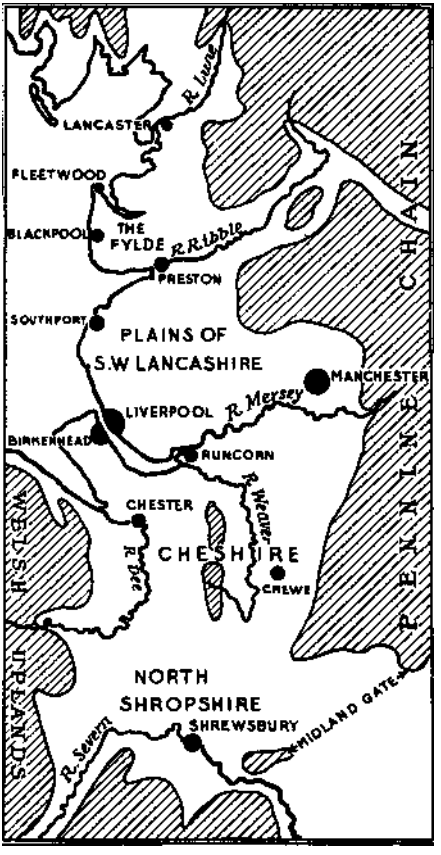


Fig. 62.

THE LOWLANDS WEST OF THE PENNINES.

(1) the Wirral, (2) on the Central Cheshire ridge, (3) on the Shropshire-Staffordshire borders, and (4) in the isolated hills of North Shropshire. There are also large areas of peaty soils as in Chat Moss on the Lancashire-Cheshire border, and in South-West Cheshire. These latter soils are particularly valuable for growing potatoes.

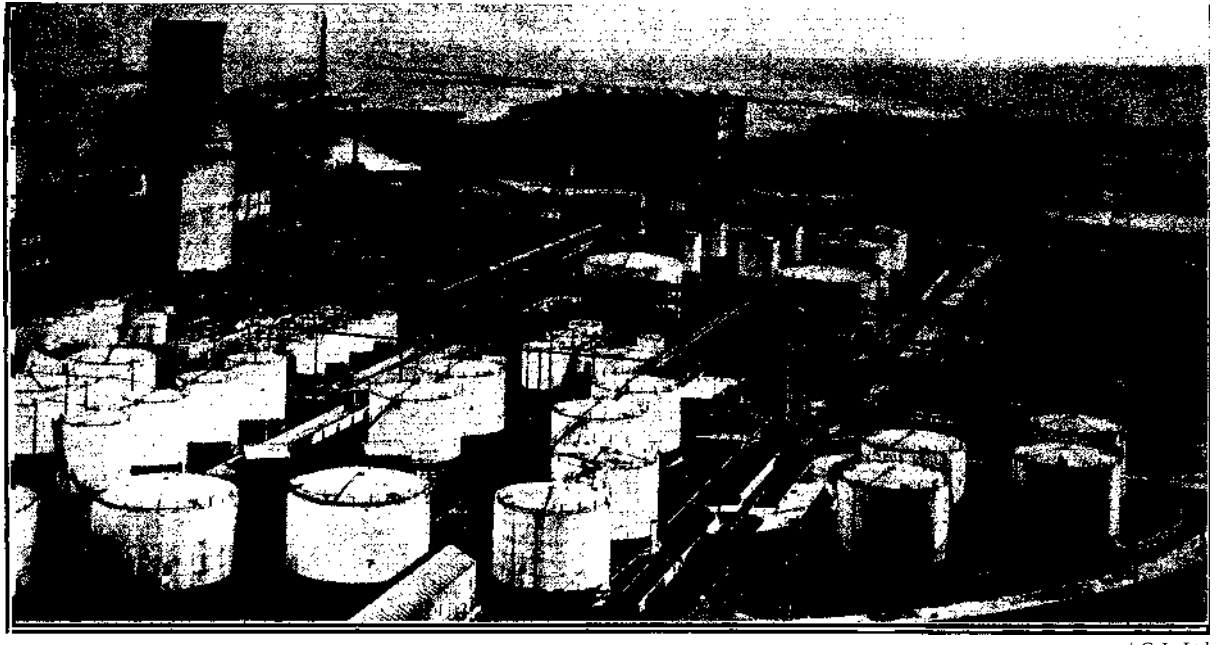
Dairying and Agriculture

Lancashire and Cheshire have more cattle per 100 acres than any other English counties. The equable temperatures, the well-distributed rainfall, and the demand for milk, butter, and cheese in the neighbouring industrial areas have led to the development of a great dairying industry. A marked feature of the dairying industry is the decrease in the "home" manufacture of dairy produce, and the great increase in the number of factories to which farmers sell their milk. The United Dairies, for example, have a big collecting depot near Nantwich. North of the Ribble a larger proportion of cattle are reared for meat.

Despite the undoubted pre-eminence of cattle rearing and dairying, other forms of agriculture are important. The Fylde peninsula between the rivers Ribble and Lune is noted for pig and poultry rearing. In the western lowlands of Lancashire between the Mersey and the Ribble there is much arable land, potatoes and wheat are extensively grown on peaty and lighter soils. Other agricultural activities are the cultivation of strawberries in the Dee Valley and the growing of sugar-beet and considerable quantities of barley in North Shropshire. In parts of eastern Cheshire rye is grown, and the rye straw sent to the Potteries, where it is used for packing china.

Salt, Chemical, and Silk Industries

The plains west of the Pennines are not, however, entirely dependent on agriculture. In the New Red Clays, which lie underneath the glacial soils of eastern Cheshire, there are extensive deposits of salt, extending from the Mersey southwards into Shropshire. Salt is worked principally in the middle Weaver valley around Northwich, Middlewich,

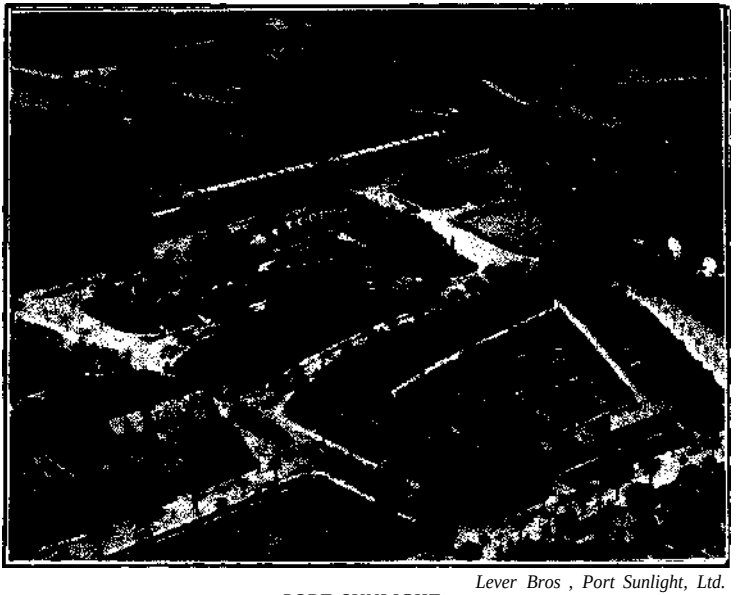


/ C I. *Ltd.*

CHEMICAL WORKS AT BILLINGHAM-ON-TEES.

This picture shows a portion of the large chemical works at Billingham. The tanks are for the storage of petrol made from coal, one of the latest and most important industrial developments in the country. Note the River Tees in the background.

Winsford, and Sandbach (Fig. 63). There is to-day only one salt mine (at Winsford). Elsewhere borings are made and water is pumped into the salt layers. The brine is then raised to the surface and evaporated. This method of obtaining salt has led to extensive subsidence in the salt regions, *e.g.* at Northwich, and many such subsidences can be seen near the L.M.S. main line north of Crewe. Salt is prepared for domestic use, and great quantities are exported



Lever Bros , Port Sunlight, Ltd.

PORT SUNLIGHT.

This is an example of a modern garden city built for the workers of the adjoining factory. With its wide streets, picturesque layout, and ample garden space it forms a striking contrast to an industrial town such as Preston (page 121).

to the fishing centres of Nova Scotia and Newfoundland, and to tropical countries where starchy foods are the basis of the diet, viz. India, Central Africa.

The greatest importance of the salt industry is, however, in its relation to the chemical industry. Northwich is the home of the Imperial Chemical Industries, and Runcorn and Widnes are the headquarters of the United Alkali Company.

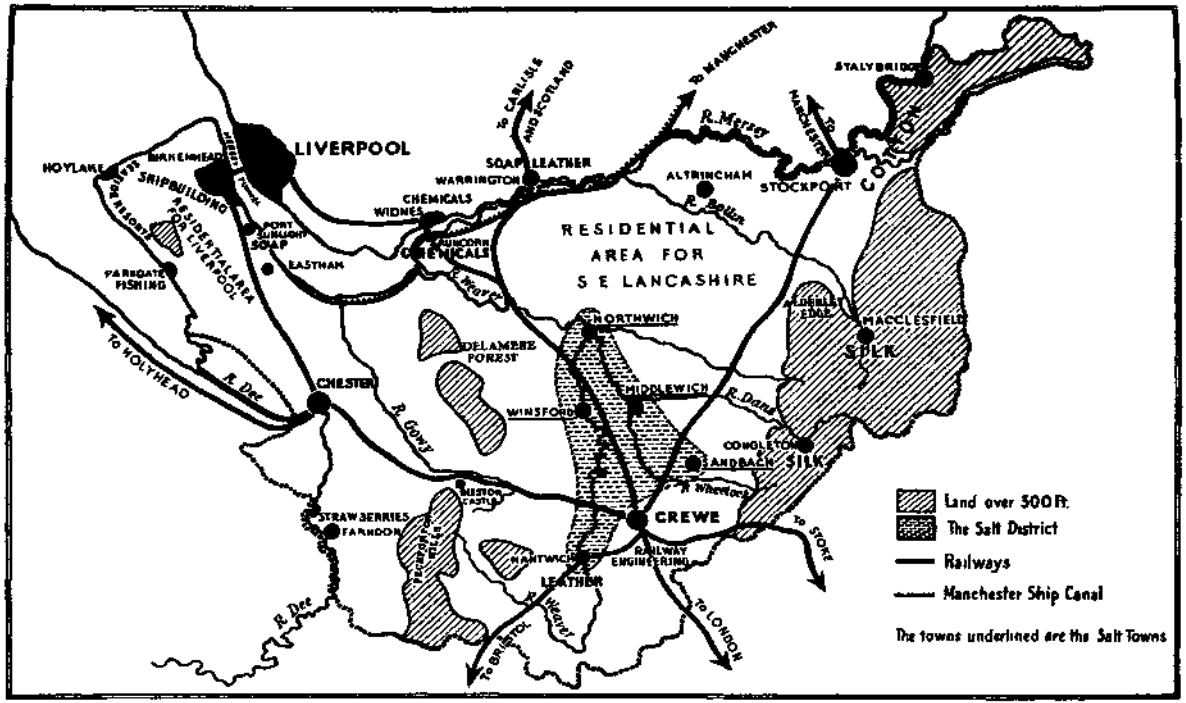


Fig. 63. CHESHIRE.

The chemical industry of north Cheshire supplies chemicals for use in the cotton industry (bleaching agents, etc.); for the glass manufactures of St. Helens; for the soap manufactures of Port Sunlight and Warrington, as well as for the tanneries of Warrington. The two latter industries have also some connection with cattle rearing. The leather industry began because of the local supplies of hides, though to-day large quantities are imported. The soap industry, too, could formerly obtain the necessary fats locally, but now a large variety of vegetable oils are imported via the Mersey estuary.

On the eastern borders of Cheshire are three important silk-manufacturing towns, viz. Macclesfield and Congleton in Cheshire, and Leek in Staffordshire. The industry probably migrated from Derby to Macclesfield, through which formerly ran the best'turnpike road between Derby and Manchester. The supplies of pure soft water has been important in localising the industry because of its suitability for dyeing processes.

The Manchester Ship Canal

The completion in 1894 of the Manchester Ship Canal, which gives a 35 mile waterway between Eastham (on the south bank of the Mersey estuary) and Manchester, opened up large tracts of country hitherto of little industrial importance. Because of the easy transport facilities factories are springing up all along the canal banks, viz. oil refineries, breweries, etc., and in particular there has been a great expansion of both factories and residential areas for work-people in the Trafford Park area immediately to the west of Manchester.

Liverpool: History and Development

The natural outlet of the Lancashire plains and of the coalfields further inland is Liverpool. Liverpool is situated at the mouth of the Mersey estuary. Because of its " bottle-necked" shape and the consequent strength of the tidal currents, the estuary is at this point deeper and freer from sandbanks than elsewhere, though dredging is constantly necessary to maintain a sufficient depth of water for large vessels.

Two hundred years ago Liverpool was a small fishing village situated round a creek called the " Pool." In those

days there was a little trade with Ireland, but it was mainly carried on through Chester, and Northern England was so scantily populated that there was little need for a great port. Then there came an increase in trade associated with the famous "Trade Triangle" which was fostered by the discovery of new lands. Ships sailed from Liverpool laden with guns, ammunition, trinkets, etc., which were sold to native chiefs in West Africa. There slaves were collected for transport to the West Indies, whence the ships returned to Liverpool with cargoes of cotton, sugar, and tobacco.

With the coming of the Industrial Revolution and the development of the cotton industry the need for a good port was realised, and Liverpool became the great importing centre for raw cotton. Miles of docks line the north bank of the Mersey, ending seawards in the famous Gladstone dock, said to have the most up-to-date equipment of any dock in the world.

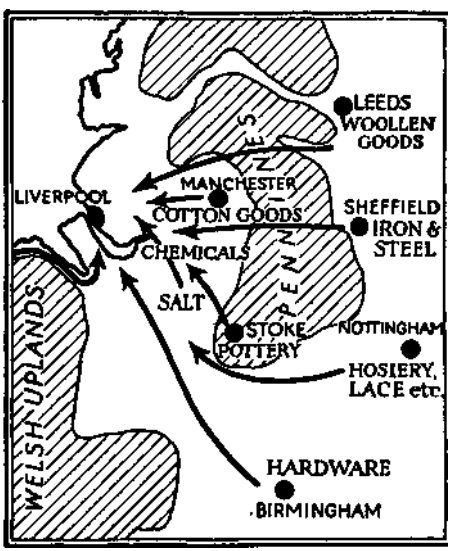


Fig. 64. THE HINTERLAND OF LIVERPOOL.—Tunnels enable goods from Yorkshire to be exported across the Pennines, and the new Mersey tunnel will give more direct communication with N. Wales.

The hinterland of Liverpool (Fig. 64) was originally merely the south Lancashire lowland. With the extension of roads and railways and the cutting of the Pennine tunnels the sphere of the trading activities of Liverpool rapidly expanded, and the hinterland is now no longer confined to South Lancashire. Liverpool exports woollen and steel goods from Yorkshire; pottery from North Staffordshire; hardware from South Staffordshire; chemicals from Cheshire; and in

fact a variety of goods from all parts of England. Her imports are not confined to cotton, but include wool for Yorkshire from Australia and Argentina; dairy produce from Ireland, rubber and tin ore from Malay; and a vast range of products from the Americas, such as wheat, maize, bacon, lard, linseed, timber, wood pulp, and hides, etc.

Though Liverpool has lost some of its trade and passenger traffic to Southampton, it still retains about one-third of the passenger traffic of Great Britain. Despite the cutting of the Ship Canal, Liverpool stills imports twice as much raw cotton as Manchester, and only in the case of very few commodities does the amount imported by Manchester exceed that of Liverpool.

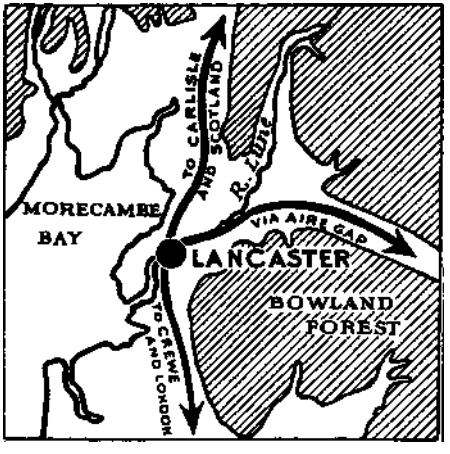


Fig. 65. THE POSITION OF LANCASTER.—*(a)* Where the western lowland is narrow, *(b)* At lowest bridging point of R. Lune, (c) As a route centre.

The industries of the city are, as in many ports, based on the imports. Thus in Liverpool there are flour mills, sugar refineries, and factories for the manufacture of cattle foods, chemicals, soap, and margarine. The cutting of the Mersey tunnel has solved a great transport problem, not only easing connections between Liverpool and Birkenhead, but between Liverpool and Chester and North Wales. Another feature of Liverpool is the fine airport from which there are regular services to London, Ireland, the Isle of Man, etc.

Other Towns

BIRKENHEAD. On the opposite shore of the Mersey is Birkenhead, the twin port of Liverpool. It has a famous shipbuilding yard, and imports large numbers of live

cattle. Until recently communication between Liverpool and Birkenhead was only by ferry boats, and traffic often became congested during rush hours, for the Wirral peninsula is a " dormitory " of Liverpool.

LANCASTER. This old Roman fortress (Fig. 65) is situated at the lowest bridging point of the River Lune. Here the Pennine uplands come closer to the west coast than elsewhere, so that west coast routes to Scotland had, perforce, to pass through Lancaster. At the same time there was easy communication via the Aire gap with York, the Roman fortress of the east. Hence it was of great strategic importance in Roman times. To-day it stands on the main L.M.S. route to the North. Its manufactures of linoleum are of some importance.

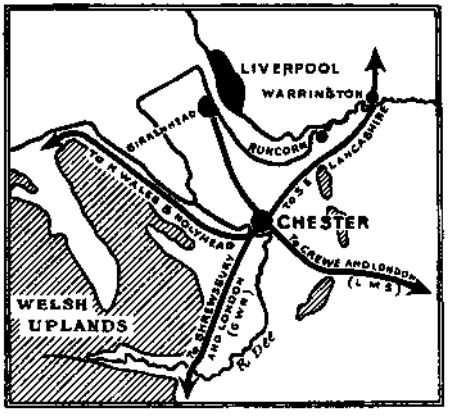


Fig. 66. THE POSITION OF CHESTER.—*(a)* Original lowest bridging point of R. Dee. *(b)* Within a loop of the river, (c) Controlling the narrow north coastal plain route into Wales.

THF PORTS OF THE DEE-MERSEY REGION.—*(a)* Chester. Roman and mediaeval port—note canalisation of Dee below Chester, *(b)* At Latchford (Warrington.) Roman port, the original lowest bridging point of the Mersey, (c) Liverpool, Birkenhead, Runcorn, modern ports. Runcorn now lowest bridging point (transporter bridge).

CHESTER. At the lowest point of bridging of the Dee, Chester (Fig. 66), another Roman fortress, guarded the route to North Wales, as Lancaster guarded the route to Scotland. Like York, it is a " show " city, having a fine cathedral and completely preserved walls. At one time Chester was an important port, but the silting of the Dee, the increased size of ships, and the competition of Liverpool led to its decline. An attempt to revive its importance was made by straightening and canalising the

Dee between Chester and the estuary, but its trade to-day is insignificant.

WARRINGTON. Originally the lowest bridging point of the Mersey, Warrington was a port of some importance in Roman times. To-day it is the point at which the west coast route (L.M.S.) to Scotland crosses the Mersey. It has important industries of soap-making, tanning, etc. A transporter bridge now crosses the Mersey and the Ship Canal some miles nearer the sea at Runcorn.

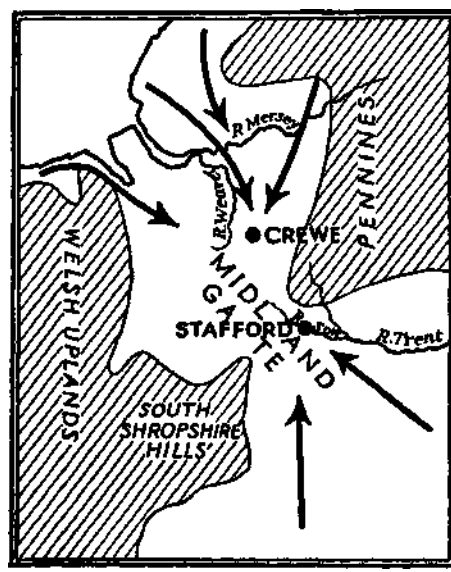


Fig. 67. CREWE AND STAFFORD.—Showing their positions in relation to the Midland Gate.

CREWE. Crewe (Figs. 67 and 68), unlike the neighbouring market towns of Nantwich and Sandbach, is entirely of modern origin. Nor is it a road centre, for the main road between Manchester, Liverpool, and London passes some miles to the north-east of the town. A little more than a century ago its site was occupied only by a few scattered farm houses. When railways were first developed across the Cheshire Plain it was the point upon which the lines from Birmingham, Manchester, and Liverpool converged, and, when

these and other small railway companies combined to form the old London and North Western Railway, it soon became the principal engineering centre of the system. Its central position relative to London, Carlisle, Holyhead, etc., should be noted.

The cheapness of the heavy clay land, which was of low agricultural value, the nearness to the North Staffordshire coalfield, and the ease with which its commanding position in

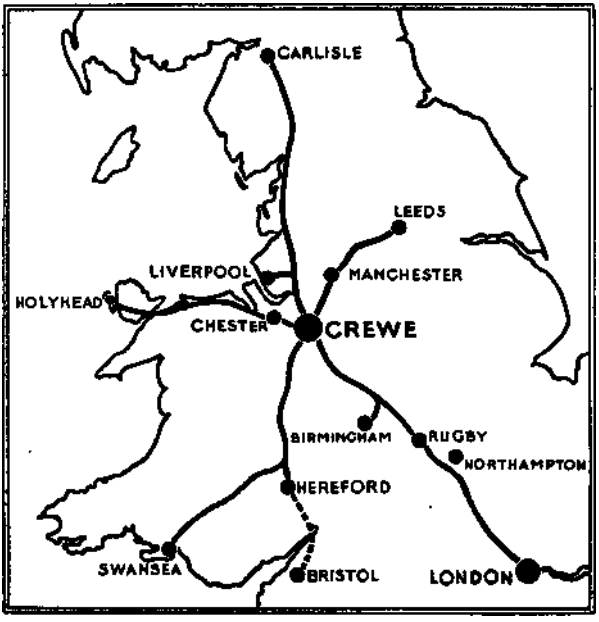


Fig. 68. CREWE. Showing its central position in relation to the old L. and N.W.R. system.

the Midland Gate enabled it to be developed as a focus of railway routes, all contributed to its rapid growth.

The fortunes of the town have been closely connected with the prosperity of the railway which finds employment for the majority of the men. The female labour is utilised in the local clothing and shirt factories, but the precarious position of a town so dependent upon one industry has been very evident during the period of industrial depression.

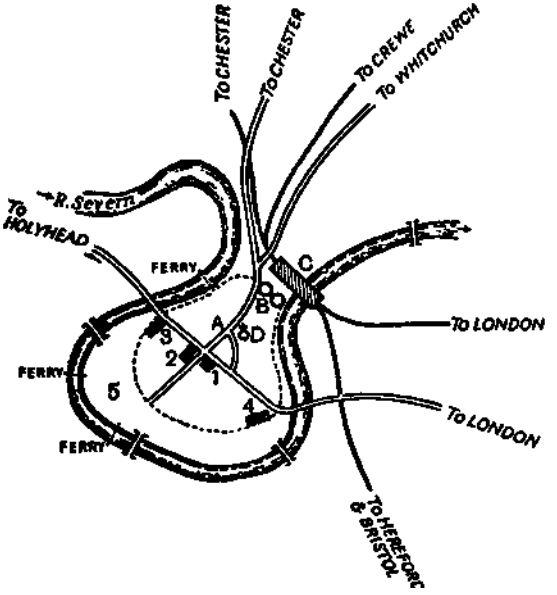


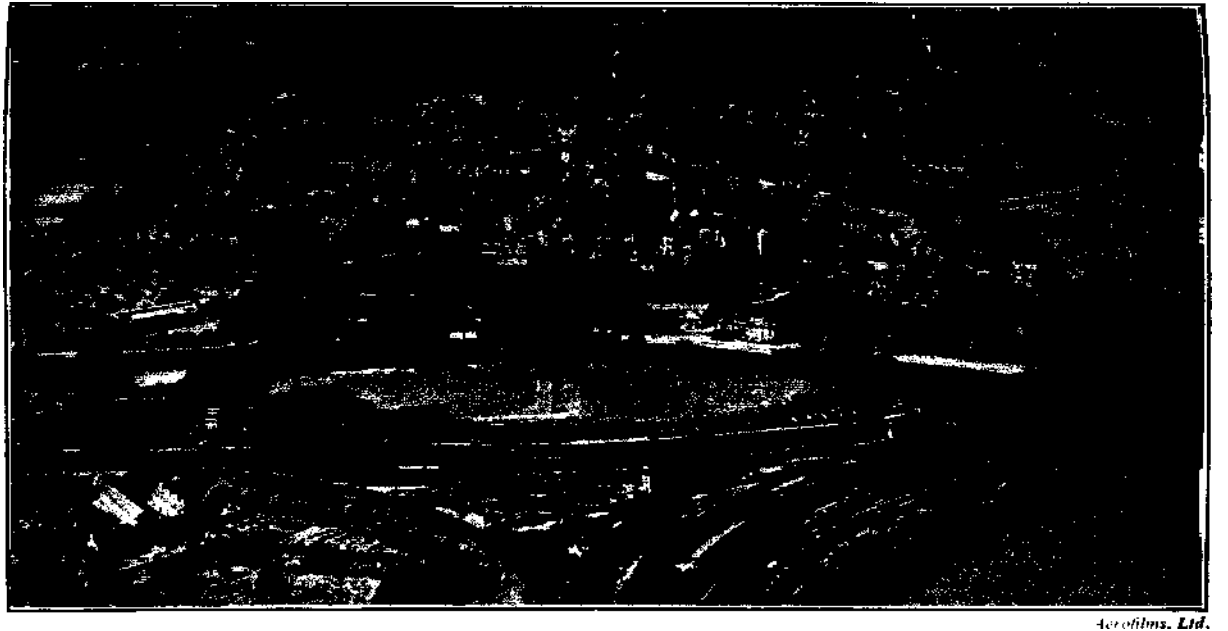
Fig. 69 *(a).* THE SITE OF SHREWSBURY.

The dotted lines represent the position of the old Walls. A. The original Market Place near the Church. B. The Castle guarding the "Neck." C. The Railway Station—built over the river because of lack of room. D. The principal Church on the highest point of the town.

1. Market Square, second position of market near main
2. Present Market, third position of t cross roads. market
3. Priory. 4. Friary. 5. Low land — originally marshy — now a park.

Note the number of bridges and ferries necessary.

SHREWSBURY. **At the extreme south of the North Shropshire plain, Shrewsbury [Fig. 69 *(b)]* is near to the most northerly bend of the Severn, and is almost surrounded by one of its meanders. It is the great market centre of the district, placed between the highlands of South Shropshire and the plains of**



Aerofilms, Ltd.

AN AERIAL VIEW OF SHREWSBURY.

This very old market town presents a striking contrast to Preston (page 121). The principal part of the town lies within a river loop. With a little care the course of the river can be discerned for it follows the line *of* trees in the background. The arched bridge carries the main road to North Wales. In the bottom right-hand corner is the railway station, built partly on another bridge over the river. This picture should be compared carefully with the diagram on page 142.

North Shropshire. It commands (1) the Severn route into Wales; (2) a southerly route via the Church Stretton gap, to Hereford and Bristol; and (3) is on the main road route between London and Holyhead.

In Roman times it was a fortified British stronghold, known

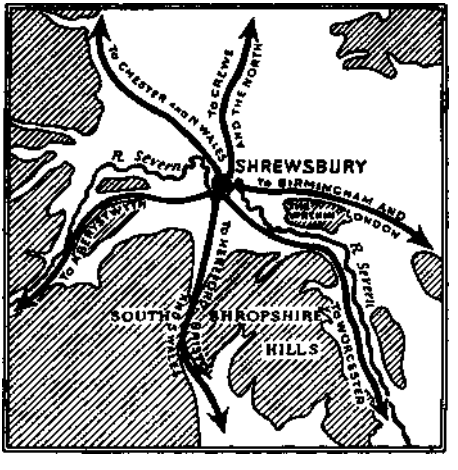


Fig. 69 *(b)*. THE SITUATION OF SHREWSBURY.

as Pengwerne (the hill among the alders), and four miles to the east was the Roman city of Uriconium. Thus, though Shrewsbury with its wealth of half-timbered houses and historical associations is a " show " town, it lacks the Roman walls characteristic of Chester and York. To-day it is an important railway junction.

CHAPTER XIV

THE CENTRAL PLAIN OF ENGLAND

Position and Relief

In the Midlands of England there is lowland area roughly triangular in shape. It is bounded on the west by the Welsh mountains, on the north by the Pennine uplands, and the south-east by the limestone escarpment (Fig. 70). Flowing

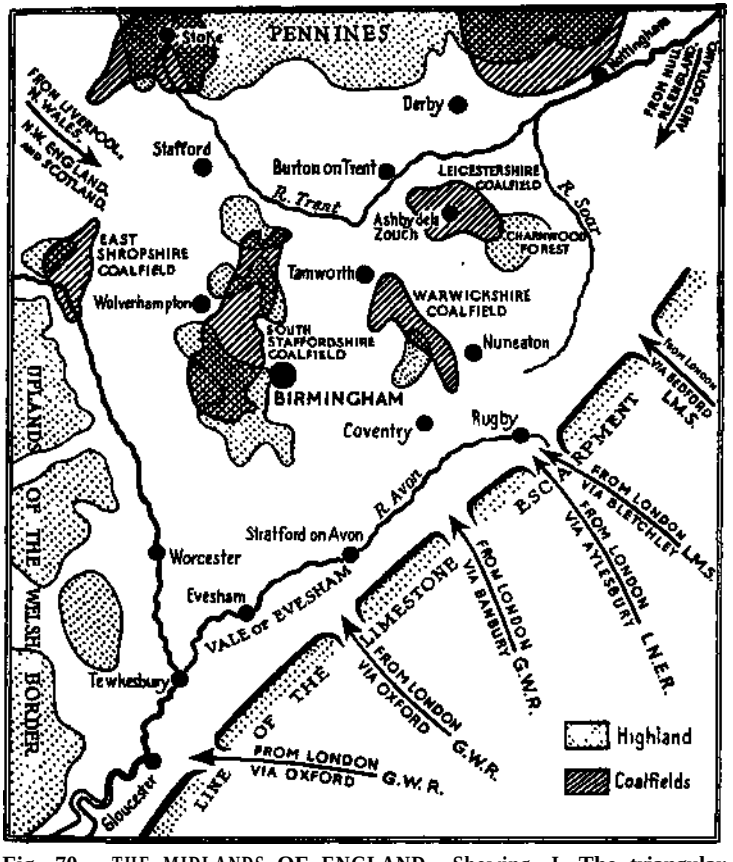


Fig. 70, THE MIDLANDS OF ENGLAND.—Showing—I. The triangular arrangement of the bordering uplands and rivers. II. The relation of the coalfields to the hilly country.

roughly parallel to the three sides of the triangle are the rivers Severn on the west, Trent on the north, and the Avon (tributary to the Severn) and the Soar (tributary to the Trent) on the south-east and east. The rivers are thus marginal to the central area and no large river flows through it. This absence of large rivers has been one of the greatest disadvantages with which the region has had to contend, and is one of the main reasons for its great network of canals (see Fig. 71).

Structurally, this plain is composed of New Red Sandstone and Clays, and is part of the great Y-shaped sandstone plain (often known as the Great Red Plain) which borders the Pennines on the west, south, and east, and extends south-westwards to the Severn estuary.

Rising above the general level of the plain are hilly districts, " islands " of harder rock, the sources of small streams which drain to the marginal rivers. The chief of these hilly districts are:—

(a) Charnwood Fprest, a region of very old rocks with granitic intrusions, in Leicestershire.

(b) The hills known as Cannock Chase in South Staffordshire.

(c) The Clent and Lickey Hills of North Worcestershire.

(d) The Wrekin and the other hills of east Shropshire.

All these districts are the natural " playgrounds " for the industrial workers of the Midland ckies.

In the neighbourhood of each of these upland areas are outcrops of coal measures, forming:—

(1) The Leicestershire coalfield.

(2) The Warwickshire coalfield.

(3) The South Staffordshire coalfield.

(4) The East Shropshire coalfield, which is linked southward with the unimportant coal measures of the Forest of Wyre.

Agricultural Activities

Climatically and agriculturally the Midland plains may be considered as transitional between the equable and rainy dairying lands of the western, and the more extreme and drier

J. Dixon-Scott.

CHARNWOOD FOREST, LEICESTERSHIRE.

Charnwood Forest, of which a small corner is shown above, has been called " a little bit of Wales in England." The hills, composed of granite which is quarried for road metal, give rise to scenery totally different from that of the surrounding sandstone plains of the Midlands.

arable lands of the eastern plains. The soils derived from the New Red Sandstones and Clays support excellent pastures and a high percentage of the land is devoted to permanent pasture for cattle rearing. To the west, in central Staffordshire, dairying is important, but stock rearing for meat increases eastward, being specially important in the neighbourhood of Melton Mowbray and Market Harborough. In general it may be said that the percentage of dairy cattle decreases eastward and the percentage of " beef " cattle increases eastwards. Everywhere, however, in the neighbourhood of the coalfields and large cities, dairying plays an important part in the farming activities. The amount of arable land is greater in the east of the region where wheat, barley, oats, root crops and sugar-beet are cultivated. The eastern half of Leicestershire is noted for sheep rearing.

In the south of the plain in the valley of the Stratford Avon and in Worcestershire is a very important fruit-growing and market-gardening region. While all types of small fruits and orchard fruits are grown, plums are of especial importance, particularly around Evesham. This region is open to the mild west winds which penetrate inland through the lowland " gate " between the Cotswold Hills and the Welsh mountains. It is particularly due to its good climate, partly due to its rich loamy soils, and partly to the demands of the industrial cities of the Midlands for fresh vegetables and fruit that this region has become so important. Further west Worcestershire grows sugar-beet which is refined at Kidderminster.

Though farming is undoubtedly an essential part of the economic life of the Midlands, far greater importance must be attached to the development of the coalfields and their attendant industries.

The Midland Coalfields

The Midland coalfields are not important to-day for the amount of coal they yield. The total output of the four coalfields amounts to only 6-6 per cent, of the coal mined in Great Britain, and of this the South Staffordshire coalfield produces nearly one-half (see Fig. 36).

THE EAST SHROPSHIRE COALFIELD. This region is unimportant to-day both for its output of coal and for its industrial

activities, but it is of interest because it once ranked among the premier iron working districts of Britain, and Shropshire formerly contained more forges than any other district except the Weald (see page 192).

The East Shropshire coalfield is now an industrial " backwater." The famous centre was Coalbrookdale, the home of Abraham Darby, a great pioneer of the iron industry. It was he who developed the possibilities of using coke instead of charcoal for smelting iron ore. Two miles from Coalbrookdale the first iron bridge was erected over the Severn in 1779, and the town which has grown up around the bridge is called Ironbridge. It was here too, that Wilkinson, another great ironmaster, launched the first iron barge which was used to carry goods on the Severn. The first iron rails were also made at Coalbrookdale, and were in great demand during the early days of railway building. The Coalbrookdale iron works still exist, and a variety of iron goods are made in the neighbouring villages of Madeley, Horsehay, etc. There are only a few small coal mines now in operation, and none employs more than a score of miners.

Tiles, bricks and " churchwarden " clay pipes are manufactured in the neighbourhood.

THE SOUTH STAFFORDSHIRE COALFIELD. This coalfield extends from the outskirts of Birmingham northwards through Wolverhampton and Walsall along Cannock Chase to within ten miles of Stafford. Within the lines joining Wolverhampton, Walsall, Birmingham and Dudley is an immense conglomeration of towns with a total population of nearly four millions. Over one million people live in Birmingham, the second largest city in England and the third in Great Britain. (Note that Birmingham is not in Staffordshire but in the extreme north of Warwickshire.) Other towns of the industrial district are Willenhall, Darlaston, Wednesbury, West Bromwich, Bilston and Tipton. The region is generally known as the " Black Country" because of the unsightliness of its factories and pit-heaps, its almost continuous urban areas and its scarcity of green fields and open spaces.

