MAP-READING FOR SCHOOLS

MARGARET WOOD

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By

MARGARET WOOD B.Sc.

HEADMISTRESS NEWQUAY COUNTY SCHOOL FOR GIRLS

WITH 10 PAGES OF MAPS IN COLOUR 15 ILLUSTRATIONS IN HALF-TONE AND MANY MAPS AND DIAGRAMS IN THE TEXT

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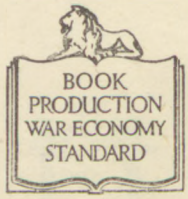

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FOREWORD

THE aim of this book is to give sufficient instruction and practice in map-reading to enable the student to use large-scale maps with profit and pleasure both in the field and in the classroom. The questions and exercises included in the book are of the style and standard set in School Certificate and subsidiary Higher School Certificate Examinations.

The map extracts illustrate the rich variety of styles obtainable in the One-inch maps of the Ordnance Survey. Each of the regions chosen has special geographical significance, and the study of these regions forms a valuable supplement to a regional survey of the British Isles such as is usually made in the School Certificate year.

I should like to express my thanks to Miss E. Bailey, who kindly read the proofs, the Great Western Railway Company for Plate I, Fig. B, the Manchester Development Committee for Fig. 23, the Manchester Ship Canal Company for Fig. 24, and particularly to my brother, Mr H. B. Wood, for Plate I, Fig. A, Plate II, Figs. A and B, Plate VI, Figs. A and B, and for the preparation of all the illustrations for the press.

The map extracts and Fig. 6c are reproduced from the Ordnance Survey maps with the sanction of the Controller of H.M. Stationery Office, and the examination questions included in Section V are reproduced by kind permission of the examining bodies concerned.

M. WOOD

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FIG. 1.—MAP SHOWING THE DISTRICTS SELECTED FOR STUDY

ESSENTIALS OF MAP-READING

I. Introduction

The number of motorists and cyclists who travel along the roads of Britain increases each year, and during the summer numberless parties of young people explore the paths and byways of the countryside on holiday walking-tours. This interest in travel and exploration has resulted in a greatly increased use of large-scale maps, and the ability to interpret these with ease and pleasure is of obvious practical value to every one.

A motorist covering many miles in a day's tour needs a map that shows the roads clearly and in detail, yet at the same time represents a large stretch of country on a single sheet. A map on the scale of 4 miles to the inch is generally suited to his needs. A larger scale, such as 2 miles to the inch, makes it possible to include far greater detail, while still representing a considerable area on the map sheet. These maps therefore are well suited to cyclists and holiday-makers generally. On the scale of 1 inch to 1 mile it is possible to represent all the main features of the countryside, and this is the most suitable map for those planning walking-tours.

Opposite p. 22, three maps of the Ambleside district, each representing exactly the same 16 square miles of country, have been reproduced. These maps illustrate the detailed representation that is possible on scales of 4 miles, 2 miles, and 1 mile to the inch respectively, and they should be most carefully studied and their differences noted. (See exercises at end of Section I.)

It is obvious that such maps contain an amazing store of information. Nevertheless they remain clear and uncrowded, a result that can only be achieved by the use of finely drawn conventional symbols to represent most of the features which are included. A knowledge of these symbols must precede any attempt to interpret or read the map.

The standard map of Great Britain is the One-inch map, and the studies and exercises in this book are based mainly on maps on this scale. The conventional signs of the Fifth Edition One-inch map of the Ordnance Survey are reproduced opposite p. 29.

II. Scales

The scale of a map denotes the relationship that exists between a length on the map and the actual distance on the ground. There are three ways of representing this proportion. It can be expressed by :

(i) A statement of scale.
(ii) A linear or plain scale.
(iii) A representative fraction.

The STATEMENT OF SCALE expresses the relationship of map to ground in words, as, for example, ' six inches represent one mile.' It is a method that is only of value to map-readers who are familiar with the units of measurement used.

The LINEAR SCALE represents the same relationship by means of a straight line divided into lengths each of which represents a certain distance on the ground. This method is

used on most maps or plans because it is possible to read directly from the scale the ground equivalent of any distance measured on the map. But again its usefulness is limited to those who are familiar with the units employed. As is shown in Fig. 2, it is usual to draw linear scales of about five or six inches in length and, when dividing the line, to leave one division to the left of the zero mark for subdivision, the divisions being numbered outward from zero in each direction.

The REPRESENTATIVE FRACTION expresses the proportion of map to ground numerically. The numerator of the fraction is always 1 and represents a length on the map. The denominator states how many times this length must be multiplied to give the distance on the ground. Thus a scale of $\frac{1}{100,000}$ indicates that any length on the map represents

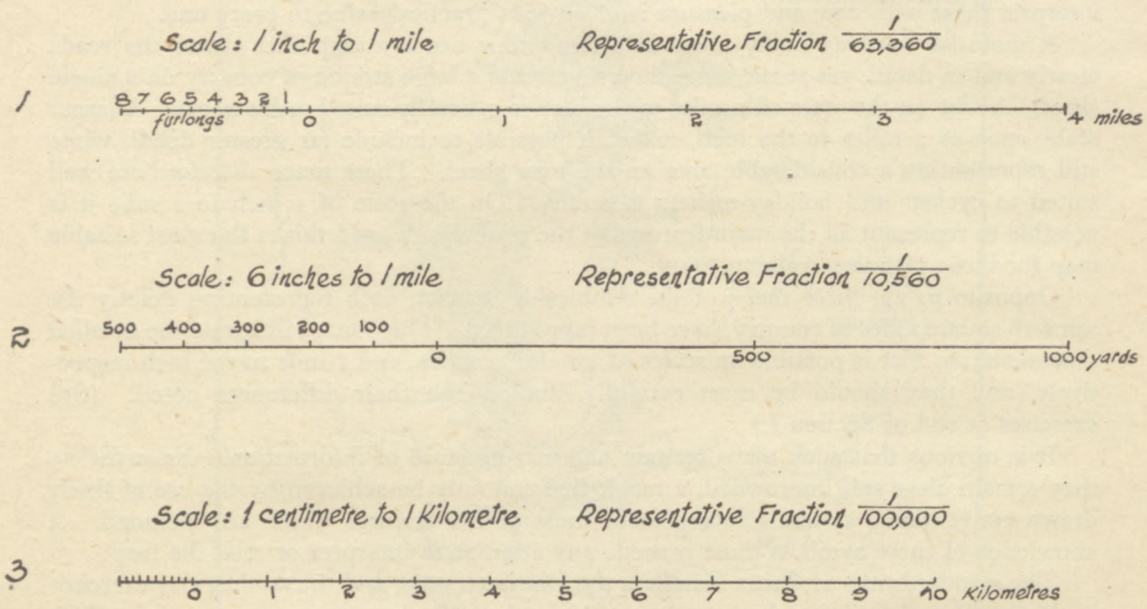

FIG. 2. SCALES

100,000 times that length on the ground. A scale of 1 inch to 1 mile can be expressed as a representative fraction as follows :

1 inch on the map represents 1 mile on the ground
or $1760 \times 3 \times 12$ inches on the ground
or 63,360 inches on the ground.

$$\therefore \text{ R. F.} = \frac{1}{63,360}.$$

The advantage of this method of representing scale is that it can be used by map-readers of any country.

SCALE AND LATITUDE. It is possible to obtain the scale of a map from a study of the latitude lines if these are given. 1° latitude represents approximately 69 miles on the earth's surface. Thus if two lines of latitude, 51° N. and 51° 20′ N., are represented on the map as 2·3 inches apart, then the scale of the map can be obtained as follows :

$$2{\cdot}3'' \equiv 20' \text{ of latitude} = \frac{69}{3} \text{ miles} = 23 \text{ miles.}$$

$\therefore$ Scale 1 inch represents 10 miles.

III. Measurement of Distance

The measurement of distance along any straight line on the map presents no difficulty. To find the length of any winding route, such as a road, one of three methods may be used :

1. The course can be followed by a thread of cotton and the thread measured.

2. The distance can be stepped out by a pair of dividers of which the legs have been somewhat closely set.

3. A straight edge of paper may be used. This is aligned with the first stretch of the course to be measured, and marks are made on the paper at the beginning of the course and where the first change of direction occurs. The pencil point on the second mark being used as a pivot, the paper is turned until its edge lies along the next section of the course. The end of this is marked and the paper turned again. When all the course has been followed the edge of the paper between the first and last marks is measured.

IV. Measurement of Areas

The measurement of rectangular areas is a simple arithmetical exercise, and no explanation is necessary. When the area to be measured is irregular its outline should be traced on squared paper. If, on this, the small squares are of 1/10″ side and the scale of the map is 1 inch to 1 mile, then each small square represents 1/100 sq. mile. The number of small squares contained within the tracing should be counted and in addition all squares of which half or more than half is included. Parts of squares which are less than half should be ignored. If the total thus obtained is divided by 100 the area required will be expressed in square miles.

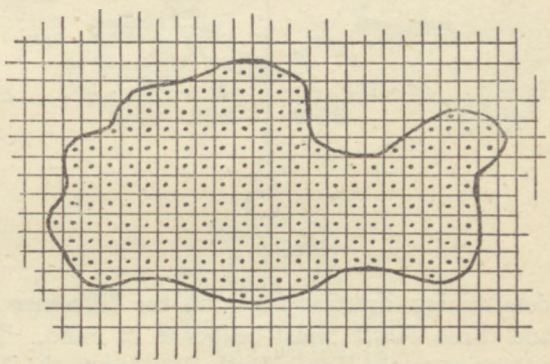

FIG. 3.—MEASUREMENT OF IRREGULAR AREAS

Fig. 3 represents an irregularly shaped area traced on squared paper.

Whole squares included	168
Squares of which half or more than half is included . .	37
Total . .	205

Each square represents $\frac{1}{100}$ sq. mile, $\therefore$ area = 2·05 sq. miles.

V. Representation of Direction

Fig. 4 shows the four cardinal points and the more important intermediate points of the compass. True North is the direction of the North Pole from the observer, and if

for any position the north-and-south line has been obtained, the east-and-west line will cut this at right angles.

The direction of one place with regard to another may be expressed in terms of the compass points or in degrees as an angular bearing. All bearings are measured from north through east—that is to say, in a clockwise direction. Thus if a point B lies due N.E. of a point A, its bearing from A is 45° ; if it lies due N.W. of A its bearing from A is 315°.

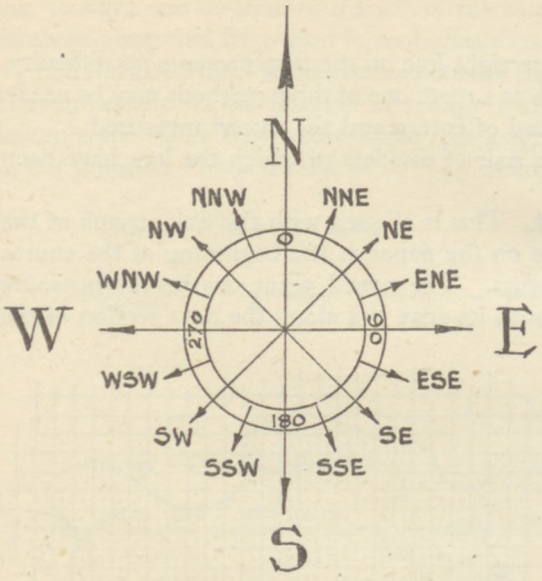

FIG. 4

In the field it is possible to obtain a rough idea of direction from the sun. As a general rule the sun rises in the east, sets in the west, and is due south at noon. But it must be remembered that the direction of sunrise and sunset varies greatly with the seasons and that sun time is an hour later than clock time in summer.

When one is walking in unfamiliar open country it is well to carry a compass. In determining direction from this the difference between Magnetic North and True North must be borne in mind. The compass needle does not point to the True North Pole but to the Magnetic North Pole, and the angle between True North and Magnetic North is called the magnetic variation. This varies from place to place and slowly changes from year to year, owing to the fact that the Magnetic North Pole is slowly changing its position. In Great Britain to-day the magnetic variation ranges from rather less to rather more than 12° W., and it is decreasing at the rate of 0°10′ annually, though this decrease is not constant.

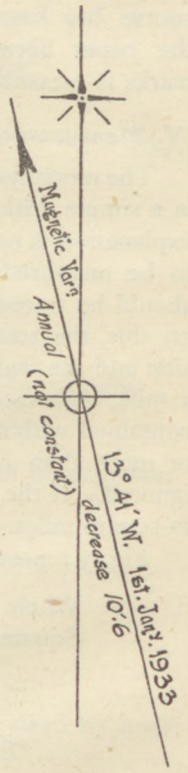

FIG. 5

On the maps of the Ordnance Survey both True and Magnetic North are indicated in the map margins (Fig. 5).

NOTE.—Unless otherwise indicated the top of each map in this book represents North.

VI. Representation of Relief

The representation of surface relief is one of the most important tasks of the map-maker, and at the same time it is one of the most difficult.

The chief methods by which relief features may be indicated on the flat surface of the map are as follows :

1. Spot heights.
2. Hachures.

3. Hill-shading.
4. Contour-lines and form-lines.
5. Layer-colouring.

Spot heights are marked on the map by a dot and associated number, thus ·341. They represent positions on the ground of which the height has been accurately determined, and the number indicates the height in feet. They are generally marked on hill summits or along roads. In addition to spot heights, the maps of the Ordnance Survey of Britain show trigonometrical stations and bench marks. The former are shown thus—△ 1931—and they mark points of which the position and height have been fixed with the utmost precision, as they indicate the various centres from which the original accurate survey of the country proceeded. Bench marks are shown on Six-inch maps thus ↑ BM.564·3. These give the surface level at that point and indicate an actual mark cut on buildings or walls.

Hachures are finely drawn lines following the direction of steepest slope. They are far apart and delicately drawn on gentle slopes and closer together and darker on steeper slopes (Fig. 6A). This method is effective in showing the general shape of relief features, but it does not give positive information of exact heights. In lofty country there is a danger of the darkly drawn hachures obscuring other detail.

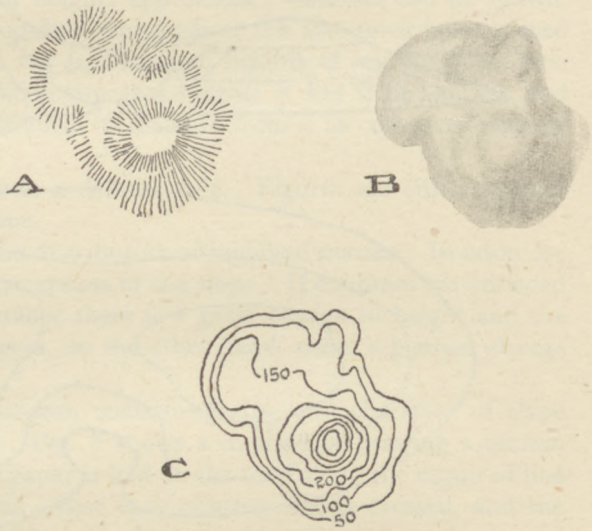

FIG. 6.—BRENT KNOLL

Hill-shading is even more pictorial in its effect and can show very successfully the general modelling of the ground, but as in the case of hachures it does not give sufficiently precise information. As the name implies, the slopes of the hills are shaded, and it appears as if the country were illuminated and shadows were cast by the highlands. On some maps the source of light is supposed to be low on the north-western horizon. In this case the southern and south-eastern slopes are deeply shadowed (Fig. 6B). On other maps the source of illumination is supposed to be directly above the region, and as a result all hill slopes are shaded, the depth of tone indicating different degrees of steepness. In both cases level land, whether high or low, is left unshaded and may easily be misinterpreted.

Both hachuring and hill-shading are almost invariably combined with the use of spot heights.