In this coalfield there were formerly large deposits of blackband iron ore which gave rise to an important smelting industry, for in 1860 there were 180 blast furnaces producing about

15 per cent, of the pig-iron of Great Britain. The smelting industry has declined to such an extent that there were only 13 furnaces in operation in 1929. It must be remembered, however, that one modern furnace has a much greater output than the small furnace of a century ago. To-day instead of producing pig-iron, South Staffordshire imports it from South Wales, Northamptonshire and Scunthorpe, and uses it as the raw material for an immense variety of metal manufactures. The reasons for the decline in the smelting of iron ore are:—

(1) The exhaustion of supplies of local ores and the consequent expense of the transport of such a bulky commodity, in view of the inland position of the coalfield.

(2) The decrease in the output of coal and the fact that local coals are not good coking coals.

To-day the South Staffordshire coalfield is primarily important for its hardware manufactures. The region is said to make anything from " a pin to a steam engine," but more surprising than the variety of articles it manufactures is the variety of metals it uses.

Though its manufacturing industries were originally based on iron, it now manufactures goods made of zinc, copper, nickel, lead, aluminium, and many alloys such as brass and bronze. Birmingham also uses the precious metals, viz. gold, silver and platinum, in its jewellery workshops. In fact, as a metal manufacturing region, South Staffordshire is probably unequalled by any other similar district in the world.

The inland position of this industrial area, away from navigable rivers and from the sea coast, has had a great influence on the nature of the articles it manufactures. Because of the expense of overland transport the district has specialised in the manufacture of goods requiring relatively little raw material but a high degree of skilled workmanship, *e.g.* watches, rifles, sewing machines, scientific apparatus, and jewellery. Many of the towns specialise in the manufacture of one particular class of goods, viz. Dudley makes chains, Wolverhampton locks and keys, and West Bromwich springs and weighing machines. Associated with the needs of the motor car manufacturers is the rubber industry centred at Wolverhampton and Birmingham. Other manufactures are the

" luxury " industries associated with many large cities, viz. chocolate, silk, furniture, etc.

Birmingham is almost at the centre of the quadrilateral formed by joining the great ports of London, Bristol, Liverpool and Hull. To facilitate the export of bulky goods and the import of metal ores, canals have been built, linking Birmingham with the marginal rivers of the Midland Plain, thus giving easy and cheap access by water with the estuaries of the Thames, Severn, Mersey and Humber and their corresponding ports (Fig. 71). Within the Black Country itself there is an intricate network of canals in constant use. The disadvantage of this canal system is that neither in depth nor width are the canals suitable for large barges. Schemes for their improvement are often suggested, and already improvements are being made in the canal linking London and Birmingham.

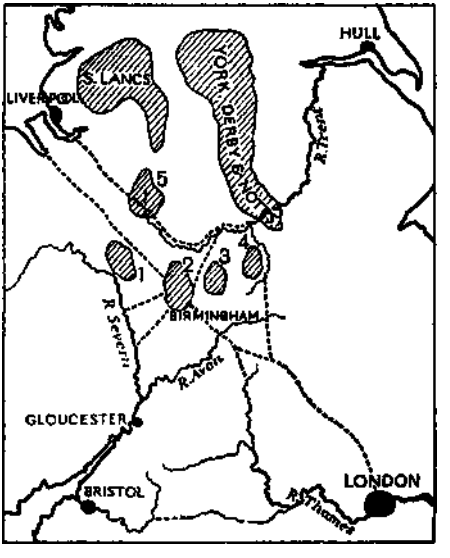


Fig. 71. THE RELATION OF THE MIDLAND COALFIELDS TO THE RIVERS AND PORTS.—1. East Shropshire. 2. South Staffordshire. 3. Warwickshire. 4. Leicestershire. 5. North Staffordshire. Dotted lines are a diagrammatic representation of the canals, showing in particular how the Birmingham area is linked to the four great ports by waterways.

THE WARWICKSHIRE COALFIELD. AS far as the output of domestic coal is concerned this is the most important of the Midland coalfields, but it has not the great industrial development of South Staffordshire. Most of the coal is distributed for domestic use, large quantities being sent to London. The coalfield extends from Tamworth in the north to Nuneaton in the south, but there are no important towns on the coalfield itself.

Coventry, an industrial centre a few miles to the south, draws its supplies of coal from this area. It is famous for its motor car industry which arose out of an earlier manufacture of bicycles. Coventry also manufactures hosiery, gloves, silk ribbons, and artificial silk, and is one of the most prosperous and rapidly-growing towns in England.

THE LEICESTERSHIRE COALFIELD. **This coalfield lies to the west of Charnwood Forest in the north-east of Leicestershire. Like the Warwickshire coalfield, it has not given rise to a group of large industrial centres. The chief coal-mining centres are Ashby-de-la-Zouch and Coalville, relatively small towns. As in the Warwickshire coalfield, most of the coal is distributed for domestic use, though some is used in the hosiery centres of Hinckley, Loughborough, etc.**

Other Industries of the Midland Plain

The hosiery and small ware industry of Leicestershire and the districts to the north of it have already been discussed (page 106).

The cattle-rearing of the Midlands has given rise in many places to the tanning of leather and the manufacture of boots and shoes, as at Leicester, the greatest centre, and Stafford. The boot and shoe making industry is also located south of the edge of the limestone escarpment at Northampton, Wellingborough and Kettering.

Burton-on-Trent is famous for its breweries, largely because of the amount of barley grown on the sandstone plains, and because of its water supply for brewing. To the north, *e.g.* at Tutbury, gypsum is mined and sent to Stoke-on-Trent for the manufacture of moulds for pottery making. Stourbridge, to the south-west of Birmingham, specialises in " English Cut" glass. At Droitwich and Stafford there are salt deposits in the underlying New Red Clays, cf. Cheshire and the lower Tees valley. The granites of Mount Sorrel in Charnwood Forest are quarried for road metal.

Rugby, on the Upper Avon, is a great centre for the manufacture of electrical equipment, and an important railway junction.

Worcester, situated at a point on the Severn where the river could easily be forded, is a market centre for the

agricultural and fruit-growing areas of Worcester. It is of Roman origin, and was important because it controlled a route into Wales along the Teme valley.

Gloucester (Fig. 72), at the lowest bridging point of the Severn, is another city of Roman origin. It controlled the m6st southerly route across the Severn to South Wales before the construction of the Severn tunnel. In mediaeval

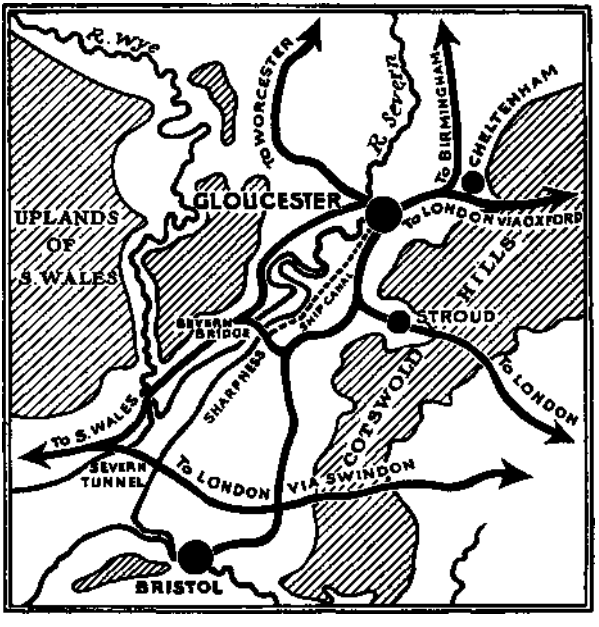


Fig. 72. GLOUCESTER.—As the lowest bridging point of the Severn, Gloucester controlled the routes from London to S. Wales. The building of the Severn Bridge and the cutting of the Severn Tunnel each in turn reduced the distance between London and S. Wales.

times it was an important port engaged in the exportation of woollen goods from the Cotswold region. Largely owing to the competition of Bristol, the difficulty of navigating the lower Severn, which contains many sand banks, and the increase in the size of the ships, Gloucester failed to progress sufficiently rapidly to become a first-class modern port. The ship canal from Sharpness to Gloucester improved

the approach to the port, but the construction of the Severn Tunnel diverted the South Wales traffic and affected Gloucester adversely. Gloucester imports timber for the Midland coal-fields, and has iron works and match factories.

Both Kidderminster and Bridgnorth in the extreme west of the Midland plain have carpet factories. This industry is a survival of the old woollen industry based on the supplies of wool from the South Shropshire Hills and Wales.

CHAPTER XV

SOUTH-EAST ENGLAND

(1) THE BASIN OF THE WASH

General Division of South-East England

To the south and east of a line drawn from the mouth of the River Tees to the mouth of the River Exe is a region composed of scarped ridges alternating with clay vales and plains. Structurally, this part of England consists of younger rocks than the remainder of the country. The limestone and chalk, with their associated clays, are of Secondary age, while the clays of the London Basin and the Hampshire Basin are of Tertiary age. These rocks were subjected to slight tilting during the period of Alpine folding. The subsequent erosion of the softer clays has produced low plains and fertile vales, while the more resistant belts of chalk and limestone rise above the lowlands as scarped ridges.

The general arrangement of these ridges and vales in relation to the earth-folding is shown in Fig. 73. From A to B the rocks were folded into a shallow basin or syncline. From B to C the rocks were raised in an arch-shaped fold or anticline.

The general arrangement of the chalk and limestone hills and their associated vales is shown in Fig. 5 and described on page 10.

The English lowlands (south of Lincolnshire, which was described in Chapter X.) can be divided into the following regions:—

(1) The Basins of rivers flowing into the Wash.

(2) East Anglia.

(3) The Thames Basin.

(4) S.E. England, *i.e.* south of the lower Thames.

(5) The Hampshire Basin.

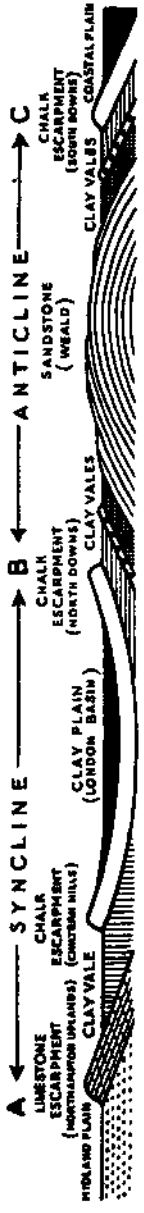


Fig. 73. SECTION OF THE WEALD AND THE LONDON BASIN.

THE BASINS OF RIVERS FLOWING TO THE WASH.

Extent

This region extends from the Wash south-westwards between the limestone and chalk ridges as far as Buckinghamshire, where a low watershed (less than 500 feet) separates the Wash drainage from that of the Upper Thames (Fig. 74).

The rivers Welland, Nen and Great Ouse all rise in the limestone ridge and flow in roughly parallel courses to the Wash. Within this region must also be included the lower valley of the River Witham, which rises on the west side of the limestone ridge in Lincolnshire, and, after flowing through the ridge at Lincoln, drains the clay vale and fenlands of Lincolnshire south eastwards to the Wash.

The Wash drainage area may be conveniently sub-divided into the three main sections which are dealt with below, viz.:—

(a) The dip slope of the limestone escarpment.

(b) The Fenlands.

(c) The higher plains to the south-west of the Fens.

Dip Slope of the Limestone Escarpment

This corresponds roughly to the county of Northamptonshire. Farming in this area varies in relation to the elevation and the quality of the soil. Sheep-rearing is important on many of the higher portions of the Northampton Uplands, but on the lower hill slopes

and in the river valleys arable farming and cattle-rearing predominate. The rearing of cattle has given rise to important leather industries at Northampton, Kettering and Wellingborough.

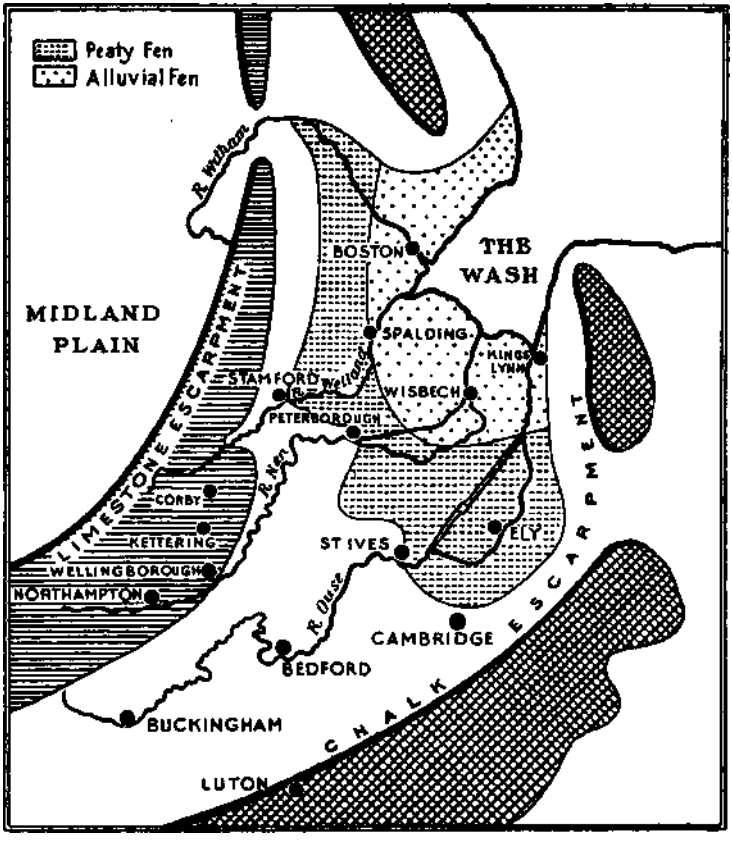


Fig. 74. THE BASIN OF THE WASH.

The modern importance of this district is due to the exploitation of the Jurassic iron ores from Wellingborough, north-eastwards to Corby (cf. Lincolnshire and North Yorkshire). This is largely a post-war development and there are now a large number of blast furnaces. New settlements are developing around the old villages *(e.g.* at Corby). The bulk

Stewarts A. Ltovds, Ltd

IRON MINES AT CORBY, NORTHAMPTONSHIRE.

In the Midlands the Jurassic iron ores he only a short distance below the surface. The beds of ore can be seen clearly below the trucks, which are easily filled by steam shovels.

of the pig-iron produced is sent to South Staffordshire, but some is exported via Boston and King's Lynn to Scotland and **European** countries.

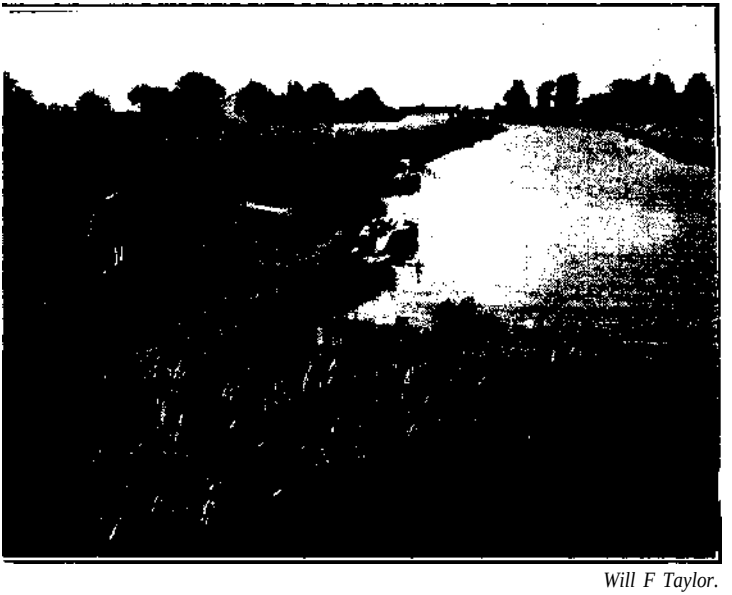
The Fenlands

The Fens is the name given to the area drained by the lower courses of the rivers flowing into the Wash. On the landward side the boundary of the Fens follows the 50 feet contour line very closely. This lowland was once a shallow inlet of the sea which has been gradually filled in. Currents of the North Sea deposited marine sediments on the seaward side, while the rivers deposited land-derived silt in the lagoons and marshes thus formed. The gradual decay of the marshland plants formed extensive deposits of peat, varying in thickness from a few inches to several feet. The distribution of peaty and alluvial fens is shown in Fig. 74.

The conversion of the wild unproductive marshlands, the happy hunting ground of fishermen and fowlers, into a fertile

region of plenty, the home of settled agriculturalists, is due to the extensive drainage schemes which have been undertaken.

It is probable that a portion of the Lincolnshire Fens was partly drained in Roman times, but the big schemes of reclamation had their beginning in the seventeenth century when the Duke of Bedford organised the draining of the Bedford Level. The chief method was to straighten the rivers, thus increasing their rate of flow, *e.g.* the Bedford Level Canal, and then to cut tributary ditches draining to them in a herring-bone pattern. Most atlas maps show the two straight parallel cuts which divert the waters of the Ouse, the region between these channels, known as the Wash, collects surplus or flood water. Water is also pumped into the drainage channels. This was first done by hand, later by windmills, and to-day by steam pumps. Little of the original fenland now remains. The fenland region, because of its flatness,



Will F Taylor.

IN THE CAMBRIDGESHIRE FENS. THE RIVER LARK NEAR PRICKWILLOW.

The general level of the river is above that of the surrounding land (note the position of the house on the left). If such a river floods the result is disastrous—hence it will be observed that the banks have been raised.

sluggish rivers, bulb fields, dykes and windmills is reminiscent of Holland. Many of the rivers by the deposition of sediment have raised their beds slightly above the level of the surrounding country.

The climate of the Fenlands is typical of the east coast, i.e. it tends to be somewhat " continental " in character with greater extremes and less rainfall than the west coast. Though the prevalent wind is south-westerly, the region is subject to dry east winds from the Continent and the average amount of sunshine is high.

These conditions are particularly good for the cultivation of cereals, especially wheat. Oats and barley are also cultivated. In recent years there have been changes in Fenland agriculture. Potatoes are now by far the most important crop, and since 1918 sugar-beet cultivation has made rapid strides. There are sugar-beet factories at Ely, King's Lynn, Peterborough and Spalding. The district around Spalding is noted for growing bulbs, and around Wisbech there is an important fruit-growing area, chiefly specialising in the cultivation of strawberries.

The towns of the Fen country falls into three groups:—

(1) Those on the fenland fringe, such as Cambridge, St. Ives, Peterborough and Stamford—all market towns.

(2) Those situated on " islands " of firm ground, such as Ely, Wisbech and Spalding. The origin of these towns dates back to the period before the reclamation of the Fens, when the slightly-elevated and better-drained sites were the only possible places for settlement. Many of them provided safe refuge in times of political difficulty, *e.g.* the Isle of Ely (cf. the Isle of Athelney in Somerset).

(3) Those situated on or near the coast, such as Boston and King's Lynn, which have lost most of their former importance as a result of the increase in the size of the ships and the silting of the mouths of the rivers. Both export some of the pig-iron from the Wellingborough region, and also engage in fishing. Boston makes tarpaulins, probably a heritage of the time when it manufactured ropes, nets and canvas for the North Sea fishing fleets.

The Wash is still being filled up by the depositions of marine sediments. Eventually the whole of the inlet will be dry land.

Meanwhile, proposals have been made for schemes to reclaim the Wash in a manner similar to that by which the Zuyder Zee is being converted into fertile lowland.

The Higher Plains to the South-West of the Fens

Extending from the borders of the Fen country south-westwards to Buckinghamshire is a clay plain drained by the upper courses of the Rivers Nen and Great Ouse. It rises in height south-westwards from 50 feet to 500 feet and in general includes Huntingdonshire, Southern Cambridgeshire, Bedfordshire and Northern Buckinghamshire. In the eastern half of the district arable land predominates, and the crops are those typical of Eastern England, viz. wheat, oats, barley, clover and roots. Around Sandy in the east of Bedfordshire is an old-established market gardening district which sends fresh salads and vegetables to London. South-westwards, the percentage of permanent pasture increases, and dairying predominates. This is one of the important sources of London's milk supply. The towns, such as Bedford and Buckingham, are all market towns. On the southern margin of the region commanding a gap through the chalk ridge is Luton.

LUTON. Luton occupies a gap in the Chilterns, where the River Lea, near its source, breaks through on its way to the Thames. The river valley provides a relatively easy route through the chalk hills, which is followed by the L.M.S. main line from London to Leicester.

Luton has long been famous for the manufacture of hats, the raw materials for which were obtained locally. The clear colour and light weight of the straw grown on the chalky soils of the Chilterns made it very suitable for plaiting. Originally the industry was essentially of the domestic type, and was carried on in the villages of southern Bedfordshire and the neighbouring parts of Hertfordshire and Buckinghamshire, but during the last hundred years the manufacture of hats has concentrated in Luton, which is said to have had the largest plait market in the world. Important changes have, however, taken place. The domestic features of the industry are rapidly disappearing. The principal supplies of raw material, once obtained locally, come chiefly from China and Japan. Many of the factories now produce both " felts " and " straws."

Luton Evening Telegraph

DUNSTABLE DOWNS.

Here is shown the scarp face of the chalk hills in Bedfordshire, and also the clay vale in the distance. Notice the smooth grassy slopes; the combe; the parallel gullies formed by the rain.

Since the majority of the hands employed in the hat trade are women and girls, it is not surprising that industries requiring the labour of men, *e.g.* general and motor engineering, have expanded rapidly, especially during the last ten years. Luton is typical of many towns in Southern England, which have attracted new industries during the post-war years, and, unlike so many towns in the Industrial North, have shown steady and continuous growth.

CHAPTER XVI

SOUTH-EAST ENGLAND

(2) EAST ANGLIA

Physical Characteristics

East Anglia comprises the extreme north of Essex, Suffolk **and** Norfolk, except for the north-west corner of Norfolk around King's Lynn, which is part of the Fenlands. It corresponds to the district which was the Angle kingdom of early history, bounded on the west by impassable marshes of the Fens and on the south by the forests which grew on the heavy clays of the London Basin. In the west is an arc-shaped ridge of chalk convex to the east coast, from which the land drops gently eastwards, and is drained by such rivers as the Wensum, Yare, Waveney, Orwell and Stour. The chalk ridge is known as the East Anglian Heights in the southern half, where it runs south-west to north-east. It rises to about 400 feet, and represents **a** scarp face to the north-west. In this region, around Newmarket, the famous racing centre, there are still tracts of **the** open " down " country which have not been brought **under the** plough. In western Norfolk the chalk lands, **known** as the Norfolk Heights, are neither so high nor so

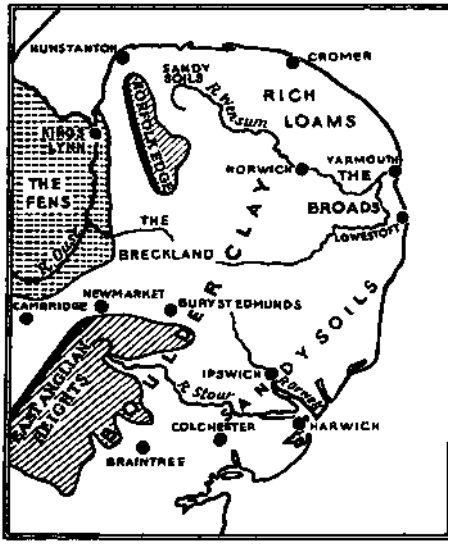
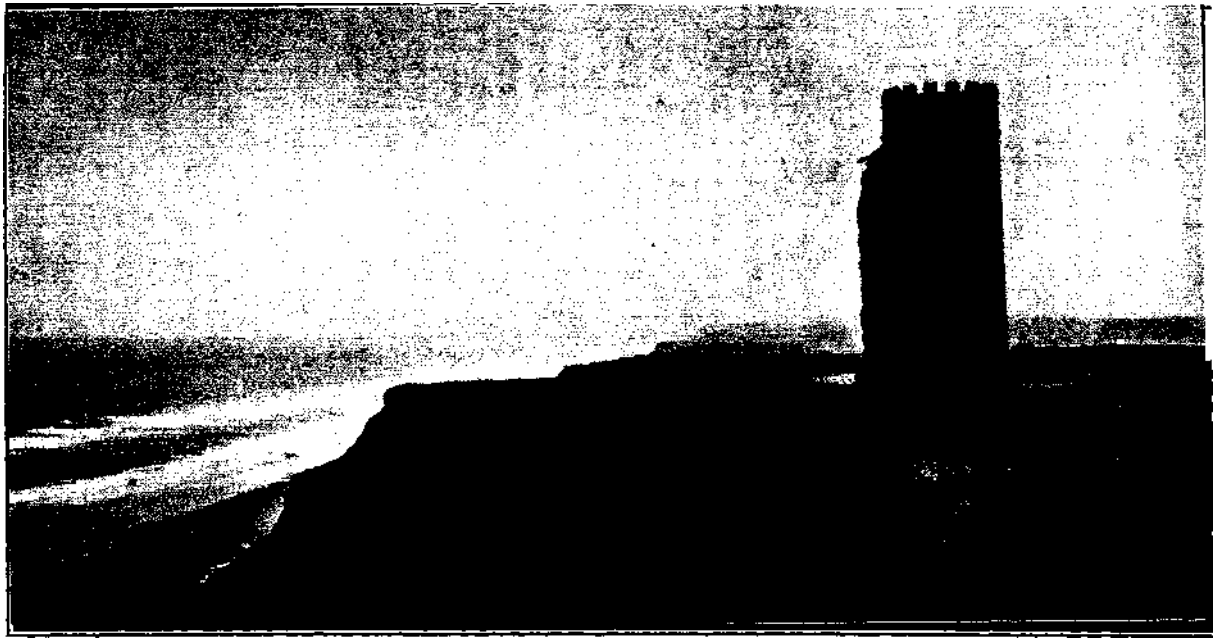


Fig. 75. EAST ANGLIA.



Judges. Ltd

THE CLIFFS NEAR CROMER, NORFOLK.

The cliffs of Norfolk are composed of soft, easily eroded material, and are being steadily worn away by the action of the sea. The tower, the last remnant of a church, no longer exists, since it collapsed as the cliffs were worn away.

broad, but many of the characteristic features of chalk lands, *Le.* open downs and dry valleys, are evident. Between the chalk ridge and the sea, East Anglia is composed of deposits of Tertiary age, but these, as well as most of the chalk lands, have been everywhere covered with a thick mantle of glacial clays and sands, varying so much in texture as to produce regions of distinctive agricultural activities. The major variations of the soils of East Anglia are shown on Fig. 75. The soft and loose materials of the East Anglia coastlands are easily eroded by marine action. Like Holderness, this is a region of receding coastline and lost villages. In past time these coastal areas have also been partially submerged, as is proved by the drowned valleys (estuaries of the Stour, Orwell, Colne, etc.) of the Suffolk and Essex coast.

The region of the Norfolk Broads was once an arm of the sea, reaching as far inland as Norwich. A spit of sand and shingle was deposited across the seaward end of this bay, and behind it river silt accumulated. The region is now one of reclaimed marshlands, but unfilled remnants of the original bay still remain—the shallow, peaceful, reed-bordered lakes known as the Norfolk Broads.

Climatically, East Anglia, like all the eastern regions of Britain, is less equable and drier than the western regions. The warmth of the summers and the high average of sunshine duration are important factors in determining the type of agriculture. The total yearly rainfall is less than 25 in., and while most of the rain falls during the summer half of the year it is largely of the thunderstorm type, quickly over and followed by bright sunshine.

Agricultural Activities

Though the climate of Britain is not really ideal for the cultivation of wheat, the nearest approach to the ideal conditions (see page 27) are found in East Anglia.

Wheat, barley, and root crops are grown throughout the region. Some localities, as a result of varying soil conditions, specialise more in the production of one crop than another. One important fact stands out, and that is that throughout East Anglia, famous as this district may be for its wheat lands, a greater acreage is devoted to barley than to wheat (see Fig. 19).

The richest soils are the loams of eastern Norfolk, and these were the first to be used for intensive agriculture. The extension of arable farming into the less fertile areas, particularly the sandy regions, was made possible by the system of crop-rotation, which was adopted in the eighteenth century.

Turnips were the real basis of the new agricultural system, and the sheep which were fed on the turnip fields trod and manured the soil, so preparing it for the barley or wheat crop. Clover was also introduced as a fodder crop. The same methods of cultivation were practised on the chalk downs, which now have a higher percentage of both arable and wheat land than any other section of East Anglia.

Barley and turnip cultivation and sheep rearing are of maximum importance in the northern sandy area, and the sheep are removed in summer to the pastures of the coastal alluvial fringe.

Cattle rearing is specially important near King's Lynn and in the region of loamy soils north of Norwich. The permanent pasture lands of the Broadland region provide rich summer pastures for the cattle of east Norfolk.

The acreage under wheat is greatest on the chalk down-land and on the boulder clay regions of the centre of East Anglia. A feature of present-day agriculture in East Anglia is the increasing importance of sugar-beet, of which the residual pulp can be used for stock feeding. While the sugar-beet is grown in all sections of East Anglia, it has become most important in the Breckland region. This region, lying between the Norfolk Heights and the East Anglian Heights is a low chalky area covered with a thin layer of light sand. Much of it is still open heath land. On its poor soil rye often replaces wheat. The sandy regions of the south-east also still have considerable heath land areas.

Industrial Activities

In the Middle Ages, East Anglia had important trade relations with Flanders, to which it exported wool for the Flemish woollen factories, barley for the Flemish breweries, and wheat for food for the Flemish people. Later, instead of exporting wool, the people of East Anglia manufactured it themselves, and the region of Norfolk between Norwich and the sea was formerly an "industrial" area of England.

The reasons for the location of the woollen industry in this district was due to two factors: (1) the available supplies of wool; (2) the knowledge gained by contact with the Flemish peoples.

The district near Norfolk manufactured worsteds (named after the village of Worstead to the north-east of Norwich). While further south, near Ipswich, worsteds and coarser fabrics were also made *(e.g.* at the villages of Lindsey and Kersey).

Silk manufacturing was introduced by Huguenot settlers at the end of the eighteenth century, and there are still many mills for manufacture of pure silk and artificial silk in the neighbourhood of Braintree.

The woollen industry, unable to survive the competition of Yorkshire, has disappeared. At Lowestoft there are small manufactures of net and sailcloth to supply the fishing fleets.

To-day, the most important industrial activities of East Anglia are those connected with agriculture; the sugar-beet factories at Cantley, Bury St. Edmunds and Ipswich; the manufacture of agricultural machinery at Norwich and Ipswich; flour milling and malting at Ipswich, Colchester and Chelmsford; the preparation of mustard and vinegar at Norwich; the refining of sugar at Cantley, Bury St. Edmunds and Ipswich; and brewing in many of the market towns.

Many of the coastal towns are important fishing centres. The chief of these are Lowestoft and Yarmouth, which are particularly busy during the herring season (about October), when large quantities of herrings are packed in salt and dried for export to the Continent. These towns are near the North Sea fishing grounds, and have quick rail communication with London.

Harwich is a packet station at the mouth, of the tributaries of the Orwell and Stour, from which packet steamers sail regularly to the Hook of Holland, Rotterdam, Flushing, and Antwerp. It has a large import trade, especially of dairy produce from Denmark and Holland, and in 1934 ranked as the seventh port of the United Kingdom (see Fig. 85).

Many of the coastal towns, such as King's Lynn, Ipswich, Yarmouth, Harwich, Lowestoft, enjoyed considerable prosperity as ports during the Middle Ages, when they traded

extensively with the Continent. Their trade declined because of the smallness of their harbours and the rapid increase in the size of their ships, so that now their importance as ports is purely local.

NORWICH. A city of Saxon origin, Norwich is situated on the River Wensum near to its confluence with the River Yare (Fig. 76). It was of early importance as a fortress and an ecclesiastical centre (it has a castle and a cathedral), and in the Middle Ages was an important river port, trading largely in wool. The convergence of river valleys gave Norwich a high degree of nodality, so that it became an important road, and later a railway centre. This nodality gave it pre-eminence as a market town for the whole of the Norfolk region. It has a variety of industries, including the manufacture of agricultural implements, leather goods, fertilisers, mustard, starch, vinegar, beer, etc., all of which are connected with the agricultural activities of the region.

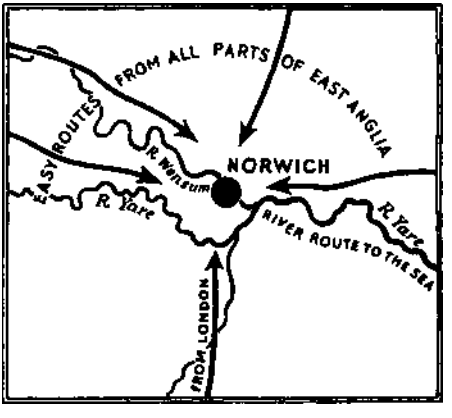


Fig. 76. THE POSITION OF NORWICH.

IPSWICH. The situation of Ipswich, at the tidal limit of the River Orwell, was important when roads were poor, for goods could be carried inland up the estuary. It is also at the lowest point where the river could be easily bridged. It was important as a wool port during the Middle Ages, and later was engaged in woollen manufactures. From the sixteenth to the eighteenth centuries it was a ship-building centre. To-day it imports considerable quantities of barley for malting, and of maize, oilcake, etc., for the feeding of animals. Like Norwich, its industries are largely connected with agriculture, and include engineering, the manufacture of agricultural implements, flour milling, malting and brewing, and the refining of sugar.

CHAPTER XVII

SOUTH-EAST ENGLAND

(3) THE THAMES BASIN

The Course of the Thames

The Thames rises in the south-western end of the Cotswold Hills and flows eastward along the Clay Vale, receiving a number of tributaries from the dip slope of the Cotswolds, viz. the Colne, Evenlode, Windrush, and Cherwell. After its confluence with the Cherwell at Oxford (the limit of navigation for river steamers), the river swings in great loops over the clay plains and then flows through a gap in the chalk ridge (the Goring Gap). On the east side of the gap at Reading the east-flowing Kennet joins the main stream, which proceeds to flow in a great northward bend towards the foot of the Chiltern Hills. The river then turns south-east and makes a large southward bend, receiving the tributaries Wey and Mole, which rise to the south of the North Downs. The river then meanders across the plain to the sea, receiving the River Lea on the north bank, and the Darent and Medway on the south bank.

The Thames basin is divided into five regions (Fig. 77). They are:—

(1) The Cotswolds.

(2) The Upper Thames basin, which is part of the Clay Vale lying between the limestone and chalk ridges.

(3) The Chalk Hills.

(4) The London Basin, enclosed by chalk ridges on the north, west, and south.

(5) The region to the south of the North Downs, which is drained by the upper courses of the Wey, Mole, and Medway. (This region will be described in Chapter XIX.)

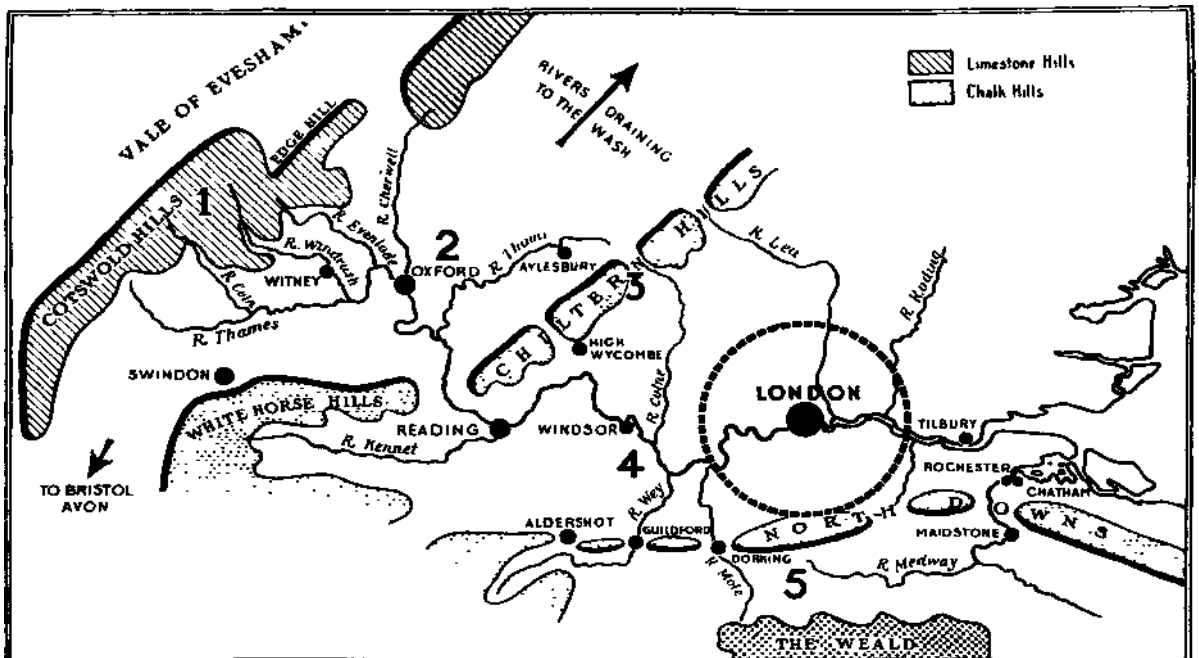


Fig. 77. THE THAMES BASIN, SHOWING TRIBUTARIES, CHIEF TOWNS, AND NATURAL DIVISIONS.—The circle around London denotes the approximate limits of "Greater London." 1. The limestone hills. 2. The Clay Vale. 3. The Chalk Hills. 4. The London Basin. 5. Vale of Holmesdale.

The Cotswolds

Rising in places to 1000 ft., the Cotswolds are the highest and broadest portion of the limestone ridge. From their high western edge there are extensive views of the lower Severn plain and the Welsh hills beyond. The Cotswold villages, with their clear streams, beautiful Elizabethan manor houses, and stone cottages with their wealth of flowers growing even by the roadside, are among the most picturesque in England. Much of the higher land of the Cotswolds is still used extensively for sheep-rearing, but there are few treeless open downs. Stone walls often enclose the fields, and there are beautiful woods of beech and pine.

The slopes facing south-east and the valleys of the Thames tributaries are farming regions of mixed agriculture. At one time there was an important woollen industry, but this only

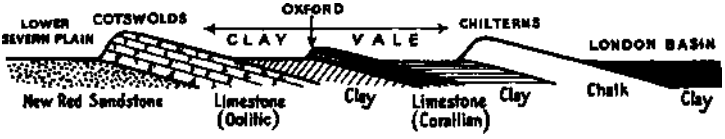


Fig. 78. SECTION OF THE OXFORD CLAY VALE.

survives in a few places, notably at Witney (blankets), Chipping Norton (whipcords), and at Stroud on the eastern side of the Southern Cotswolds.

The Clay Vale

The Upper Thames Basin is bordered on the north-west by the dip slope of the Cotswolds, and on the south and south-east by the scarp slopes of the White Horse Hills and the Chiltern Hills. The Clay Vale, often known as the Vale of Oxford, is a region of clay soils, largely used for permanent pasture and cattle-rearing. Aylesbury, to the east of Oxford, is the centre of a rich dairying region. Much of the milk is sent to London, but some is used in local creameries and " patent food " factories. The lighter clays and loams of the south of the vale are among the most valuable farming lands in Britain, producing large crops of cereals. On the whole, throughout southern England, there is a tendency to increase

permanent pasture and dairying at the expense of arable land and cereal production. This is partly due to the competition of cheaper cereals from abroad, and partly to the dominance of London, with its immense population and increasing demands for fresh milk and dairy produce.

Running through the centre of the vale from N.E. to S.W., and parallel to the limestone and chalk scarps, is a " miniature " scarp of Corallian limestone which forms low heights around Oxford (Fig. 78).

Oxford (Fig. 79) is situated in the centre of the Clay Vale, at the confluence of the Thames and Cherwell, and where the river flows through the Corallian ridge. Thus it stands at the " cross-roads " of the vale, and is the great market centre of the region. Its importance as a market centre is, however, masked by its importance as a university city. The colleges of Oxford and Cambridge owe their foundation and endowment to the agricultural wealth of southern England in the Middle Ages, in contrast to the newer universities (principally in the northern cities) which derive most of the endowments from industrial wealth. On the outskirts of Oxford, at Cowley, are the famous motor works, indicative of the modern tendency of manufacturing industries to concentrate in the old route centres of southern England.

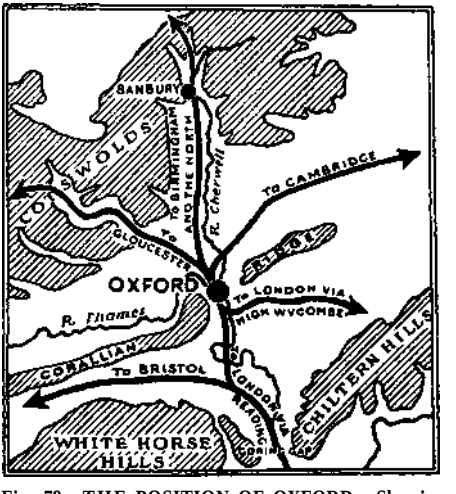


Fig. 79. THE POSITION OF OXFORD.—Showing its importance as a route centre.

West of Oxford, at the foot of the White Horse Hills, is Swindon, a town which, like Crewe (page 140), owes its origin and growth to a railway. A hundred years ago Swindon was a small village, to-day it is a large town and the chief engineering

centre of the Great Western Railway. Like Crewe, it is centrally situated in relation to the railway system (G.W.R.) which it serves.

The Chalk Escarpment

Separating the Upper and Lower Thames Basin, the chalk escarpment is broken by the Thames Gap at Goring. West of the gap are the White Horse Hills and the Berkshire Downs, while to the east of the gap are the Chiltern Hills. The Chiltern Hills are broken by a series of gaps which are utilised by railways radiating north-westwards from London (see Fig. 84):—

(1) The G.W.R. uses the Thames Gap for its route from London to Oxford, Swindon and South Wales.

(2) The G.W.R. main line to Birmingham and Birkenhead uses the High Wycombe-Princes Risborough Gap.

(3) The old Great Central (now L.N.E.R.) route follows the Amersham-Wendover Gap to Aylesbury.

(4) The main L. and N.W.R. (now L.M.S.) uses the Berkhamstead-Tring Gap.

(5) The Midland Railway (now L.M.S.) uses the St. Albans-Luton Gap.

A first glimpse of the forested slopes of the Chilterns serves to destroy all previous conceptions as to what the scenery of the chalk country should be, yet, a few miles further east, there is open chalk down country in the neighbourhood of Dunstable. In the chalk lands there is a variety of types of scenery and soil.

(1) Much of the chalk country provides good arable land, as in the East Anglian Heights.

(2) Where the chalk soils are not deep enough for ploughing, or where the gradients are too steep, the chalk is covered with short springy turf, which is good sheep pasture. This is the " down land " type of chalk land.

(3) There is sometimes a layer of gravel covering the chalk, and this produces a rough heathy land covered with bushes, such as gorse and hawthorn.

(4) Chalk land is sometimes covered with a layer of "clay with flints." Where this occurs there are extensive woodlands of oak and beech. When these woodlands are cleared the land provides good cattle pasture. The beech forests of the Chilterns were the reason for the origin of the chair-making industry at High Wycombe, which now also makes furniture of all kinds.

The Lower Thames Basin, or the London Basin

The* London Basin is a V-shaped plain, tapering westwards to the Vale of Kennet. It is bounded on the south by the North Downs, and on the north by the Chilterns, and through it the lower Thames flows eastwards to the sea.

Structurally it is a basin or syncline of chalk (Fig. 80), filled with rocks of Tertiary age, the chief being London Clay. Between the London Clay and the chalk are pebbly and sandy soils, known as Woolwich Sands, which appear at the surface around the edge of the clay, and result in decided infertile areas, such, for example, as the Blackheath Common.

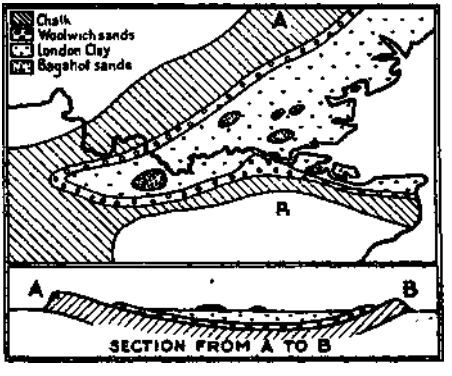


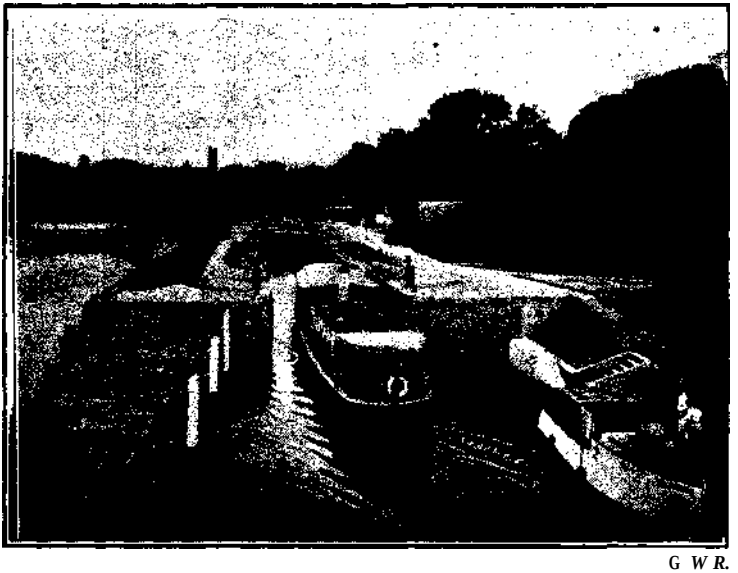
Fig. 80. THE ROCKS OF THE LONDON BASIN.

Above the London Clay occur patches of sands (Bagshot Sands), which are of little agricultural value, and give rise to heath land and pine woods. Such regions are to be found at Hampstead and Harrow. Because they are higher than the surrounding land these sandy areas are being developed as residential centres. To the south-west of London is Bagshot Heath, on which are situated the military training centre of Aldershot, the Bisley rifle ranges, and the military colleges of Sandhurst, Wellington, and Camberley.

Except for these relatively infertile districts the rural areas of the London Basin are all primarily concerned with the provision of food for the capital. The clay lands are used for dairying,

the lighter soils, as in Essex, for market gardening, and sheep are reared for their mutton on the surrounding chalk ridges.

West of London the Thames-side towns provide residential areas and " playgrounds " for the workers of the metropolis. This is specially so at Henley, Marlow, and Maidenhead, where the Thames cuts northwards into the chalk, and the river scenery is more picturesque than it is in the flat clay



G W R.

GORING LOCK.

There are many locks on the Thames between Oxford and the sea. The effect of these locks is to raise the level of the water and so render the river more navigable at all times for large river steamers. To-day, the river is used mainly as a " playground."

lands nearer London. At Windsor, the Thames cuts into a chalk bluff on which stands Windsor Castle.

Reading (Fig. 81), at the confluence of the Kennet and the Thames, is a great focus of routes, for it commands the routes eastwards to London; northwards to Oxford and the Midlands; westwards through the Vale of Kennet to Bath and Bristol; and southwards to Southampton. Because of its nodal position and the variety of products from the

surrounding vales and downs it is an important market centre, and was of great strategic importance during the Civil Wars. Its two principal industries are seed-growing and biscuit-making. This latter industry was formerly based on the use of local wheat flour, but to-day its supplies are mainly imported from other countries.

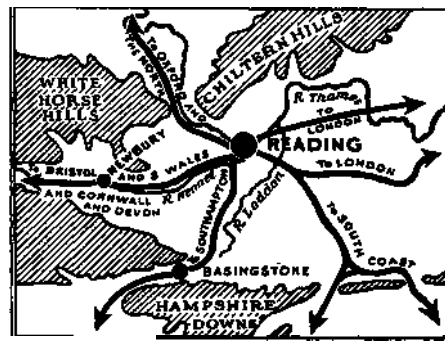


Fig. 81. THE POSITION OF READING AS A ROUTE CENTRE.

Newbury, in the Vale of Kennet, is another market centre, and, because of the nearness of open chalk downland on the north and south, is well known as the centre of a district famous for the training of race-horses.

The dominating unit of the London basin is London, and to it the roads, railways, agriculture, " playgrounds," dormitory towns, and industries are all tributary.

CHAPTER XVIII

SOUTH-EAST ENGLAND

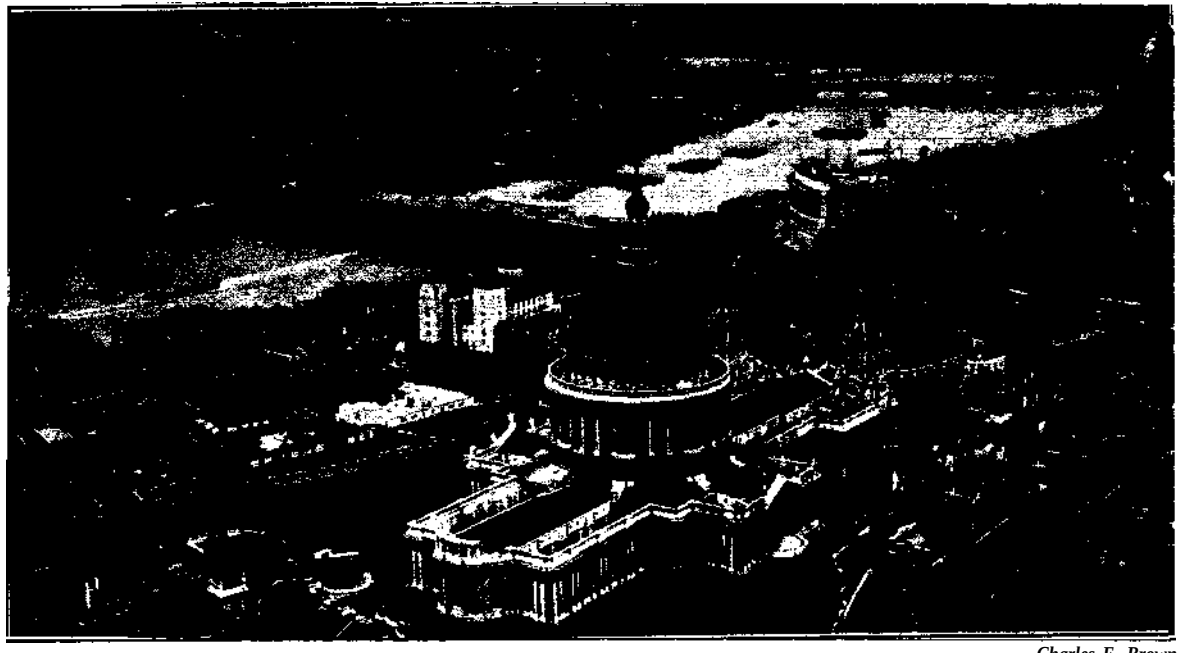
(4) LONDON

London: Its Position and Origin

It is difficult to define exactly what is meant by London. The actual city of London is a very small area (less than 700 acres) lying north of the Thames near London Bridge. This is the business centre of the world, and though half a million people work within its limits by day, only about 10,000 reside there, often as night watchmen. Many of the city workers live as much as thirty miles from their employment, and travel daily from distant " suburbs." These " dormitories " extend to the forested hills of the Weald, and even to Brighton on the south; to Maidenhead on the west; to the Chiltern Hills on the north; and to Rochester and Chelmsford on the east.

Greater London, however, does not include for administrative purposes, these far-flung suburbs, and may be approximately limited by a circle of fifteen miles radius with its centre at London Bridge. This circle bounding Greater London passes through Watford, Epping, Erith, Epsom, and Staines and Uxbridge; within these limits live over eight million people (Fig. 82).

London probably originated as a Roman settlement, situated at a point where the river could be crossed with relative ease, possibly near Westminster, where there was a ford. The firm banks also, at a later date, made possible the building of a bridge near this point. Until the construction of Tower Bridge further downstream, London Bridge was the lowest point of bridging. It soon developed as a crossing place of the Thames, and therefore became an important road centre. The two low hills nearby, on which St. Paul's and the Royal Exchange are now built, were suitable positions for the defence of this important bridge. The original settlement was roughly coincident with what is now termed " The City," *i.e.* it is the heart of London. From such beginnings London



Charles E. Brown.

LONDON.

An aerial view of the Thames as it winds its way through the heart of the City. In the foreground is St. Paul's Cathedral. This busy section of the Thames should be contrasted with that shown on page 176.

grew. The phenomenal development and expansion of the city in late history is due to a number of causes, viz:—

(1) Sea-going vessels, because of the high tides, can reach London Bridge in the heart of the city, hence it grew as a port.

(2) The main roads and railways from all parts of Britain were built to converge on London.

(3) The Thames estuary is opposite to the busiest region of the Continent, with which it has traded for centuries.

(4) London has a great entrepot trade.

(5) London is not only the capital of England, but is virtually the "capital" of the British Empire, so that her interests and connections are world-wide.

(6) Finally, in more recent times the constant assemblage of a vast range of raw materials at London have caused a great industrial development.

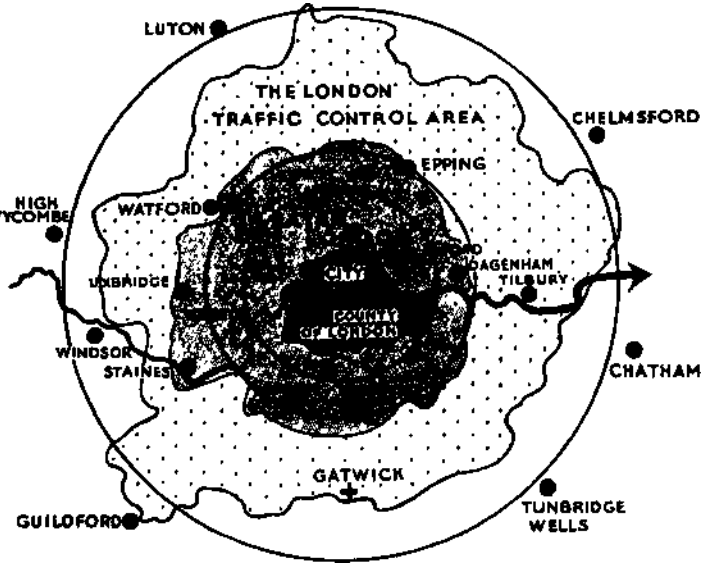


Fig. 82. LONDON.—Circles drawn at 10, 15, and 30 miles from the city. This diagram should be compared with the atlas and the towns near the 30-mile circle located. Airports are shown by crosses.

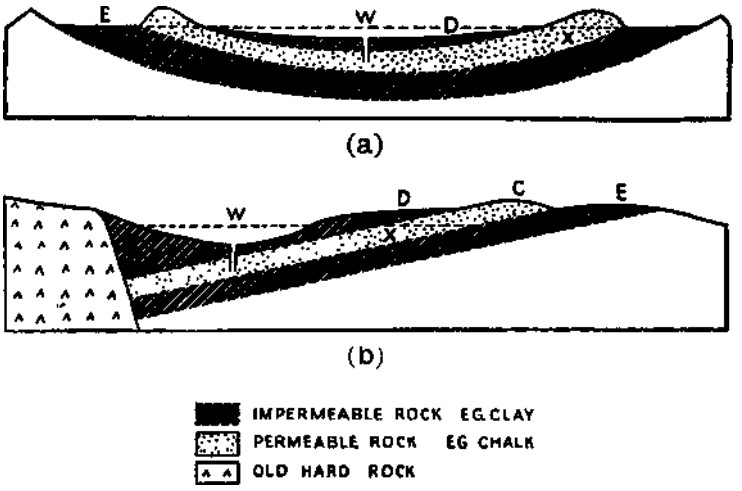


Fig. 83. ARTESIAN WELLS.

Water Supply

One of the most important necessities for the existence and health of the millions of people of this vast urban area is an adequate supply of pure water. London's water supply of 37 gallons per head per day *(i.e.* 300,000,000 gallons daily) is derived from a number of sources: —

(1) Three hundred years ago water was carried by wooden conduits from the upper course of the River Lea in Hertfordshire to supply London. This is still one of the important sources of London's water supply, but it is now conveyed to London by more modern methods.

(2) The structure of the Thames basin makes it possible to obtain water by boring artesian wells (Fig. 83). In this way water from the underlying layers of porous chalk is raised to the surface. Where the artesian water does not rise sufficiently high to reach the surface it has to be pumped, sometimes from a depth of 600 ft. There are hundreds of such wells. At the end of last century the number of private bores, made by manufacturers who used large quantities of water, rapidly increased. The reserves of subterranean water were diminishing so quickly that there were grave fears of a water shortage,

and new schemes had to be formulated to increase the supply of water, and to avoid the danger of shortage in time of drought.

(3) Large reservoirs have therefore been constructed. The Chingford reservoir in the Lea Valley was completed in 1913. In 1925 another huge reservoir was constructed near Staines.

Communications **and Trade**

Although ridges of chalk hills surround the London Basin on three sides, they do not seriously interfere with communication between London and the provinces, for they are broken by a number of gaps (Fig. 84) which are used by the main railways converging on the metropolis.

The Southern Railway, with termini at Waterloo, Victoria, and Charing Cross, links London with all the south coast ports and seaside resorts from Plymouth eastwards to Dover.

The L.N.E.R., with termini at Liverpool Street, King's Cross, and Marylebone, links London with the Eastern Counties, the Midlands, and with Scotland, via the east coast route through the Vale of York to Berwick and Edinburgh.

The L.M.S. Railway, with termini at St. Pancras and Euston, links London with North Wales, the Midlands, the industrial areas of Lancashire and Yorkshire, and with all northern Scotland via the west coast route through Crewe and Carlisle, or via the Midland route through Leeds and Carlisle.

The G.W.R., with a terminus at Paddington, links London with Cornwall, with South and Central Wales, and with the west Midlands and south Merseyside.

Not only do the main railways converge on London, but so do the great trunk roads. Some of these important roads are the Great North Road (A1) from Edinburgh; the Dover Road(A2); the Portsmouth Road (A3); the Bath Road (A4); the Holyhead Road (A5); and the road from Manchester and Carlisle (A6).

In recent years London's road communications have been greatly improved by the construction of wide by-pass roads to avoid congested areas, viz. the Kingston by-pass and the Watford by-pass.

While railways and roads link London with all parts of Britain, important sea routes link her with all parts of the

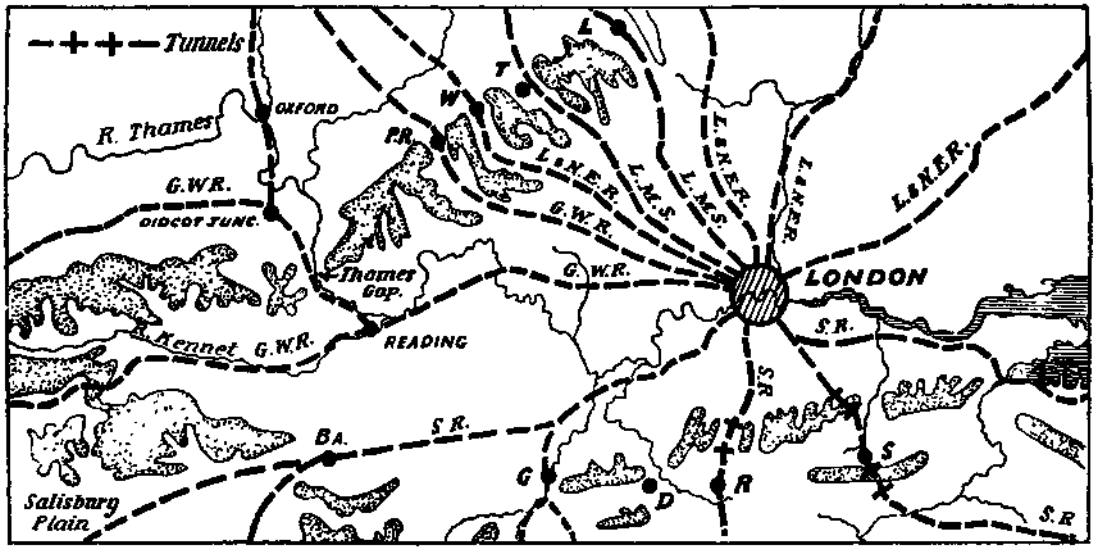


Fig. 84. RAILWAYS FROM LONDON THROUGH THE GAPS IN THE CHALK.—The "Gap" towns are: P.R., Princes Risboro. W., Wendover. T., Tring. L., Luton. BA., Basingstoke. G., Guildford. D., Dorking. R., Reigate. S., Sevenoaks.

world. Hence the port facilities are of great importance in connection with the maintenance of overseas routes.

The Port of London extends from London Bridge downstream to Tilbury, which might be termed the outport of London.

Since early times London Bridge has been the limit of navigation for sea-going vessels. Goods destined for points above London Bridge are carried by barges and lighters. The " reach " of the Thames between London Bridge and Tower Bridge, is known as the " Pool of London." This was the original " port," and ships of moderate size still reach it, for Tower Bridge has been specially constructed to allow the passage of ships. In the " Pool " ships of all nations can be seen discharging their cargoes. As the size of ships increased and the volume of trade grew, it was realised that large docks were necessary. The West India Docks, on the Isle of Dogs, were opened in 1802, and since that date there has been a great period of dock construction, ending with the opening of the King George V. Dock in 1921.

The sides of the Thames are now lined with docks and warehouses for ten miles from Tower Bridge to Woolwich. The building of the docks was facilitated by the soft nature of the soil and rocks, and much land, hitherto useless on account of its marshiness, became of great commercial value. Tilbury docks, fifteen miles further downstream and twenty-five miles by river below Tower Bridge, was opened in 1886, is the point of departure for ocean liners to all parts of the world.

Finally, London is an important centre for transport by air. It has four air ports, Croydon, Heston, Ilford, and Gatwick (see Fig. 82). There are regular air services between London and the cities of the provinces *(e.g.* Manchester, Birmingham, etc.), and also between London and the Continent. These air routes across the " Narrow Seas" represent the most active development of air transport in the world.

Trade, Markets, and Industries

London is the greatest port in Britain (Fig. 85). It receives nearly 40 per cent, of our imports, and dispatches 25 per cent, of our exports. In addition it has a great entrepdt trade. A

striking feature of the imports is the high percentage of certain imported commodities which London handles. This is shown in the following table:—

COMMODITY	% OF BRITISH IMPORTS THROUGH LONDON	COMMODITY	% OF BRITISH IMPORTS THROUGH LONDON
Tea	93	Wool	45
Rubber	80	Butter	44
Paper	50	Hides	43
Petroleum	50	Eggs	40
Meat	48		

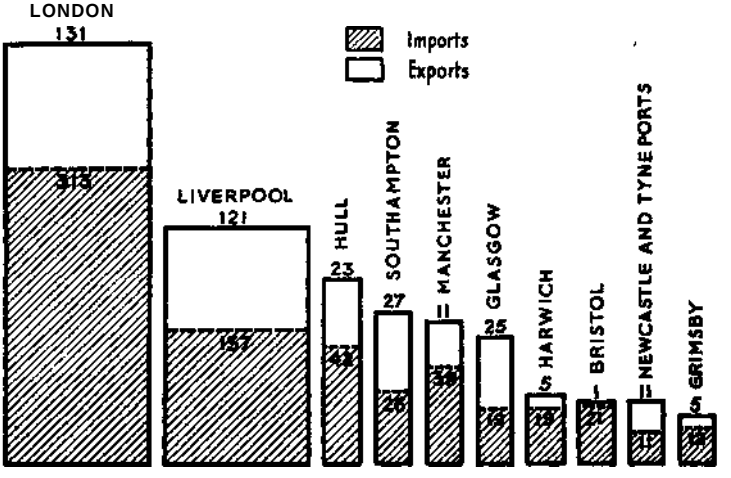


Fig. 85. THE TEN LEADING PORTS OF THE UNITED KINGDOM, 1934, SHOWING TOTAL TRADE (BY VALUE) AND RELATIVE VALUES OF EXPORTS AND IMPORTS.—Figures refer to the value in millions of pounds sterling.

In addition, London imports wheat, timber, metal ores, tobacco, vegetable oils, and a host of other commodities.

The assembling in London of vast quantities of foodstuffs and raw materials has had a two-fold effect:—

(1) The growth of great markets, such as Smithfield for meat; Covent Garden for fruit, flowers, etc.; Billingsgate for fish; the Provision Exchange for bacon and dairy produce; and Leadenhall for poultry.

(2) The development of industries based on imported raw materials, partly because of the easy means of exporting the finished goods. The industrial development owes much to the network of communications and, in very recent times, to the increased use of electric power, made possible by the " grid " system.

The industries of London fall into three groups:—

(a) The old-established industries, such as the silk manufacture of Spitalfields, the leather working of Bermondsey, and the bell-making of Stepney.

(b) The industries involving large quantities of bulky raw materials, such as all oil refining, flour milling, sugar refining, the manufacture of cement and paper, and certain types of engineering. These industries are generally to be found in the " East End " of London, near to the docks.

(c) The " new" industries, such as the manufacture of gramophone records, radio sets, electrical apparatus, patent foods, confectionery, and so on. There is a great tendency for these industries to be established on the fringe of London, along the railways, and the main arterial roads. This is very evident along the G.W.R. to Slough and on the L.M.S.R. northwards, as well as along the Great West Road.

The population of London is gradually moving outwards. The congested areas of the centre are decreasing in population, partly owing to slum clearance, and there is a great increase in the population of the " fringes " of London, to which workers are attracted both by the better housing conditions and the establishment of new industries. The most spectacular increase in population is at Dagenham, in the extreme east, where the population rose from 9000 in 1921 to 89,000 in 1932, an increase of nearly 900 per cent., partly due to the establishment there of the Ford Motor Works. During the last decade there has been a great increase in manufacturing industries in S.E. England. In the counties bordering London there is now 36 per cent, of the industrial workers of England, as compared with 32 per cent, in the seven counties (Northumberland, Durham, Cumberland, Westmorland, Lancashire, Yorkshire, and Cheshire) of the so-called " Industrial North."

CHAPTER XIX

SOUTH-EAST ENGLAND

(4) KENT, SURREY, AND SUSSEX

Position and Relief

The extreme South-East of England comprises the counties of Kent, Surrey, and Sussex, and the eastern borders of Hampshire, the whole region lying south of the Thames and east of Longitude 1° W.

Structurally, this region is an anticline, which has been eroded to expose alternate layers of hard and soft rock resulting in alternations of hilly ridges and flat plains (Fig. 86).

In the centre, on the borders of Kent, Surrey, and Sussex, is a hilly district of sandstones and sandy soils, rising to 800 ft., known as Ashdown Forest, which is bordered on the north and south by vales of Wealden clay. These two vales and the intervening sandstone area are known as the Weald.* To the north and south of the Weald are low ridges of Greensand, well marked on the northern side, where the ridge is known as Ragstone Ridge, but low on the southern side. Beyond the Greensand ridges to the north and south are vales of Gault Clay—the vale of Holmesdale in the north and the vale of Sussex on the south. To the north and south respectively of these two vales are the chalk escarpments of the North and South Downs, with their steep slopes facing towards the Weald. On the north the North Downs sink gently to the plains of the Thames Valley, and in the south the South Downs slope gently to the coastal plains. On the map the bounding rims of chalk are somewhat similar to a wishbone in shape (Fig. 87).

The rivers of south-east England rise in the Weald to flow northwards through gaps in the North Downs to the Thames, *e.g.* Wey, Medway, or else southwards through gaps in the South Downs to the sea, *e.g.* Arun, Adur, Ouse.

•Authorities vary as to the exact definition of the Weald, as to whether it is bounded on the north and south by the chalk hills or the Greensand ridges.

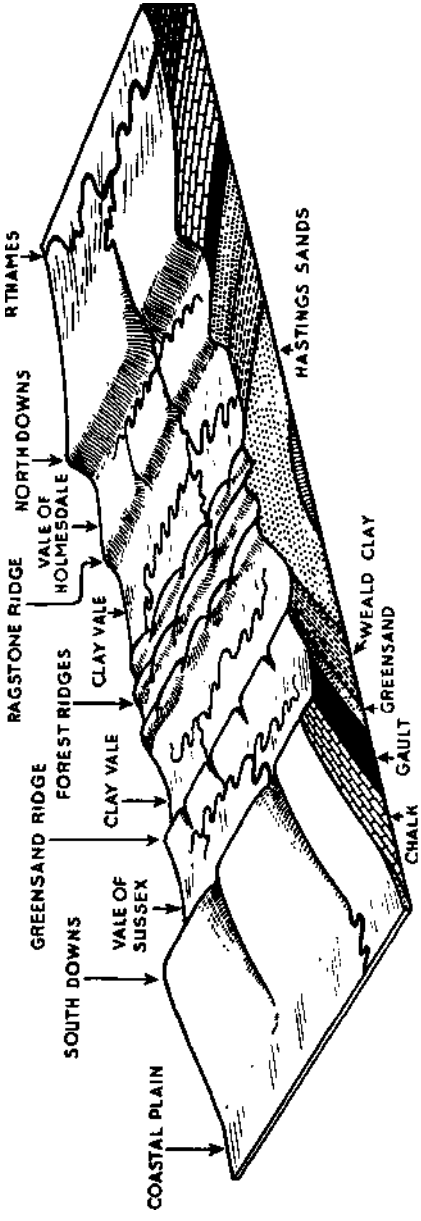


Fig. 86. A BLOCK DIAGRAM TO SHOW THE RELIEF FEATURES OF THE WEALDEN AREA.

The broad flat valleys parallel to the ridges, and occupied by the east- and west-flowing tributaries, are called *longitudinal valleys, e.g.* Vale of Sussex and Vale of Holmesdale. Where the valleys are deep and narrow, and lie across the "grain" of the country, they are known as *transverse* valleys. The latter valleys are of great value for communications, since they facilitate transport between the regions on either side of the ridges.

The coastal features of south-east England reflect very clearly the structure of the region. Where the chalk ridges reach the sea there are bold headlands, *e.g.* North Foreland, the cliffs of Dover, and Beachy Head. Where the softer clays reach the sea the coastal regions are low. Dungeness, a prominent feature of the coast, is not a bold

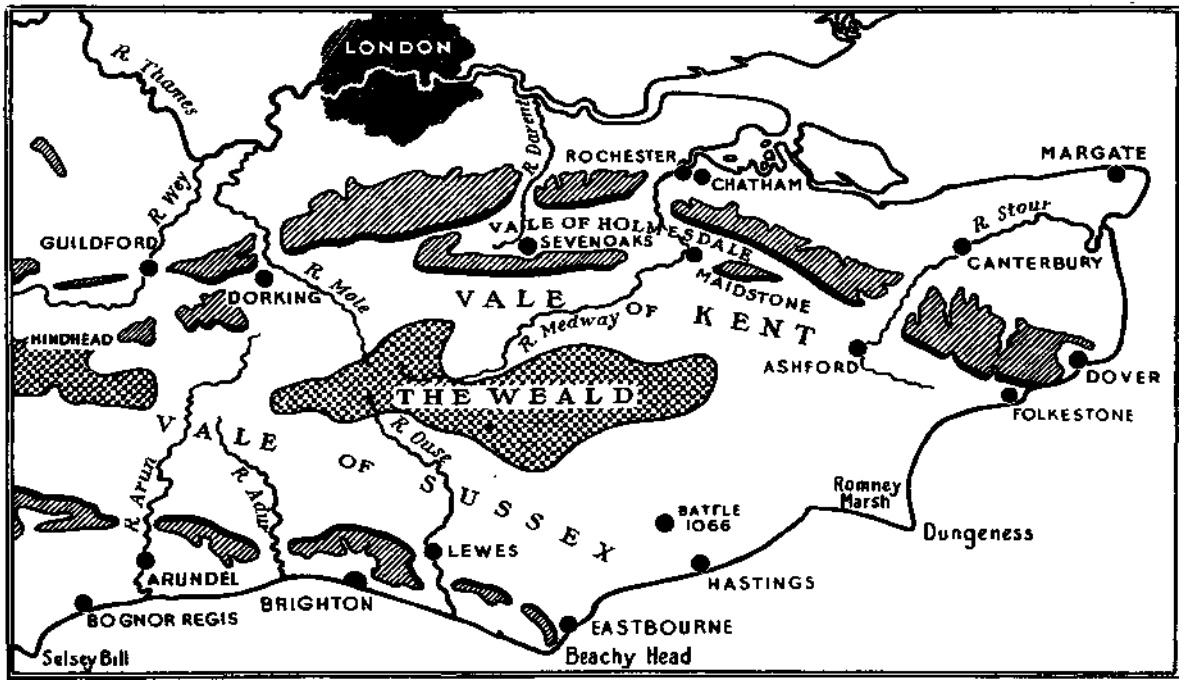


Fig. 87. SOUTH-EAST ENGLAND—MAIN FEATURES.—**Compare the arrangement of hills and vales carefully with Fig. 86. Notice the position of " Gap " towns.**

headland but an accumulation of silt and gravel behind a former sand spit. The low-lying area behind Dungeness is known as Romney Marsh.