A *contour-line* is a line drawn on a map to represent a certain definite level on the land surface, and it separates all land areas above that level from all land areas below that level. Thus along a contour line of 50 feet the land is everywhere precisely 50 feet in height, and it separates all areas over 50 feet in height from all areas under 50 feet in

height. Contours are usually drawn at either 50-foot or 100-foot intervals, and the vertical distance between one contour-level and the next is called the vertical interval, or V.I.

Fig. 7 represents an island with two hills linked by a lower ridge. The dotted lines on this diagram represent the levels on the hillsides at which heights of 100 feet, 200 feet, 300 feet, and 400 feet respectively are attained. They therefore represent contour-lines. If the island were to sink or the sea to rise 100 feet, the 100-foot contour-line would become the new coast-line and would represent sea-level. Below the diagram a contour sketch-map of the area has been drawn. The two diagrams should be carefully compared.

The representation of relief by means of contour-lines (Fig. 6c) does not produce so pictorial an effect as the use of hachures or hill-shading. Its outstanding advantages are

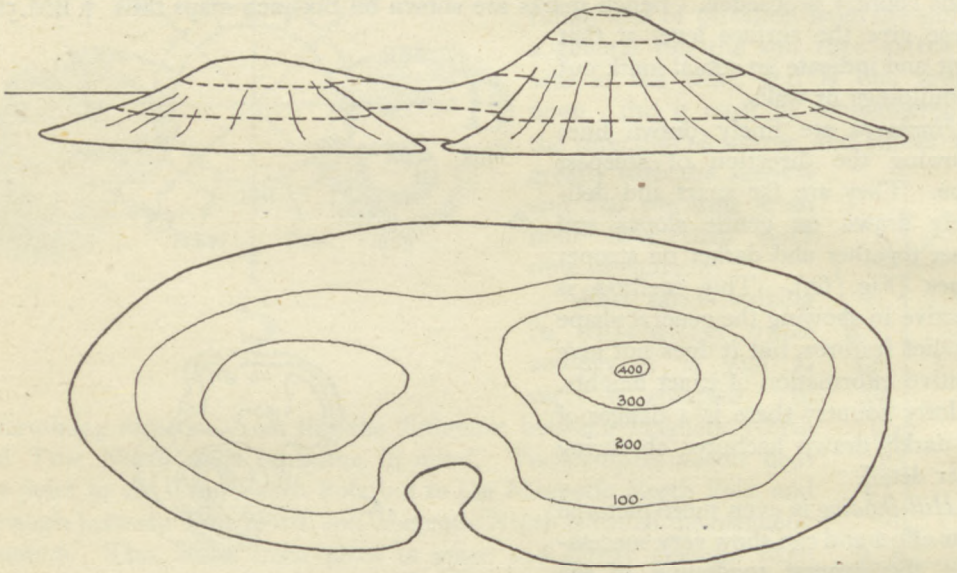

FIG. 7.—DIAGRAM AND CONTOUR SKETCH-MAP OF AN ISLAND

its accuracy and legibility. Even crowded contours are less obscuring than hachures or hill-shading.

Form-lines are approximate contours, drawn on the same principle but less accurately surveyed.

Layer-colouring. On many contour maps the relief is made to stand out more clearly by the use of different tints or of different depths of colour. These vary according to the height, but all the land between any two successive contours is of the same tint. In the Ordnance Survey Tourist maps the tints are beautifully graded, and even in high ground, where darker colour is used, there is generally no loss of legibility. These maps are both graphic in their portrayal of relief and exceedingly accurate.

In many maps relief is expressed by a combination of two or three of the methods described. Hachures, contour-lines, and spot heights are frequently used in combination. Layer-colouring is never used apart from contour-lines, and sometimes hachuring is

very successfully combined with these methods. In the Fifth Relief Edition of the Ordnance Survey One-inch map relief is shown very elaborately by a combination of contour-lines at 50-foot intervals, spot heights, hachuring in two colours to produce a hill-shaded effect, and faint layer-colouring.

VII. The Contour Expression of Relief Features

By far the greatest number of the maps of to-day represent relief by means of contour-lines, and the ability to interpret contour patterns in terms of surface features is of the utmost value to motorists, cyclists, and all map-users.

The principle of the contour-line has already been explained. On British maps the contour interval is generally 50 feet or 100 feet, and the lines are based on a large number of points which have been instrumentally fixed.

On maps that show a number of spot heights approximate contours can be drawn. If it is necessary to draw on the map a 200-foot contour-line, this line must be so placed that it separates all heights of more than 200 feet from all heights of less than 200 feet. Thus the 200-foot contour will pass between two spot heights A and B of 220 feet and 170 feet respectively, and if the slope is uniform its distance from A as compared with its distance from B will be as 2 : 3.

The numbering of contour-lines follows a definite rule. Figures are either printed on the line, or on the higher side of the line.

It is clear that contour-lines indicate the distribution of highland masses. In addition, the spacing of the contours expresses the steepness of the slope. If contours are crowded together it means that within a short distance there is a great change in height and the slope will be steep. Widely spaced contours, on the other hand, mean a gradual change in height and gentle slopes.

Section-drawing. The relationship between contour-spacing and character of slope is best illustrated by means of a section. Fig. 8 shows a method of drawing a section across a contour map. A straight edge of paper is laid on the map along the required line of section (AB). On this a mark is made where each contour-line is crossed, and the contour-heights are noted. These points and numbers are transferred to a horizontal line of the same length as the line of section. A suitable vertical scale is chosen, and from the points on the horizontal line perpendiculars are erected of the correct height. The profile is then obtained by drawing a smooth line which just touches the tops of the perpendiculars. Care should be taken to round the tops of hills and hollow the floors of valleys ; if the map does not give the exact height of these then a reasonable estimation should be made.

Section AB brings out the contrast between the steep slopes near A, where the contours are crowded, and the gentle slopes near B, where the contours are widely spaced.

Section CD is more difficult. Along its course the 200-foot contour-line is crossed three times in succession and the 400-foot contour-line four times in succession. However, a study of the map shows that the land at X^1 is higher than at Y^1, and that the land at X^2 and at X^3 is higher than at Y^2. These differences in height can be estimated from the map and transferred to the section. Thus the profile has no long level stretches, but is of the form shown.

Sketch-sections are profile sections drawn without accurate measurement. The

relative heights and positions of the chief features are roughly estimated, and with these as guides an approximate section is drawn which shows the broad features of the relief.

VERTICAL EXAGGERATION. A true section, representing actual slopes on the ground, is only possible if the vertical and horizontal scales are the same. However, this results

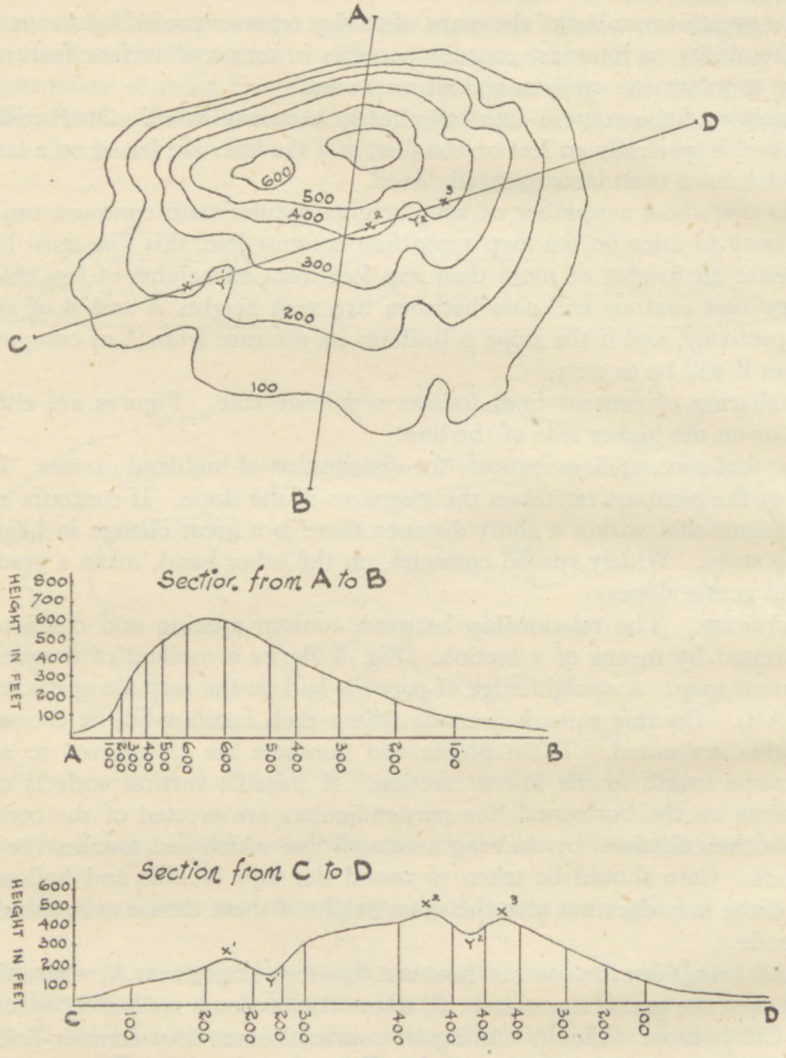

FIG. 8

in a profile in which gentle slopes are barely discernible, and in practice it is generally more satisfactory to exaggerate the vertical scale about five or six times. For One-inch maps a vertical scale of 1 inch to 1000 feet is suitable. On every section the vertical scale should be stated, as otherwise the slopes may be most misleading.

CONVEX AND CONCAVE SLOPES. Section AB (Fig. 8) shows the relationship between closeness of contours and steepness of slope. It also illustrates the different slope profiles that result from changes in contour-spacing. The hillside which 'faces' A is represented

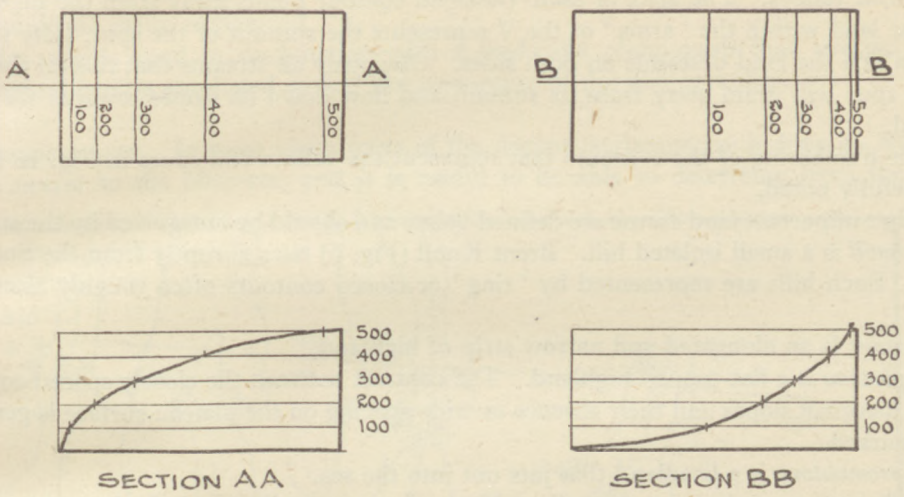

FIG. 9.—CONCAVE AND CONVEX SLOPES

by contours that are close together at the foot of the hill and become more and more widely spaced as the summit is reached. Evidently the slope is at first steep, but as the higher ground is reached it becomes more gentle. This is a *convex* slope. From B the contour-spacings decrease towards the summit, and the slopes become progressively steeper. This is a *concave* slope. Fig. 9 shows these slopes in a more pronounced form. Obviously if the contour-spacing remains uniform the slope too will be uniform or even.

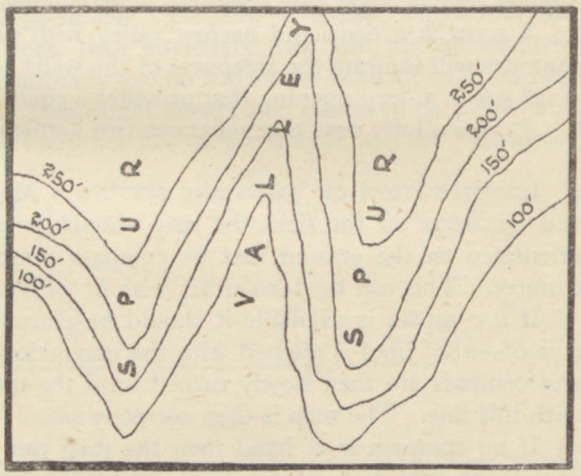

FIG. 10.—VALLEYS AND SPURS

VALLEYS AND SPURS. Fig. 10 represents by means of contours two important land forms—valleys and spurs. Valleys are areas of low ground which penetrate into the surrounding highlands. Within them the streams of a countryside collect, soil accumulates, villages find shelter, and roads and railways easy routes. Their recognition is important, and the diagram shows that they are represented by V-shaped contours and that the apex of each V points towards the highland. From the floor of the valley within the 'arms' of the V the land rises on each side, and the steepness of these valley walls is indicated by the spacing of the contours.

Spurs are fingers of highland which project into lower ground, and they frequently separate one valley from another. The diagram shows that they too are represented by V-shaped contours, but the numbering of these should make it impossible to confuse them with valleys. The apex of each V-shaped contour points away from the highlands, and the land within the ' arms ' of the V represents the summit of the spur, lofty ground from which the land descends on both sides. Obviously all streams that rise on the sides of the spur will drain away from its summit and flow down its slopes towards the lower ground.

The numbering of the contours that represent the valleys and spurs in Fig. 10 should be carefully noted.

Other important land-forms are defined below and should be recognized by the student.

A knoll is a small isolated hill. Brent Knoll (Fig. 6) rises abruptly from the Somerset Plain. Such hills are represented by ' ring ' or closed contours often roughly circular in shape.

A ridge is an elongated and narrow strip of highland.

A plateau is a flat-topped highland. The contrast between the closely spaced contours of the marginal slopes and their absence or wide spacing on the plateau surface is generally very marked.

A promontory is a headland that juts out into the sea.

Cliffs are precipitous rock walls. If these are actually vertical the contour-lines coincide. If a 50-foot contour-line ends on the coast the coast at that point is a vertical wall 50 feet in height.

Dissected highlands are highlands that are cut up by valleys.

Undulating lowland is low country that gently rises and falls. The low mounds or hillocks may be shown by irregular, closed contours.

A gorge is a deep and narrow valley with precipitous walls. The crowding of the contours will indicate the steepness of the walls.

A gap is a deep opening that provides a route through upland country.

A col is a lofty pass that separates two highland areas.

Identification of Views and setting a Map. Before attempting to correlate map and landscape in the field the map should be *set*, which means that it should be so orientated on the ground that its compass directions coincide with those of the actual country. This can be done either with or without the help of a compass.

If a compass is available it should be placed on the horizontal map so that its axis (the 0°—180° line) is aligned with the magnetic north-and-south line on the map. Map and compass are then slowly turned until the magnetic needle of the compass coincides with this line. The map is then correctly set.

If no compass is at hand then the map can be accurately orientated as follows. A prominent distant object, which is clearly recognized in the view, is identified on the map, and a straight line is drawn on the map to join its position with that of the observer. The map is then turned until this line points directly to the distant object itself. Features on both maps and country are now seen in their correct relative positions.

When the observer's position is not known, then it is necessary to find two easily recognized features of the view, one of which is either directly above or behind the other.

It is clear that these features must be in a line with the observer, and they are identified on the map and a line is drawn through them. This is repeated for a second pair of similarly arranged features, and the intersection of the two lines drawn on the map marks the position of the observer. The map can then be set, and all the features of the landscape should be easily recognized.

If the map is used in conjunction with a landscape photograph then precisely the same method can be employed to find the view-point of the photographer.