Climate

This region approaches the Continent more closely than any other part of Britain. As in other parts of Eastern Britain, the climate is " semi-continental" in type, with hotter summers and colder winters than the average. Rainfall is low on the sheltered vales (25 in. to 30 in.), but is higher on the ridges (30 in. and over, rising to 40 in. in the west of the South Downs). A prominent climatic feature is the long duration of sunshine, particularly along the south coast. This has an important result on the agriculture and the popularity of the south coast resorts.

Agriculture

•In general it may be said that agriculture in Kent, Surrey, and Sussex is determined, not only by soil and climatic conditions, but also by insatiable demands of London. Because of this there has been in recent years, as in other parts of southern England, an increase in the rearing of dairy cattle on permanent pasture at the expense of arable land. Not only milk, but fruit, vegetables, hops, and mutton are finding a ready market in London.

The sandy soils of the Wealden Heights are not fertile, and there is much uncleared woodland. In the surrounding clay vales dairying is the most important branch of farming, and large crops of hay are harvested.

On the fringes of these vales, where the clays are mixed with chalk on the one side, or with sands on the other, there are rich soils which are used for the cultivation of fruit (strawberries, raspberries, currants), hops, cereals, roots, and potatoes. In this part of England, in contrast to East Anglia, the cultivation of barley is less important than that of wheat.

Where the North and South Downs are capped with " clay with flints " there are large woodland areas, as on the South Downs west of Arundel. On exposed chalk areas the short springy turf makes excellent sheep pastures, principally on the South Downs. The lowlands of Romney Marsh are also

used as summer pastures for sheep, but in the winter the flocks are transferred to the drier pastures of the Downs (cf. Norfolk Heights, page 167). The downland is also used for training racehorses, *e.g.* Goodwood, Epsom. The North

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HOP PICKERS IN KENT.

Hops are climbing plants which grow to a considerable height. In some hop gardens the plants twine around poles, while in others there are specially constructed wire frameworks.

Downs are being increasingly used as residential areas for London.

Because of the demand for mutton in London and the extent of downland and other sheep pastures, Kent has more sheep per 100 acres than any other English county. The important areas for fruit and hops are in east Sussex, mid-Kent, and on the northern side of the eastern half of the North Downs. Near Worthing there are many acres of glass-houses used for the cultivation of tomatoes.

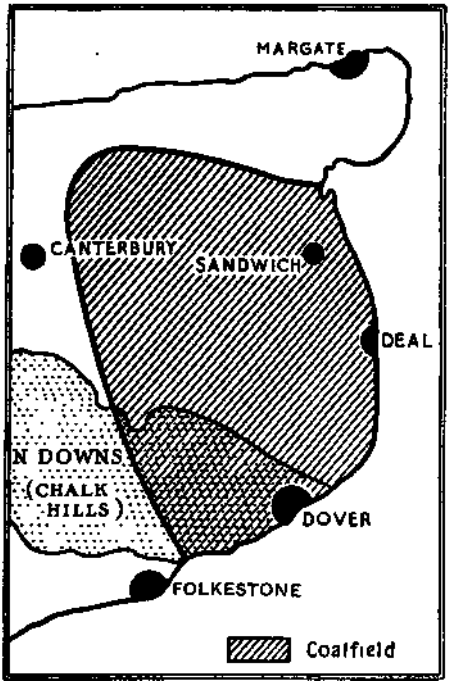
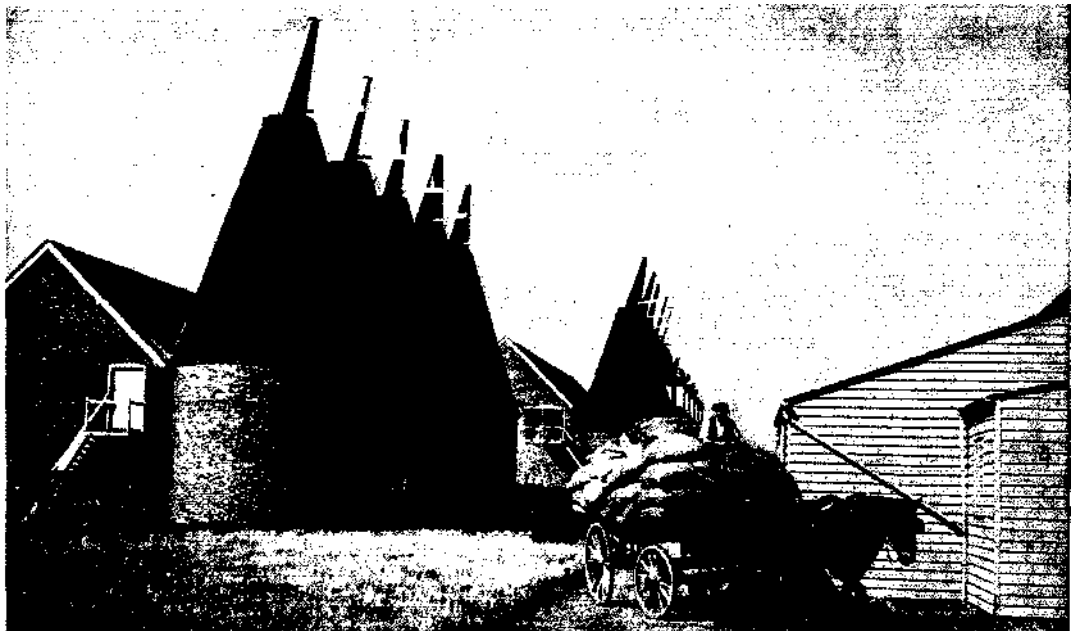


Fig. 88. THE DOVER COALFIELD.

Industries

An Ordnance map of the Wealden area reveals such names as Forge Farm, Iron River, etc. Such names date back to the time of the Wealden iron industry, which flourished for many centuries prior to the Industrial Revolution. The sandstones supplied the iron ore, whilst the charcoal for smelting came from the woods of the clay vales. The iron was forged and hammered out by hand, although occasionally power was here and there derived from the streams as the ruins of the water-driven forges show. This industry has now disappeared, for it could not survive in face of the competition of regions like South Staffordshire and Sheffield, with their abundant supplies of ore and newer methods of smelting with coke. There is, however, a possibility that the iron industry may be developed on the Kent coalfield.



OAST HOUSES NEAR TONBRIDGE, KENT.

Oast houses, or kilns in which hops are dried, are a characteristic feature of the Kentish landscape.

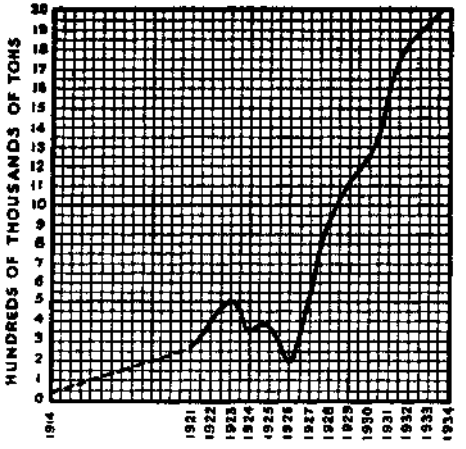


Fig. 89. To SHOW THE INCREASE IN PRODUCTION OF COAL IN THE KENT COALFIELD.

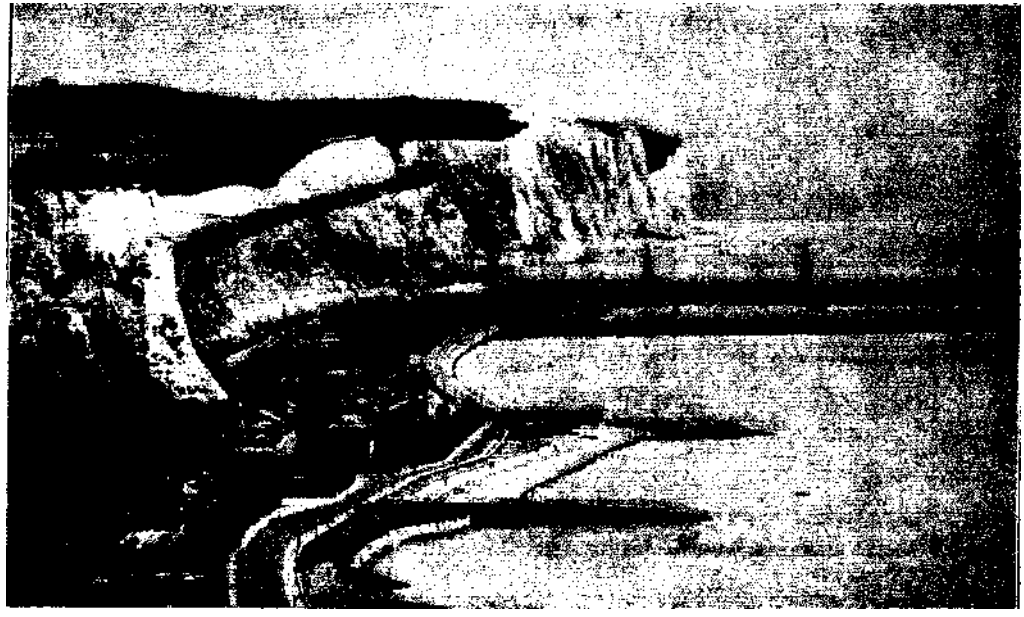
In the south-east of this county, between Canterbury and Dover, is the most recently worked coalfield in the country (Fig. 88). The coalfield is entirely " concealed," and is therefore not shown on the geological map. Deposits of iron ore also occur in the south-west of the coalfield. An interesting feature of this region is that mining and its attendant industries are being developed in such a way that industrial " ugliness " shall not mar the natural beauty.

The greatest modern industrial centre is around Chatham, Rochester, and Gillingham, at the mouth of the Medway. Chatham is a great naval port, originally established as part of the scheme of defence of the Narrow Seas and the Thames estuary (see Fig. 97). Rochester, with ruins of a fine Norman castle which once guarded the Medway gap, shares with Chatham a variety of industries, viz. paper-making, oil refining, engineering, and the manufacture of cement made from chalk and river muds.

Other industries of south-east England are those connected with agriculture, *e.g.* the making of steam tractors and threshing machines at Rochester, the manufacture of jam, and the bottling of fruit and vegetables. Many of the coastal towns are important for their fisheries, *e.g.* Whitstable for oysters.

Towns

Many important towns of this region are situated in gaps in the chalk hills, *e.g.* Guildford, Dorking, Arundel, and Lewes, or else they are so situated in the vales that they



E. O. Hoppe.

DOVER.

Dover is the packet station from which steamers sail to Calais and Ostend. Notice the artificial harbour; the high chalk cliffs; the absence of hedges and trees on the chalk downland; the road winding round the edge *of* the cliff.

command the routes through the neighbouring gaps, viz. Maidstone (Fig. 90), Ashford, Canterbury. All such towns are naturally great road centres, and as such become great market centres. In olden days castles defended the routes through the gaps, viz. Arundel and Rochester. To-day, many of the gap-towns have become important railway centres, viz. Ashford, with its railway engineering works.

Another important group of towns include the sea-side resorts. Within easy reach of London, especially in these days of quick and cheap motor transport, they might all be termed " London by the Sea." Among these are Margate, Folkestone, Hastings, Brighton, Worthing, and Bognor Regis.

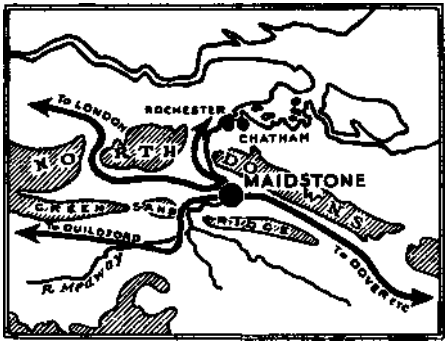


Fig. 90. THE POSITION OF MAIDSTONE.

Residential towns for London are chiefly located on the higher lands of the central Weald and on the North Downs.

Packet Stations

The " ancestors " of the modern packet station were the Cinque Ports. These five old ports, Sandwich, Dover, Hythe, Romney, and Hastings (and later Winchelsea and Rye were added), were established before the Conquest. In the Middle Ages they practically controlled the fishing industry and trade with the Continent. In return for special privileges they had to provide ships and men for the Navy. With the exception of Dover, the Cinque Ports are now of little importance, for their harbours have gradually filled with silt.

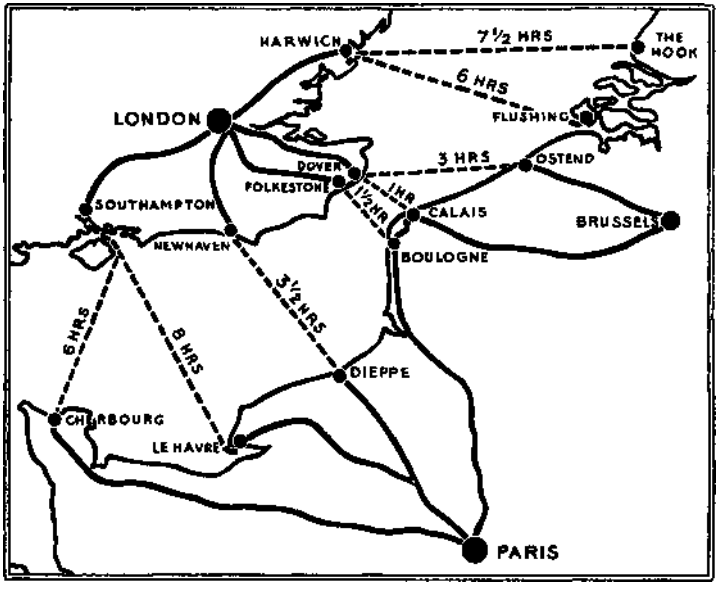


Fig. 91. THE FERRIES OF THE NARROW SEAS.

To-day, regular communication with the Continent is maintained through packet stations. The south coast is served by a number of railways which used to belong to separate companies, now all amalgamated as the Southern Railway. Each of these railway companies had its own packet station to which it ran services of express trains. A train ferry service operates between Dover and Dunkirk. The corresponding continental stations are similarly situated at the termini of quick main line routes to Paris or Brussels. The packet stations of the south-eastern portion of England are shown in Fig. 91.

The great air port is Lympne, a few miles inland from Hythe. In Roman times there was a sheltered harbour nearby (Portus Limanus), but this has long been filled with silt.

The development of commercial airways has made it possible to travel from London to Paris in approximately one hour, *i.e.* the same time of the shortest sea crossing between England and the continent.

CHAPTER XX

SOUTH-EAST ENGLAND

(6) THE HAMPSHIRE BASIN

Position and Relief

The Hampshire Basin extends through Dorset, Hampshire, part of Wiltshire, and the south coast plains of Sussex, west of Brighton. It is similar in structure to the London Basin, that is, it is a syncline or downfold of chalk filled with Tertiary rocks, *e.g.* London Clays and sands (Fig. 92). Just as chalk hills surround the London Basin, so they surround the Hampshire Basin, the steep faces of the ridges facing outwards. But the chalk " rim " of the Hampshire Basin is very wide (up to 30 miles) on the northern border, where it forms the chalk " plateau " of the Hampshire Downs and Salisbury Plain. This chalk plateau is separated from the scarped ridge of the White Horse Hills by the Vale of Pewsey and the Vale of Kennet, which together provide a great natural route for road and rail communication between London and Bristol. From Salisbury Plain the chalk lands strike south-west as the Western Downs, and **then** turn abruptly eastward parallel to the coast as the Purbeck Downs. Here the chalk has been breached by the sea, but it reappears in the chalk stacks of the Needles, and forms a west-east ridge across the Isle of Wight, ending at Culver CM. Within the chalk rim only a small percentage of the lowland has exposures of London clay, and these are principally around the margins. A much larger area is covered with sands (Bagshot Sands, cf. page 175) than in the London Basin, and these sandy soils are generally infertile and covered with extensive heaths and pine forests, viz. the New Forest.

Rivers and Communications

Whereas the London Basin is drained by one main stream and its tributaries, the Hampshire Basin is drained by a series of streams arranged fanwise. From west to east they

are the Frome, Stour, Avon, Test, and Itchen (Fig. 93). It is supposed that before submergence separated the Isle of Wight from the mainland, the Frome flowed eastward along the lowlands now occupied by Solent anil Spithead, and that the other rivers of the Hampshire Basin were tributary to it.

Communications from the London Basin outward is facilitated by " gaps " in the chalk rim. The rivers of the Hampshire Basin and their tributaries have cut valleys in the encircling chalk rim, but, owing to its great width, these natural routes into the Hampshire Basin are " valley corridors" rather than gaps. Because of this, two lines of market towns and route centres have developed, one group on the outer rim and one on the inner rim of the chalk, and usually a pair of these towns lies on each important route. The most important routes are the two which link the Hampshire Basin with the London Basin, viz. from Southampton via Alton (the Itchen route), and from Southampton via Basingstoke (the Test route). Other routes follow the Avon and Wylye valleys from Salisbury to Warminster, the Stour valley through Blandford, and the Frome valley through Dorchester.

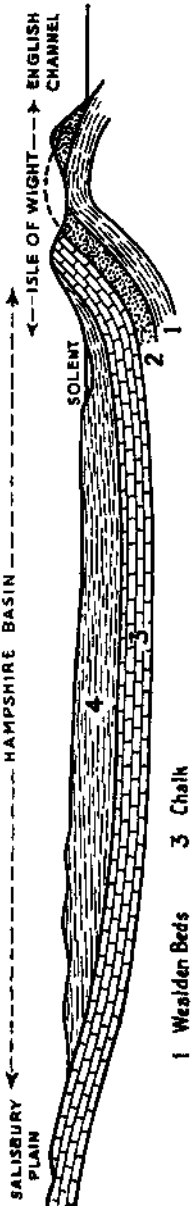


Fig. 92. SECTION ACROSS THE HAMPSHIRE BASIN.

Agriculture

Agriculturally the chalk land has **a** variety of aspects. The upper chalk is **porous and** dry-surfaced, **and** is of

little use other than for sheep rearing. In both the Hampshire Downs and the Salisbury Plain there are still wide tracts of unfenced downland, but visitors to this district are generally disappointed to find that the " wide open spaces " are neither so wide nor so open as they are expected to be. Below the hard porous chalk are layers of somewhat pebbly chalk, usually infertile—such as is usually associated with the military training grounds of Salisbury Plain. As in the other chalk regions which have been described, chalk is sometimes covered with a layer of " clay with flints." Here, as elsewhere, these soils

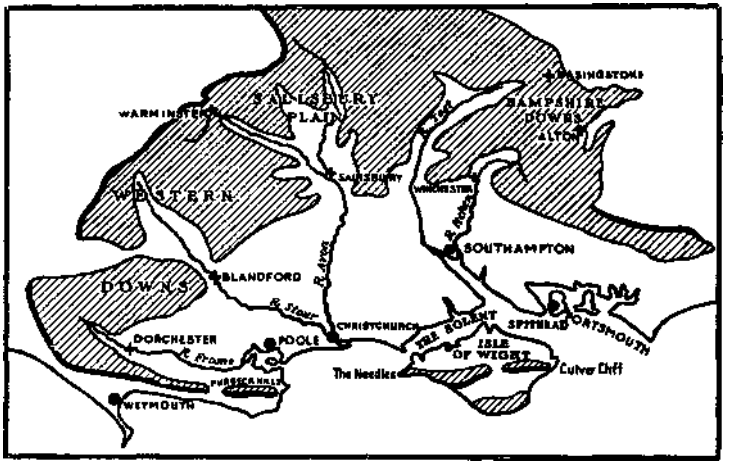


Fig. 93. THE HAMPSHIRE BASIN.—Showing: *(a)* the encircling zone of chalk upland; *(b)* the rivers; (c) the principal towns: " gateway " towns are marked with a cross.

are associated with woodland, but if cleared can, with patience, and care, be made into reasonably good arable land. The chalk of the lower slopes, somewhat marly in character, is extremely fertile, and is nearly everywhere used for the production of cereals. Near the streams of the lower valleys are rich water meadows associated with cattle rearing. The fame of Wiltshire bacon indicates an important side-line of the dairying industry. In recent years some of the farmers of the chalk lands have turned their attention to the growing of watercress and poultry rearing.

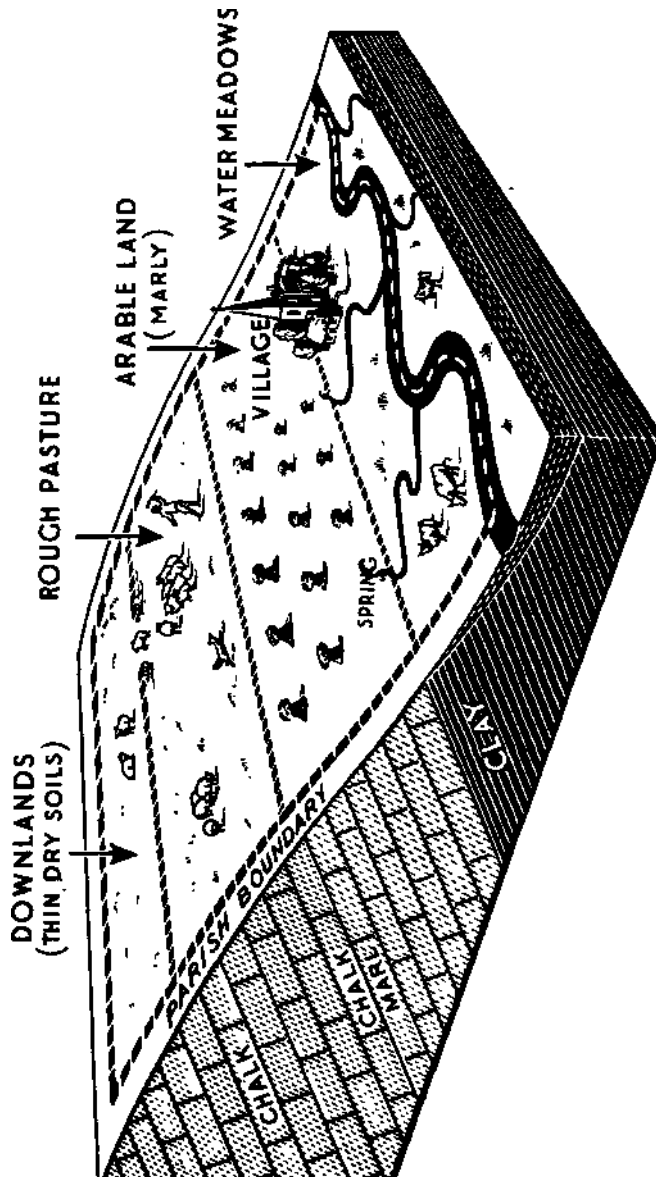


Fig. 94. A PARISH IN THE CHALK COUNTRY.

Because of the varying quality of the upland and lowland soils, parishes in the chalk regions have a characteristic form and shape (Fig. 94). They are usually " strips " of land varying in width, one end on the valley stream and the other up on the chalk heights. Thus each parish had water meadows, arable land, rough pasture, and downland, and possibly timber, and could therefore be virtually self-supporting. The village centre of such parishes was usually placed part way up the hill slope where the lowland clays met the chalk. Thus it avoided the dampness of the valley and had supplies of spring water. Because of the extensive areas of sand overlying the clay, the lowlands of the Hampshire Basin are not as productive as those of the London Basin, though scientific treatment is resulting in greater fertility.

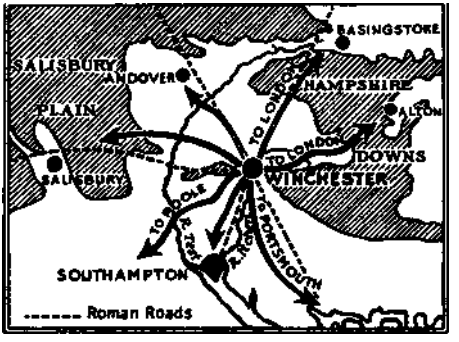


Fig. 95. THE POSITION OF WINCHESTER.

Towns

There is a remarkable convergence of roads at Salisbury and Winchester, the twin centres of the plain.

SALISBURY. This town is situated on the Avon at a point near to the convergence of five tributary streams. Thus it is a great focus of roads from, and a meeting place for the farmers of the clay plains and the chalk uplands. Nearby, on higher land, are the historic remains of Old Sarum, the meeting-place of the British hill-top tracks in olden times, and later the site of a strongly fortified Norman settlement.

WINCHESTER. On the Itchen is also a remarkable road centre at Winchester (Fig. 95). Once the meeting-place of Roman roads and later the capital of Wessex, it is to-day a great market centre and the gateway through which pass the main lines from Southampton to London.

There is a variety of coastal towns.

Some, to-day, are sea-side resorts such as Swanage, Bournemouth, and many of the towns in the Isle of Wight, *e.g.* Ventnor. Others, such as Lymington, Christchurch, and Poole, were once busy ports, but their harbours are silted and are too small for modern ships. Weymouth is a sea-side resort, and a packet station from which steamers sail to the Channel Isles.

SOUTHAMPTON. **On a smaller scale, Southampton stands in the same relation to the Hampshire Basin as London does to the London Basin. It is at the head of Southampton Water, a long drowned valley, at a point where the Rivers Test and Itchen enter the sea (Fig. 96). As a port it has a number of advantages, viz.:—**

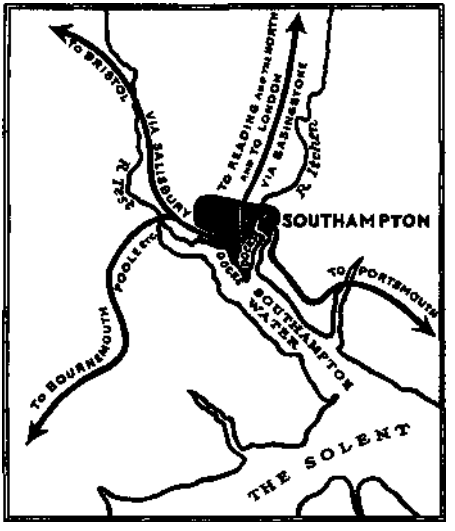


Fig. 96. THE POSITION OF SOUTHAMPTON.

(a) **Owing to its "double tides" it has the benefit of long periods of high water, during which ships can enter and leave the docks.**

(b) **The triangular peninsula between the Test and Itchen provides a long waterfront for the docks.**

(c) It is well served by the Southern Railway and nearly thirty shipping lines.

(d) **Passengers and goods landed at Southampton can reach London twelve hours earlier than by proceeding to Tilbury. In this respect Southampton may be considered an " outport " of London.**

Southampton is the premier passenger port of Britain, having displaced Liverpool. As a port for cargo it ranks fourth (Fig. 85). Its imports are primarily goods requiring

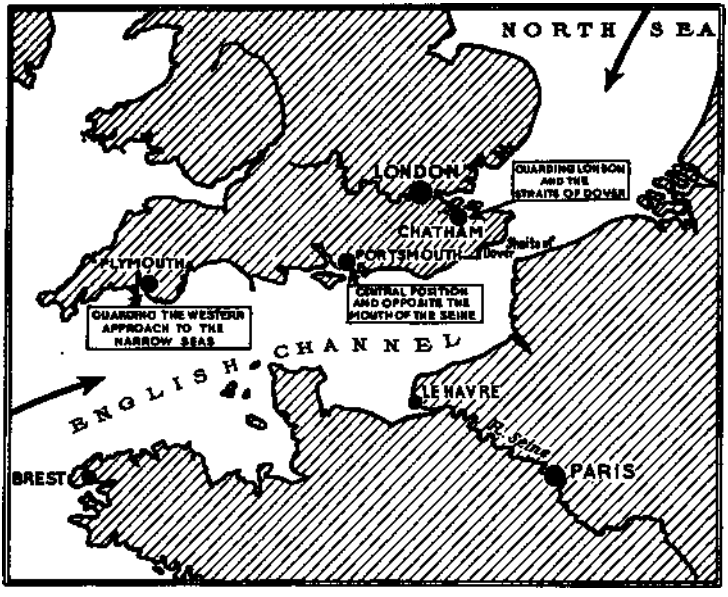


Fig. 97. THE POSITION OF THE THREE PREMIER NAVAL PORTS IN RELATION TO THE DEFENCE OF THE '* NARROW SEAS.**

quick transport, so it has special facilities for the import of fresh fruit from South Africa, and for meat, flowers, vegetables, etc. In recent years the trade of Southampton has expanded to include the import of bulkier commodities such as wool, grain, timber, and oil. Its export trade is increasing, particularly the export of goods from the Midlands. The industries are mainly concerned with shipping and, more recently, the manufacture of aircraft. The imports of crude oil have led to an oil-refining industry.

PORTSMOUTH. **Situated on the north shore of Spithead, Portsmouth is the largest town of the Hampshire Basin (Fig. 97). It is a strongly fortified naval station, sheltered by the Isle of Wight, and backed by a small chalk ridge on which stand the forts protecting the harbour. Its original importance as a naval centre is due partly to its position opposite the mouth of the Seine, the natural outlet of northern France, partly to the protection afforded by the Isle of Wight, and partly to its position relative to London.**

SOUTHAMPTON DOCKS.

In the foreground are the docks and a number of large ships, while in the background is the River Test. Notice the railways which come right down to the dock side. There are a large number of buildings, some of which are specially equipped for the storage of imported fruit.

THE CHANNEL ISLANDS

The Channel Islands, of which the chief are Jersey, Guernsey, Alderney, and Sark, lie off the coast of Normandy. Their political link with Britain dates from the time of William the Conqueror. Because of their southerly position they are an important source of supply of early potatoes, tomatoes, and other vegetables, and are also of considerable importance as holiday centres.

CHAPTER XXI

COMMUNICATIONS

Railways

The railways of Great Britain are now divided into four groups, which all radiate from London (Fig. 98):—

(1) London Midland and Scottish.

(2) London and North-Eastern.

(3) Great Western.

(4) Southern.

These groups are given in order of mileage. They all include several of the earlier railway systems. The map gives a general idea of the portion of Great Britain served by each railway group, but it must be remembered that branches of many lines run into the areas served by another group. For instance, Wales is almost entirely served by the Great Western Railway, but the north coast route to Holyhead is part of the main London Midland and Scottish system. Similarly, the L.N.E.R. has a branch south-westwards from Edinburgh to Carlisle, and another westward across the Pennines into Cheshire, right into the heart of the L.M.S. area.

(1) LONDON MIDLAND AND SCOTTISH. This system has two main lines running north from London.

(a) Firstly, via Rugby, Crewe, Preston, and Carlisle to Scotland. This route crosses the Midland plains, passing through the Midland Gate along the plains west of the Pennines, and over Shap Fell to the Eden Lowlands. The North Wales route branches from the main route at Crewe.

(b) A route from St. Pancras (London) via Derby, Leeds, Sheffield, and Carlisle to Scotland. This second line lies to the east of *(a)* and follows the plains east of the Pennines to Leeds, whence it crosses the Pennines by means of the Aire gap.

All the railways of Western Scotland (except the one from **Glasgow to** Fort William), including the main northern route,

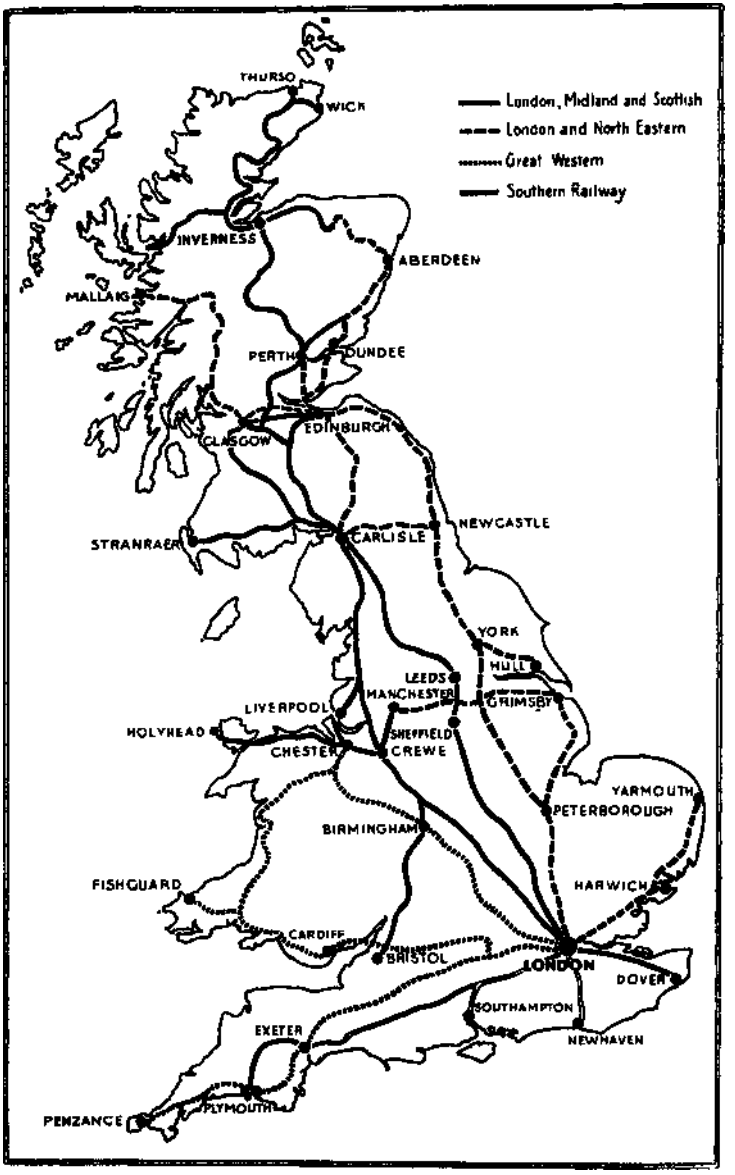


Fig. 98. THE MAIN RAILWAYS OF GREAT BRITAIN.

viz. Perth and Inverness to Wick and Thurso, are part of the L.M.S. system.

Thus it will be seen that the L.M.S. connects all the important Midland industrial areas, the South Lancashire cotton towns, the York, Derby, and Nottingham coalfield, and the coalfields of Central Scotland. It serves Liverpool, Bristol (branch from Birmingham), Glasgow, Manchester, and all the principal ports of the north-west coast. North Wales, the Lake District, the Southern Uplands of Scotland are the chief tourist centres that add to its traffic. With the exception of Fishguard, it serves all the packet stations for Ireland (see Fig. 115).

(2) LONDON AND NORTH-EASTERN. The main route of this group is from London (King's Cross), northwards across the English Plain to Doncaster, and via the Vale of York to Darlington. Thence it goes to Durham and Newcastle, and follows the coastal plain through Berwick-on-Tweed to Edinburgh. This is the route of the " Flying Scotsman." Beyond Edinburgh this line serves the east coast plains through Dundee and Aberdeen to Inverness, crossing the Firths of Forth and Tay by means of large and famous bridges. Another series of lines in this famous group are those which run from London (Liverpool Street) north-eastwards to serve East Anglia.