INTERVISIBILITY. In most views parts of the distant landscape are hidden by features that lie nearer to the observer, and it is useful to be able to determine from the map

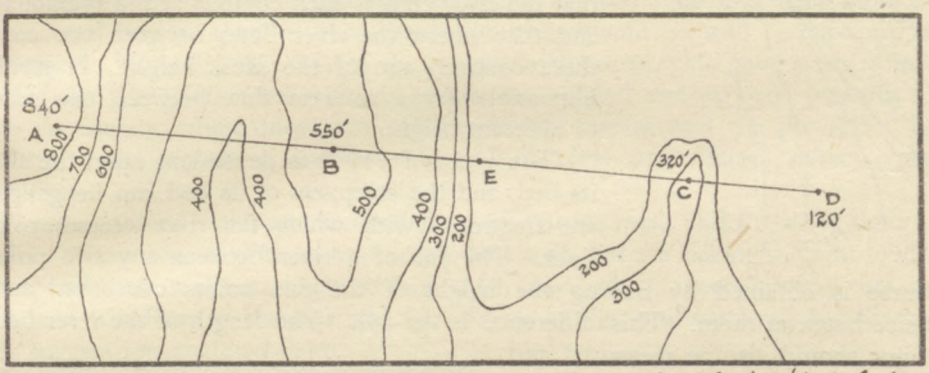

FIG. 11

which features will be visible from any particular view-point. If the map shows that high ground towers up between two places, then obviously they will not be mutually visible. On the other hand they will be mutually visible if they are both situated on high ground and only low ground intervenes. One might expect two points to be intervisible if one is situated on the top of a hill and the other lies on lowland at its foot. However,

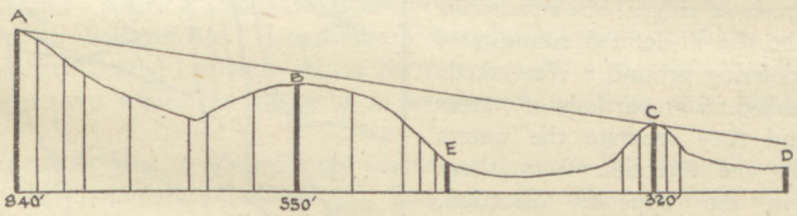

FIG. 12

this is only the case if the slope between them is concave. Figs. 11 and 12 show that E, which is situated at the foot of a convex slope, is not visible from B on the summit. In all cases where there is any doubt it is advisable to draw a section. In Fig. 11 one might expect D (120′) to be visible from A (840′) as the two low ridges that intervene only reach 320′ and 550′ respectively. However, the section in Fig. 12 shows that D is not visible from A, as the hill C blocks the view.

It is only necessary to draw *skeleton sections* to determine the intervisibility of two places. In this section only the darkened perpendiculars need have been drawn, for they mark the summits likely to impede the view.

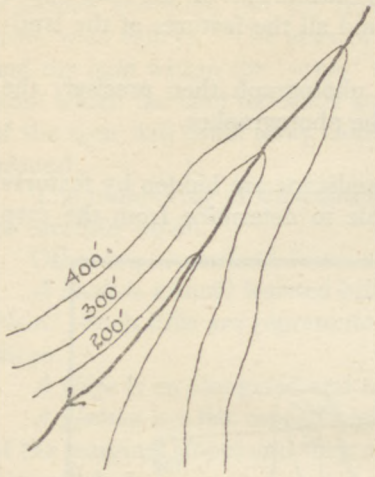

FIG. 13

VIII. Drainage

Flowing water seeks the lowest level possible, and thus streams flow in the lowest parts of their valleys. Fig. 13 shows a valley in which a river flows in the direction indicated by the arrow. It should be noted that the river crosses each contour at the apex of the V, and that where the river flows between two contours these contours are of the same height. It would be impossible for a river to flow between two contours of different height.

The speed of a river is dependent upon the slope of its bed, and the steepness of its bed can be gauged by the frequency with which the river crosses contour-lines. The *fall* of a river between any two points of its course is obtained by finding the height of the two points concerned and the difference between them. This difference is the fall. The length of the river between the points should also be measured and the fall is then expressed in inches or in feet per mile.

The *basin* of a river is the area drained by the river and all its tributaries, and the line which joins the tops of all the slopes draining into the basin is the *watershed* of the river. Sometimes the tops of these slopes will be the lofty crests of ridges, but sometimes they will be the ill-defined summits of gently undulating ground. Watersheds are often called water-partings or water-divides, and they separate the waters draining in one direction from those draining in the opposite direction. Within a river basin subsidiary watersheds may divide the small streams flowing into one tributary from those that flow into another.

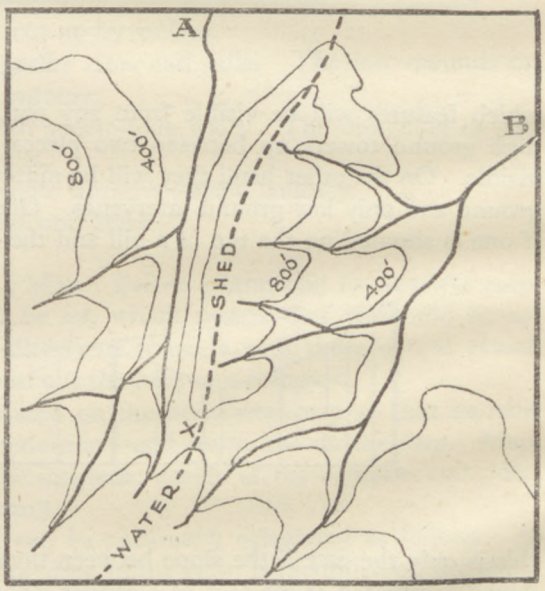

FIG. 14

Fig. 14 shows part of the watershed between the streams A and B. At X it crosses a low col which forms a passage-way between the two valleys.

IX. Settlement and Land Utilisation

The positions of farms, villages, towns, and cities represent sites that have been deliberately chosen by man. In some cases the reasons for the choice are apparent and can easily be read from the map, and it is obvious that the position of all settlements will be determined to a greater or less degree by the natural resources of the surrounding area.

Since farmers are concerned with the growing of crops and the rearing of stock animals, the position of farms will be closely related to the distribution of rich soils or pasture-lands. These in their turn will be dependent upon the nature of the underlying rock, the relief of the land, and its climate.

In the latitudes of the British Isles highlands of even 1500 feet suffer from a severe climate, and heights that in more genial countries would be well peopled are desolate and empty. Nevertheless many of the mountain slopes provide good pasture for sheep, and for the sake of this some farms endure an isolated and exposed position. Lower down the slopes, where mountain valleys provide shelter and the possibility of some agriculture, the increasing number of small hamlets and villages reflects improving conditions.

Pure limestone, chalk, and sandstone are all porous rocks and therefore their surfaces are dry. Moreover, all of them tend to produce soils that are lacking in plant food. Thus outcrops of these rocks are likely to form open lands, either moor, springy turf, or heath and sparse woodland as the case may be. Farms are few and scattered and the unfenced roads suggest few enclosed fields.

On the other hand, lowlands composed of such rocks as loam, clay, and alluvium may, provide rich arable lands. Here the productivity of the region will be suggested by the number of the farms scattered everywhere and the close network of the roads. However, low alluvial flats may be overwatered and useless for agriculture and only valuable as pasture-land if carefully drained. On the map the absence of farms in these areas and the numerous drainage channels and wind pumps have an obvious story to tell.

All these considerations will affect the site of the farming-village as well as the individual farm. A sheltered and sunny aspect, a good supply of drinking-water, safety from flood, and a position within easy reach of all the available farmlands are other factors that determine choice of site. A particularly favourable position is at the junction of hill pastures and cultivated lowlands, where there is a mixture of soils and a probability of spring water, and where the village is in touch with meadows, crop lands, and sheep pastures.

Market-towns have developed from smaller settlements and generally they owe their success to their command of routeways. Some are centrally situated in a plain or stand at the entrance of a routeway into hill country ; others have developed where two rivers meet or where routes converge to file through a gap. Other factors too have played a part in their development, and in the past great importance was attached to the possibilities of defence. The occurrence and exploitation of supplies of slate, building-stone, metal ores, or china clay gives an explanation of the site of many small industrial villages and towns.

The relationships and interaction between a large town and its geographical setting are far more complex. But the One-inch map can give much information with regard

to its size, shape, and general plan, the disposition of its business centres and residential suburbs, its main routes and functions, and its possible expansion.

As opportunity offers, the student should note the frequent occurrence of characteristic town shapes—the compact cluster of buildings typical of many nodal towns, the open character of residential villages and garden cities, the new *ribbon* settlements stretched along the great trunk roads, or the long water frontage of seaports and seaside resorts.

X. Communications

The clear representation of routeways is one of the most important functions of large-scale maps. It is, in fact, as road maps that the Quarter-inch, Half-inch, and One-inch maps are most frequently used. On the Ordnance Survey maps the roads are classified, and by symbol and colouring roads which are suitable for fast or heavy traffic are distinguished from those that are steep, winding, narrow, or rough. In the Fifth Edition of the Ordnance Survey One-inch maps main and secondary roads bear the Ministry of Transport numbers. On these maps, too, all railways are shown and special symbols indicate embankments, cuttings, bridges, and level crossings.

Roads and railways are links whereby towns, villages, hamlets, and even individual houses and farms are brought into communication one with another. The main railway

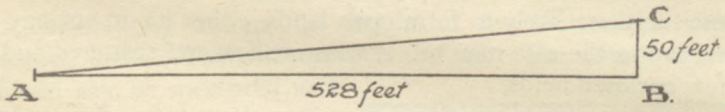

FIG. 15

lines and great trunk-roads can ignore and by-pass small settlements and ribbon out their relentless routes from city to city, but the minor roads must link up the smaller towns and villages and thus their courses are far more winding.

As a general rule all highways are as direct as is practicable. Nevertheless, both major and minor routes seek gentle slopes and easy climbs and generally avoid steep hill slopes, bleak and lofty moorlands, or easily flooded lowlands. Therefore valleys that penetrate into highland country and low passes that lead across difficult ridges become exceedingly important as routeways, as do raised and drier slopes skirting low wet plains.

GRADIENTS. The steepness of the slopes along any road or railway is indicated by the spacing of the contour lines that are crossed. The *gradient* of any slope is the relation that its rise or fall in height bears to its length measured on the ground. This is illustrated in Fig. 15. AB represents the distance between two contour lines as measured on the map=528 feet. BC represents the vertical interval between the two contours=50 feet. The line AC represents the actual distance on the ground between the two contour levels, and this approximates so closely to the distance as measured on the map that it may be regarded as equal to it. Thus AC can be considered as equal to AB, which is called the Horizontal Equivalent. The gradient is therefore :

$$\frac{\text{Vertical Interval (V.I.)}}{\text{Horizontal Equivalent (H.E.)}} = \frac{BC}{AB} = \frac{50}{528} = \frac{1}{10{\cdot}56} \text{ or 1 in 10·56.}$$

Useful approximate gradients can be obtained by calculating on the basis of 5000 feet to the mile. If the contour-lines of a one-inch map are found to be $\frac{1}{25}$ inch apart, the gradient is :

$$\frac{\text{V. I.}}{\text{H.E.}} = \frac{50}{\left[\frac{5000}{25}\right]} = \frac{50}{200} = \frac{1}{4} \text{ or 1 in 4.}$$

Gradients of 1 in 7 are unusual on main roads and unsuitable for heavy traffic. Gradients of 1 in 5 are dangerous, especially in bad weather, and demand caution on the part of motorists. Gradients of 1 in 2 are too steep for walking and involve climbing with the use of handholds.

Railways cannot attempt the slopes that are possible for roads and a gradient of 1 in 60 is unusually steep for a main railway line.

Slopes can also be expressed in degrees. In Fig. 15 ∠ BAC represents the angle of slope, and is approximately 6°. It has been found by measurement that for a slope of 1° the gradient is approximately 1 in 60 (57·3), and for moderate slopes the gradient is proportional to the angle of slope and can be converted into degrees by multiplying by 60. Therefore a gradient of 1 in 10 represents an approximate angle slope of $(\frac{1}{10} \times 60)° = 6°$. This does not hold good for gradients steeper than 1 in 3.

ROAD PROFILES. A section or profile along a road clearly indicates its changes of slope, and for the guidance of motorists profiles of many main roads are published. To draw such a profile a straight edge of paper should be aligned in turn with each approximately straight length of the road (see p. 9). On this paper a mark is made whenever the road crosses a contour, and the height of the contour is noted. A mark is also made for each major change of direction. A straight line to represent the road is drawn on a separate piece of paper, and to this the marks are transferred. On this line a section is constructed as described on p. 13, and on this section are indicated those points on the road where major changes of direction occur.

CANALS. On the maps of the Ordnance Survey canals are coloured in blue and named and the position of locks is shown. It is well to notice that canals do not necessarily keep to valley floors ; they may follow the sides of valleys, or they may run along the slopes of hills and even burrow through them in low tunnels. Between locks canals maintain the same level, so that they frequently follow the courses of contour-lines.

XI. Map References

The ' Popular ' and ' Tourist ' Editions of the Ordnance Survey One-inch maps are divided into squares of two-inch sides. This system of squares is called a grid. The divisions along the top and bottom of the map are numbered 1, 2, 3, etc., from left to right, and the divisions along the sides of the map are marked A, B, C, etc., from top to bottom. Thus any square can be identified (*e.g.*, A4, B1, etc.), and any place can be located with reference to the square in which it lies. Such a grid should be drawn on tracing-paper for use with the Norwich District map (facing p. 42).

On the Fifth Edition One-inch maps of the Ordnance Survey grid lines divide the

map into squares of which the sides represent 5000 yards. These grid lines are numbered in the margins of the full sheets with their distance in yards east or north of a point of origin 49° N. and 2° W. The grid of any single map sheet, therefore, is a small part of a grid system covering the whole of England and Wales. The position of any place on any such map can be defined as so many yards east and north of this point of origin.

EXERCISES

1. Study the three maps of Ambleside.
   (*a*) The Quarter-inch map shows main roads clearly and a few minor roads. What additional routeways are shown on the Half-inch and One-inch maps respectively? Which map is most suited to (i) the touring motorist, (ii) the hiker?
   (*b*) What features of the lowlands are shown on all three maps? Make a list of additions found on the Half-inch and One-inch maps respectively.
   (*c*) A photograph of Ambleside is reproduced opposite p. 65. It is a view obtained from Loughrigg Fell. Compare it with its representation on the map. Which map enables you to picture the town best?
   (*d*) Compare the representation of (i) highlands, (ii) rivers, (iii) lakes, on the three maps.
2. How are the following shown on Ordnance Survey Maps?
   (*a*) A village with a church, telegraph office, and youth hostel. (The church has a spire.)
   (*b*) Coniferous woodlands, orchards, marshes.
   (*c*) Main roads, 2nd-class roads, difficult or bad roads, lanes and minor roads, footpaths.
3. A double-track railway line passes through two towns A and B six miles apart. After leaving A it runs for one mile through a cutting and then leaves this and crosses a plain for the remaining five miles to B. A slow stream bordered by marshes flows across the plain, and the railway is carried over these marshlands on an embankment, and over the river by means of a short viaduct. The railway crosses two roads, one at a level crossing and the other by means of a bridge. Draw a sketch-map of the railway on the scale of 1 inch to 1 mile.

Scales

4. Express as representative fractions the following scales:
   (i) 4 miles to the inch. (iii) 1 cm. to 1 km.
   (ii) 4 inches to the mile. (iv) 10 miles to the inch.
5. Express as statements of scale in inches and miles:
   (i) $\frac{1}{50{,}000}$. (ii) $\frac{1}{31{,}680}$.
   Express as statements of scale in cm. and km.:
   (iii) $\frac{1}{1{,}000{,}000}$. (iv) $\frac{1}{63{,}360}$.
6. Draw linear scales of:
   (i) 2 miles to the inch. (ii) 2 cms. to 1 km.

Measurement of Distances and Areas

7. (*a*) What area is represented by the map of Snowdon facing p. 58?
   (*b*) What area is represented by one of the squares on this map?
   (*c*) What is the area of Lyn Ogwen?