The industrial areas included in this system are York, Derby, and Nottingham, Northumberland and Durham, and the east Scottish coalfields. It serves the ports of Hull, Immingham, Newcastle, Leith, and Dundee, and all the east coast fishing ports. Its tourist traffic is to the holiday resorts of the east coast, such as Cleethorpes, Scarborough, Cromer, etc. Finally, it serves the agricultural areas of East Anglia and the packet station of Harwich.

(3) GREAT WESTERN. Three main routes radiate from London (Paddington) viz:—

(a) South-west to Exeter, Plymouth, and Penzance.

(b) Westwards to Reading, Bristol, through the Severn Tunnel to Cardiff, Swansea, and Fishguard.

(c) To Oxford, Birmingham, Shrewsbury, Chester, and Birkenhead, with branches via the Severn and Dee valleys

westward to Wales. This system also includes a number of short lines in the coal-mining valleys of South Wales.

It will be seen that the G.W.R. serves the following industrial areas: South Wales, Bristol, South Staffordshire, East Shropshire, and Flintshire. Bristol, Swansea, Cardiff, and Birkenhead are its chief commercial ports, and Fishguard its packet station. The tourist areas through which this railway system runs are the Welsh mountains, the sea-side towns of west and south Wales, and Cornwall and Devon.

(4) THE SOUTHERN. This group consists of a series of lines radiating from London (Victoria, Waterloo, and Charing Cross). Its main lines are:—

(a) London to Plymouth.

(b) London to Southampton.

(c) London to Brighton.

(d) Xondon to Folkestone.

(e) London to Dover.

The area served contains no coalfields except the small recently-developed coalfield around Dover. The lines, however, run to a large number of coastal resorts from Exeter eastwards, and also carry the bulk of the continental traffic through the packet stations (Fig. 91).

Canals

Canals were constructed before the railway-building era, mainly in the latter half of the eighteenth century. Whereas railways can be constructed over gentle gradients, canals must be absolutely level. This often entails a roundabout course, as well as the building of locks or " steps " in the canal. Canals are therefore most useful for the transport of heavy and bulky goods across flat land. Lock construction is not only expensive, but the use of them retards the traffic. England, particularly in the industrial areas of the north, is not suited for canal construction because of the steep gradients encountered. As a result inland navigation is not as important in Great Britain as it is in countries with large unbroken areas of flat land, such as are found in North Germany. Canals are often constructed to connect natural waterways (i.e.

rivers) so as to give through water communication. The principal canals of this type are:—

(1) KENNET AND AVON. This provides through waterway from London to Bristol.

(2) SEVERN AND THAMES. This links the lower Severn to the upper Thames.

(3) TRENT AND MERSEY. This canal links the Mersey estuary with the Humber, *i.e.* Liverpool with Hull.

(4) LEEDS AND LIVERPOOL. This was one of the first canals to be built across the Pennines. The aim was to link the cotton towns of Lancashire with the woollen towns of Yorkshire, but owing to the number of locks necessary on each side of the Pennines, and the shallowness of its central portion, it is little used for trans-Pennine traffic to-day.

(5) FORTH AND CLYDE. This affords a water route across the narrowest part of Scotland, but it is too shallow for large barges.

(6) AIRE AND CALDER. This so-called canal is a waterway formed by deepening and straightening the rivers Aire and Calder. It links the woollen towns with Hull and Goole, and is one of the busiest canals in Great Britain.

(7) THE CALEDONIAN CANAL. This canal, linking the lakes of the Glenmore depression in Scotland, is of little commercial value, for it neither connects nor passes through important areas.

The most important network of canals in England is that which centres on Birmingham (Chapter XIV.). Six canal systems radiate from the Black Country; they are:—

(a) To the Severn at Stourport and thence to Gloucester.

(b) To the Severn at Worcester and thence to Gloucester.

(c) The Oxford Canal to the Thames at Oxford, and thence by the Thames to London.

(d) The Grand Junction Canal to the Thames at London. From this canal a northerly branch runs to Leicester and thence by the River Soar to the Trent.

(e) The Trent and Mersey Canal, and thence to the Humber.

(/) The Birmingham Canal, which joins the Shropshire Union system, and proceeds to the Dee and Mersey estuaries.

(8) THE BRIDGWATER CANAL links the Mersey estuary with Manchester, and was the first great British canal to be constructed by Brindley, the famous engineer, Its great success stimulated the building of canals in other parts of the country. It is not deep, and is mainly used by small boats to relieve congestion on the Manchester Ship Canal.

(9) THE MANCHESTER SHIP CANAL stands apart from those already considered, for it is a " Ship Canal," deep and wide enough to allow ocean vessels to go right to Manchester. It was constructed in 1894, and begins at Eastham, on the south side of the Mersey estuary. Its total length is about thirty-five miles. It follows the Mersey estuary to Runcorn, and thence follows the Mersey and Irwell valleys to Manchester. At Manchester (Trafford Park) are large docks and warehouses, so that the city, although so far inland, is an important port.

There is one other ship canal in England—from Gloucester southwards to Sharpness, a distance of about fifteen miles. This canal, now little used, was built to avoid the windings and shallows of the Severn estuary.

Canals provide cheap transport for bulky goods, such as iron ore, coal, and china clay. At the beginning of the Industrial Revolution, when roads were in bad condition and practically the only means of transport was the pack-horse, canals were of great value. But their period of importance was short-lived because of the rapid growth of railways in the first half of the nineteenth century.

Roads

In the days before the Roman invasion the chief routes consisted merely of tracks. Most of the lowlands were forested, and these tracks were naturally along the crests of the unforested chalk hills of South England, and over the open moorlands elsewhere. To-day they can sometimes be traced

as mere lanes or field footpaths on the Ordnance maps. Along them one usually finds burial mounds (tumuli), defensive earthworks, and camps. The best known of such old tracks is the Pilgrim's Way, which links Winchester and Canterbury.

In the Roman period many fine roads, such as Watling Street and Ermine Street, were constructed. The Romans built their roads as straight as possible, even if such a course involved climbing steep hills. On the Ordnance maps these roads can be traced by their straightness, for they have the appearance of having been ruled on the map. Unfortunately, only parts of these fine Roman roads remain, for after the departure of the Romans they were allowed to deteriorate, and in some cases were even ploughed up.

To-day, many of our main roads, unlike the Roman roads, are very winding, because they have developed from systems of lanes linking one village with another. It was not until the eighteenth century that the question of improving roadways was seriously considered. It was then that famous road-builders like Telford and Macadam, both Scotsmen, did their work. Macadam introduced new methods of making a good road surface. Telford concentrated on road construction, and his greatest work was the improvement of the London to Holyhead road (A5), including the building of the Menai suspension bridge and many other bridges on the route.

This century has seen an amazing development of motor transport both for private and commercial purposes. Hence we are once again in a road-building era, but now the road engineer is mainly concerned with " by-pass" roads, to shorten circuitous routes, or to avoid old towns with narrow streets where traffic becomes easily congested.

The increase in road transport has led to the classification of roads by the Ministry of Transport. All very important roads are denoted by the letter A and a number, *i.e.* the London-Holyhead road is A5. Less important roads are lettered B.

The accompanying map (Fig. 99) marks a few of the more important main roads. It may be noted that roads Al to A6 radiate from London and that they are numbered clockwise.

Airways

Aeroplane transport is becoming increasingly important for passenger traffic and the transport of light articles. In the British Isles the saving of time is, however, small, and the

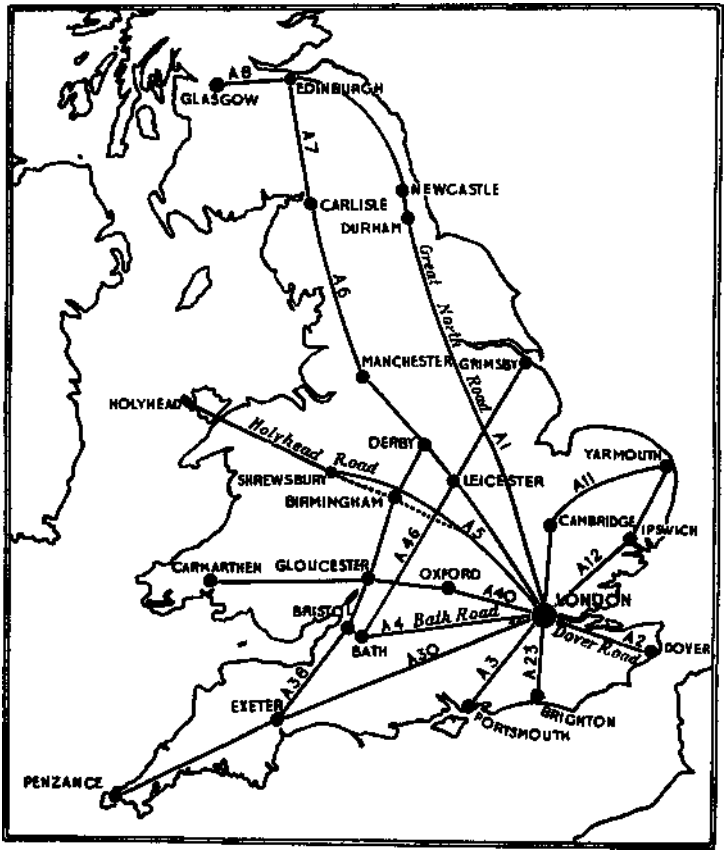


Fig. 99. MAIN **ROADS.—Notice that Birmingham is on a loop road. All the great road centres are old towns.**

number of air lines operating regularly within the country is not great. Most of the regular air services operate over stretches of water, across which any other mode of transport would be much slower. The frequent air service between

Hull and Grimsby is one of the best examples. Road and rail transport between these two ports is long and slow because of the detour that must be made around the Humber. There are numerous flights daily between Portsmouth and Ryde (I.O.W.). The air service across the Bristol Channel, the Pentland Firth, and the Firth of Clyde all illustrate the same point. Other air services were directly concerned with transport to sea-side resorts, as Blackpool, Douglas, Skegness, Clacton, etc., and the route between Birmingham, Cardiff, Torquay, and Plymouth. The lack of demand for the latter services during the winter months, and also the unsettled conditions of our winter weather make it impracticable to operate these lines all the year round. The chief air ports, *i.e.* aerodromes with Customs facilities, are at Croydon, Heston, Ilford, Gatwick, Lympne, Blackpool (Stanley Park), Bristol, Cardiff, Manchester (Barton), and Dublin. Southampton, Portsmouth, Harwich, Dover, Liverpool, and the Channel Islands have air ports which are used both by aeroplanes and seaplanes.

Many of the larger urban centres have an aerodrome and extensive landing grounds, and these, for obvious reasons, are situated in open spaces on the outskirts of the cities, *e.g.* Castle Bromwich (Birmingham), Speke (Liverpool).

CHAPTER XXII

SCOTLAND

(1) THE SOUTHERN UPLANDS

Physical Divisions of Scotland

If two lines are drawn on the map of Scotland (1) from Helensburgh to Stonehaven (the Highland line), and (2) from

Fig. 100, THE DIVISIONS OF SCOTLAND.

Dunbar to Girvan, they divide the country into three well-marked physical divisions, viz. (Fig. 100):—

(1) The Southern Uplands south of the Dunbar-Girvan line.

(2) The Central Lowlands between the two lines.

(3) The Highlands north of the Helensburgh-Stonehaven line.

WOOLER, IN THE CHEVIOTS.

This view of the Scottish Borderlands shows the typical rounded hills so similar in form and structure to those of Central Wales. This is a portion of the most important sheep rearing region of the British Isles.

The Highlands can be subdivided into:—

(a) The Grampians.

(b) The north-western Highlands.

(c) The islands of the north and west.

THE SOUTHERN UPLANDS

Structure and Physical Features

The Southern Uplands extend northwards from the Cheviot Hills of Northumberland, and are a dissected plateau of old rock similar to the rocks of Central Wales. The plateau is bounded on the north by the faults which run from Dunbar to Girvan, and north of which the structure is completely different. The plateau rises to well over 2000 ft., culminating in the highlands of Merrick, Broadlaw, and Hartfell. In the south-west the uplands are drained by the Liddel, Annan, and Nith to the Solway Firth, and in the north by the head-streams of the Clyde. The whole of the eastern half of the Uplands comprises the Tweed Basin, whose broad lower valley separates the Cheviots on the south from the Moorfoot and Lammermuir Hills on the north. The Uplands differ from the Highlands in that they are less rugged, the hills being characterised by smooth rounded outlines, the rivers are less swift, and lakes fewer in number.

Because of its altitude the region has, except in the vales, heavy rainfall (up to 60 in.) and low temperatures. The eastern lowlands of the Tweed are more sheltered, drier, and have higher summer temperatures than the west of the Uplands.

From the point of view of its agriculture the region falls naturally into three sub-divisions:—

(a) The plains of the south and west.

(b) The upland zones.

(c) The Tweed valley.

The Western Plains *(e.g.* Galloway)

On account of their westerly position and resultant equable temperatures and well-distributed rainfall (30-50 in.), the western plains are largely devoted to the rearing of cattle.

Wheat is not extensively cultivated, arable land being used for oats, roots and rotation grass. Because of its distance from the industrial centres, most of the milk supply is used for the making of butter and cheese, and in recent years a large number of creameries have been opened in market towns such as Stranraer and Kirkcudbright. Some milk is, however, sent by quick motor transport to Newcastle and the industrial towns of Lancashire. This is one of the most important districts in Scotland for the rearing of pigs, because they can be fed on the by-products of the creamery and cheese factory.

The slopes of the dales are used for sheep rearing, chiefly the black-faced variety, for mutton.

The market towns are not large. The population of Dumfries, the largest, is 15,000, and Maxwellton and Stranraer come next (6000 each).

The Uplands

Owing to its height, low temperatures, cloudiness, thin soils, and difficult communications, the upland region is a sheep rearing moorland, broken by valleys used for mixed agriculture. It is in many respects economically similar to Central Wales. The number of sheep per acre increases from the wetter west to the drier east, and the type of sheep reared changes also. In the west are more black-faced sheep reared for mutton, while in the east there are more white-faced Cheviot sheep, of greater importance for their wool. The upland counties of southern Scotland, viz. Roxburgh, Selkirk, and Peebles, constitute the most important sheep rearing region of the British Isles (see Fig. 25). The sheep farms are often as large as 5000 acres, and consist of wide, unfenced and uncultivated grasslands. Immediately below the open moorlands are walled fields, which were once ploughed, but which are now under permanent grass and almost as wild as the moorlands themselves. The only method of maintaining good sheep pastures on the moorland is by burning the old heather periodically to encourage the growth of young shoots, valuable for sheep grazing. At the end of the summer the sheep are rounded up, dipped, and then the surplus are sent to the sheep markets or to the lowland farms for winter feeding.

The Uplands generally are poor in minerals. Lead is mined at Leadhills in the Clyde Basin. There is a small coalfield at Sanquhar in the north-east of Dumfries which is structurally part of the Ayrshire coal basin.

The Tweed Basin

The uplands surrounding the Tweed and its tributaries are part of the great sheep rearing area, but the lowlands of the Tweed form a distinct agricultural unit.

Drier, sheltered, and more sunny than the west, this region has a high percentage of arable land. The'driest and lowest

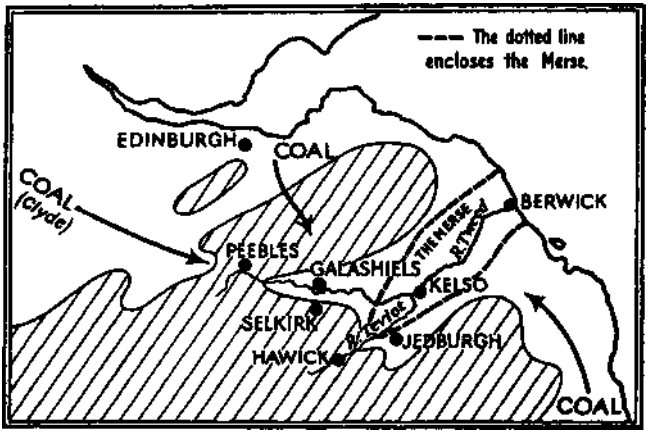


Fig. 101. THE WOOLLEN TOWNS OF THE TWEED BASIN AND THE SOURCES OF COAL SUPPLY.

(below 250 ft.) portion of the Tweed valley is known as the Merse (Fig. 101). Throughout the district oats are the important cereal, and turnips, winter food for sheep, the important root crop. The proportion of arable land is highest in the Merse, which is very important for its barley, and which also grows considerable amounts of wheat. In these lowlands of mixed agriculture cattle are also reared, chiefly for their meat, in contrast to the dairying regions of the western plains. This distribution of dairy and beef cattle should be compared with the distribution in England, *i.e.* the gradual decrease of dairy cattle from Cheshire eastwards

across the Central Plain, and the eastward increase of beef cattle (see page 148).

The Tweed Woollen Industry

The Middle Tweed Basin ranks next to the West Riding of Yorkshire as a woollen manufacturing region. It owes its importance to three factors:—

(1) The old-established domestic weaving industries and therefore the traditional skill in weaving.

(2) The abundant supplies of wool.

(3) The abundant supplies of soft water.

Although at the time of the Industrial Revolution machinery was introduced and operated by water power, it was not long before the district felt the great disadvantage of the distance from coal supplies. Coal is obtained to-day from three sources *(a)* the Lanarkshire coalfield, *(b)* the Midlothian coalfields, *(c)* the Northumberland and Durham coalfield.

Because of this disadvantage the Tweed towns have had to specialise in the manufacture of goods of exceptionally high quality in order to compete with the West Riding. They manufacture tweeds, sports materials, blankets and hosiery. High-grade goods require high-grade wools for their manufacture, and since the local wool is only suitable for coarse fabrics and carpets, much foreign wool has to be imported.

The chief towns engaged in woollen manufactures are Galashiels, Hawick, Peebles, Selkirk and Jedburgh (Fig. 101). Hawick specialises in hosiery, and Jedburgh, in addition to its woollen industries, manufactures rayon.

These towns are a great contrast to the industrial centres of the West Riding, for the largest, Hawick, has a population of only 16,000, while the population of Jedburgh is under 2500 (cf. the woollen towns of the "West of England").

At one time Berwick, at the mouth of the Tweed, was important for its wool trade, but its growth has been retarded by the old low-arched stone bridge which crosses the river very near the sea.

The middle Tweed valley is famous for its abbeys, whose monks did much in past ages to develop both agriculture and

the weaving industry. The historical interest of these abbeys *(e.g.* Melrose) and the association of the region with Sir Walter Scott attracts a large number of tourists.

Communications

The Southern Uplands were once a barrier between the Romans and the Picts; in the Middle Ages they separated the English and Scotch; to-day they are a relatively sparsely populated area set between the densely populated industrial regions of Northern England and Central Scotland. The towns bordering the Uplands were formerly fortresses, guarding the natural routes; to-day the same towns are railway junctions controlling the same routes. Railways across the Uplands now link the important centres of England and Scotland, but even on the railways the function of the Uplands as a barrier is still evident in that extra engine-power is usually needed for the negotiation of steep gradients, as on the route from Carlisle to Carstairs (via the pass of Beattock).

The railway routes of the Uplands follow the valleys or the coastal plains (Fig. 102). They are:—

(1) The East Coast route (L.N.E.R.) from Newcastle through Berwick and along the east coast plain to Edinburgh. The advantages of this route are, firstly, its directness, and secondly, that there are no steep gradients.

(2) The Waverley route (L.N.E.R.), which goes up the Liddel valley across the watershed and down the Teviot valley to Galashiels. Thence it proceeds up the Gala valley, over a second watershed and down the valley of a tributary of the Esk to Edinburgh. While this route has the advantage of serving the woollen towns and the " Scott" country it has two great disadvantages: *(a)* that it has two watersheds and their associated gradients to negotiate, and *(b)* that the nature of its traffic has changed. Whereas before the railway amalgamation it carried the " through " traffic to Edinburgh for the Midland railway from points south of Carlisle, to-day the majority of the "through" trains follow the L.M.S. routes further west.

(3) The third route (L.M.S.) ascends the Annan valley from Carlisle, crosses the watershed to the Clyde valley and

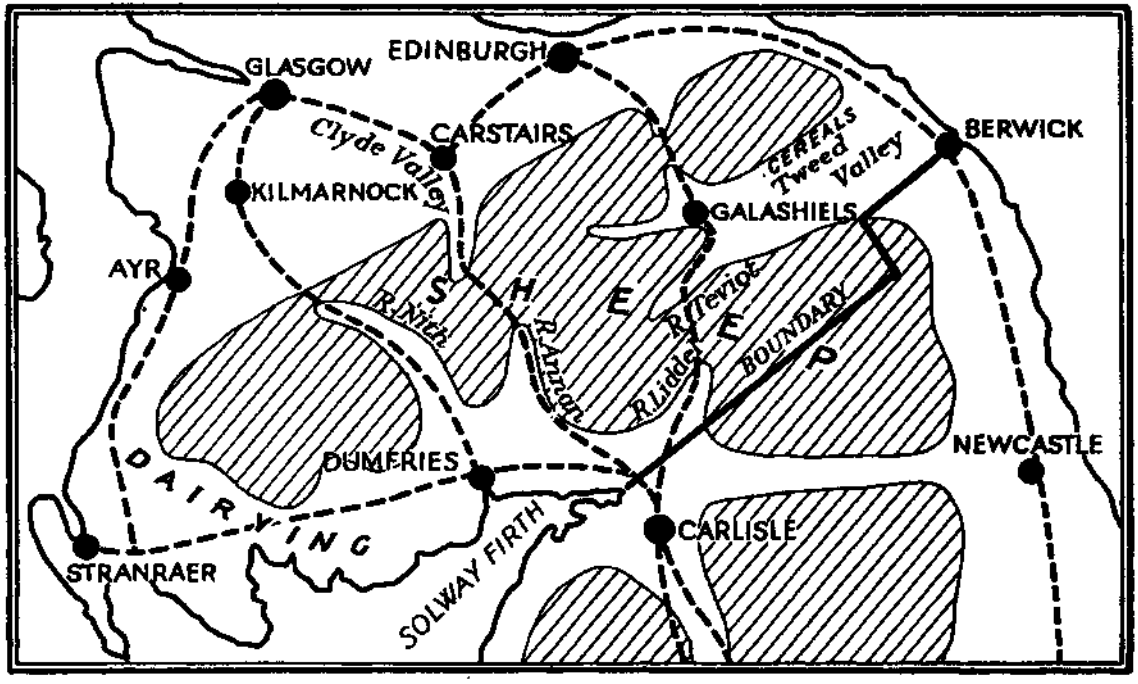


Fig. 102. THE RAILWAYS OF THE SOUTHERN UPLANDS.—Shows the rail connections between Northern England and the Central Valley of Scotland.

divides at Carstairs, one branch going to Edinburgh and one to Glasgow. This is the busiest of all the Upland routes. Its obvious advantages are its directness, and the fact that it serves both the east and west of the Central Lowlands, but it has the disadvantage of steep gradients.

(4) The fourth route (L.M.S.) is from Carlisle along the Solway Plains to Dumfries, whence it follows the Nith valley northwards, crosses a low watershed and reaches Glasgow via the Ayrshire lowlands. It is mainly used for traffic to the western side of the lowlands, being somewhat circuitous for through traffic to Glasgow.

(5) The fifth route (L.M.S.) is that which follows the coastal plains to Stranraer and thence northwards along the western coast plains to Ayrshire and Glasgow. It is mainly used for traffic converging on Stranraer (a packet station for Ireland) from the north and east.

CHAPTER XXIII

SCOTLAND

(2) THE CENTRAL LOWLANDS

Relief

The Central Lowlands, or Midland Valley of Scotland, is a rift valley 50 miles wide, between two parallel sets of faults which follow the lines from Helensburgh to Stonehaven and Dunbar to Girvan.

The formation of the rift valley was accompanied by:—

(1) Submergence, which partly accounts for the long estuaries in this part of Scotland, and by (2) volcanic activity, which accounts for the presence of volcanic hills within the Lowlands (Fig. 103).

The rocks of the Lowlands are newer and often less resistant than those of the Highlands to the north, and the Uplands to the south. Hence the largest plains are to be found in this part of Scotland. Moreover, it is only in the Central Lowlands that important deposits of coal are found. Because of the rich agricultural plains and the coalfields and their attendant industries, the Central Lowlands contain 80 per cent, of the population of Scotland, although it occupies only 10 per cent, of the total area.

On the north side of the Lowlands the Highland wall rises steeply forming a clear cut boundary. Running parallel to the edge of the Highlands is a long line of hills composed of volcanic rock. They are broken by the transverse valleys of the Clyde, Forth, and Tay, and from south-west to north-east are known as the Renfrew Heights, Campsie Fells, Ochil Hills and Sidlaw Hills. Between these volcanic hills and the Highlands is a broad vale composed of Old Red Sandstone, and known, east of the River Earn, as Strathmore (the Great Vale).

On the south side of the Central Lowlands the structure is not so well defined. The slope from the Southern Uplands is less abrupt than the steep Highland face. Running parallel

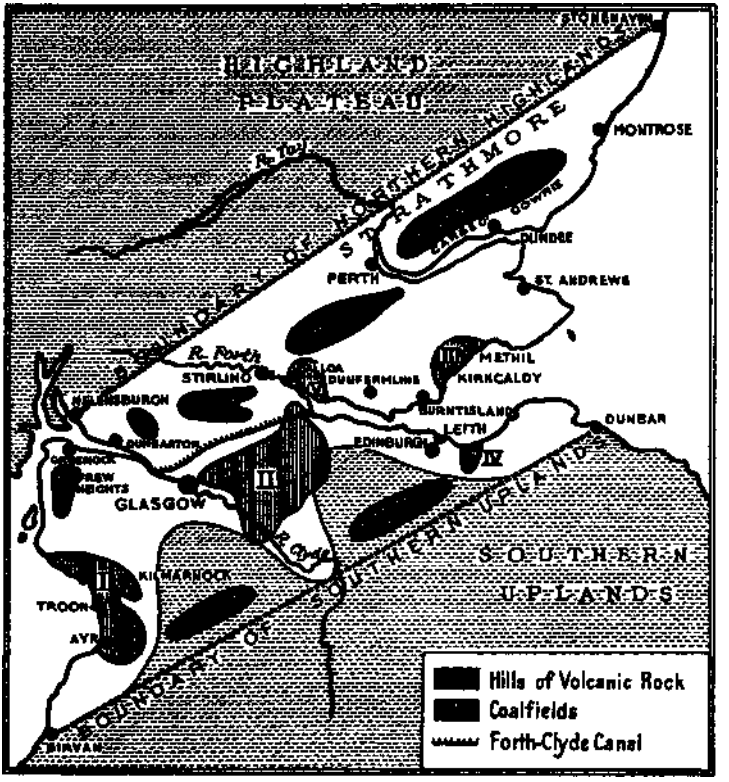


Fig. 103. CENTRAL LOWLANDS OF SCOTLAND, TO SHOW CHIEF HILLS, RIVERS, TOWNS, AND COALFIELDS.—I. Ayrshire Coalfield. II. Central or Lanarkshire Coalfield. III. Fifeshire Coalfield. IV. Midlothian Coalfield. V. Clackmannan Coalfield.

to the edge of the Uplands is a second line of volcanic hills extending from the isolated Castle Rock in Edinburgh through the Pentland Hills and the Haughshaw Hills. Westward of Ayrshire the island of Ailsa Craig continues this "volcanic line."

Between the volcanic hills and the Uplands, however, there is no broad vale corresponding to Strathmore. Extending northwards from the Pentlands and Haughshaw Hills is a plateau region averaging 500 feet to 1000 feet in height This is divided into two portions by the Clyde valley. An

important feature of the relief of the Central Lowlands is the narrow " corridor " of low land which joins the Firth of Forth to the Firth of Clyde. Here is the narrowest part of Scotland, viz. 30 miles. The Lowlands are drained by the three most important Scottish rivers, viz. the Clyde, which rises in the Southern Uplands and flows north-west to the west coast, and the Tay and Forth, which rise in the Highlands and flow roughly south-east to the east coast.

Agriculture on the Central Lowlands

As in England there is a marked contrast between the agricultural products of the western and eastern coastal areas.

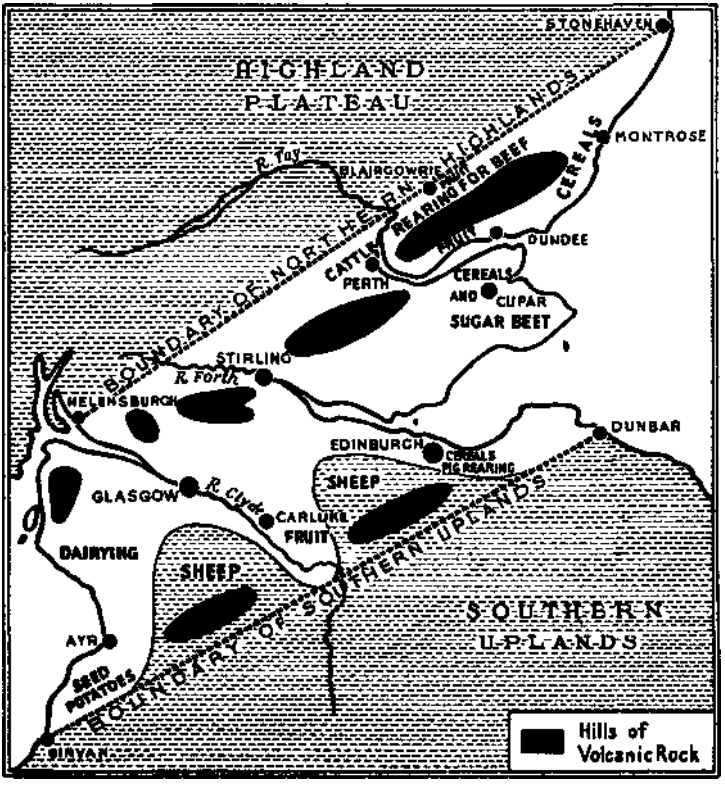


Fig. 104. CENTRAL LOWLANDS OF SCOTLAND, TO SHOW AGRICULTURAL ACTIVITIES.

The western regions with equable temperatures, heavy rainfall (30 inches to 60 inches) and cloudy skies are more important for permanent grasslands and dairying; while the eastern regions, with rainfall below 30 inches, warmer summers, and less cloud have a much greater percentage of arable land (Fig. 104).

(1) THE EASTERN MARGINS. **These comprise the east coast from Stonehaven to Haddington. Agriculturally they fall into three sub-divisions :—**

(a) **The Angus region, which includes the south of Kincardine and the coastal lowlands of Forfar, Perth and Strathmore.**

(b) **The lowland fringes of Fife.**

(c) **The Lothians.**

The " Angus " district. **This region is noted for its cereals and fruit. This is the most northerly district of the British Isles where wheat cultivation is important. Barley is also cultivated, but the greatest acreage is devoted to oats. The rotation of crops is different from that of eastern England. Here a six years' rotation is used, viz. oats, potatoes, wheat, turnips, barley, grass, *i.e.* cereals alternating with some non-cereal crops.**

Because of the amount of sunshine, the length of the summer days and the shelter afforded by the hills to the north, this is the most important fruit-growing region in Scotland. The greatest centre is on the sunny south-facing lands around Blairgowrie on the southern margins of the Highlands. Here raspberry-growing is pre-eminent. Another important raspberry district is the Carse o' Gowrie, the sheltered south-facing plain between the Ochil Hills and the Firth of Tay. Strawberries as well as raspberries are grown in the neighbourhood of Montrose. Much of this fruit is used in the jam factories of Dundee. Newtyle on the south side of Strathmore is a centre for bulb-growing.

Though the demands of Dundee make dairying important in the district near that city, cattle rearing in the east is generally for beef. The rich sandstone pastures of Strathmore are famed for their herds of Aberdeen Angus and Shorthorns, and this is one of the most important cattle fattening regions in Britain.

The Fifeshire lowlands. Here is a similar type of farming, a similar rotation of crops and a similar importance of oats, wheat and barley. Large-scale fruit growing is, however, absent, but sugar-beet is being increasingly cultivated. Cupar has a sugar-beet factory.

The Lothians. In this district, also, large crops of wheat, oats and barley are produced. There is here no specialisation in fruit or sugar-beet. The presence of Edinburgh and Leith and other towns have made dairying important, and associated with the dairying industry is pig rearing. There are more pigs per 100 acres here than in any other part of Scotland.

(2) THE WESTERN REGION. The volcanic hills and the low plateaux to the east and west of the Clyde are all associated with sheep rearing. The Ayrshire lowlands, particularly the northern portion of Ayrshire known as Cunningham, with its equable temperatures, heavy rain, cloudy skies and nearness to the great industrial centres of Lanarkshire, is preeminently a dairying region (compare Cheshire and its relation to Lancashire). The Ayrshire breed of dairy cattle are world-famous. It is too damp and cloudy for the cultivation of wheat or barley, so that oats is the only important cereal crop. The south of Ayrshire around Girvan, with light sandy soils, is the centre of the Scotch seed potato industry. In the middle Clyde valley, sheltered by the surrounding plateaux, is a region devoted to the large-scale production of tomatoes and strawberries. The latter have given rise to an important jam-making industry at Carluke.

Industries and Towns

Over 99 per cent, of the output of coal of Scotland is mined in the Central Lowlands, this being about $^1/_6$ of the total for Great Britain. Whereas the coalfields of England are all associated with highland areas, the Scottish coalfields are found in the lowest basins of the Lowlands. These coalfields are (see Fig. 103):—

(I) The Western Basin, *i.e.* the Ayrshire coalfields.

(II) The Central Basin, *i.e.* the Lanarkshire coalfield and its eastward extension to the head of the Firth of Forth, where it is known as the Clackmannan coalfield.

(III) The Eastern Basin, i.e. the Fife and Midlothian coalfields, these coal measures underlying the widest part of the Firth of Forth.

The Western Basin produces 13 per cent., the Central Basin 45 per cent., and the Eastern basin 41 per cent, of the total Scottish production (Fig. 105). The greatest reserves of coal are in the Eastern Basin.

(I). THE AYRSHIRE COALFIELD. **In this coalfield mining is scattered, and there is no great degree of industrial development. As a result there is a large surplus of coal which is exported through Troon, Ayr, and Ardrossan to Ireland. The chief town and industrial centre is Kilmarnock, noted for its engineering industries (Fig. 106). Ayrshire is one of the lesser woollen manufacturing regions of Britain. The chief centres are Kilmarnock (carpets), Ayr, Dairy, and Girvan. These towns specialise in the manufacture of knitted wear, homespuns, plaids, etc. Leather industries, due to the importance of cattle rearing, are centred at Kilmarnock and Maybole. The valley of the River Irvine in Northern Ayrshire has scattered cotton-mills associated with those of the Glasgow and Paisley region. The coastal towns of Ayrshire and the islands off the coast, *e.g.* Arran, are the " play-grounds" for industrial Scotland, a special attraction being the number of excellent golf-links (e.g. Troon).**

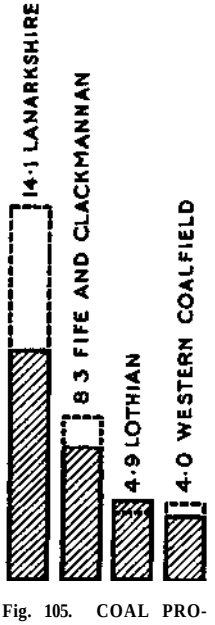


Fig. 105. COAL PRODUCTION IN MILLIONS OF TONS, 1934 (DOTTED LINE PARTS SHOW 1913).

(II). THE CENTRAL COALFIELD. **This coalfield extends from the outskirts of Glasgow, south-eastwards to within about five miles of Lanark. Only a small proportion of its area lies to the west of the Clyde, but it extends east and north-east over the low plateaux and through the Clyde-Forth " corridor " to Clackmannan. It has the advantage of being served by Glasgow and the Clyde ports on the west, and by Grangemouth on the east. The Forth and Clyde canal,**

linking Grangemouth and Glasgow, follows the Forth-Clyde " corridor."

There is a large and varied industrial development associated with this coalfield and the industrial centres fall into four groups.

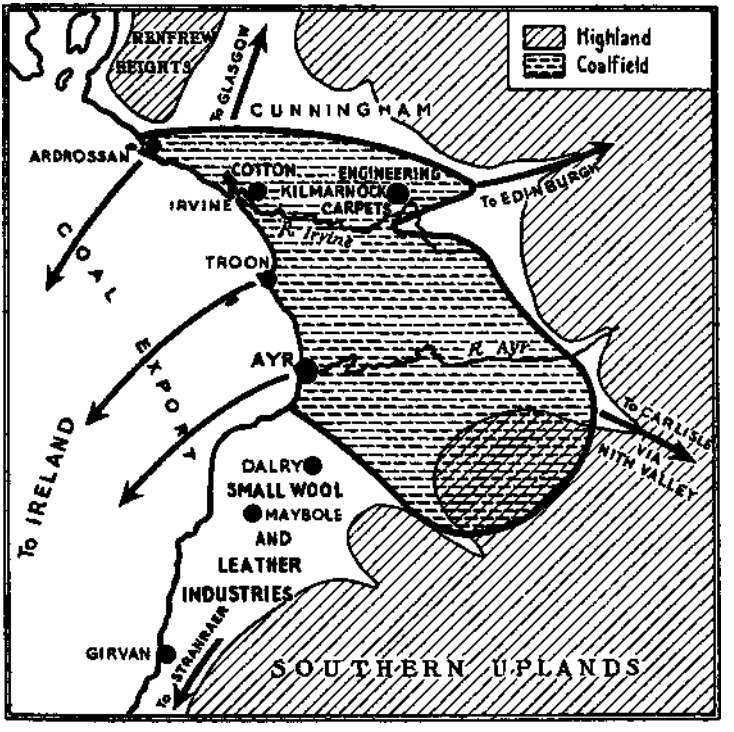


Fig. 106. THE AYRSHIRE COALFIELD.

(a) The Clackmannan Region, North of the Forth.—This is not an important industrial area, and mining is scattered. Stirling, to the north of the coalfield, and Alloa, are centres of a small woollen industry, including the manufacture of blankets, carpets and knitting wool.

(b) The Eastern Region of the Coalfields South of the Forth. Here, Falkirk, originally an important market town, is the centre of a district engaged in iron-working, an industry which

began at Carron in 1760. Most of the pig-iron used is imported from the Tees district.

Grangemouth, at the eastern end of the Forth and Clyde canal is an important port which not only serves the Falkirk region, but is the eastern outlet for the iron manufactures of Lanarkshire. Bo'ness, an older port, imports large quantities of pit props from Scandinavia, and exports coal.

(c) *The Western Portion of the Coalfield in Lanarkshire,* This is one of the most important iron-working centres in Britain. Originally local supplies of black band ore were used, but, although these are not completely exhausted, the industry to-day uses cheaper imported pig-iron.

This iron industry is mainly that which is known as the " heavy " iron-industry, viz. the manufacture of steel girders, bridges, the steel framework of buildings, etc. (contrast the metal industries of South Staffordshire, page 150). The best known centres are Motherwell, Airdrie, Coatbridge and Wishaw on the east side of the Clyde (Fig. 107). Hamilton, to the west of the river, is a coal-mining centre. South of the coalfield, near Lanark, are the series of rapids known as the Falls of Clyde. These are now used for the generation of hydro-electric power, an additional source of energy for the Clyde industries.

(d) Glasgow and the Clyde Estuary. This great industrial region is not actually on the Lanarkshire coalfield, but its industries are based on the Lanarkshire coal and the iron manufactures. From Glasgow to Greenock, a distance of 20 miles, with docks lining both banks of the Clyde, is the greatest shipbuilding district in the world. Some thirty shipbuilding firms have their headquarters on Clydebank, including that of John Brown and Co., Ltd., who in 1936 completed the building of the *Queen Mary.*

Much of the success and pre-eminence of the Clydebank shipbuilding area is due to the deepening and constant dredging of the Clyde estuary, thus enabling the port of Glasgow to keep pace with the steady increase in the size of ships. The shipbuilding industry owes much to the nearby supplies of coal **and** iron ore, to the sheltered position of the Clyde estuary, and to the early start of the construction of steam-ships in this region, which dates from the building of the

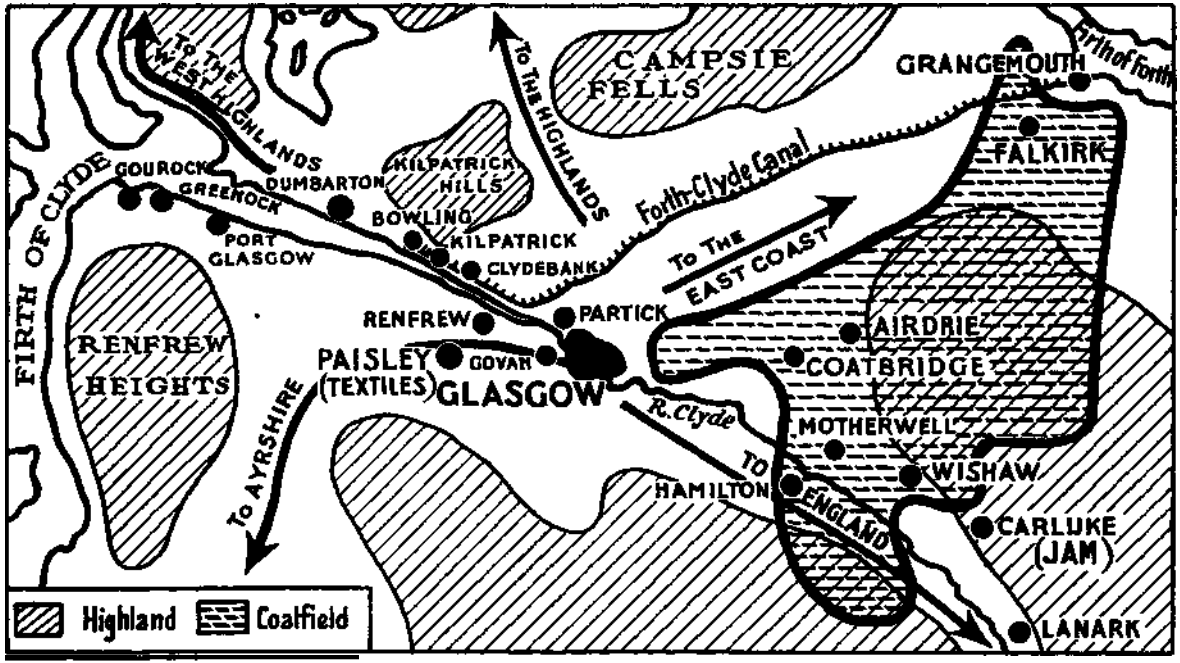


Fig. 107. THE LOWER CLYDE AND ITS ESTUARY.—TO show: **(a) the iron working towns on the coalfield south-east of Glasgow; *(b)* the shipbuilding towns of the Clyde estuary north-west of Glasgow; *(c)* Glasgow as a route centre.**

Comet in 1812. Some of the shipbuilding centres of the Clyde estuary are Partick, Clydebank, Bowling, Dumbarton, Port Glasgow and Greenock (Fig. 107). Marine engineering, *i.e.* the manufacture of boilers, marine engines, etc., rank next in importance to shipbuilding, and is complementary to it. Glasgow is primarily an engineering centre, but it has a great variety of industries based on its imports, and on the needs of its great population. Thus there are flour mills, paper mills, soap works, oil refineries, chemical works, dye works, glass works, and a whole range of " luxury " industries, including the making of confectionery, furniture, etc.

The Glasgow region is a miniature South-East Lancashire, in that all branches of the cotton industry are represented, spinning, weaving, bleaching, dyeing, etc. Paisley, noted for its cotton thread, is the chief centre. There are also some woollen industries in Glasgow, including the manufacture of carpets.

Glasgow is the second city in Britain, and ranks as sixth port according to total trade (see Fig. 85). The export trade, however, is so great that it ranks next to that of London and Liverpool. The importance of Glasgow is due to a number of factors, viz :—

(1) It was originally the market centre of the agricultural lands of the lower Clyde.

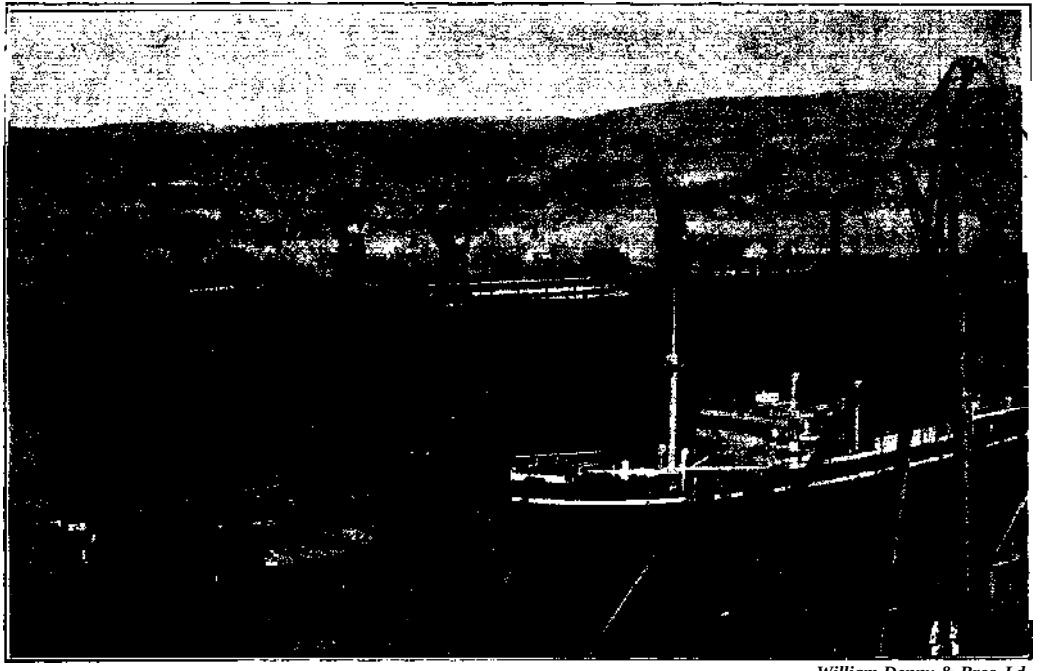
(2) At the lowest bridging point of the Clyde, it is the natural focus of land routes, *(a)* to the Highlands via Loch Lomond, *(b)* to the Forth via the Clyde-Forth corridor, *(c)* to England via the Upper Clyde and Annan valley, *(d)* to Ayrshire via the Lochwinnock gap east of the Renfrew Heights.

(3) Situated on the west of Scotland it had the right " outlook " at the time of the rise of trade with America.

(4) It is on the only large estuary on the west coast of Scotland.

(5) It is backed by the densely-populated and highly industrialised Central Plain.

Greenock, on the south bank of the Clyde, has sugar refineries due to long-established trade connections with the West Indies.



William Denny & Bros Ld

A SHIPBUILDING YARD ON THE CLYDE.

A partially-built ship can be seen in the middle of the picture.

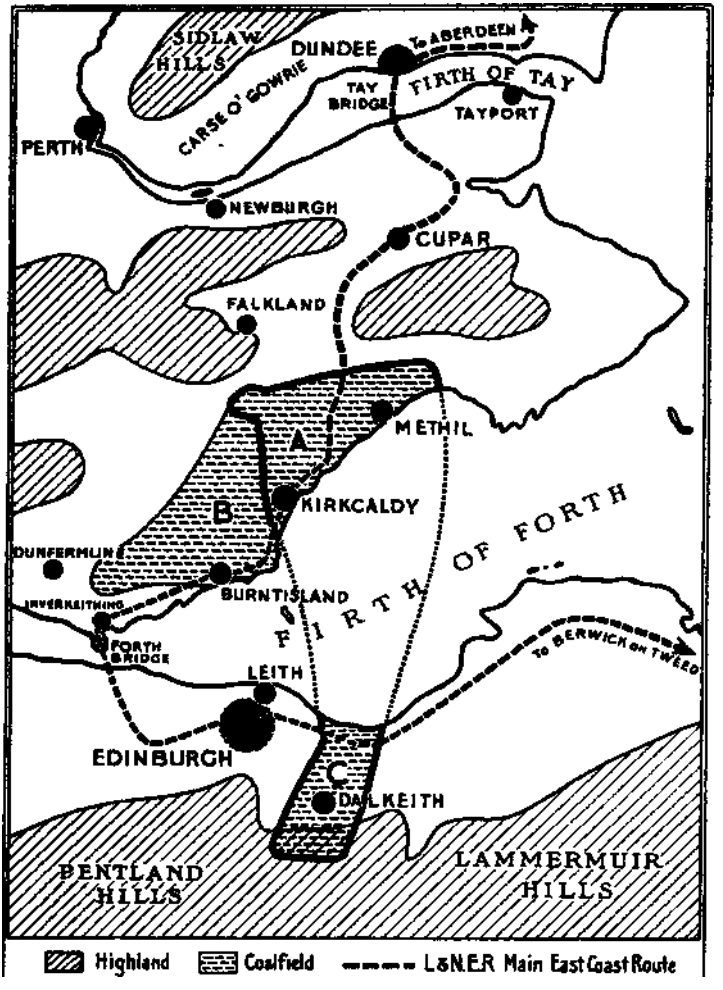


Fig. 108. THE EASTERN COALFIELD OF SCOTLAND. A and B. Fifeshire coalfield (B is the concealed coalfield). C. Midlothian coalfield.

(Ill) THE EASTERN COALFIELDS (Fig. 108). These comprise the Lothian coalfield on the south side of the Firth of Forth and the Fifeshire coalfield on the north side.

(a) The Lothian Coalfield. Situated in the counties of Edinburgh and Haddington this field is notable for its increased

coal output in recent years (Fig. 105), and also for its deposits of shale from which oil is extracted. Edinburgh, the capital of Scotland, is the chief centre of this region. Many of its industries are those connected with its functions as a capital, and'"luxury" industries to supply the needs of a large professional population. Thus paper-making, printing, book-binding, brewing and distilling, and the manufacture of biscuits and confectionery are important industries.

The paper industry is due to (i) the local demands for paper in connection with government departments and the university, (ii) the ease with which supplies of wood pulp can be obtained from Scandinavia and Finland, and (iii) the supplies of clean water in the Esk valley. Brewing and distilling are connected with the local supplies of barley, though large quantities of this grain are now imported. Engineering industries are also important.

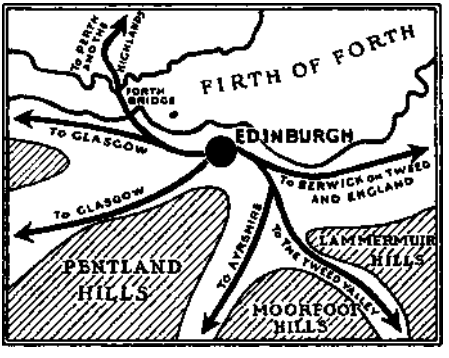


Fig. 109. THE POSITION OF EDINBURGH, to show its control of routes, and its position guarding the narrow lowland between the hills and the sea.

Edinburgh (Fig. 109) grew up around a volcanic hill surmounted by a castle, which guarded the east coast route between the Southern Uplands and the coast, the easiest entry into the Scottish Lowlands from England. As the capital of Scotland before the Union with England, it undoubtedly owed much to its strategic position. Like London, it stands on the eastern side of rich agricultural plains, and had important trade and cultural relations with Europe before the discovery of America led to a rapid growth of Glasgow, now more than twice as large as Edinburgh.

Leith is the port of Edinburgh and is the second port of Scotland, though its trade does not amount to one-third that of Glasgow. The trade of Leith is mainly connected

with the import of dairy produce, bacon, and wood pulp from the Baltic countries, and with the export of coal.

(b) The Fifeshire Coalfield. As in the Lothian coalfield there has been a notable increase in the output of coal during recent years. The coalfield extends along the coast from Largs to Kirkcaldy, and inland its westward extension reaches nearly to Dunfermline. A remarkable feature of this coalfield is the volume of its coal export trade through the ports of Methil and Burntisland to the Baltic countries. Methil is a specially-constructed coal-port, which, though small from the point of view of its population, has, owing to its coal trade, become the fourth port in Scotland.

Kirkcaldy is the centre of the linoleum industry. The jute base of the linoleum is obtained from Dundee, and the necessary cork and linseed oil are imported. Falkland, in Central Fife, and Newburgh, on the northern coast of Fife, though not quite on the coalfield, are also engaged in the manufacture of linoleum. Inverkeithing, the port of the ancient city of Dunfermline, has engineering industries. At the narrowest part of the Forth estuary near Inverkeithing is the Forth Bridge.

On the eastern shore of Fife, away from the coalfield, is St. Andrews, famous for its old university and its golf links.

DUNDEE. On the north shore of the Firth of Tay, at the crossing point of the Firth of Tay by the Tay Bridge, Dundee is not on a coalfield, but is an important industrial centre, the third city and fifth port of Scotland. It has many important industries, the chief of which is engineering, the making of jam and marmalade, the manufacture of linen, and of hemp and jute into string, ropes, nets, sailcloth, canvas and sacking. With the exception of local supplies of fruit, all the raw materials for these industries have to be imported, viz. pig-iron from the Tees basin, oranges from Spain, flax and hemp from the countries of the North European Plain and Russia, and jute from India.

The origin of the linen industries of Dundee was due to local supplies of home-grown flax. Other linen-weaving centres of eastern Scotland are Arbroath, Forfar, and Brechin. With the rapid increase in population in the Central Lowlands, following the Industrial Revolution,

Scottish farmers found it more profitable to grow food than flax, hence flax had to be imported, and with it was imported hemp, the bulk of which also comes from the countries of the North European plain. The demands of the North Sea fishing industry for ropes, nets and sailcloth led to a rapid growth of the hemp industry. The main source of supply of both flax and hemp is Russia. The breaking of commercial relations with Russia during the Crimean war cut off the supplies of flax and hemp, and so Dundee had to import suitable substitutes, viz. jute from India, sisal hemp from Mexico and Manila hemp from the Philippines. When Russian supplies were again available Dundee still continued to import and to manufacture the " new " fibres, and to-day the jute manufactures completely overshadow the manufactures of flax and hemp. Over 99 per cent, of the world's supply of jute is grown in the lower Ganges valley. The jute was sent to Dundee for manufacture, and the sacking sent back to India for the packing of exports. Indian merchants realised that if jute sacking were made in India that the expense of the carriage to Scotland and back would be saved. Large jute factories have been built near Calcutta (some by Scottish manufacturers), and, since labour in India is plentiful and cheap, sacking can be manufactured much more cheaply than in Dundee. As a result there has been serious depression in the Dundee jute trade, with resultant unemployment through the closing of factories unable to withstand the Indian competition.

Gateway Towns

Long before the period of industrial development the fertile plains of the Lowlands were more densely-peopled than the more barren Highlands to the north and Uplands to the south. Driven outwards by the unproductiveness of their own lands, and lured by the fertility of the Central Lowlands, the hill peoples made constant raids on the rich farm lands of the plains. Added to which the Lowlands were always aware of the possibilities of attacks from England beyond the Border. In order to guard their lands they built fortresses at the important natural" gateways." Around these castles, market towns grew which centuries later became important railway centres. The strategic importance of Edinburgh guarding

the main route from England has already been noted. More spectacular is the line of " castle " towns on the north side of the Lowlands (Fig. 110).

DUMBARTON. The capital of the old kingdom of Strathclyde, Dumbarton guards the route to the Western Highlands via the north bank of the Clyde estuary and Loch Lomond.

STIRLING. At the lowest point of bridging of the Forth, with its castle perched on a plug of volcanic rock, similar to the Castle Rock of Edinburgh, Stirling controls the route between the Campsie Fells and Ochil Hills.

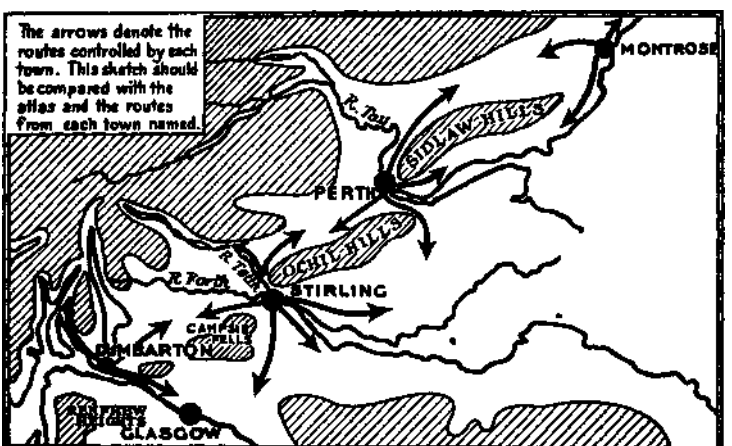


Fig. 110. THE GATEWAY TOWNS ON THE NORTHERN SIDE OF THE CENTRAL LOWLANDS.

PERTH. At the lowest point of bridging of the Tay, Perth guards the route between the Ochil Hills and the Sidlaw Hills which leads to the central region of the Highlands. This route follows the valley of the rivers Tay and Spey to Inverness and thence follows the east coast plains to Wick and Thurso.

MONTROSE. Situated on a " bar " and almost surrounded by water, Montrose guards the coastal route between the Sidlaw Hills and the sea.

To-day these four towns control the road and rail routes to the Highlands and later will be taken as the starting points of the railways which serve Northern Scotland.

Photo by Valentine, Dundee.

STIRLING.

In the background are the Ochil Hills. In the centre of the picture is the town and **the** castle hill. In the foreground is the River Forth meandering across the lowland.

CHAPTER XXIV

SCOTLAND

(3) THE NORTHERN HIGHLANDS

The Highlands of Scotland lie north of the line from Helensburgh to Stonehaven. They can be divided into two sharply contrasting areas, viz. *(a)* the plains bordering the east coast, and *(b)* the Highlands and islands of the remainder of the region.

The Mountain Region

The true Highland zone is a plateau of ancient sedimentary, volcanic and metamorphic rocks, which has been deeply dissected by ice and river action. The plateau is broken into two sections by the deep rift of Glenmore, in which lie lochs Ness, Oich, and Lochy, joined by the Caledonian Canal. To the South of Glenmore are the Grampians, higher and more deeply dissected than the North-West Highlands to the north of Glenmore. In the Grampians are the well-known peaks of Ben Nevis (4406 feet), Cairngorm (4241 feet), Cairntoul (4064 feet), Ben Macdhui (4296 feet), and Lochnagar (3768 feet).

The west coast of the Highlands is of the fiord type, deeply indented with long sea lochs, the result of glaciation, faulting and submergence. Off this coast are hundreds of islands and islets which fall into two groups, *(a)* the Inner Hebrides, including the islands of Islay, Jura, Mull, Tiree, Coll and Skye, *(b)* the Outer Hebrides, including Harris and Lewis, North and South Uist, and Barra. The Outer Hebrides and the Inner Hebrides are separated by a submerged rift valley known as the Minch. At the time of their formation there wefe extensive lava flows, the remains of which are to be seen in the basaltic heights of the Coolin Hills (Skye), Ben More (Mull), in the columnar formations of Fingal's Cave **on** the Isle of Staffa, and the Antrim plateau of Northern Ireland. **The** Outer Hebrides are, except for **a** portion of Harris, much lower than the Inner Hebrides. The combination

of islands, sea lochs and narrow cliff-bordered sounds makes this coast extremely picturesque, but it is of little economic value.

The general slope of the Highlands is from the west to the east where the old rocks dip under the newer and less resistant rocks of the east coast plain. The western rivers are short, swift mountain torrents, while the east-flowing streams, though rapid in their upper courses, are longer.

The longest rivers are those from the Grampians, viz. the Tay flowing south-east, the Dee and Don flowing east, and the Deveron and Spey flowing north-east. The rivers of the North-West Highlands are shorter. In the courses of many of the rivers are deep long ribbon-shaped lakes, formed partly by the scooping action of ice and partly by the deposition of morainic dams across the valleys. Some of the most noted of these lakes are Lochs Lomond, Tay, Rannoch, Awe, Shin, and Maree.

CLIMATE. Because of their altitude the Highlands have cold winters and cool summers, and because of their exposure to westerly winds and their proximity to the main track of depressions, the rainfall is heavy. Fort William, has nearly 80 inches per annum, and Ben Nevis 180 inches. In addition there is a high percentage of cloudiness, and mists are common. The rainfall decreases rapidly eastwards to under 30 inches on the east coast plains.

POPULATION AND ECONOMIC DEVELOPMENT. The average population of the Highlands is less than one person per square mile (Fig. 111). There are few natural resources, no mineral wealth, and the old hard rock yields only a thin soil which is usually infertile; moreover, the climatic conditions do not favour agriculture, and communications are generally difficult. Except for a few towns on the west coast, *e.g.* railway termini, such as Mallaig, or seaside resorts, such as Oban, the population is to be found in scattered hamlets on the coast and in the glens. The high plateau regions are moorlands of heather, bracken, and coarse grass. These are sometimes used for sheep runs, but more often they are preserved as deer forests or grouse moors. Occasional shepherds' huts or shooting boxes are the only signs of habitation. In the valleys there is some farming,

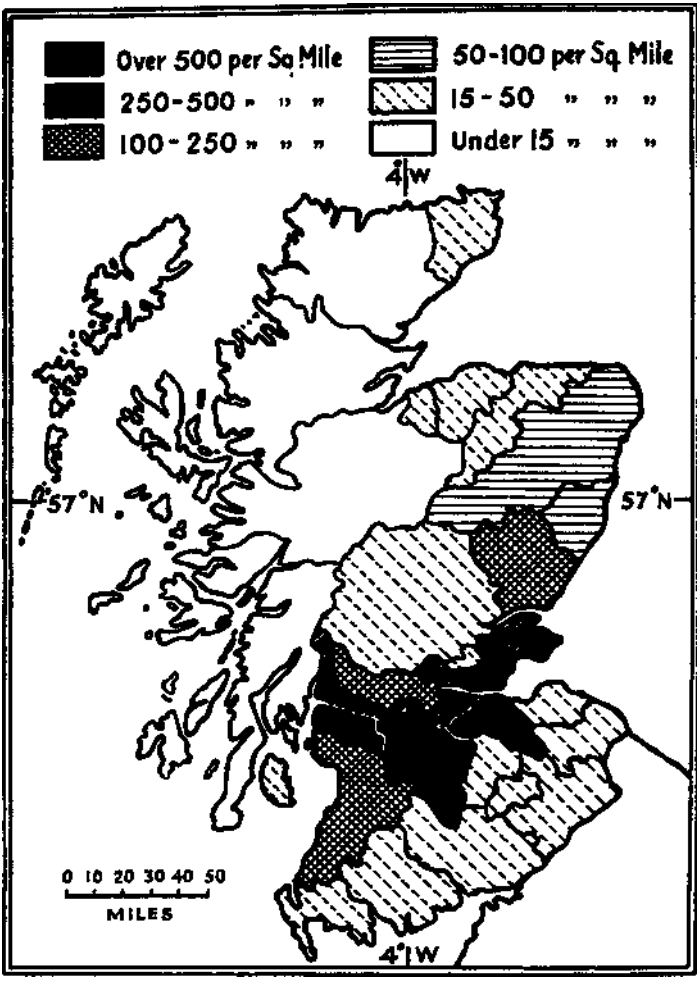


Fig. 111. POPULATION MAP OF SCOTLAND BY COUNTIES.

cattle and sheep are reared, and crops of oats and potatoes are raised. These are not, as a rule, money crops, only sufficient being grown to satisfy the needs of the population. Near the coasts these Scottish peasant farmers turn to fishing to supplement agriculture, and are known as " crofters." As they have little to sell they can buy little, and most of their

needs have to be satisfied by what they themselves can produce. Their one or two cows provide milk, cheese, and butter; their pigs bacon; their fields potatoes, cabbages, and oats for oatcakes and porridge. Their somewhat meagre food supply is eked out by fish (often salted for the winter), and by rabbits. They dig peat for their fires, and in many of the remoter regions still spin and weave wool. The tweeds of Harris and the hand-made shawls of Shetland are well known, and it is by the sale of these goods that the crofters obtain the money wherewith to buy such necessities as they cannot produce themselves. The dwellings of the crofters are long, low cabins, built of roughly-hewn stone, clustered together in some sheltered spot. The standard of living is necessarily low, and it is not surprising that for many decades the total population of these remote Highlands areas has been declining. In respect to its dwindling population, the Highlands of Scotland can be compared with the moorlands of central Wales (see page 65).

WATER-POWER. Because of the swiftness of the streams water-power has been developed at several places within the Highlands, e.g. at Foyers, where there are aluminium smelting works. The waters of Rannoch Moor are carried westward to the generating station at Kinlochleven. Loch Rannoch is also the centre for the development of hydro-electricity for the lower Tay valley and Dundee. The most spectacular hydro-electricity scheme is that which supplies Lochaber, a small town two miles from Fort William. A tunnel is being constructed through Ben Nevis to carry to Lochaber the waters of the moorlands to the east. The development of other hydro-electric generating stations might give the west coast of the Highlands a new economic outlook.

The Eastern Plains

The eastern coastal plains offer a great contrast to the highland areas. Here are relatively low plains partly composed of Old Red Sandstone, which yields a richer and deeper soil than the old hard rocks of the Highlands. These plains are sheltered by the mountains to the west, and the rainfall is about 30 in. per annum. Moreover, there is less cloudiness. On these plains mixed farming is practised. In the triangular

The North British Aluminium Co., Ltd.

LOCHABER.

This view is taken looking down the pipelines towards Lochaber and the aluminium works.

plain of Caithness (where the summers are too cool for wheat or barley) oats, turnips, and potatoes are the chief crops, and cattle are extensively reared especially for meat. Further south, on the sheltered plains at the head of the Moray Firth, wheat can be grown in limited quantities, chiefly as a result of the length of the summer days and the exceptionally sheltered position. The coastlands of Nairn, Moray, and Banff, and the Buchan plain also grow oats and roots, and in particular the Buchan lowlands are famous as a cattle fattening region.

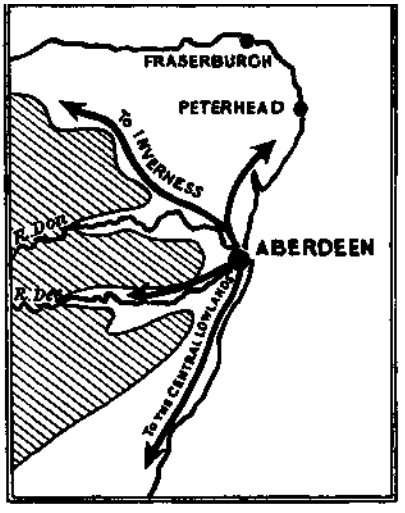


Fig. 112. THE POSITION OF ABERDEEN.

TOWNS OF NORTHERN SCOTLAND. The coastal towns, Wick, Thurso, Fraserburgh, Peterhead, and Aberdeen are important as fishing centres. Of the towns of Northern Scotland only three have a population exceeding 10,000, viz. Aberdeen, Inverness, and Peterhead. Fraserburgh, Elgin, Oban, and Wick each have a population of over 5000 and under 10,000, and the remainder of the " towns " marked on the map are all very small.

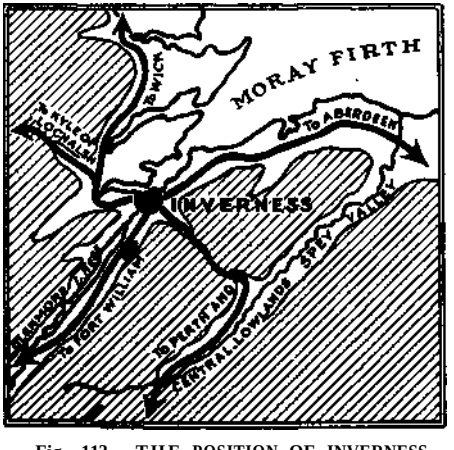


Fig. 113. THE POSITION OF INVERNESS.

Aberdeen (Fig. 112), situated at the mouths of the Rivers Dee and Don, controls the chief route into the Highlands up the Dee valley to Ballater, Braemar, and Balmoral. In the neighbourhood of the town are well-known granite quarries.

Inverness (Fig. 113), at the north-eastern end of Glenmore is an important route centre, and lies on the main L.M.S. route to Wick and Thurso. It is becoming increasingly important as a tourist centre.

POPULATION OF THE COASTAL PLAIN. The population of the coastal plain is over 100 per square mile, and under 50 per square mile in the valleys; a strong contrast to the almost uninhabited moorlands. The greater density of population of the coastal plain is the result of the drier climate, richer soils, the greater extent of agricultural land, easier communications, and the fishing industry. With the exception of Argyll, all the Highland counties have a share of the coastal plain, and the county towns are in every case on the eastern "plain" section where the bulk of the population has congregated.

The Orkney Islands are similar in structure and agricultural activities to the east coast plain, but the Shetland Isles are composed of the same type of rocks as the Highlands.

The Railways of the Northern Highlands

The Highlands are served by four main railway routes from the Lowlands (Fig. 114):—

(1) From Glasgow along the northern shores of the Firth of Clyde, and along the coast of Loch Long to the northern end of Loch Lomond. Thence the railway winds northwards over the wild Rannoch Moors to Fort William. From Fort William the railway proceeds westward to Mallaig, a ferry town for Skye.

(2) From Stirling a railway follows the Teith valley to Callander, at the eastern end of the Trossachs. From Callander this railway continues northwards to the western end of Loch Tay. Here it turns westwards and follows the valley of the Awe to Oban, from which town there is steamer-connection with the Western Isles.

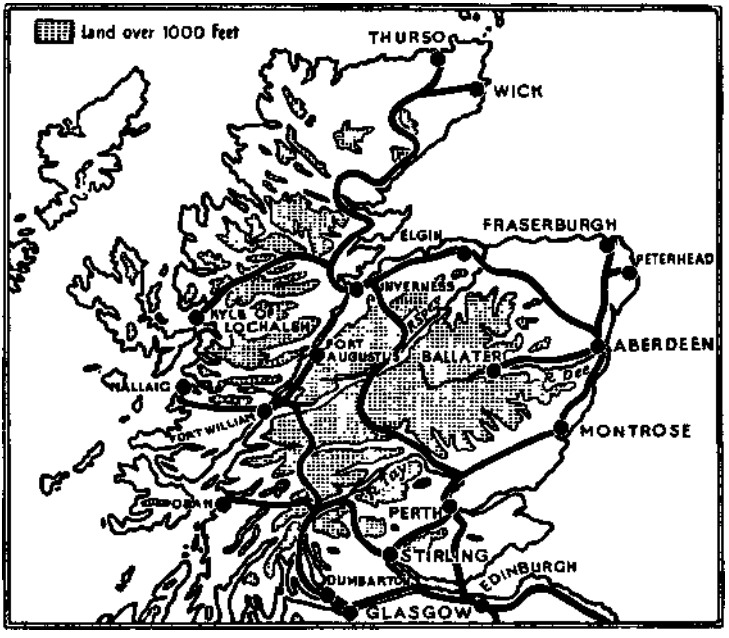


Fig. 114. THE RAILWAYS OF NORTHERN SCOTLAND.

(3) From Perth an important railway route ascends the valley of the Tay and its tributaries, the Tummel and the Garry. It passes from Glen Garry to the Upper Spey by the pass of Drumochter. Kingussie, in the upper Spey valley, is the tourist centre for the Cairngorm area. Leaving the Spey valley the railway crosses the Monadliath Mountains to Inverness. Northwards of Inverness the railway takes a circuitous route around the heads of Moray, Cromarty, and Dornoch Firths and, by following the coastal plains and the Helmsdale valley, reaches Wick and Thurso. A branch of this railway strikes westward from Inverness to Strome Ferry and the Kyle of Lochalsh, another centre of steamer-communication with Skye and the Western Isles.

(4) From Perth or Dundee a route follows the coastal plains through Montrose and Stonehaven to Aberdeen. It then turns north-westward across the Aberdeen lowland to Elgin, Nairn, and Inverness.

The west coast of Scotland north of the Central Lowlands is only served by railway at four points, viz. Oban, Mallaig, Strome Ferry, and the Kyle of Lochalsh. Between the Kyle of Lochalsh and Thurso the coastal areas are devoid of railway communication, but the development of omnibus services has, in recent years, done much to lessen the isolation of the north-western hamlets and villages.