AMBLESIDE

QUARTER-INCH MAP, SHEET 2

Scale: One inch represents four miles.

HALF-INCH MAP, SHEET 5

Scale: One inch represents two miles.

ONE-INCH MAP, LAKE DISTRICT

Scale: One inch represents one mile.

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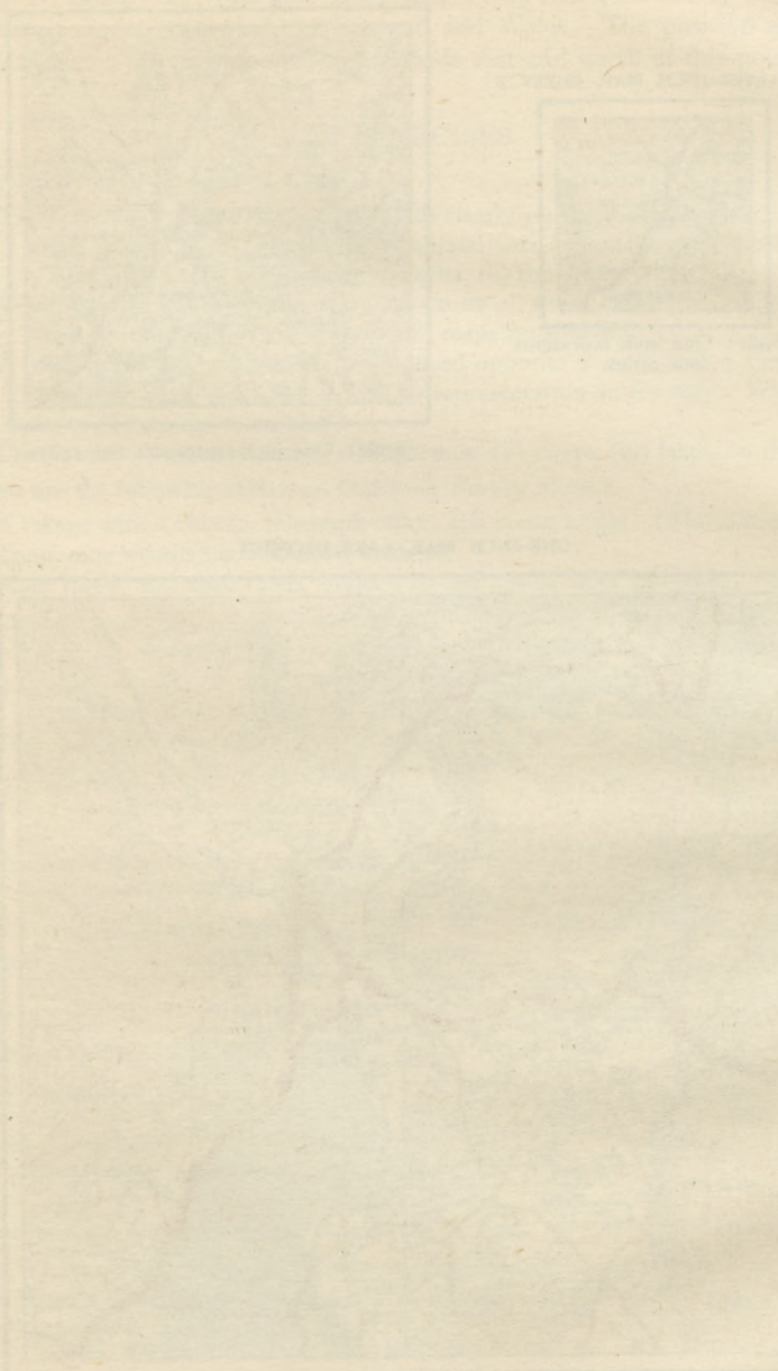


8. On the map of the Torridge valley facing p. 52 :
   (*a*) Find the area of the park of Stevenstone House.
   (*b*) Find in yards the length of the sides of the squares on this map.
   (*c*) How far is it by road from Great Torrington to Landcross ?

9. (*a*) Find the area represented by the map of the Manchester docklands facing p. 38.
   (*b*) What is the water frontage of the Tatton and Ordsall Mills ?

10. A town A in latitude 37° S. lies due south of a town B in latitude 35° 40′ S. The map shows them as four inches apart. What is the scale of the map ?

Direction

11. Using the map facing p. 58, give the compass direction from Snowdon summit of :
   (i) The summit of Carnedd Dafydd.
   (ii) The summit of Elidir Fawr.
   (iii) The lake Nardroedd (Llyn Nardroedd).

12. Using the map facing p. 30, find the bearing from Crook Peak of the following :
   (i) Loxton Church.
   (ii) Christon.
   (iii) Compton Bishop Church

Representation of Relief

13. Study the map of Weston. What is the height of the summit of (i) Crook Peak, (ii) Brean Down ? What is the height of the Golf Links at the southern end of the promenade ?

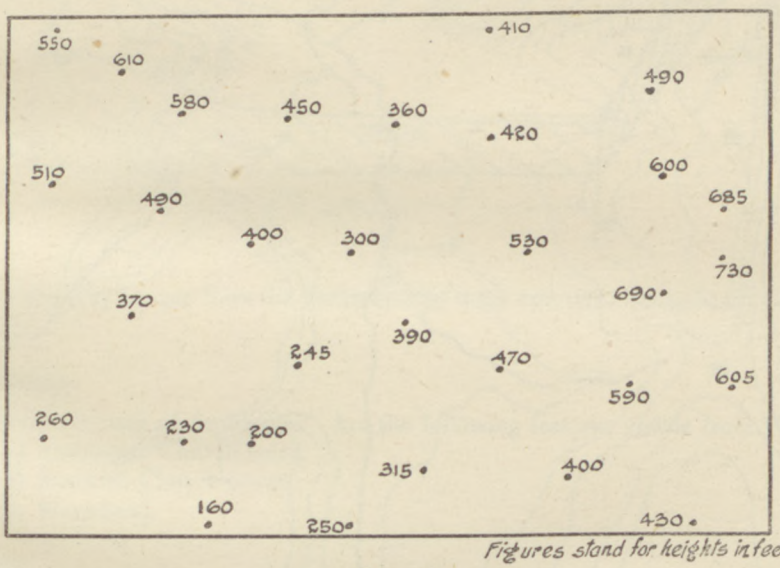


FIG. 16

14. Trace Fig. 16 into your note-book, and on it draw contour-lines of 200, 300, 400, 500, 600, and 700 feet. Shade lightly the land between 300 and 600 feet, and a little more heavily the land over 600 feet. Add a key to your colouring.

15. Study Fig. 17. Make a list of the land-forms indicated on the map by the

letters A, B, C, D, E, F, G, H, I, J. What coastal features are indicated at K, L, M respectively? What river features are shown at N and O respectively?

16. Within squares of 2″ side draw contour sketch-maps to illustrate the ten land-forms described at p. 16.

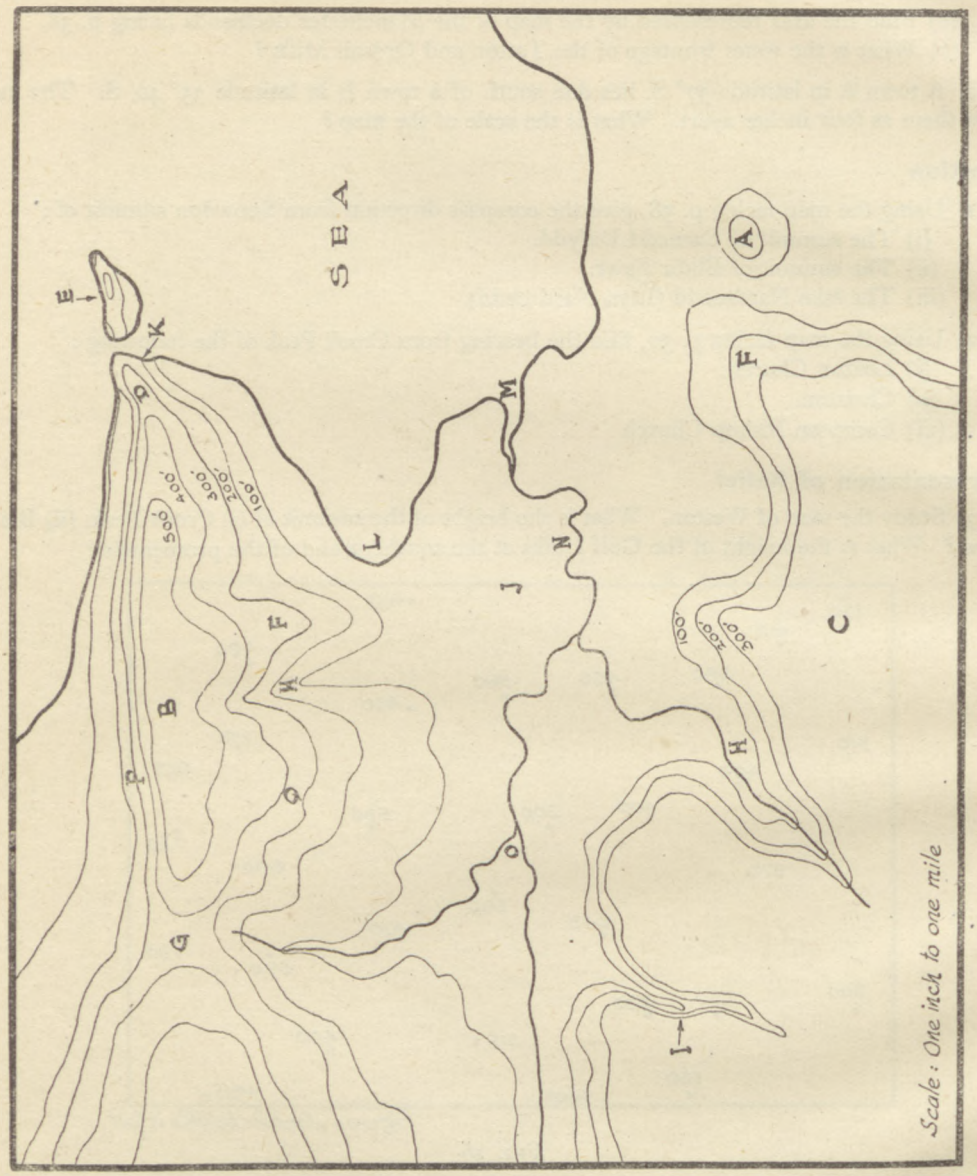


FIG. 17.—LAND-FORMS AND CONTOUR-PATTERNS

17. Study Fig. 18. It is a block diagram of an area of hilly country. Draw a contour sketch-map of the area on a scale of 1 inch to 1 mile. Use a vertical interval of 100 feet.

18. Draw a section across Fig. 17 along a line parallel with the sides of the map and passing through C. Use a vertical scale of 1 inch to 1000 feet.

19. Draw a section across Fig. 20 from the top left-hand corner to the bottom right-hand corner of the map. Use a vertical scale of 1 inch to 1000 feet.

20. Using the map of the Snowdon District (facing p. 58), draw a sketch section from Pen-yr-Olen-Wen (B.3) to Halfway Station (C.2). Name the chief physical features shown on the section.

Drainage

21. Trace Fig. 19 into your note-book. Print the word SPUR in three appropriate places on the map. Draw in the most important streams and their tributaries.

22. Trace Fig. 20 into your note-book. Draw in the tributaries of the two rivers that flow

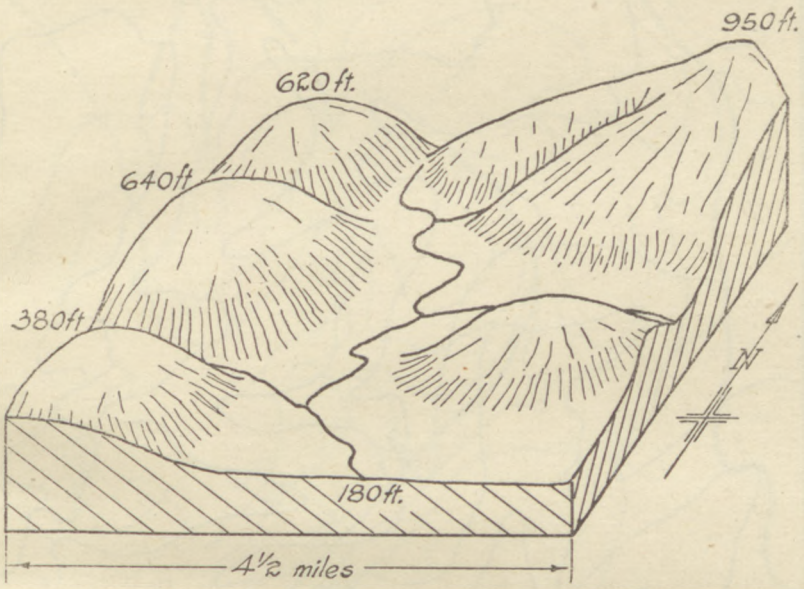


FIG. 18

south, and show by broken lines the watersheds of these two river basins as far as they are shown on the map.

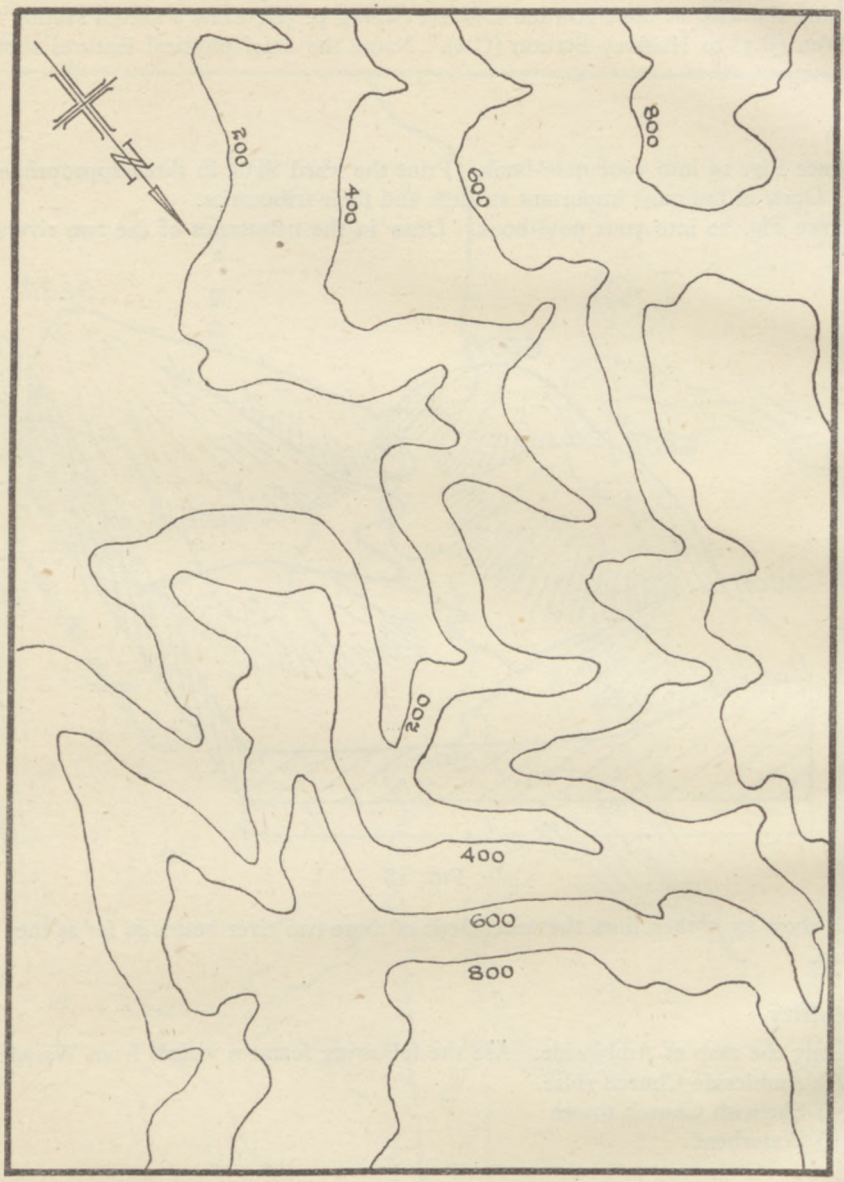
Intervisibility

23. Study the map of Ambleside. Are the following features visible from Wansfell Pike ?
   (i) Ambleside Church spire.
   (ii) Skelwith Church tower.
   (iii) Waterhead.