CHAPTER XXV

IRELAND

The Ways to Ireland

Just as England is linked to the mainland of Europe by regular steamer services from packet stations, so there are regular steamer services to Ireland. In determining routes for mail and passenger steamers, the main consideration is the saving of time, hence ferry towns are situated at points where the intervening seas are narrowest. For instance, mail and passenger boats ply between Dublin and Holyhead, a distance of 61 miles, but boats carrying cargo *(e.g.* live cattle) for which cheap carriage is essential, often take the longer route to Liverpool or Birkenhead, a distance of 120 miles.

The packet stations are operated by the railway companies serving the west coast. Since the amalgamation of the railways all the Irish ferries, with the exception of the Fishguard-Rosslare route (G.W.R.), are controlled by the L.M.S. railway. The principal routes to Ireland and the packet stations are shown on Fig. 115.

Political Divisions

In Ireland there are two political units:—

(1) NORTHERN IRELAND, which sends parliamentary representatives to Westminster, and which consists of the counties Down, Antrim, Londonderry, Tyrone, Fermanagh, and Armagh, six of the nine counties of the original province of Ulster.

(2) THE IRISH FREE STATE, consisting of the remainder of Ireland, which is a self-governing Dominion of the British Empire, and has its own parliament at Dublin.

The reasons for the separation of the Irish Free State are:—

(a) The great cultural and racial differences between the Irish and the English. Ireland was not invaded by the Romans or the Anglo-Saxons, and her peoples are descended from the early Celtic inhabitants of Britain. In their outlook on life, language, and religion the Irish differ from their English neighbours.

(b) The grievances that Ireland has accumulated against England in past centuries, chiefly in relation to the Cromwellian invasions, the acquisition of Irish land by the English nobles, and the strong feeling that the money obtained from rentals and taxes was not used for the improvement of conditions in Ireland.

(c) The creation of self-governing Dominions within the British Empire early this century caused Ireland to demand the same privileges. It was only after a bitter struggle that self-government was granted to the Irish Free State in 1921.

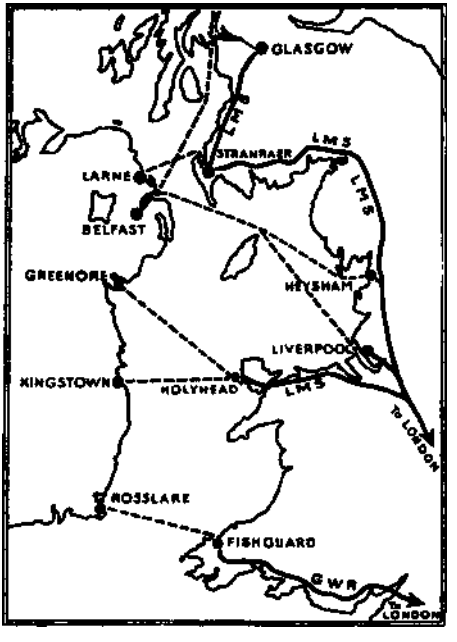


Fig. 115. THE FERRIES TO IRELAND.

The six counties of Northern Ireland differ from the Irish Free State in that there are fewer Roman Catholics, and a higher percentage of people not of pure Irish lineage, largely due to the "plantation" of Scottish settlers during the reign of James I. The people of Northern Ireland have many Scotch characteristics and are more thrifty, far-seeing, and methodical than the more carefree, happy-go-lucky, quick-tempered peoples of the south.

Relief and Structure

The study of a geological map shows striking similarities between the rocks and structure of Ireland and the west of Great Britain, and would suggest that the two islands were connected in early geological periods. The major points of similarity (shown on Fig. 116) are:—

Fig. 116. To SHOW STRUCTURAL CONNECTIONS BETWEEN GREAT BRITAIN AND IRELAND.

(1) The old hard rocks of the Northern Highlands of Scotland are continued in the Mountains of Donegal, Mayo, and Connemara.

(2) The rocks of the Southern Uplands are similar to those of the Mourne Mountains.

(3) The Welsh Mountains and the Wicklow Mountains are of similar structure.

All the foregoing mountains are characterised by the same north-east to south-west trend (" The Caledonian Trend ")•

(4) The rocks of south-west Ireland and of Cornwall and Devon are similar (the Armorican System).

Although the popular idea of Ireland being saucer-shaped is erroneous, nevertheless the mountains of Ireland are arranged near the coast, but rise in detached blocks which nowhere present the length of unbroken highland found in the Welsh Mountains, the Pennines, and the Highlands of Scotland. The northern group of coastal highlands includes the Mountains of Connemara and Mayo and the Mountains of Donegal, the Sperrin Mountains, the Antrim Plateau, and the Mourne Mountains.

The southern group of mountains comprises Wicklow Mountains, the Knockmealdown Mountains, and the mountains of Kerry, including Macgillycuddy's Reeks with the highest mountain of Ireland, viz. Carrantuohill (3414 ft.).

Between the two groups of highlands is the Central Plain, which reaches the east coast between Dublin and Dundalk and the west coast at Galway and Limerick.

The largest river in Ireland is the Shannon (220 miles), which flows roughly north to south over the western portion of the Central Plain. In its course it passes through a number of broad shallow lakes, *e.g.* Loughs Allen, Ree, and Derg, which have been formed in some cases by the solution of limestone. After leaving Lough Derg the Shannon flows through a gap between the Slieve Bernagh and Silvermine Mountains. In this section of its course there are rapids, which have been utilised for the generation of hydro-electricity. The River Suck and the River Brosna are the principal tributaries of the Shannon.

Other important rivers of Ireland are the Lagan, Boyne, Liffey, and Slaney, draining to the east coast; the Barrow, Nore, Suir, Blackwater, Lee, and Bandon, draining to the south coast (note the parallelism of the courses of the four last-named); and the Foyle and Bann draining to the north coast. Except for the Shannon, the rivers flowing to the west coast are short and unimportant.

Climate

The outstanding features of the climate of Ireland are its humidity and its equability. Winter temperatures never fall below 40° F. except in the north-east, and the average July temperatures are always below 60° F., except in the south-east, within the loop of the 60° F., isotherm (see Fig. 12). Thus everywhere in the west the mean annual range of temperature is less than 20° F., and even in the most easterly districts around Dublin the range is only 19° F. Only in the eastern portion of the Central Plains does the range exceed 20° F. (cf. London, 26° F.).

As Ireland is further west than Britain it receives the full force of the rain-bearing westerlies and cyclonic storms. The rainfall of Ireland is therefore heavy, but, because of the breaks in the mountains of the west, the winds carry the rain inland, and the strong contrasts in rainfall distribution found in Britain are absent in Ireland. The rainfall is neither so heavy near the west coast, nor so light near the east coast as in England, and it is more evenly distributed over the whole country (see Fig. 14). Two small mountainous areas on the west have over 80 in. of rainfall, viz. the mountains of Kerry and Connemara. Only a small area around Dublin has less than 30 in., and the remainder of the Central Plain has between 30 and 40 in. (contrast the English plain with an average rainfall of less than 30 inches).

Agriculture

The climate of Ireland strongly influences agricultural activities. Over most of Ireland the summer temperatures are generally too low for the ripening of wheat and barley, so that oats are everywhere the most important cereal crop (see Figs. 18, 19, and 20). The district with the highest summer temperatures, viz. the south-east in the valleys of the

Suir, Nore, Barrow, and Slaney, has the greatest acreage devoted to cereals. The warm winters, (particularly in the south-west), allow the growth of grass almost throughout the year, so that there is a high percentage of permanent pasture devoted to cattle rearing. The humidity of the atmosphere, the absence of any well-defined dry season, and the prevalence of cloud, have resulted in that greenness of the Irish pastures which have earned for Ireland the name " Emerald Isle." A hundred years ago, before large supplies of foreign grain were available, Ireland grew more cereals than she does to-day, the amount of arable land at the present time being only 45 per cent, of what it was in 1847. In the same period the amount of permanent pasture has increased, and the acreage devoted to hay has more than doubled. These changes in Irish agriculture are due to the competition of cheap foreign cereals, and the realisation that the Irish climate is not suitable for their really successful growth. The climatic conditions are, however, ideal for the production of grass and for dairying, and it is largely on the methodical organisation of the dairying industry that the future prosperity of Ireland depends. That Ireland has not yet developed her agricultural industries to the full is shown by the following figures:—

	SIZE IN SQ. ML.	VALUE OF CEREALS IN £1,000,000	VALUE OF DAIRY PRODUCE AND MEAT IN £1,000,000
England and Wales	65,700	21,403	56,266
Ireland	31,800	2,254	16,612
Scotland	30,400	4,615	8,900

The first column shows that Ireland and Scotland are approximately the same size, and each is about half the area of England and Wales. Bearing this fact in mind, the second column shows the relative unimportance of the Irish cereal cultivation. Scotland, the same size and with a higher proportion of barren moorland, produces twice as much, and relatively *(Le.* per sq. mile), the cereal production of England and Wales is five times as great as that of Ireland.

The third column indicates that, although the value of dairy produce in Ireland is twice as great as that of Scotland, in relation to size, dairy produce in England is nearly twice as

valuable as in Ireland. In the last decade rapid strides have **been made** by the establishment of creameries, and centralised depdts for milk collection. The industrial districts of England are **a** convenient market for Irish eggs, butter, and bacon.

The Five Divisions of Ireland

Ireland may be divided into a number of well-defined natural regions (Fig. 1), viz.:—

(1) Northern Ireland (as limited by the political boundary).

(2) The mountains of the north and west, including the mountains of Donegal, Connemara, and Mayo.

(3) The mountains and vales of the south-west.

(4) The mountains and vales of the south-east.

(5) The Central Plain.

NORTHERN IRELAND

Relief and Occupations

Five of the six counties of Northern Ireland touch Lough Neagh, and in the sixth county, Fermanagh, are the two lakes Upper and Lower Lough Erne.

RELIEF.—The simplest idea of the relief of Northern Ireland is to regard the lowlands as a cross, with Lough Neagh at the intersection of the two arms. The four lowland arms of the cross are the valleys of the Bann and Blackwater draining into Lough Neagh; of the Bann flowing out on the north; and the valley of the Lagan flowing eastwards from the Mourne Mountains to Belfast Lough (Fig. 117). In the four quadrants are the highland areas, viz.:—

(a) Between the lower Bann and the Lagan valley is the Antrim plateau, which is mainly composed of basalt, a black volcanic rock which sometimes splits so as to form hexagonal columns. This is well seen at the Giant's Causeway. Some of the cliff scenery is spectacular, belts of black columnar basalt alternating with layers of white chalk. In some parts of the plateau the chalk is exposed at the surface, and gives rise to typical chalk country, treeless downs, white roads,

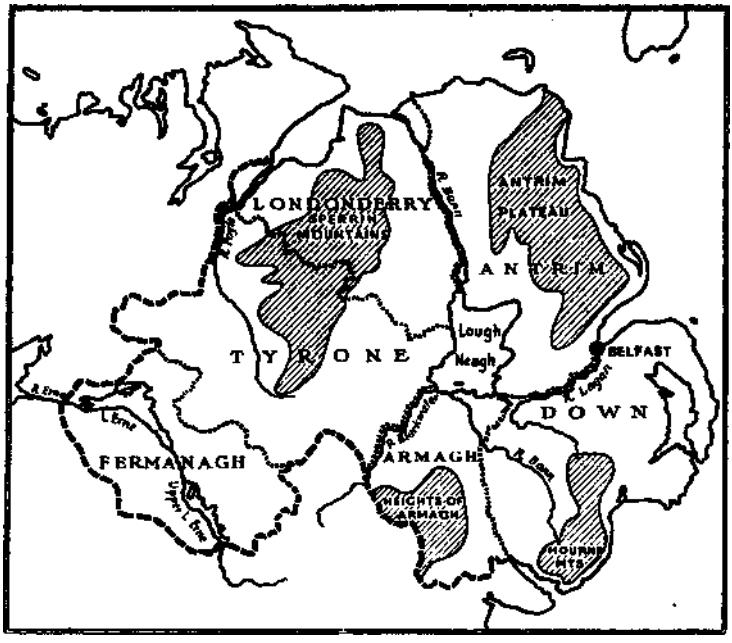


Fig. 117. NORTHERN IRELAND, TO SHOW THE CHIEF RELIEF FEATURES AND THE SIX COUNTIES.

and sheep rearing. Lough Neagh was formed by the subsidence of a portion of the basalt plateau.

(b) Between the Lagan and the Upper Bann are the Mourne Mountains, composed of rocks similar to those of the Southern Uplands of Scotland. The north-western edge of the Mourne Mountains is a fault line continuous with that of the Dunbar-Girvan fault in Scotland.

(c) Between the Upper Bann and the Blackwater the hills (Armagh Heights) are lower than, but similar in structure to, the Mourne Mountains.

(d) Between the Blackwater and the lower Bann are two distinct areas. The first, immediately north of the Blackwater, is a region of rolling country and low heights mainly composed of limestone and Old Red Sandstone. This region is structurally a continuation of the Scottish rift valley, and

Photo by Valentine Dundee

GIANT'S CAUSEWAY.

TJjis picture shows the six-sided columns typical of basalt.

there is a small area of exposed coal measures just to the west of the Lough Neagh at Dungannon. Further north are the Sperrin mountains, composed of ancient rocks similar to those of the Scottish Highlands.

The western boundary of Northern Ireland is the River Foyle, whose broad vale lies between the Sperrin Mountains and the Mountains of Donegal.

AGRICULTURE. The agricultural activities of Northern Ireland may be generalised as sheep rearing on the uplands, and other forms of farming in the river lowlands. Sheep rearing is most important on the uplands of County Down (cf. the Southern Uplands), and on the north of the Antrim plateau, especially where there is chalk downland. Of the cereals, oats are cultivated throughout the lowlands, but the acreage devoted to barley and wheat is almost negligible, and is mainly in the sheltered south-east of County Down (see Figs. 18, 19, and 20). Cattle rearing is important everywhere below 600 ft., but there are a few areas of major importance, viz. the damp lowlands of Fermanagh, the lowlands surrounding Lough Neagh and in the neighbourhood of Belfast (Island Magee). Cattle rearing for beef is especially important in the sandstone regions of the Lagan valley (compare the sandstone plains of Eastern Scotland).

The cultivation of flax is centred chiefly in the lower Bann valley and the Lough Neagh lowlands. Although flax used to be cultivated in other parts of Ireland, its production is now limited to Northern Ireland. The rearing of poultry and the production of eggs for export is of great importance, especially around Ballynahinch, a town about 15 miles south of Belfast. On account of the cool summers, fruit growing is relatively unimportant, the largest output being from Armagh. In the neighbourhood of Belfast, around Comber, there is some market gardening.

INDUSTRIES. In spite of the absence of adequate supplies of coal and iron, Northern Ireland has two important manufacturing industries, viz. shipbuilding and linen.

The shipbuilding industry is centred at Belfast, supplies of coal and iron ore being obtained from Ayrshire and Lanarkshire.

4 R. Hogg.

RETTING FLAX.

In this picture the flax, ready tied in bundles, is being placed in the lint hole, or retting dam, for the retting process.

Northern Ireland is the most important linen-manufacturing district in the British Isles, and its development is due to the local supplies of flax (see Fig. 118) and the fact that the river water is free from lime, a fact important for " retting," *i.e.* the separation of the fibres from the stem by soaking.

The chief centre of the linen industry is Belfast (Fig. 119). It is also to be found in every town and village of Northern Ireland, but notably in the lowlands west of Belfast, at such towns as Lisburn, Lurgan, Newtownards, Portadown, Banbridge, Ballymena and Lame. In the Foyle Valley, Londonderry, Lifford, and Strabane are noted for the manufacture of linen garments, *e.g.* shirts.

With the exception of Belfast and Londonderry, the towns engaged in linen manufacturing are all small (comparable in size with small English market towns). None of them has a population greater than 15,000, so that in this, the greatest manufacturing region of all Ireland, there is a complete

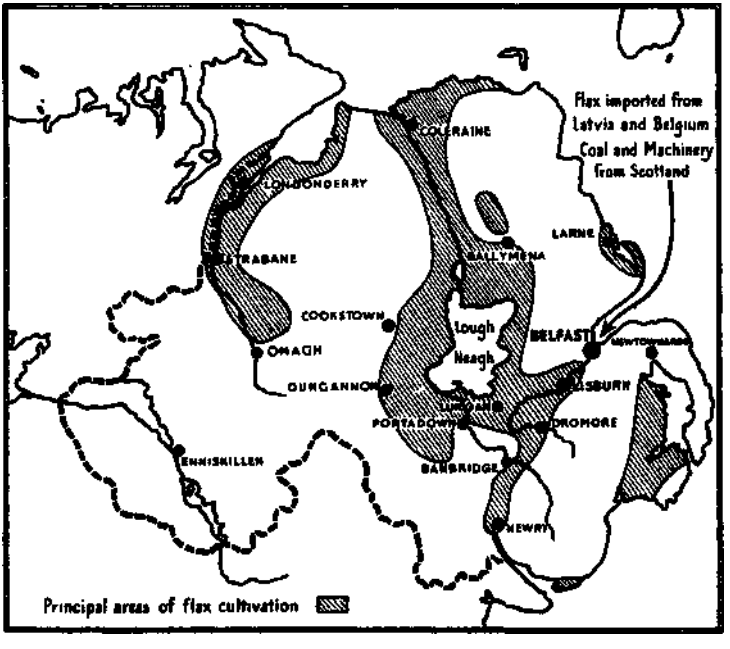


Fig. 118. THE LINEN TOWNS OF NORTHERN IRELAND.

absence of the densely-crowded industrial towns such as are associated with the Lancashire cotton industry.

The supply of Irish flax is insufficient for the needs of the industry, so that large quantities are imported from Latvia, Belgium, and Russia. Belfast also manufactures jute and hemp, and distils whisky.

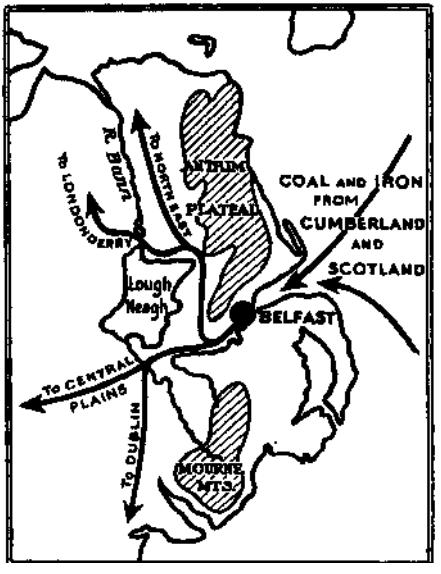


Fig. 119. THE POSITION OF BELFAST.

Londonderry, at the lowest bridging point of the River Foyle, is the outlet for dairy produce and linen goods from the Foyle lowlands. Near the mouth of the Foyle is Moville, a port of call for Transatlantic steamers from Glasgow to Quebec.

THE IRISH FREE STATE (EIRE)

The Mountains of the West and North-West

RELIEF AND CLIMATE. This district includes the mountains of Connemara, Mayo, and Donegal, regions of boggy uplands, and rugged peaks, such as the Twelve Pins of Connemara and Mount Errigal in Donegal. These mountains are composed of ancient rocks, and are similar in type to the Highlands of Scotland. They are the regions most remote from contact with modern developments (with them in this respect should be included also the western peninsulas of Kerry), and in them the Irish language and Irish customs have survived more strongly than elsewhere. It is here that the descendants of the earliest inhabitants of Britain are to be found.

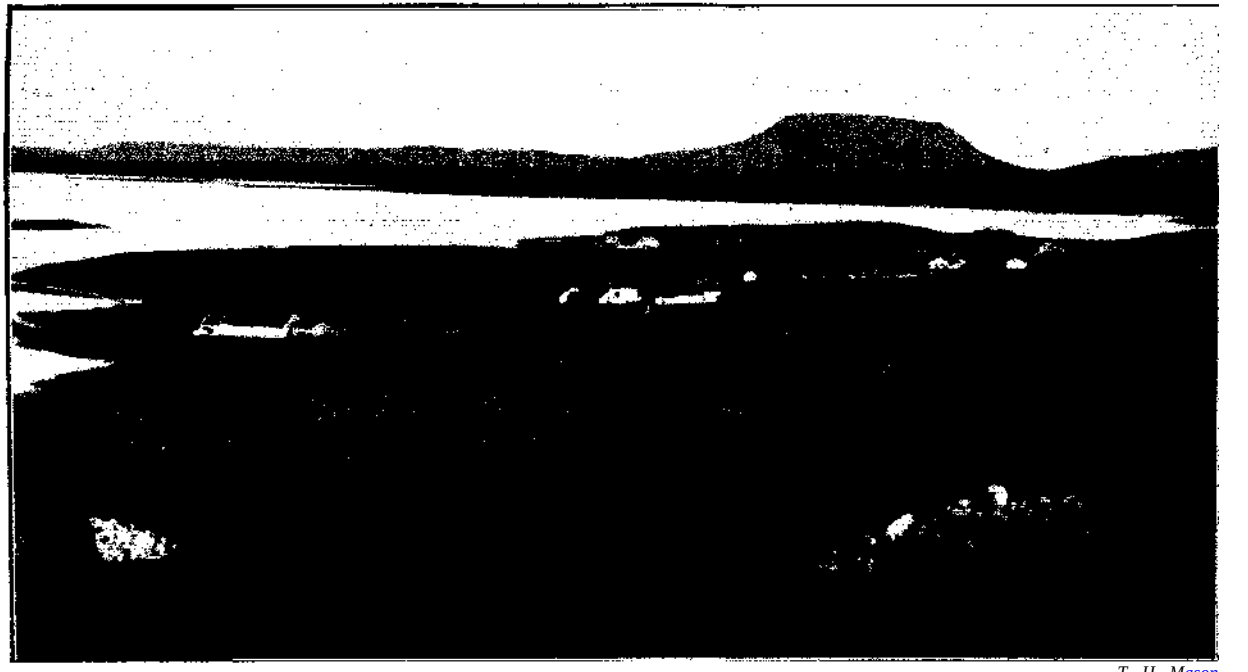
The exposure to the Atlantic winds, the hard rocks, thin soils, the damp atmosphere, and the remoteness and inaccessibility of these regions have all contributed to their backwardness.

THE PEOPLE AND THEIR MODE OF LIFE. As in the Scottish Highlands, the population is extremely scanty, much of the highland being uninhabited. Hamlets and small villages are clustered around the coast and in the more fertile valleys. Although the density of population is so low, these districts are often referred to as the " Congested Districts " of Ireland, for the natural resources are insufficient to support even the small numbers of people who struggle to eke out a meagre livelihood. The type of agriculture is similar to that practised by the Scottish crofters, *i.e.* the rearing of a few cattle, pigs, and poultry, and the cultivation of small crops of oats, potatoes, cabbages, and hay in small stony fields. Sheep are reared on the hill slopes, and from their wool the well-known Irish homespuns and Donegal tweeds are made by the cottagers. It is from these districts that there has been the highest percentage of emigration during the last few decades, particularly to America. At the end of last century schemes were formulated for the improvement of these western areas. Railways and roads were built, harbours reconstructed, fishing fleets reorganised, and some factories built, notably the carpet factory at Killybegs, where many of the carpets for the *Queen Mary* have been made. Though much has been done to improve the standard of living, it still remains extremely low. There are no large towns, the chief being market centres, such as Westport and Sligo, situated where railways reach the west coast.

The Mountains and Vales of the South-East

The south-east of Ireland consists of two regions: *(a)* the Wicklow Mountains, and *(b)* the land drained by the Rivers Suir, Nore, Barrow, and Slaney.

(a) The Wicklow Mountains, extending from Dublin southeastwards, are high moorlands similar in structure to the Welsh mountains. They rise to over 3000 ft. (Lugnaquilla 3030 ft.), and are dissected by beautiful broad, wooded vales,



T H Mason

A VIEW IN COUNTY DONEGAL.

A typical landscape in Donegal showing the small holdings of the peasant farmers.

such as the Vale of Avoca and the Vale of Glendalough. The slopes of the Wicklow Mountains form one of the most important sheep rearing areas in Ireland (see Fig. 25), and in the sheltered vales mixed agriculture is practised.

(b) The remainder of the south-east of Ireland is a rich agricultural region. Because of its easterly position, it has higher summer temperatures and less rainfall than the rest of Ireland. Hence it is the most important area for the cultivation of cereals, particularly oats and barley. Even in this relatively favoured region wheat cultivation is restricted to the most easterly lowlands of Wexford.

Root crops, such as turnips and mangolds, are more extensively cultivated than in any other part of Ireland. In recent years sugar-beet has been introduced, but its cultivation is limited to the valley of the Barrow and the Wexford lowlands (see Fig. 21). Sugar-beet factories have been opened at Thurles and Tipperary. As in all parts of Ireland, cattle rearing is important.

Between the valleys of the Nore and Barrow in the north of County Kilkenny and the south of Leix (Queen's County) are the most extensive coal deposits of Ireland, but the output is small, and there is no important industrial development. The chief towns are market towns such as Carlow, Kilkenny, Waterford, and Wexford. The two latter towns are also small ports, Waterford, on the estuary of the River Suir, has a small export trade in dairy produce. Wexford, on the estuary of the River Slaney, has suffered as a result of the building of Rosslare Harbour, the packet station for England, but still exports live cattle to Liverpool.

The Mountains **and** Vales of South-West Ireland

STRUCTURE AND RELIEF. Structurally, this region is part of the old Armorican system of highlands which is continued in Cornwall and Brittany. The most striking feature of the relief is the series of east to west mountain ranges composed of Old Red Sandstone. The intervening vales are composed of Carboniferous Limestone. Originally, parallel consequent streams* flowed southwards, and lateral east-west tributaries developed along the limestone vales. As the result of river

*** Sec *Foundations of Geography,* Preece and Wood, pp. 24 and 26.**

capture the present river system has evolved. The Rivers Bandon, Lee, Blackwater (and the Suir of the south-eastern region) all flow eastwards in broad longitudinal valleys, but before reaching the sea turn sharply southwards (compare the Wealden rivers, page 188). Wind gaps (the valleys of the original south-flowing streams) notch the sandstone ridges and make communication from Cork northwards, and from valley to valley, relatively easy. Consequently the railway from Cork to Limerick makes use of some of them *(e.g.* the gap at Mallow).

In the west of the region is the high sandstone mass of Macgillycuddy's Reeks, which is a barrier to communication between the coastlands of Kerry and the rest of Ireland. The coastline is of the " ria " type, *i.e.* long drowned valleys separated by hilly peninsulas. This district, like Connemara, Mayo, and Donegal, was until recently very isolated. Much of the highland is inhospitable, boggy, and unproductive, and the population correspondingly scanty. The beauty of the mountain, lake, and coastal scenery, and the mildness of the winters, are making this an increasingly popular tourist region. As in Cornwall, plants characteristic of the Mediterranean grow in the open, because of the absence of frost.

DAIRYING AND AGRICULTURE. TO the east of Kerry is the greatest dairy farming region in all Ireland (see Fig. 23). The heavy rainfall, warm winters, cool summers, and fertile soil all combine to produce pasture land unsurpassed by that of any other section of the British Isles. Ireland has not a large population, hence there is a large surplus of milk. To-day this is made into butter and cheese in co-operative creameries. It is noteworthy that nearly 90 per cent, of the milk produced to-day in the county of Limerick is collected and dealt with by the creameries. The development of the Shannon hydro-electricity scheme has produced cheap power for these establishments (see page 273). Skimmed milk is used for feeding pigs, hence this region is also important for its large output of bacon and ham. There are bacon factories at Limerick and Cork.

Oats are the chief cereal crop, and potatoes and turnips are grown. Sheep rearing is of little importance.

CORK. Cork is a large city situated at the lowest bridging point of the River Lee, and at the head of Cork harbour (Fig. 120). The lower harbour of Cork, at Queenstown (Cobh) on Great Island, is a caHing port for Transatlantic liners. Cork exports live cattle, dairy produce, and bacon, and imports large quantities of coal and maize, the latter for the feeding of cattle. Of relatively recent introduction is the manufacture of motor cars.

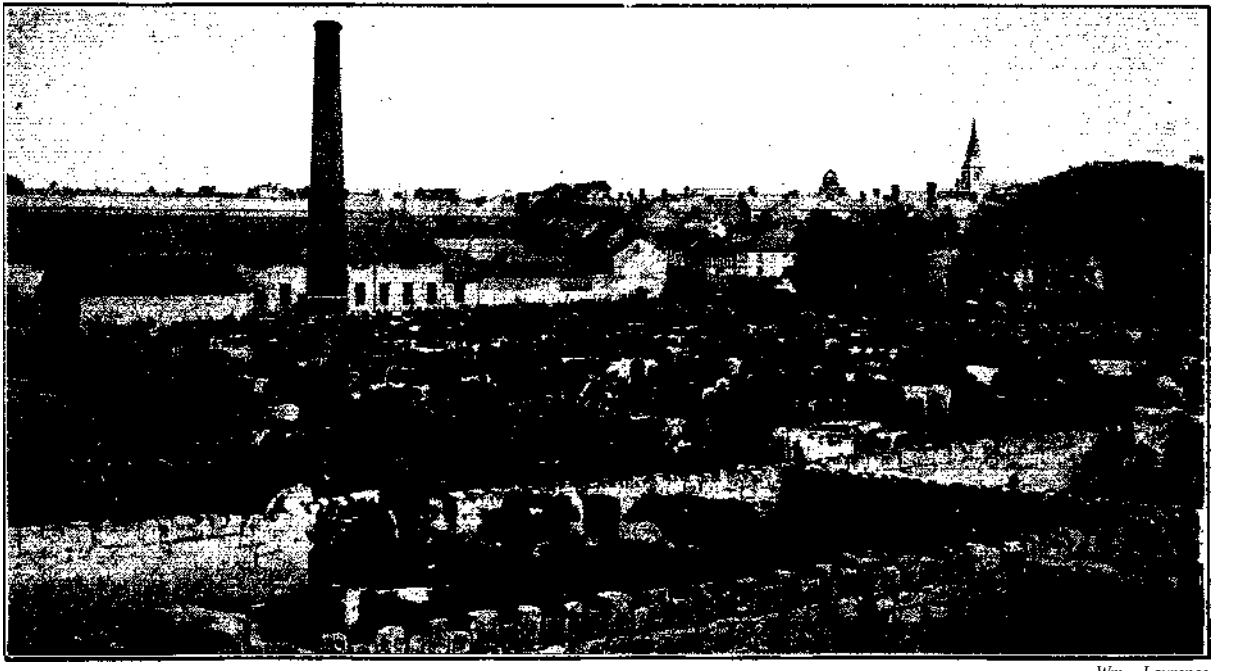
Fig. 120. To show: *(a)* The parallel arrangement of hills and valleys in the hinterland of Cork, *(b)* The gaps in these hills which facilitate communication inland, (c) The position of Cork as an export centre for dairy produce from the Golden Vale, *(d)* The relative unimportance of Limerick as a port for the Golden Vale.

Other towns of the region, such as Tipperary, Mallow, Fermoy, are all small market centres.

Valentia, on the coast of Kerry, is the point from which the Transatlantic catyes start.

The **Central Plain**

STRUCTURE AND RELIEF. The Central Plain is a low plain, rarely rising to 300 ft., covering the whole of Central Ireland and extending to the east coast between the Wicklow Mountains and the Mourne Mountains, and to the west coast at several points where there are breaks in the coastal mountains, viz. at Limerick, Galway, and Sligo. A geological map shows that this plain is almost entirely composed of Carboniferous Limestone. This is misleading, for, except to the west of the River Shannon, the limestone rarely appears at the surface, but is covered by a thick mantle of glacial clays (cf. the pasture lands of Cheshire.



Wm Laurence.

TIPPER ARY.

Market day in an Irish town. This picture emphasises the importance of cattle rearing in the region around Tipperary.

A large portion of the plain is drained by the River Shannon, but much of the eastern half of the plain is badly drained. Around the headwaters of the Brosna and the Boyne in the counties of West Meath and Offaly (King's County) are extensive bog lands. These bogs are the result of the accumulation and decay of plants in the shallow lakes and swamps. Some of the bogs are valuable for the supply of peat both for fuel and as litter for animals. The greatest difficulty of the bog lands is communication, and many of the original roads keep to the crests of low elongated glacial ridges (called eskers) which rise above the level of the bogs. An almost unbroken line of eskers extends westwards from Dublin across the plain, giving that city a natural line of communication with its hinterland.

CATTLE AND SHEEP REARING. It might be thought that the damp lowlands of central Ireland would be ideal for dairy farming, but modern dairy farming involves the regular collection of milk and the rounding up of cattle for milking every night and morning. The difficult communications and the long distances between the farms and their fields, due to the wide detours that have to be made, render this impossible. Hence dairying is relatively unimportant except near Dublin; in the north in Cavan and Leitrim; and in the vales which border the southern mountains. Immense numbers of cattle are, however, reared for their meat, and the Central Plains are sometimes called the " Beef and Bog " country (see Fig. 24). Large numbers of live cattle are exported through Dublin and the other east coast ports to England.

In the east of the plain near Dublin and in County Meath the growing of oats, barley, and potatoes is important. County Kildare is famous for the breeding of horses.

To the west of the River Shannon in the east of County Galway is a large area of exposed limestone. Because of *the* porous nature of the rock and the resultant dry pastures, this is one of the important sheep-rearing districts in the country (see Fig. 25).

Throughout the plain potatoes are an important crop, but particularly in the western areas where cereals do not flourish.

There are no large towns in the Central Plain, but only small market centres, such as Athlone, Longford, Mullingar, etc.

Aerofilms, Ltd.

KILDARE.

In its size and general characteristics Kildare is typical of the market towns of Central Ireland. Notice the open market square, and compare Kildare in size with an English market town, *e.g.* Shrewsbury, page 134.

DUBLIN. **Situated at the mouth of the Liffey on the east coast, Dublin (Fig. 121) is the natural outlet of the Central Plain. The lowland entrance to Ireland between the Wicklow and Mourne Mountains is just opposite to the Midland Gate into England between the Welsh Hills and the Pennines, hence Dublin has developed because of the trade along this natural route. From it all the principal roads, railways, and canals radiate fan-wise, so linking it with all parts of the country. It has manufactures of whisky, biscuits, poplin, stout, as well as a small engineering industry.**

It exports live cattle, sheep and pigs, poultry, eggs, dairy produce, and bacon. Its chief imports are wheat, maize, fertilisers, cattle cake, coal, manufactured articles, and a large variety of tropical products.

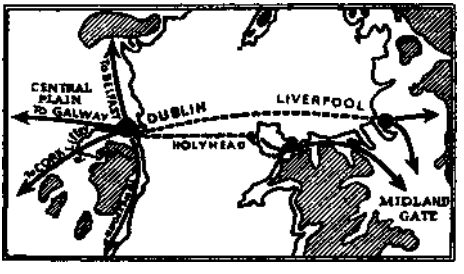


Fig. 121. THE POSITION OF DUBLIN.

LIMERICK. **At the lowest bridging point of the Shannon, Limerick (Fig. 120) would appear to be well situated for the development of a great port. It suffers, however, from two great disadvantages: (1) It does not face countries requiring its exports, and the route by sea from Limerick to England is long, so that Dublin and Cork export the products of its hinterland. (2) There is no railway communication between the quays and docks of Limerick and the railway terminus, hence transport costs are high. It remains to be seen whether the Shannon Electricity Scheme will make any appreciable difference to Limerick.**

GALWAY. **This old port formerly had extensive trade with Spain. Unfortunately, the entrance to Galway harbour is barred by a ridge of rock over which there is only 2\ ft. of**

water at low tide. It has been suggested that, with harbour improvements, Galway might become a great Transatlantic port, as it would be only 3½ days' sail by the fastest ships from Halifax (Nova Scotia). But as the traffic would be mainly from England, and as the big shipping companies are already established in English ports, there seems little likelihood of this idea materialising. There may be, however, a great future for Galway as an air port.

Sligo is the chief port of north-west Ireland, but it suffers from the lack of equipment for the speedy loading and unloading of vessels, hence its trade is declining.

Dundalk, Drogheda, and Greenore are small ports on the east coast, mainly concerned with the import of coal and manufactured goods from England.