Gradients

24. What is the average gradient of the footpath that leads from Stockgill Force to Wansfell Pike ? What is the steepest gradient of the 2nd-class road that climbs north-east from Ambleside ? What is the meaning of the black arrows along the course of this road ?

Note.—See Section V for revision and examination questions.



Scale : 1 inch represents 1 mile

FIG. 19

Scale: 1 inch represents 1 mile

FIG. 20

THE ORDNANCE SURVEY MAPS OF GREAT BRITAIN

THE Ordnance Survey of Great Britain has mapped the whole surface of the country on scales ranging from 10 miles to the inch to 6 inches to the mile, and in addition has produced large-scale plans of all but the most mountainous and unproductive regions.

The chief large-scale maps are the Six-inch maps on the scale of six inches to the mile, and the Twenty-five-inch maps on the scale of 25·344 inches to the mile. On these maps every building, railway, road and footpath, stream, field, and enclosure is drawn, and all boundary lines are shown. Relief is indicated by bench marks and spot heights, and in the Six-inch maps by contour lines. This detailed information is of great value to land agents and property owners, architects and engineers, and these maps are used for such purposes as town and factory planning, road and railway building.

The map of Manchester Docks which follows in Section III is part of one of the Six-inch maps of Lancashire (sheet Lancashire CIV.S.W.).

The principal small-scale maps are the One-inch, Half-inch, and Quarter-inch maps.

The One-inch maps, drawn on a scale of 1 inch to 1 mile, are of outstanding value to those planning walking-, cycling-, or motoring-tours. Various forms of this map are published, of which the chief are described below :

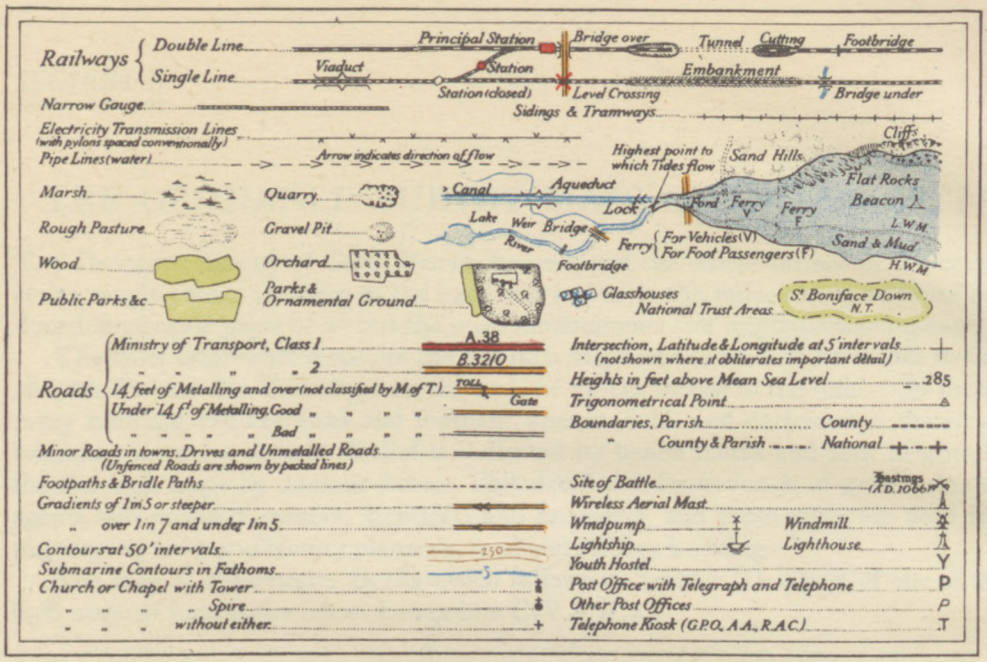
(*a*) POPULAR (FOURTH) EDITION. In this edition relief is shown by spot heights and contour-lines printed in orange at a vertical interval of 50 feet. Woodlands are shown in green, water in blue, 1st-class roads in red, 2nd-class roads in brown, 3rd-class roads in chequered brown, and minor roads are uncoloured. A specimen map of this edition (part of sheet 102) is reproduced facing p. 35.

(*b*) FIFTH EDITION. This edition is replacing the Popular Edition as the standard One-inch map of England and Wales. In general style it resembles the Popular Edition, but it has been completely revised and many improvements have been made. These include improved symbols for railways and roads with the addition of the Ministry of Transport road numbers. Parish boundaries have been reintroduced and a new style of lettering adopted. The maps of Weston-super-Mare (facing p. 30) and Torrington (p. 52) are examples of this edition, and some of the map-symbols are reproduced facing p. 29.

(*c*) FIFTH (RELIEF) EDITION. This differs from the Fifth Edition in the representation of relief. Spot heights and coloured contour-lines with a vertical interval of 50 feet are used in combination with hachures and faint layer-colouring. The hachures are printed in two colours, light gold on the north-western slopes of hills and light brown on the south-eastern slopes, and the hill-shading which is thus produced gives a striking pictorial effect, almost that of a model.

(*d*) TOURIST EDITION. This edition does not cover the whole country, but maps have been published of those regions that are of special interest to tourists. On most of these maps relief is shown by spot heights, contour-lines at 50-foot intervals, and layer-colouring. The shades of green, buff, and brown that are used are in some cases very

CONVENTIONAL SIGNS



FIFTH EDITION

ONE-INCH MAP

LAND UTILIZATION SURVEY.

EXPLANATION OF COLOURS

HEATH AND MOORLAND

Heath, moorland, commons, and rough pasture - - - -

Rough marsh pasture - -

ARABLE LAND—Including fallow, rotation grass, and market gardens - - - -

MEADOWLAND AND PERMANENT GRASS

FOREST AND WOODLAND

Deciduous - - - - - -

Coniferous - - - - -

Mixed - - - - - -

New plantations - - - -

GARDENS, Etc.

Houses with gardens sufficiently large to be productive of fruit, vegetables, flowers, etc. - - - -

Orchards - - - - -

New housing-areas, nurseries, allotments, and new orchards -

LAND AGRICULTURALLY UNPRODUCTIVE

Land so closely covered with houses and other buildings or industrial works as to be agriculturally unproductive -

Yards, cemeteries, pits, quarries, tip heaps, new industrial works, etc. - - - - - - - - -

Marshes unsuitable for grazing - - - - -

delicate in tone and perfectly graded, and these maps are outstandingly clear and of great beauty. Some sheets make use of hachures either with or without layer-colouring.

The maps of Lewes (facing p. 45) and of Buxton (p. 49) are examples of Tourist maps with layer-colouring, and that of Snowdon (facing p. 58) illustrates the use of hachures and hill-shading.

Land Utilisation Maps. These maps are prepared and published by the Land Utilisation Survey of Britain, and are based on the Popular Edition One-inch map of the Ordnance Survey. By means of a series of contrasted colourings they show the use to which the land-surface is put, and present a most significant picture of the countryside, representing its intricate pattern of woodland and open moor, ploughed land and meadow. An explanation of the colourings used is given in the plate facing p. 29, and a small part of the Norwich map (Sheet 67) is reproduced facing p. 42.

The Half-inch and Quarter-inch maps of the Ordnance Survey cover the whole of the country, and in style are somewhat similar to the Tourist maps. Relief is shown by contours and layer-colouring, and the roads are shown with great clearness. Some special district maps of the Half-inch series use hill-shading as well as contours to represent relief. These smaller-scale maps are of special value to motorists and cyclists.

EXERCISES

1. The Fifth Edition One-inch map of England and Wales is published in 146 sheets. Each sheet measures $29 \times 17\frac{1}{2}$ inches. What area is represented by each sheet ?

2. What methods of representing relief are used on the maps of Weston, Lewes, and Snowdon respectively ? Which of these three maps do you prefer, and why ?

3. Make a table of conventional signs or symbols for use with the Six-inch map of the Manchester Docks. Include the symbol for : (i) a road, (ii) a double-line railway, (iii) a single-line railway, (iv) a railway in a cutting crossed by a road, (v) a station, (vi) a bridge, (vii) trees, (viii) buildings.

4. Give the meaning of each of the following conventional signs (see main roads and the Cornbrook Sidings on the Manchester map) : P.O., G.P., L.B., M.S., P.H., S.B., S.P., Ch., Sch.

5. There are many types of grasslands. How are they classified by the Land Utilisation Survey ? How can you distinguish mountain pastures and river meadows ?

6. What is meant by (i) arable land, (ii) fallow land, (iii) rotation grass, (iv) market gardens ? Why are (ii), (iii), and (iv) classified as arable lands ?

7. Consider the scheme of colouring chosen by the Land Utilisation Survey. What do you consider to be the advantages (or disadvantages) of this scheme ?

Note.—The Land Utilisation Survey symbol for heath, moorlands, and rough pasture is incorrectly shown in the facing plate. It should appear as the Ordnance Survey symbol for rough pasture with yellow colouring superimposed.

SOME SELECTED MAP-STUDIES

(1) WESTON-SUPER-MARE AND DISTRICT

One-inch Map of the Ordnance Survey. Fifth Edition. Part of Sheet 111

See Note at p. 10

THE region is one of simple and yet striking relief. The contrast between the low and flat plains and the abruptly rising hills is immediately clear.

The Plains

A study of the map shows that the lowlands of this area are of very slight elevation and unusually level. In only a very few regions is there a rise to 50 feet above sea level, the general surface of the plain as indicated by spot heights being less than 20 feet in height (A3 C2).

Across these lowlands flow many slow streams, and in the south of the area the river Axe swings lazily in great meanders to the sea. The intricate network of intersecting drainage channels or rhynes is easily distinguished from these natural streams. The close pattern of watercourses both natural and artificial indicates that the lowlands are over-watered, and that the farmer must undertake to drain his land. That he must also protect his drained fields from inundation is shown by the imprisoning of the Axe within dykes or levees which, if partly natural, have probably been strengthened by man. An attempt to increase the fall of the river and speed up its current is seen in the artificial straightening of the river course which cuts off large and elaborate meanders (C2 and 3).

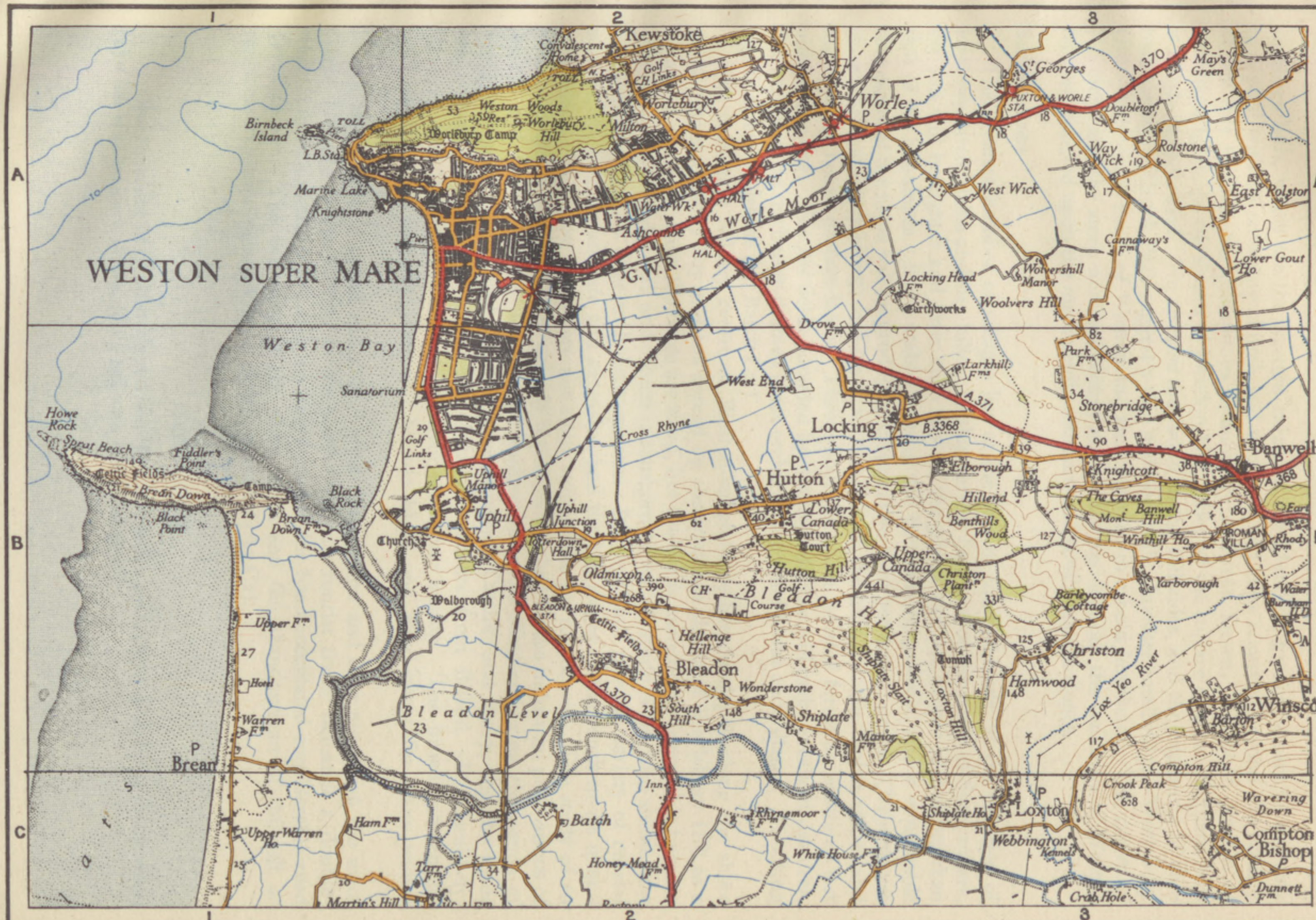
Near the sea the plains rise slightly; thus along the shores of Brean and Weston Bay heights of 27 and 29 feet are reached and some tiny hillocks rise to over 50 feet (C1). On a coast where a great expanse of sandy shore is exposed at low tide and which receives the full force of prevailing westerly winds, it is reasonable to interpret this low rampart as a belt of sand hills and dunes. The names Warren Farm and Upper Warren House in Brean are in keeping with this interpretation, as is the presence of golf links immediately behind the beach at the southern end of Weston Bay. (Note that the bay marked to the north of Worlebury Hill in A2 is called Sand Bay, and just beyond the limit of our area the region immediately behind this bay is marked on the map as an area of sand.)

This sandy ridge has been utilized in Brean for the building of roads, farms, even hotels, and in Weston itself the main promenade has followed its course. At high tide the sea evidently reaches its foot, but at low tide the water retreats for a mile or more, leaving acres of sand and mud exposed.

The Hills

From the plains two ridges of hills rise abruptly, the close contour pattern of Crook Peak and Wavering Down (C3) showing how sudden and steep are the hill-slopes. The

WESTON-SUPER-MARE



FIFTH EDITION

Scale of one inch to one statute mile $=\frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 — 1 — 2 — 3 miles

PART OF SHEET 111

Printed by W. & A. K. Johnston Limited, Edinburgh & London.

southern hills, which are the western ridges of the Mendips, gradually narrow and sink to Uphill with its crowning church and windmill and then reappear beyond the estuary of the Axe to form the precipitous promontory of Brean Down. Although patches of woodland occur on the slopes of Bleadon Hill, much of the surface of these southern hills is rough pasture-land. No streams are found in the hill-sides, and the exposures of bare rock shown on Crook Peak suggest a thin and poor soil. Another small ridge—Worlebury Hill—rises to the north of Weston and ends seaward in a bold headland. The crown of this ridge and the steep northern slopes are thickly wooded, but the buildings of Weston have encroached upon the more gentle southern and south-eastern slopes.

Settlements

The greatest number of villages lies at the foot of the highlands, at the junction of level saturated plains and dry hills. In this narrow belt, out of the reach of flood waters, the soil will be lighter and drier than that of the plains and yet deeper and richer than that of the hill-slopes. Some arable farming will therefore be possible, and it is probable that many of the fields will be producing crops rather than permanent grass. Orchards are shown around every village and creep up the foot of the hills, but the higher slopes and hill-tops are rough pasture-lands. Throughout the plains isolated farms are scattered but villages are few. The flat fields bounded by drainage ditches will make excellent pastures, but here, too, on the better-drained areas orchards surround farms and villages. (Locking B3, Wick and Rolstone A3, Batch C2.)

The important holiday centre of Weston-super-Mare has developed along the shore of an immense sandy bay and has spread up the southern slopes of Worlebury Hill to a height of 250 feet. Here the roads are steep, but the site is particularly favourable because of its sunny aspect, dry soil, and extensive southern views. A study of the map shows how much Weston has to offer to holiday-makers. Its headlands provide variety of coastal scenery, its beaches are safe and extensive, and the hill ridges to the south invite inland excursions. But these factors are not alone responsible for its success. The study of an atlas map shows how easily and cheaply it may be reached by the industrial populations of Bristol and South Wales. During the summer pleasure-steamers bring thousands of 'trippers' across the Bristol Channel from Newport, Cardiff, and Barry, and the roads and railway carry an endless stream of holiday-makers from Bristol. It is unlikely, however, that Weston will have more than a summer season. The broad promenade, open to the full westerly gales, will be too bleak and wind-swept for many winter visitors.

Although Weston is not naturally a great route-centre and does not lie on the main Great Western Railway route to the south-west, the tourist traffic demands a double-track loop-line to the town, and the heavy road traffic has necessitated considerable road development. The widening of the main roads and the abandonment of difficult or unnecessarily winding stretches is clearly indicated (A3 C2).

EXERCISES

1. Give the name of (i) a flat-topped hill, (ii) a hill with a peak, (iii) a spur, (iv) a promontory, (v) a hill with concave slopes, (vi) a hill with convex slopes.

2. Study the two views of Brean Down in Fig. 21. State as exactly as you can the position from which these views are obtained.

3. Describe the course of the main river (the Axe) in the south of the area. What evidence is there that this river is subject to floods ?

4. What is a rhyne ? Account for the presence of so many rhynes in the lowlands of the area.

5. Describe the view from Brean Down (i) looking north-east, (ii) looking south-east.

6. Trace Fig. 22 into your note-book, and on this grid show the new coastline of the area, supposing that the sea were to rise 100 feet. Shade those regions that would be converted into islands.

7. Nearly all the hills of this area are without streams. Can you account for this ?

8. Confining your attention to squares BC 23 give the names of six villages that are built at the foot of hills. What are the advantages of this site ? Why are there comparatively few villages on the plains ?

9. What contrasted regions lie within the parish of Bleadon ? Draw a sketch-map of the parish to show the position of the different regions that you have described.

10. Name two other parishes which are similar in character to that of Bleadon.

11. What advantages does Weston possess as (i) a residential town, (ii) a holiday resort ?

12. Account for the building of (i) a marine lake on the shore, (ii) a second pier (the New Pier) to Birnbeck Island. Which of the two piers is more likely to be used by Bristol Channel pleasure-steamers ?

13. Find Brean Down Farm (B1). What kind of farming is probably carried on here ? How is it possible to reach Weston from the farm (*a*) with, (*b*) without a car ? Explain why the farm is so isolated.

14. Name the post office which is nearest to Brean Down Farm. How far is it away ?

15. How can you account for the presence of a hotel in B1?

16. How far is it by road from Weston (Old Pier) to Banwell ? Along this road what is meant by (i) A.371, (ii) 39 ?

17. Where on this route has a new road better suited to the needs of modern traffic replaced a difficult stretch of the old road ? Find two other examples of similar road development within the area.

18. A main road and Great Western Railway line enter the region in the north-east and leave the region in the south-west. (Notice the loop-line that serves Weston.) From what city do these routeways come and to what main towns do they lead ?

19. What do you notice about the gradients of these routeways ? The hills in the south of the area and the river Axe have presented obstacles. How have they been overcome ?

20. What other railway does the region possess ? What is its character and where does it lead ? How does the map suggest that there is comparatively little traffic on this line ?

21. Study Plate I, Fig. A. This photograph shows a view from Crook Peak. Identify and name (i) the village opposite you, (ii) the hill which rises above it, (iii) the small stream that flows in the valley at your feet.

22. In what direction is this stream flowing and of what main river is it a tributary ?

23. Can you see any part of the main river in the photograph ? If so, state where. Describe the country through which this river flows.

24. How can the farmers of this region utilize (*a*) the lands you have just described, (*b*) the hills shown in the view, (*c*) the gently sloping lands at the foot of the hills ? Bring out the contrasts between these three regions.

25. Can you see the sea from Crook Peak ? How far distant is it ? Over the crest of Loxton Hill and to your right a distant spur, promontory, and island can be seen. The island is the

PLATE I

FIG. A

VIEW FROM CROOK PEAK

Photo H. B. Wood

FIG. B

CROOK PEAK FROM THE EAST

By courtesy of the Great Western Railway

PLATE II

FIG. A

A WELSH MINING-VILLAGE (NEW TREDEGAR)

Photo H. B. Wood

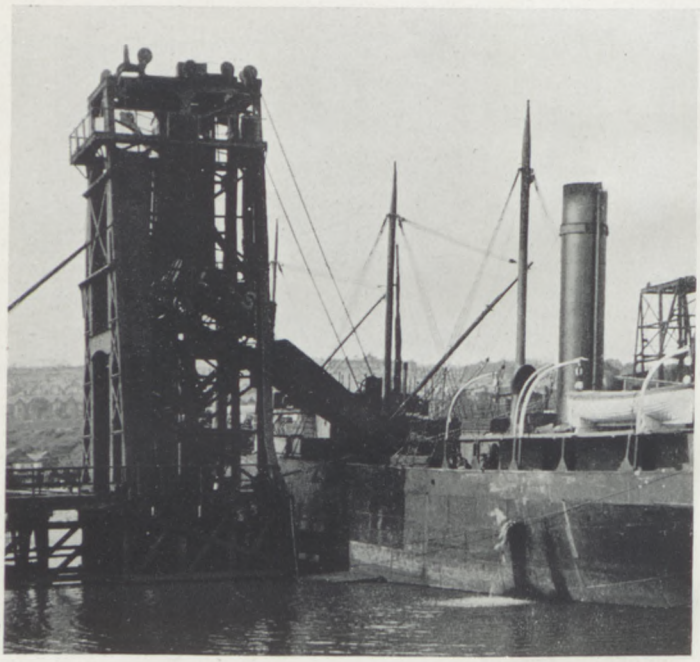


FIG. B

A COAL-TIP IN ACTION AT A WELSH COALING PORT (BARRY DOCKS)

Photo H. B. Wood

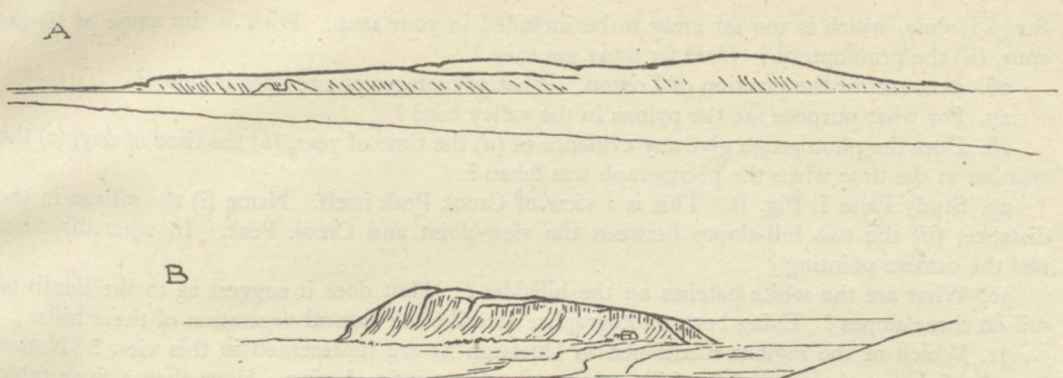


FIG. 21.—BREAN DOWN

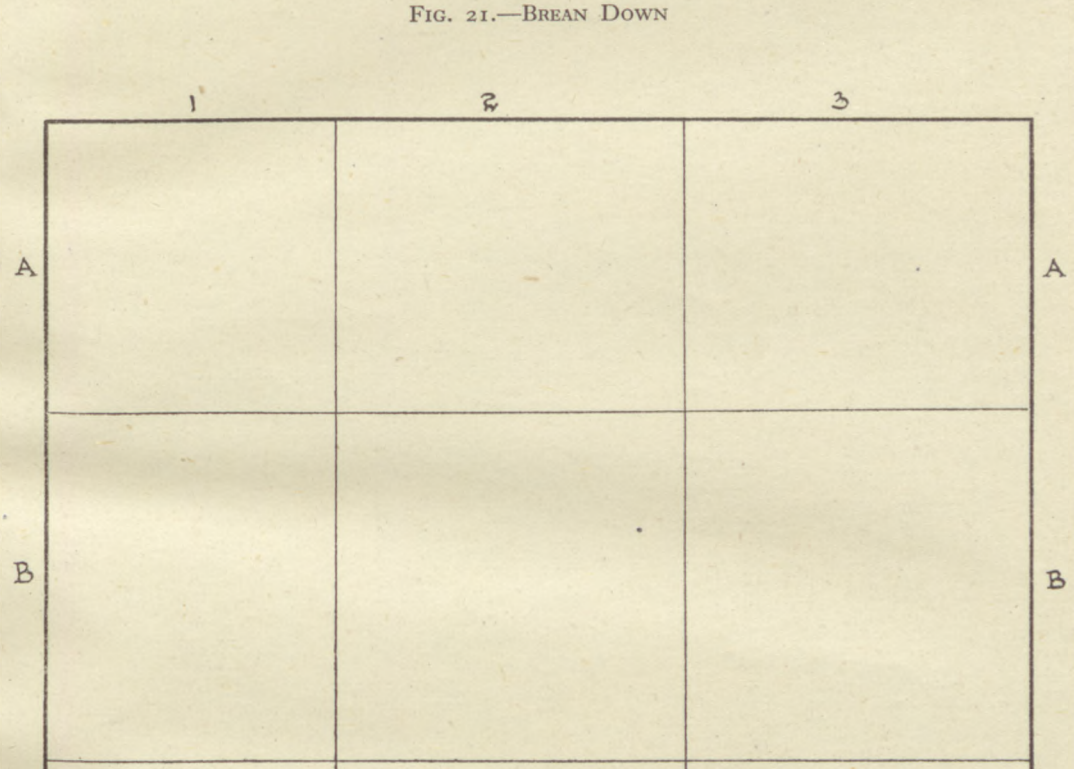


FIG. 22
(Based on Map of Weston-super-Mare)

Steep Holme, which is too far away to be included in your map. What is the name of (i) the spur, (ii) the promontory ? How far away are they ?

26. Account for the position of Loxton. What advantages of site does it enjoy ?

27. For what purpose are the pylons in the valley used ?

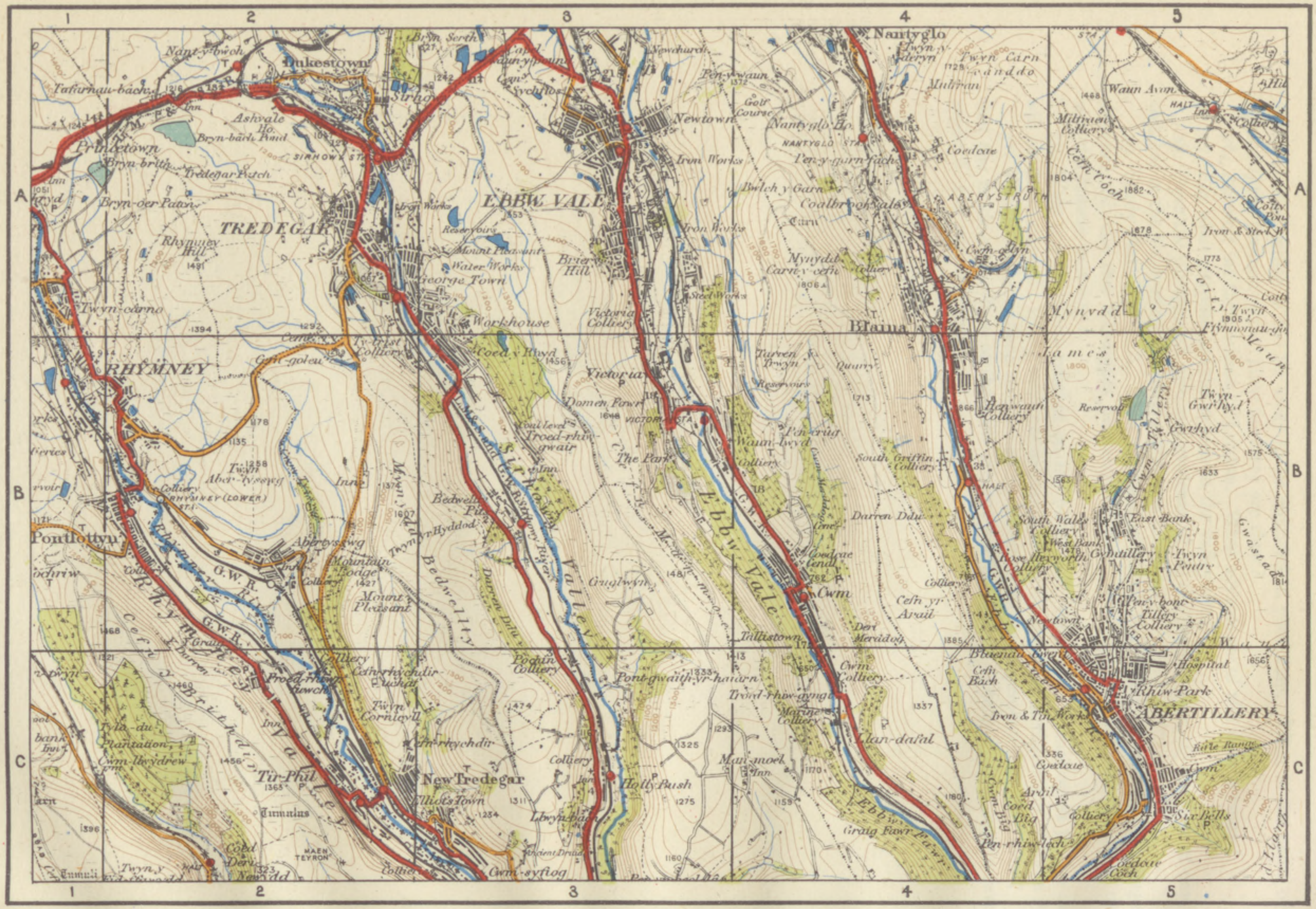
28. Does the photograph give any evidence of (*a*) the time of year, (*b*) the time of day, (*c*) the weather at the time when the photograph was taken ?

29. Study Plate I, Fig. B. This is a view of Crook Peak itself. Name (i) the village in the distance, (ii) the two hill-slopes between the view-point and Crook Peak. In what direction was the camera pointing ?