SOME ASPECTS OF IRELAND

Lack of Industrial Development

The predominance of agriculture in Ireland is partly due to its climatic conditions, and partly to the national characteristics, but chiefly to the lack of mineral wealth, particularly of coal and iron.

Coal is worked only in three places, viz:—•

(1) At Dungannon in County Tyrone.

(2) In the south of County Monaghan.

(3) In Kilkenny.

The large areas of coal measures which are shown on a geological map, in Limerick and Clare, do not contain seams of coal thick enough to be worked.

Peat, from the peat bogs, is the usual domestic fuel in the rural areas, and large quantities of coal have to be imported from England and Scotland.

It was the shortage of coal in Ireland and the dependence on foreign supplies that led to the inception of the great Shannon hydro-electricity scheme. For 125 miles north of Lough Derg the Shannon is a sluggish stream, falling only six feet per mile; but between Lough Derg and the sea the river falls 110 ft. A dam has been built at Killaloe to raise the level of the lake by 10 ft., and the water is then carried by

T H Mason.

AN IRISH PEAT BOG.

The peat is cut and stacked in piles to dry. Where the peat has been removed are ditches filled with dark brown water.

canal to Ardnacrusha, near Limerick, where electricity is generated.

The electric power, distributed by a " grid " system (Fig. 122), is sufficient to supply all the domestic needs of the Irish Free State and to provide power for industries. The completion of the second part of the scheme will double the output. Thus Ireland looks to a future independent of imported coal, and the use of cheap electric power may lead to the establishment of a greater range of industries.

Except for the shipbuilding of Belfast and the Ford works at Cork, the whole of the industries of Ireland are those directly connected with agriculture, *e.g.* linen manufacture, based on local flax; brewing, based on supplies of barley; the distilling of whisky, for which barley is also required; bacon curing; the making of butter and cheese; and domestic industries such as the manufacture of lace and homespuns.

Apart from coal, Ireland has deposits of bauxite (aluminium ore) in Antrim. These are sent to Foyers and Kinlochleven in Scotland for smelting.

Distribution of Population

The absence of highly developed industrial areas reflects on the size of the towns and cities of Ireland.

(1) There are only three large cities: Dublin, Belfast, and Cork. The fourth town is Londonderry, with a population of about 40,000.

(2) All the towns with a population of over 10,000 are *(a)* either on the coast where market towns have the additional function of a port, or *(b)* are included in the linen towns of the Lagan valley. In this second category are (i) Limerick, Waterford, Wexford, Tralee, Galway, Sligo, Dundalk, Drogheda on the coast; (ii) Lisburn, Lurgan, Portadown,

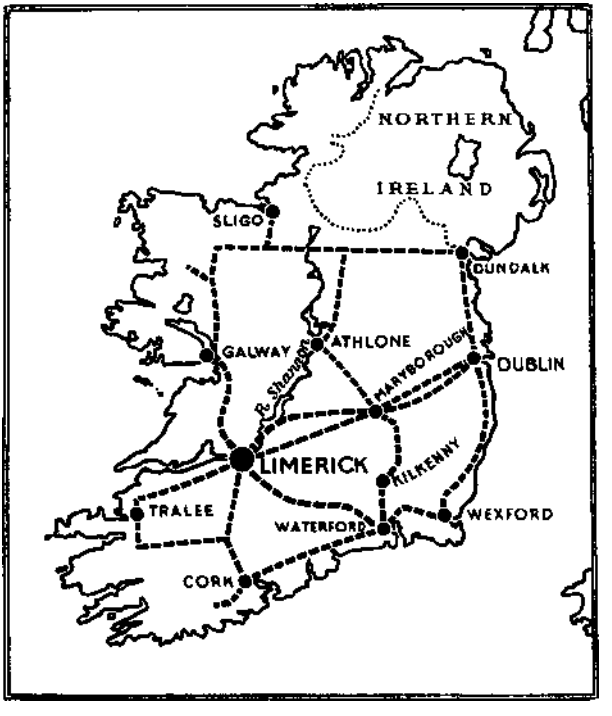


Fig. 122. THE MAIN LINES OF THE ELECTRICITY GRID OF THE IRISH FREE STATE.

Newry, Newtonards, and Ballymena in the linen district of Northern Ireland.

(3) With the exception of the linen towns, all the inland towns of Ireland have populations of less than 10,000, and often less than 5,000. Thus in type they are similar to very small English market towns.

The population is much more evenly distributed than it is in Great Britain. Except for the mountainous western areas there are few regions of scanty population, but on the other hand, there are no very densely populated areas comparable to the English coalfields and the Metropolitan area.

The Trade of Ireland

Both Northern Ireland and the Irish Free State send over 80 per cent, of their exports to Great Britain, from which they derive nearly 70 per cent, of their imports. Thus the importance of Great Britain as a market for Irish goods, and of Ireland as a market for the manufactures of Britain cannot be minimised. The exports of Northern Ireland differ from those of the Irish Free State. Approximately two-fifths of the exports of Northern Ireland are of agricultural origin *(e.g.* dairy produce, eggs, etc.), and the remaining three-fifths of the exports are manufactured goods, *e.g.* linen and ships. In contrast, nine-tenths of the exports of the Irish Free State are of agricultural origin, there being little in the way of manufactured goods to export, except biscuits, stout, etc. Live animals constitute over two-fifths of the exports of the Free State.

Manufactured goods make up about 50 per cent, of the imports of both the political divisions of Ireland. Both import coal, grain, maize, and fertilisers, and tea, sugar, and other products of tropical origin.

The Railways of Ireland

Dublin is the great route centre of the railways of the Free State, and Belfast the centre of the railways of Northern Ireland. As in England, the railways have been amalgamated into groups, of which there are three:—

(a) The Great Southern Railway, which includes all the railways of the Free State except those Which run northwards to Northern Ireland.

(b) **The Great Northern System.**

(c) The Northern Counties Committee, which is part of the English L.M.S. system.

Irish railways radiate from Dublin like the ribs of a fan. In a clockwise direction these routes are:—

(1) From Dublin southwards along the coastal plain, via Wicklow to Wexford and Rosslare.

(2) From Dublin south-westwards via Kildare and Tipperary to Cork, with a branch to Limerick. This line serves the great dairying region of the south-west.

(3) From Dublin westward through Mullingar, Athlone, Athenry, to Galway and Clifden. From Athlone there is a north-westerly branch to Westport, and from Mullingar a northwesterly branch to Sligb.

(4) From Dublin northwards along the coastal plain via Drogheda to Dundalk, and thence north-westwards by the Foyle valley to Londonderry.

(5) From Dublin to Dundalk as in (4), and thence via Newry and Lurgan to Belfast.

The first three routes are part of the Great Southern system, and the others are part of the Great Northern system.

(6) The Northern Counties Committee line runs from Larne to Belfast, and thence north of Lough Neagh and via the lower Bann valley and the north coast plain to Londonderry.

In addition to the routes given above there is an outer semicircular route running from Sligo through Athenry, Limerick, Tipperary to Waterford and Wexford.

Outlying western districts, such as Donegal and Kerry, are served by light railways.

In the recent experimental flights across the Atlantic the flying boats of Imperial Airways and Pan-American Airways have made use of the airport of Foynes near Limerick. In view of the success of these flights and the short time it now takes to cross the Atlantic it is to be expected that some centre in the west of Ireland will be selected as the eastern terminal of the Atlantic "Air Ferry."

CHAPTER XXVI

FOREIGN TRADE, POWER, POPULATION

Foreign Trade

In 1935 the total exports of the United Kingdom were **valued at 481** million pounds, and her imports at 757 million pounds. Imports are mainly foodstuffs and raw material for manufacture, while the exports are principally manufactured goods. Exports, to keep a trade balance, should be as large as imports in value, but it will be noted that there is a difference of nearly 300 million pounds, and in some way or other, this huge sum must be provided to pay for the excess of imports over exports. This difference is to a large extent counter-balanced by (1) the interest of British money invested in foreign concerns; (2) payments received for banking and insurance to foreign customers; (3) payment for transport by the British Mercantile Marine of foreign countries' goods. Most of the deficit then remaining is paid in gold (bullion).

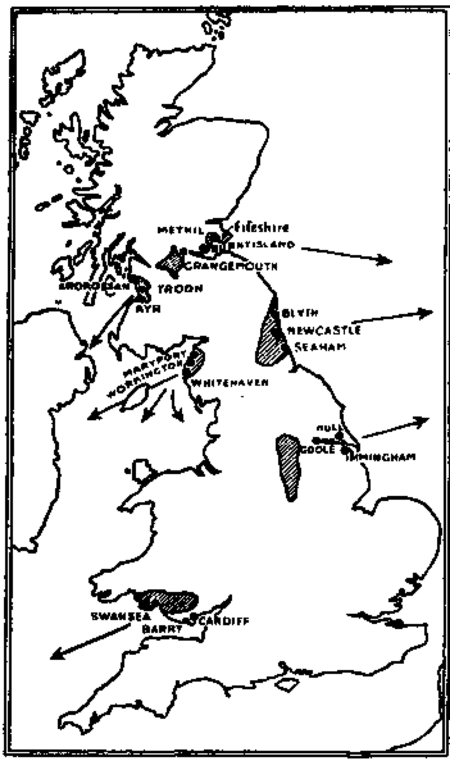
In recent years British exports have been decreasing, and there are many reasons for this. In earlier chapters, repeated reference has been made to the Industrial Revolution in Britain towards the close of the eighteepth century. Britain was **the** first country of the world to develop great industries and manufacturing areas. So all other countries bought Britain's manufactured goods, and she was, as it were, the world's great " shop," and her people a " nation of shop-keepers." Since then other European countries have also developed industrial areas and manufactures, *e.g.* Germany, France, and Belgium, and as their manufactures have increased their purchases from Britain have relatively decreased, and **our** European markets have become less important. The latter half of the nineteenth century saw a vast industrial development in the United States, and more recently there has **been** a rapid increase in manufacturing in the countries of Eastern Asia, such as Japan, India, and China. In these Asiatic countries an **abundance** of **cheap labour** has **considerably** reduced the cost of the manufactured articles.

Japanese cotton merchants can sell cotton goods in Britain more cheaply than the Lancashire mills can produce them, even though the Japanese goods have to stand the cost of a long journey. India, in times past, bought vast quantities of cotton cloth, but to-day she manufactures cotton in the Bombay mills, and supplies a large percentage of her own needs. Countries without coal, such as Sweden and Italy, are developing industries with hydro-electric power. So, gradually, our great customers of Europe and the East are supplying more of their own needs and buying less from us. The great agricultural areas of the Southern Continents still remain, but of these, both Australia and South Africa are rapidly developing their coal resources and manufactures. Russia, too, under the Five Year Plan, has concentrated on the development of manufacturing industries and so needs to purchase less from other countries.

It must not be forgotten that the population of Great Britain is at present steadily increasing, and that the increase is mainly in the urban areas where little food is grown. Thus, we are less able than before to supply our own food, and the demand for food and raw materials is growing, while our sales to other countries are decreasing.

TRADE OF UNITED KINGDOM, 1934

Principal Imports (value in millions of pounds sterling)		Principal Exports (value in millions of pounds sterling)	
Meat, Bacon, etc.	68	Cotton manufactures	59
Timber	39	Iron and steel goods	33
Wool	37	Machinery	33
Cotton	35	Coal	32
Butter	33	Woollen goods	29
Wheat and flour	30	Chemicals	20
Tea	28	Vehicles	18
Mineral oils	24	Clothing	9
Tobacco	15	Spirits	8
Sugar	14	Electrical goods	8
Maize	13	Metal goods (other than those of iron and steel	8
Rubber	11	Paper	6
Machinery	13	Artificial silk manufactures	5
Chemicals, dyes, etc.	11		
Vegetable oils, etc.	26		


METHIL
Fifeshire
GRANGEMOUTH
TROON
AYR
BLYTH
NEWCASTLE
SEAHAM
MARYPORT
WORKINGTON
WHITEHAVEN
HULL
GOOLE
SWANSEA
BARRY
CARDIFF

The sources of our chief imports are given in the following tables:—

Wheat:	Canada Argentina. Australia.
Rice :	India (chiefly Burma). Siam. Spain. United States.
Sugar:	Cuba. San Domingo. Australia. Mauritius.
Tea :	India. Ceylon. Java.
Coffee :	British East Africa. Costa Rica. Brazil.
Cocoa :	British West Africa (chiefly Gold Coast).
Beef:	Argentina. Uruguay. Brazil. Ireland (live cattle).
Ham and Bacon :	United States. Denmark. Canada.
Mutton :	New Zealand. Australia. Argentina.
Butter :	New Zealand. Denmark. Australia.
Cheese :	New Zealand. Canada. Holland.
Wool:	Australia. New Zealand. South Africa. Argentina.
Cotton :	Egypt. India. Sudan. United States. Brazil.
Flax :	Russia. Belgium. Baltic States.
Rubber :	Malay States. Straits Settlements. Ceylon.
Wood :	Sweden. Finland. Canada. Russia.
Iron Ore:	Spain. Algeria. Sweden.
Tin :	Malay States. Bolivia. Chile. Nigeria.

Power in Britain

For a century and a half England's success as an industrial nation has largely been based on her good supplies of coal, which have been used to produce steam power. Other conditions are, of course, essential for the success of any industry, such as the supply of raw materials, good communications, good markets, and good labour supply. To-day, through the great development of world-wide communications raw materials are almost equally available to every nation, and it seems that, in the near future, the most successful manufacturing countries will be those that have the cheapest and most efficient power supplies.

The present age is seeing a great development of electricity, and, if economically produced, this is a very cheap form of

power. Falling water, *Le.* waterfalls or swift streams may be used to drive dynamos which generate electricity. Very wet and mountainous countries, such as Norway, Sweden, and Switzerland, have the best natural advantages for the development of hydro-electric power.

In Great Britain there are few really large waterfalls, and, although the mountainous areas have a heavy rainfall, they are not very high, so that, as far as hydro-electric power is concerned, we cannot hope to compete with countries such as Switzerland. There are several schemes of note, such as those at the Falls of Foyers on the south side of the Caledonian Canal, at Kinlochleven, and at Rannoch in the Scottish Highlands. One small town in the Welsh Highlands, Castle Caerinion, has very cheap electricity generated by its swift stream, the Inion. Electricity is so cheap in this village that it is used in all the farm buildings. The most ambitious hydro-electric scheme is that at Killaloe on the lower Shannon, from which electricity is being carried to all Southern Ireland. Most electricity used in our factories and homes in England is generated by dynamos driven by steam power, the latter being produced by the use of coal. Almost every town has an electricity works. But a great change in the production and distribution of electricity is taking place.

Pylons carrying electric cables have now been erected all over the countryside. These recently-erected lines of pylons carrying electric current, cross one another roughly at right angles, forming what are known as " grids."

Great Britain has been divided into ten districts (Fig. 124), and in each of these a large number of small electric generating stations will be dismantled, and the electricity for the whole of the given region will be generated from a few well-equipped new centres and distributed all over the district by means of the grid system. This form of distribution of energy will, in the long run, provide a more economical way of using coal than by the present method of direct steam power. It is hoped that ultimately electricity for factory use will be very cheap.

In 1925 a committee was formed to investigate the possibilities of using the tidal power of the Severn estuary for the generation of electricity, a question which has been revived time and again. The report, published in 1933, states that

the scheme would take fifteen years to complete, and would cost 38 million pounds. When finished it would supply about eight per cent, of the electricity required in England at very low cost indeed. The best site for the works would be at English Stones, near the Severn Tunnel.

The replacement of coal by electricity in large industrial areas will mean that the air will be purer and more free from the smoke which at present pollutes it. The cleaner and clearer atmosphere must inevitably have a beneficial effect on the health, efficiency, and contentment of workers in large urban areas. The availability of supplies of electricity will probably lead to the greater development of manufacturing industries in districts not on the coalfields.

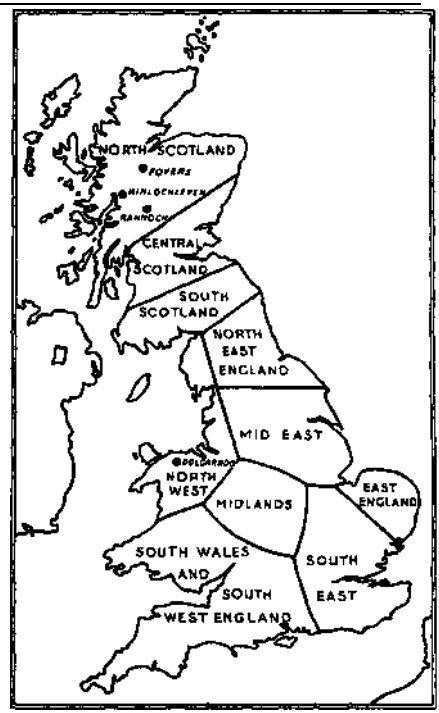


Fig. 124. AREAS OF DEVELOPMENT OF ELECTRICITY.—This map shows the ten areas into which Great Britain has been divided for the purpose of distribution of electricity by the " grid " system.

Distribution of Population

In 1801 the population of England and Wales was 8,892,536, and at the last census, taken in 1931, it had risen to 39,947,931, or an average population of 685 per square mile. With the possible exception of Belgium and Java this is the highest density of population recorded for any country.

During the same period the population of Scotland has increased from 1,608,420 to 4,842,554.

Not only has the population of Great Britain increased rapidly, but great changes have taken place in the distribution of the people.

Before the Industrial Revolution, when England was mainly an agricultural country, the majority of the inhabitants lived in the fertile lowlands which he south of the Pennines and east of Wales, and the greatest centres of population were around London and Bristol.

The Industrial Revolution caused a great movement of people from country districts to towns, and, in particular, to the great new towns of the coalfields. This meant that the centres of densest population moved from South-Eastern England to Northern England and South Wales. Note that the south-eastern plains are more densely populated now than they were in 1801, but relatively they contain less people than the industrial areas.

The last census (1931) shows a new trend. Some of the industrial areas, especially those where trade depression has been most acute, show a decrease in population. This is the case in Lancashire, South Wales, and Durham. The other areas showing a decrease are (1) the congested areas to the east of London, such as West Ham, due to the people moving further out into better surroundings, and (2) the unproductive counties of Northern Scotland, such as Ross and Cromarty and Shetland. The greatest increases in population are in Southern England, and particularly in the suburbs of London. Dagenham, in Essex, a new town engaged in motor car manufacture, has since 1921 increased from 9000 to 89,000 inhabitants.

So the last decade shows a reversal of the population movements of the preceding century.

Industrial counties, such as Lancashire, Glamorgan, Warwickshire, Durham, and Staffordshire have more than 1000 people per square mile (Fig. 125). Two counties near London, viz. Essex and Surrey, have equally dense populations because they border the Metropolitan area. Cheshire, too, with its many industries, its agriculture, and residential areas for Lancashire, comes within this group.

Counties that have much agricultural land, but which have some industrial areas or are near large population centres, have a density varying from 500 to 1000 people per square

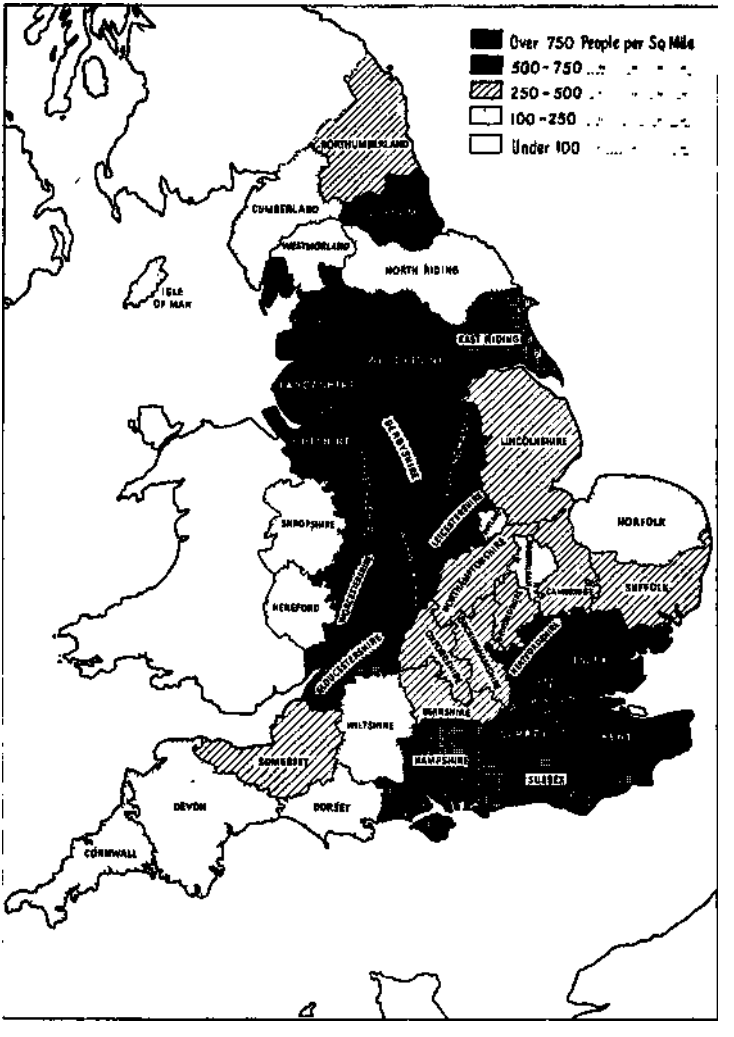


Fig. 125.

mile. Included in this group are such counties as Sussex, Monmouth, Worcestershire, Hampshire, Leicestershire, Hertford, Gloucestershire, Derbyshire, and the East Riding of Yorkshire.

The counties mainly dependent on agriculture only have under 500 per square miles (av. 200-300). Examples are Buckinghamshire, Cambridgeshire, Somerset, Devonshire.

Finally, the very mountainous counties have less than 100 people per square mile. The only English county with such a low average is Westmorland, but it is true of most of the Welsh counties, and of the mountainous counties of Scotland. In these areas the land is too unproductive to support a flourishing agricultural population. Radnorshire has only an average of 45 persons per square mile, and the population of the whole county is about the same as that of an English market town. Anglesey has nearly 50,000 inhabitants, and an average density of 177 per square mile. It is, for Wales, a well-populated county, yet there are in England and Wales one hundred and thirteen towns which contain more than 50,000 people, and fifty-one of these contain more than 100,000 people. The latter are given in the following table:—

POPULATION OF CHIEF TOWNS, 1931
Towns over 100,000 inhabitants

London	4,396,821	Coventry	167,046
Glasgow	1,088,417	Swansea	164,825
Birmingham	1,002,413	Tottenham	157,748
Liverpool	855,539	Birkenhead	147,946
Manchester	766,333	Brighton	147,427
Sheffield	511,742	East Ham	142,460
Leeds	482,789	Derby	142,406
Edinburgh	438,998	Rhondda	141,344
Belfast	415,000	Oldham	140,309
Dublin	405,500	Middlesbrough	138,489
Bristol	396,918	Wolverhampton	138,489
Hull	313,366	Walthamstow	132,965
Bradford	298,041	Ilford	131,046
West Ham	294,086	Leyton	128,317
Newcastle-on-Tyne	283,145	Norwich	126,207
Stoke-on-Trent	276,619	Stockport	125,505
Nottingham	268,801	Blackburn	122,695
Portsmouth	249,288	Gateshead	122,397
Leicester	239,111	Southend	120,093
Croydon	233,115	Preston	118,839
Cardiff	223,648	Ealing	117,688
Salford	223,442	Bournemouth	116,780
Plymouth	208,166	Hendon	115,682
Sunderland	185,870	Huddersfield	113,467
Willesden	184,410	South Shields	113,452
Bolton	177,253	St. Helen's	106,793
Southampton	176,025	Walsall	103,102
Dundee	175,583	Blackpool	101,543
Aberdeen	167,259		

QUESTIONS

1. Enumerate the geographical factors which may have contributed to the advance of the British Isles.

2. Make a sketch map of the chalk and limestone belts of S.E. England. Name the chief hill systems, mark the scarp slopes, and insert the names of the chief mining and quarrying districts.

3. Suggest other reasons for the development of industries in the south of England during recent years.

4. Compare climatic conditions in *(a)* Cornwall and Lincoln, *(b)* Cumberland and Kent.

5. Explain the meaning of the following terms: secondary depressions, rain-shadow, anticyclones, insular climate.

6. Account for the summer maximum of rainfall in S.E. England.

7. How may the work of local government benefit from the possession of accurate and detailed rainfall statistics of an area ?

8. Draw temperature and rainfall graphs to represent conditions in the four climatic quadrants of the British Isles:—

		J.	F.	M.	A.	M.	J.
Temp. °F.	A. Cambridge ..	37·5	39·0	41·9	47·0	52·2	58·8
	B. Valentia ..	44·6	43·8	45·4	48·5	52·2	56·9
	C. Nairn ..	37·4	37·7	39·8	44·1	49·0	54·7
	D. Fort William	38·7	38·8	40·4	45·1	49·7	55·4

		J.	A.	S.	O.	N.	D.
Temp. °F.	A. Cambridge ..	62·4	61·5	57·1	48·9	42·6	38·
	B. Valentia ..	59·	59·3	56·6	51·3	47·6	45·4
	C. Nairn	57·4	56·7	52·9	46·0	41·0	37·5
	D. Fort William..	57·1	56·5	53·2	46·6	44·0	40·1

		J.	F.	M.	A.	M.	J.
Rainfall in Inches	A. Cambridge ..	1·5	1·4	1·3	1·5	1·9	2·2
	B. Valentia ..	5·6	4·9	4·1	3·9	3·1	3·5
	C. Nairn.. ..	2·0	1·8	1·9	1·5	1·8	1·8
	D. Fort William..	8·7	6·9	7·0	4·0	3·5	3·5

		J.	A.	S.	O.	N.	D.
Rainfall in Inches	A. Cambridge ..	2·5	2·4	2·0	2·4	2·0	1·6
	B. Valentia ..	3·7	5·1	4·6	5·5	5·5	6·5
	C. Nairn.. ..	2·7	2·4	2·2	2·3	2·4	2·2
	D. Fort William..	4·6	6·9	8·2	7·9	7·5	11·3

9. What do you understand by the terms: —mixed farming, permanent grassland, crop-rotation, and intensive farming ?

10. Compare and contrast the farming activities in—
(a) Cheshire and Cambridge;
(b) Somerset and Kent.

11. What are the chief developments in recent years in the farming activities of England? Give examples.

12. Trace outline maps of Cornwall and Devon and indicate—
(a) the physical features;
(b) summer and winter isotherms and annual rainfall;
(c) products;
id) towns and rail communications.

13. Draw a sketch map of Somerset, and on it summarise the chief facts given in the text.

14. Describe the position of Bristol, account for its growth and importance in comparison with Liverpool.

15. On a map of Wales insert the chief rivers and show how the main railways make use of these valleys and the coastal plains.

16. Flint and Glamorgan have over 500 people per square mile, the counties bordering the south and north coasts between 300-200 per square mile; the remainder have under 200 per square mile. Draw a sketch map of Wales, divide it into counties, and indicate by shading this distribution. Add explanatory notes to your map.

17. Account for the decline in coal exports from the British Isles.

18. Give in tabular form the main sources of supply of the metals used in the smelting industries of South Wales. Name the ports of export.

19. Illustrate by a sketch map the statement that " The Cumbrian Mountains form a dome-shaped area from which the rivers drain radially." Name the rivers, the chief lakes, and routes.

20. It has been suggested that a direct motor road across Morecambe Bay should be made to connect the Cumberland coalfield with North Lancashire. What advantages would accrue from such an undertaking?

21. Compare and contrast the industrial activities of Cumberland and Northumberland.

22. Explain why the city of Durham has not developed along the same lines as Newcastle.

23. Draw a sketch map of Northumberland and Durham, marking the 1000-ft. contour, the chief rivers, extent of coalfield, chief coal ports and industrial centres.

24. Explain why the York, Derby, and Nottingham coalfield has the greatest output of any British coalfield.

25. Account for the development of the Yorkshire woollen industry.

26. Trace the development of the metallurgical industries of the Sheffield area.

27. Draw sketch maps to illustrate the positions of Derby, Nottingham, **and** Leicester.

28. Give an account of the farming activities of Yorkshire.

29. Indicate on a sketch map the five regions of Lincolnshire. Mark the positions of the chief industrial centres.

30. Describe the east coast of England between the Tees and the Wash, accounting for variations.

31. Account for the development of any three industries connected with the Lancashire coalfield.

32. Draw a sketch map of the Manchester Ship Canal indicating the industrial towns it serves.

33. In which parts of the British Isles are salt deposits worked ? Give a list of the various industries dependent upon the salt industry.

34. Compare the positions and trade of Liverpool and Hull. Give sketch maps.

35. Draw a sketch map of the physical features of the Central Plain of England.

' 36. Describe the position of Birmingham and account for the varied nature of the city's industries.

37. On a large map of Central England mark the extent of the midland coalfields, naming the chief towns and the industries connected with each.

38. Define the extent of the Fenlands and account for their formation.

39. " Luton is typical of many towns in Southern England which have attracted new industries." Find six other towns which could be included in such a list and state the industries which have been developed.

40. Compare the Fenlands and the Plain of Somerset as regards physical features, climate, occupations, and sites of settlements.

41. " The manufactures of East Anglia are based upon the farming activities of the region." To what extent is this true ?

42. On a map of East Anglia mark distinctively—

(a) the chief fishing ports;

(b) the chief packet stations;

(c) the county towns;

(d) the manufacturing centres.

43. Explain why the towns and ports of East Anglia are not to-day as important as they were in the Middle Ages.

44. Draw a map of the Thames Basin and divide it into five main regions. Give a brief description of any two of the regions.

45. Show how farming activities vary within the Thames Basin with soil conditions.

46. Compare the sites of Swindon and Crewe as centres for the railway systems they serve.

47. Name the countries of the world and the ports of export of the commodities named on page 185.

48. What are the advantages and disadvantages of the concentration of population and industries around London ?

49. What is meant by entrepdt trade ? Give three examples of ports in other continents which depend on this type of trade for much of their commerce.

50. Trace the changes which have occurred in the location of the English iron industries from the days of the Wealden industry.

51. Draw a sketch map to illustrate the position of Canterbury.

52. Mark on a map of the English coast between the Humber and the Solent, the chief routes linking Great Britain and the Continent.

53. Show on a sketch-map the convergence of roads upon Salisbury and Winchester.

54. Compare the farming activities carried on in the Hampshire and London Basins.

55. Compare the advantages of Southampton and Liverpool—

***(a)* as passenger ports;**

***(b)* as cargo ports.**

56. Compare the plains of Galloway and the Tweed Valley.

57. Show on a sketch map the close connection between relief and railway routes across the Southern Uplands.

58. Why was the east coast route more important than the west until the nineteenth century ?

59. Account for the woollen industry of the Tweed Valley. How does it differ from West Yorkshire industry ?

60. Give an account of the farming activities of the Central Lowlands of Scotland.

61. Draw a detailed map of the industrial regions of the Central Lowlands.

62. Compare and contrast the development of the Lanarkshire and Lancashire coalfields.

63. Describe the various textile industries.carried on in the Central Lowlands.

64. Under the headings *(a)* Physical Features, *(b)* Climate, (c) Economic Resources, compare the Highlands of Scotland and the mountains of Wales.

65. Describe and account for the distribution of population in Scotland.

66. Compare the distribution of population in Scotland and the Irish Free State.

67. Describe a railway journey from Perth to Inverness.

68. Write a description of the life of the " Crofters."

69. Account for the division of Ireland into two political divisions.

70. Explain clearly why dairying is more important than cereal cultivation in Ireland.

71. Draw a map showing the chief steamship routes between the United Kingdom and Ireland. Give distances.

72. Give a geographical account of Northern Ireland under the headings *(a)* Position and Relief, *(b)* Climate, and (c) Occupations.

73. Compare Dublin and Limerick as outlets for the produce of Central Ireland.

74. What steps are being taken to improve farming and industrial conditions in Eire ?

75. Give the position of the following and account for the importance of each: Valentia, Cobh, Greenore, Galway, and Waterford.

76. Construct a railway map of Ireland using the information given on pages 276-7.

77. The value of the annual imports into the United Kingdom is always in excess of the exports. How can this fact be explained ?

78. Give in tabular form two countries and the probable exporting ports from which the imports given on page 279 will come.

79. Why has the export of coal been of great value to the development of industry in Great Britain ?

80. Why is it that countries such as Switzerland make greater use of water power for the generation of electricity than England does ?

81. To what countries does each coal-exporting area of the British Isles send its coal? Suggest what is likely to be the return cargo in each case.

82. Give as many examples as you can of industries which depend for some processes upon the salt industry. State the areas in the British Isles producing salt.

83. Name four important shipbuilding regions in Great Britain and account for their importance.

84. State where each of the following is made or produced in Great Britain: kaolin, soap, linoleum, rayon, beet-sugar, paper.

85. Find examples, other than those mentioned in the text of towns in Great Britain at *(a)* a gap; *(b)* a bridging point; (c) a river confluence; *(d)* a river bend; *(e)* head of an estuary. Give a sketch map to illustrate each answer.

86. Plan a seven-day tour on the Scottish railways, stating the places at which you would stop and the things you would like to see. Calculate the mileage covered.

87. Draw a large sketch map of *one* important industrial area of England, and summarise on it—

(a) Sources of raw materials and chief food-stuffs;

(b) Holiday resorts within 50 miles radius of the chief town;

(c) Means of transport;

{d) Ports serving the area.

88. Describe and account for the distribution of population in (a) Aberdeenshire, *(b)* Warwickshire, *(c)* Westmorland, *id)* Norfolk, *(e)* Buckinghamshire, (/) Somerset, *(g)* Shropshire, (h) Northumberland.

89. Describe the characteristics of the coast of West Scotland and contrast them with those of S.W. Ireland.

90. Account for the importance of Glasgow as a port. Why are there no other first class ports on the west coast of Scotland ?

91. Give in tabular form the chief imports into Scotland, naming their probable destinatioiis and uses; the chief coal exporting ports; the chief packet stations.

92. What is meant by: fen, dissected plateau, scarpland, rift valley, boulder clay ? *Give* examples of each within the British Isles.

93. Draw a map of the Trent Basin indicating the industrial areas within the basin. Describe and account for the agricultural activities of the basin.

94. Describe, with reference to definite examples, the scenery of *(a)* a clay plain; *(b)* a granite upland; *(c)* a limestone plateau; *(d)* a chalk plateau.

95. What are the chief characteristics of the trade of each of the following: Harwich, Immingham, Southampton, Cardiff, Liverpool, London.

96. Account for the importance of *(a)* Torquay as a holiday resort; *(b)* Carlisle as a railway centre; (c) Manchester as a port; *(d)* Holyhead as a packet station.

97. Describe the scenery and economic importance of the Pennines. Show on a sketch map how communications are affected by these highlands.

98. Describe and compare the past and the present distribution of important wool industries in Great Britain.

99. Compare the climatic conditions on the two sides of the Irish Sea and explain differences.

100. What factors determine the temperature of a region ? Illustrate your answer by reference to temperature conditions in the British Isles.

101. Describe and, as far as you can, account for the position of the chief lakes of Ireland, mentioning the rivers with which each is connected.

102. Give an account of the distribution of the iron and steel industry of the United Kingdom, pointing out changes which have occurred in the relative importance of different regions during the last century.

103. Locate the chief industrial areas of Scotland and Ireland; contrast their natural resources and show how far these explain their respective manufactures.

104. Give an account of the trade relationship between *(a)* England and S. Africa; *(b)* England and India; (c) England and Australia.

105. What is the Continental Shelf? In what ways has it affected the economic development of the British Isles ?

106. Where are the principal leather manufacturing centres of Great Britain. As far as you can explain the reasons for the growth of the industry.

107. Name the principal industries which are located around the lower Mersey and the Mersey estuary. Explain why these industries have developed there.

108. South Wales imports quantities of foodstuffs, timber, and metal ores. Explain why these are imported and whence they are obtained.

109. What are the conditions necessary for the growth of an important fishing port ? Name the chief fishing ports of Britain and show how they satisfy the conditions you have outlined.

110. What do you understand by textiles ? Where are the principal textile manufacturing centres of the British Isles ?

INDEX

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