30. What are the white patches on the hillsides ? What does it suggest as to the depth of soil on these slopes ? Using both photographs, describe the natural vegetation of these hills.

31. Which of the regions mentioned in Question 24 are represented in this view ? Notice that the fields at the foot of the hills are not flat but gently sloping. Have they a favourable aspect ? For what are they used ?

PART OF THE WELSH COALFIELD



POPULAR EDITION

Scale of one inch to one statute mile $= \frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 — 1 — 2 — 3 miles

PART OF SHEET 102

Printed by W. & A. K. Johnston Limited Edinburgh & London.

(2) PART OF THE SOUTH WALES COALFIELD

One-inch Map of the Ordnance Survey. Popular Edition. Part of Sheet 102

See Note at p. 10

THE region represented is a small part of the South Wales Coalfield in north-east Glamorganshire and north-west Monmouthshire. It lies about sixteen miles north of the Bristol Channel, and the main streams of the area—the Ebbw and the Rhymney—flow southward to the sea.

General Description of the Region

The country represented is lofty, consisting of five parallel mountain ridges trending N.N.W. to S.S.E., separated by four deep and narrow river valleys. The highlands sink in the north-west of the area and the valleys open somewhat, while cols or passes lead across the ridges and mark a shallow E.N.E. to W.S.W. depression.

Four swift streams flow south across the region, and they have entrenched themselves in narrow valleys which become increasingly deep in the south. A number of small torrents cataract down the valley sides to join the main streams, but only a few tributaries have cut well-marked valleys for themselves, and the map shows that these are very steep and narrow and do not penetrate far into the mountain ridges. The highlands therefore are very little dissected and present formidable barriers to communication between the valleys. The chief routeways—rail and road—are confined to the river valleys, and their number indicates the outstanding importance of transport in this area. Each valley is served by a double-track railway and first-class road—in the Rhymney valley there are two of each—and yet the map shows that the valley floors are rarely more than a quarter of a mile in width.

The number of large settlements linked by these routeways is remarkable. The map shows that there are eleven towns within an area of 44 square miles, and of these four are towns of considerable size. Thus, in spite of its mountainous character, the region is densely peopled and the population is mainly urban. The explanation of this density of population is seen in the great number of collieries that are marked—over 20—and to a less extent in the presence of iron-and-steel works and tin-works. The region would appear to be peopled by miners, metal-workers, and railwaymen.

The closed stations in the Rhymney Valley suggest that the region has declined in prosperity, and it is probable that some of the collieries are idle and that some of the metal-works are disused. It is well to remember that this is one of Britain's most tragic 'depressed' areas. Nevertheless there is still an enormous output of coal that has to be carried away, and an endless stream of coal-trucks move south along the valleys to end their downhill journey at the coal-tips that line the docks of Newport and Cardiff.

EXERCISES

1. Write a brief description of the mountains of this area. See that you refer to their shape arrangement, height, slopes, vegetation.

2. Name in order from west to east the four main streams that cross the area. The river Ebbw Fawr is seen on the map to cross the 950-foot contour-line near New Church (A3) and the 550-foot contour-line at the southern limit of the area (C4). What is the average fall of the river expressed in feet per mile ? Is this fall small or great ? Compare it with the fall of the river Axe in the Weston district. Comment upon the speed of the river current.

3. In the north of the area the map shows a great many watercourses. Some of these run parallel with contour-lines, some end abruptly, and others cross each other at right angles. What are these watercourses and for what purpose are they used ?

4. We have already noted that the area is densely peopled. Describe the distribution of population within the area.

5. What are collieries ? Comment on the number and position of the collieries in this district.

6. State what evidence the map gives of the following facts :

(*a*) Rhymney, Tredegar, and Ebbw Vale are situated on the northern edge of the coalfield.

(*b*) Within the coalfield itself the coal-bearing rocks are overlain by considerable thicknesses of unproductive rock (hard Pennant Sandstone).

7. Study the characteristic shape and plan of the colliery towns. Notice that there is little room for expansion in the narrow valley floors and that the towns have climbed the steep slopes of the valley walls. State what has been the effect of these steep sites upon the following :

(*a*) The arrangement of the houses and streets.

(*b*) The gradient of the roads.

(*c*) The provision of such amenities as gardens, parks, playgrounds, or the possibility of beautiful views.

(*d*) The amount of sunshine received.

8. Does the map tell you anything about farming in the area ? How might the hill-ridges be utilized ?

9. Part of the boundary between England and Wales is shown. Describe its course. (Note that Monmouthshire is an English county.)

10. Study the photograph of New Tredegar (Plate II, A). It is a view taken from the main road in the extreme south of the area and the camera is pointing northward. What river is seen in the photograph ? Find from your map what lies between the photographer and the river. Why is it invisible in the view ?

11. What are the buildings in the centre of the photograph, and what is their purpose ?

12. Plate II, Fig. B, shows a coal-tip at Barry (8 miles west of Cardiff). Notice how the tip projects into the deep water of the dock and permits large vessels to moor. Hundreds of coal trucks are lined up behind the tip. The trucks enter the tip in turn, are lifted, tilted, and emptied as shown in the picture, the coal pouring down a chute into the hold of the vessel. Clouds of coal dust envelop the tip in action. Fig. A shows the loading of the trucks at the colliery; in Fig. B the end of the short land journey is shown, and the coal is now shipped for export overseas.

(3) MANCHESTER DOCKS

Six-inch Map of the Ordnance Survey. Part of Sheet Lancashire CIV, S.W.

See Note at p. 10

THE district shown on this map is part of the dock area of Manchester. The picture—Plate III—is a view obtained from the air, and shows a still smaller area of the docklands. Most of the permanent features seen in the picture can be recognized on the map.

General Description of the Area

The map and the picture show the region to be an industrial one, where the works of man are far more in evidence than natural features.

In the centre of the area is a broad canal, on the sides of which docks have been constructed. Warehouses and transit sheds line the wharves of the docks, and all the quays are well supplied with rail communications. A second and much smaller canal lies to the south of the main canal and parallel with it. Many industries have developed around the docks and along the canals, as is evidenced by the long lines of factories, mills, and engineering-works. Behind these, and crowded together in uninteresting streets, are the homes of the industrial workers.

EXERCISES

1. Study Plate III. The most prominent features of this view are the two canals which here run roughly parallel to each other. These canals are quite different in character. What are these differences ?

2. What kinds of vessels can you see using these canals ?

3. On the south side of the main canal the Pomona Docks have been built. Notice the vessels lying at the wharves. How many docks are there ? What are the buildings on the wharves and for what are they used ?

4. On the north side of the canal are many mills and factories. What are the advantages of this site ?

5. Make a list of the means by which commodities may be carried to and from the docks or the factories.

6. In the foreground are three canal bridges. The one over the larger canal is a swing bridge, but the other two are not. Why is there this difference ? How does a swing bridge work ?

7. Notice the streets of houses. These are the homes of many of the factory workers, the dockers, and the railwaymen. Write a brief description of one of these streets.

8. Among the houses are some large open spaces. (Notice one in the far distance on your right, and one in the middle distance on your left.) What do you think these are ?

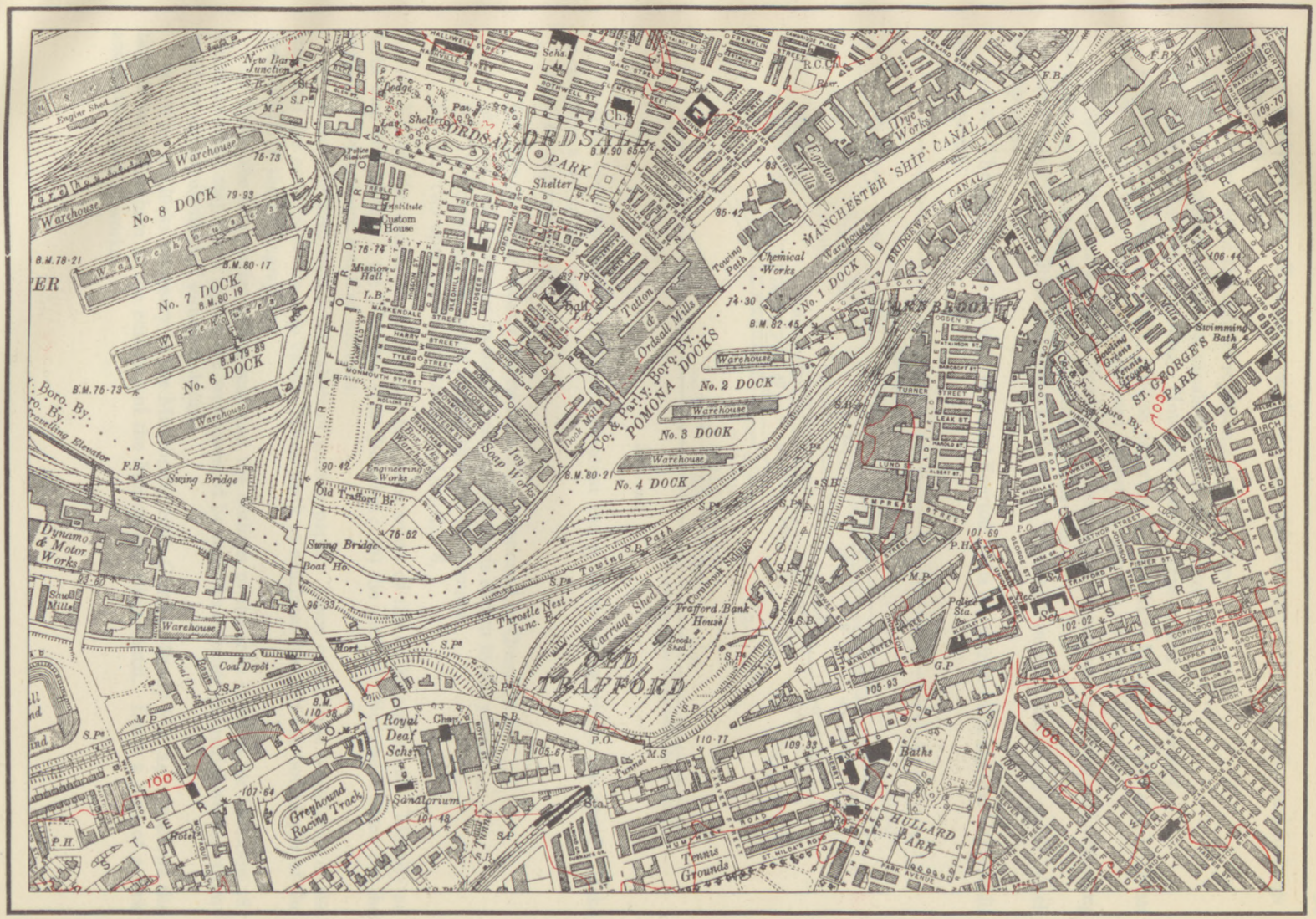
9. The photograph was taken with the camera pointing north-east.

   (*a*) In what part of the day was the photograph taken ?
   (*b*) What season of the year was it ?
   (*c*) In what direction was the wind blowing ?
   Give reasons for your answer in each case.

By courtesy of the Manchester Development Committee

FIG. 23

MANCHESTER DOCKS



Scale of six inches to one mile = $\frac{1}{10560}$.

PART OF LANCASHIRE CIV S.W.

1 furlong 0 ¼ ½ mile

10. Study the map. Draw linear scales for use with the map to show (*a*) miles and furlongs ; *b*) thousands of feet.

11. Find the area of the district represented by the map.

12. Give the names of the two canals shown in the photograph.

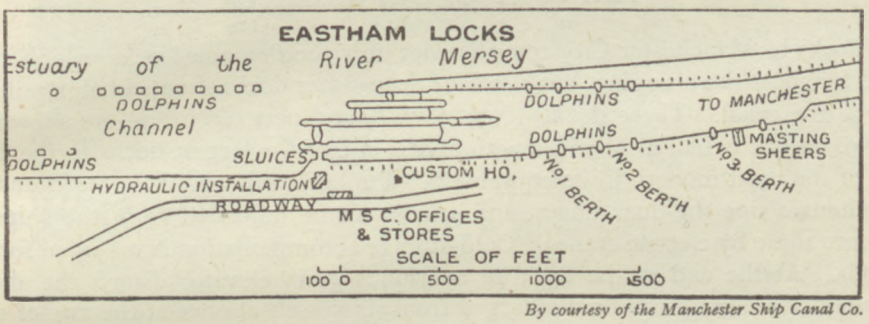
The ship canal is 35½ miles long. How much of it is represented on the map ?

13. Find the Pomona Docks. What other docks are included within the area ? What evidence is there that these docks are more important than the Pomona Docks ?

14. Apart from dock activities (loading and unloading of cargoes, repairing and refuelling of vessels, etc.) what are the chief industries of this area ?

Name some commodities which are likely to be important imports and some goods which are exported.

NOTE.—The Tatton and Ordsall Mills and Egerton Mills are cotton-mills and the Dock Mills are flour-mills.



By courtesy of the Manchester Ship Canal Co.

FIG. 24

15. What opportunities for outdoor recreation and sport are there within this area ? Make as complete a list as you can.

16. Give the names of :

(*a*) The road that crosses the swing bridge mentioned in Question 6.
(*b*) The two north-east to south-west parallel roads shown in the picture.
(*c*) Two roads shown in the picture that are tram routes.
(*d*) The two open spaces mentioned in Question 8.

17. Follow the course of the railway that runs south of the docks and canal. Identify on both map and picture : (*a*) Throstle West Junction ; (*b*) the viaduct. Suggest a name for the station in the extreme south of the area.

18. Cover the map with a thin sheet of tracing-paper. Draw on this the boundaries of the map and the outlines of the ship canal. Then mark as nearly as you can the boundaries of the area visible in the photograph.

19. Draw the boundaries of the map and the outlines of the ship canal as for Question 18. On this outline map shade lightly the areas covered by factories or other industrial works. Comment on the localization of industry shown.

20. Why are locks necessary in the Manchester Ship Canal ? Study Fig. 24. It shows the tidal locks at Eastham at the entrance of the Manchester Ship Canal. Draw a plan of a lock and explain how it works.

21. The most important factors determining the localization of manufactures are :

Cheap accessible transport ;
Access to sources of power ;
Nearness to markets ;
Nearness to raw materials ;
Abundance of skilled labour.

How many of these advantages are secured by industries developed on the land adjoining the Manchester Ship Canal ?

22. Make a list of the industrial regions lying within the hinterland of Manchester. Name the chief manufactures of each of these regions and their main imports and exports.

23. Draw a large sketch-map of Manchester and its hinterland. Show the chief rail and canal communications.

THE PORT OF MANCHESTER

The docks of Manchester City comprise not only the Pomona Docks, which are small and used for coastwise shipping, but also four deep-water docks situated half a mile farther west along the canal. These docks—Nos. 6, 7, 8, and part of No. 9—are shown on the map. No. 9 dock is half a mile in length and is one of the largest docks in the kingdom and one of the most modern in its equipment. Timber-yards and fire-proof transit sheds and warehouses line the dock quays, and goods can be unloaded from the ships' holds directly into these by electric cranes. Cold-storage accommodation is provided for perishable goods. At the end of the dock an enormous grain elevator dwarfs the sheds and warehouses. Here grain can be discharged from six vessels at once at the rate of 900 tons per hour. A second elevator faces the entrance to this dock.

The railways that serve the Manchester Docks are owned by the Canal Company and link up the quays with the main railway systems. Thus cargoes can be unloaded into the transit sheds, or into lorries on the quay-sides for road distribution, or into railway wagons on the quay-sides for direct rail distribution to any station in the Kingdom. These facilities for the rapid handling and transport of goods greatly increase the efficiency of Manchester's docks.

The existence of these deep-water docks 40 miles from the sea is due to the building of the Manchester Ship Canal. This canal is 35½ miles long and deep enough to permit ocean-going liners of 15,000 tons to reach the city docks. In its upper part it is first the widened and deepened river Irwell and then the canalized Mersey. For the remaining 24 miles it is a cut channel keeping to the south of the Mersey and finally following the curve of the estuary. Five series of locks enable vessels to reach the level of the city docks (about 70 feet above mean sea-level).

Along the length of the canal an amazing variety of industries has developed, including manufacturing of soap and of heavy and light chemicals, iron-smelting and steel-rolling, oil-refining, paper- and board-manufacturing, heavy and light engineering, and brewing.

At Ellesmere, Stanton, Runcorn, and Partington subsidiary docks have been built, and these are included in the Port of Manchester. Stanton is especially important for the discharge and storage of oil, Partington for its coaling facilities, Ellesmere and Runcorn stand at the junction of the Ship Canal with the Shropshire Union and with the Trent and

PLATE III

POMONA DOCKS, MANCHESTER

Photo Aerofilms Ltd.

PLATE IV

FIG. A

LEWES, SUSSEX

Photo "The Times"

FIG. B

POYNINGS, SUSSEX

Photo "The Times"

Mersey Canals respectively. Other barge-canals linked with the Ship Canal are the Bridgewater, the Leeds and Liverpool, and the Rochdale Canals.

The Port of Manchester not only serves south Lancashire, but also east Lancashire, the West Riding of Yorkshire, the Sheffield district, and the industrial regions of North Staffordshire and the Midlands. This great hinterland has a population of well over ten millions.

(4) THE NORWICH DISTRICT

Land Utilisation Survey of Britain ; based on the Ordnance Survey One-inch Map Popular Edition. Part of Sheet 67

See Note at p. 10

Physical Features

THE area that has been chosen for study lies four miles to the north-east of Norwich and forms a small part of the East Anglian farmlands.

The map shows the region to be a low undulating plateau which lies about 50 feet above sea-level. It is somewhat lower in the east than in the west, where in the extreme south a height of over 100 feet is reached.

Two major streams flow across the area in well-defined valleys which are only a few feet above sea-level. The Bure meanders in great loops from west to south-east and receives many small tributaries which drain the plateau. The Ant flows southward in the east of the region and joins the Bure in the south-east, where their united valleys form extensive level flats. Above their confluence both streams flow through regions of marsh and fen, and closely associated with them are the expansive shallow lakes which are called the ' Broads.'

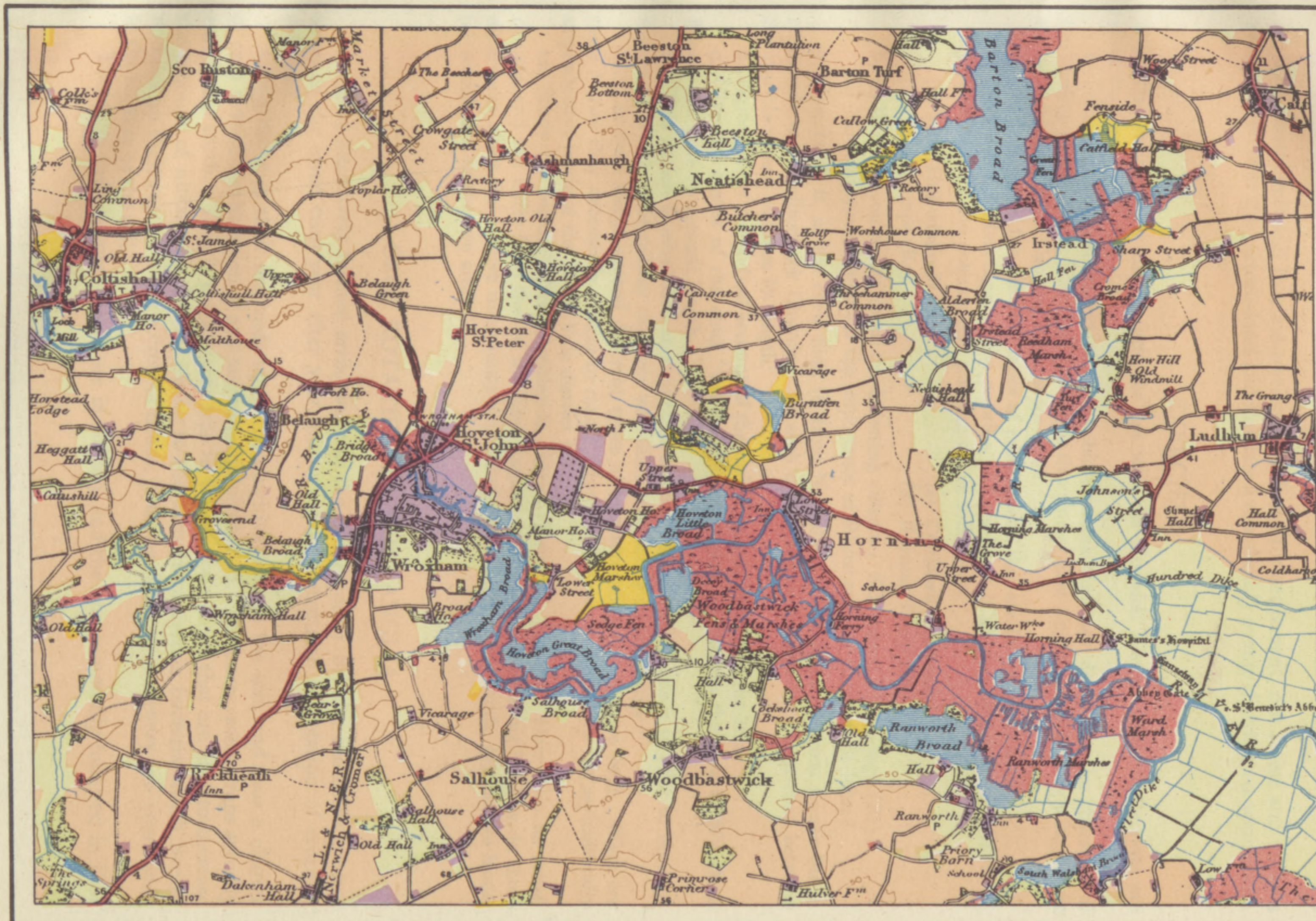
There is thus a clear distinction between the plateau-lands, which are adequately but not over watered, and the low flats of the rivers, which are obviously useless unless drained. Apparently in some places drainage has been impossible, and there fen and marsh persist, but elsewhere a maze of drainage channels indicate that the land has been reclaimed.

Land Utilisation

The map shows that the area is almost entirely agricultural, and that most of the better-drained plateau-lands are under the plough. The mind should be able to picture the patchwork of hedged fields which covers the region. If in winter these lie bleak and brown, in the summer there will be great variety of colour, the yellow and gold of barley and wheat, the light glossy green of root crops, and the darker green of clover and grass. But even in the plateau arable land does not cover the whole surface. Patches of woodland and meadowland occur, especially in the numerous parks and estates, and small areas of permanent pasture surround most of the farms and villages, many of which still retain their ' commons.' Some orchards are indicated, but fruit-growing does not appear to be widespread.

Land utilisation in the river flats is of a very different character. In the unreclaimed lands there are some woodlands, probably consisting of shrubby willows and alders, but marshes and fens predominate and for the most part are unproductive. Elsewhere, where numerous dykes and drainage channels indicate reclaimed land, permanent grasslands are found. Trees are few and watercourses separate the fields. In winter these are exposed and desolate, but in the summer they will provide excellent pasture for large numbers of cattle and sheep.

PART OF EAST ANGLIA, NEAR NORWICH



LAND UTILIZATION SURVEY

Scale of one inch to one statute mile = $\frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 1 2 3 miles

PART OF SHEET 67

Printed by W. & A. K. Johnston, Limited, Edinburgh & London.

The marshlands and flats are obviously unfitted for settlement, but farms and villages are scattered over the plateau-land and indicate a remarkably evenly distributed population.

EXERCISES

1. On tracing paper draw a grid for use with the Norwich District Map. Directions are given at p. 21.

2. What are the most important geographical factors that may determine the character of the farming in any area ? The map shows that this part of East Anglia is outstandingly important for its arable farming. Can you account for this ?

3. Briefly describe the different types of pasture-land that are found in the area.

4. What are the advantages of the position of Low Farm (C4), and Manor Farm (A1) ?

5. Comment on the position and purpose of the following :

(*a*) How Hill windmill (B4).
(*b*) Wind pumps (B4).
(*c*) Coltishall malthouse (A1).
(*d*) Horning Ferry (B3).

6. (i) What do you notice about the following villages : Salhouse (C2), Belaugh (B1) ?
(ii) How can you account for the importance of Wroxham and Hoveton St John ?

7. How far is it, as the crow flies, (i) from Neatishead to Catfield, (ii) from Lower Street crossroads to Woodbastwick Church ? In each case describe the shortest motor-road between the two places and estimate its length.

8. Write a short methodical account of the main communications of the area.

9. Give the names of the chief ' broads ' of the region. Calculate the area of Wroxham Broad, and state its greatest length.

10. This region is advertised as a summer holiday resort. What has it to offer to holiday-makers ? Which great railway company will aim at increasing its popularity ?

11. The map shows several different types of agriculturally unproductive land. What are these ? Are they necessarily useless to man ? How are they contrasted with the agriculturally unproductive lands of the Ebbw Vale district ?

12. Study the picture of the Ambleside district (Plate IX, Fig. B). How does its relief, climate, and soil differ from that of the East Anglian region you are studying ? How do these differences affect the relative importance and distribution of (*a*) arable lands, (*b*) pasture-lands, (*c*) woodlands, in the two areas ?

CROP ROTATION IN EAST ANGLIA

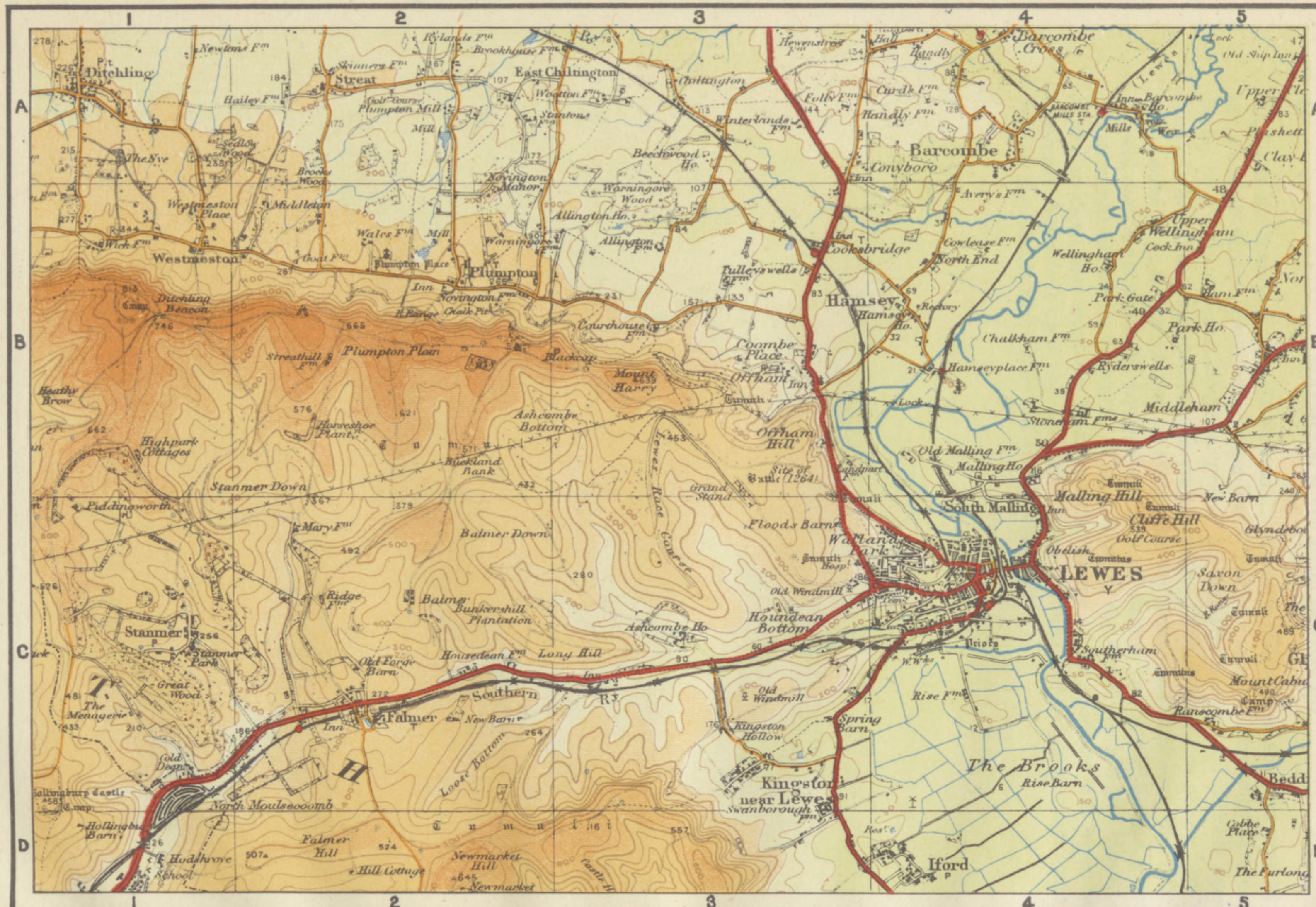
In most intensively farmed areas, such as the farmlands of Britain, the fields are not sown to the same crop year after year, but a regular succession or rotation of crops is followed.

Crops differ in their demands upon the nutritive salts in the soil, and thus a change of crop prevents exhaustion of any one valuable plant food. Moreover, some crops actually enrich the earth. This is particularly true of leguminous crops that are able to increase the amount of nitrates in the soil owing to the activity of certain bacteria which live in nodules on their roots. Thus a crop of beans, peas, or clover grown every few years adds to the fertility of the soil.

There are various rotations in use in Britain, and the one commonly followed in East

Anglia is the four-year Norfolk Rotation. Wheat is followed in the next year by a root crop, such as turnips, potatoes, or sugar beet. The root crop is followed by barley, and the barley by a crop of beans, clover, or grass. In the fifth year the soil is ready again for a crop of wheat; and the succession is started anew. Not all the fields of any farm will be at the same stage in the rotation, as every year the farmer will need some of all the crops. He will need some wheat, barley, or sugar beet as ' money ' crops, and turnips, clover, and hay as winter fodder for his stock. The growing of the root crops will give him an opportunity to clean and weed his land, and the variety of his products will make him less anxiously dependent upon the weather. Even if conditions should damage some of his crops it is probable that others will remain unharmed.

PART OF THE SOUTH DOWNS



TOURIST EDITION

Printed by W. & A. K. Johnston Limited, Edinburgh & London.

Scale of one inch to one statute mile $= \frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 — 1 — 2 — 3 miles

SOME TYPICAL LAND-FORMS

(5) CHALK DOWNLANDS

Tourist Map of the Ordnance Survey. Part of Brighton and South Downs Sheet

See Note at p. 10

THE chalk lands of England cover a considerable area in the south and east of the country. Their distribution is seen in Fig. 25. In some places, such as Salisbury Plain, they form broad, rolling plateaux ; in others the hills are ridges, such as the Downs and the Chilterns. Where the chalk uplands reach the sea bold white cliffs and headlands give a special character to our coast.

The area selected is part of the South Downs of Sussex and shows many of the distinctive characteristics of chalk uplands. The map shows that the hills are not lofty, rarely rising much above 700 feet, but they form a striking rampart owing to the abruptness with which they rise from the northern lowlands. This steep slope is the *scarp* slope. Southward the hills slope more gently, and this *dip* slope is dissected by many valleys separated by rounded convex spurs.

The valleys are remarkable. There are many of them and they are well formed, but they contain no streams. Some of them lead to gaps in the hill summits known as *wind-gaps* which may be utilized by roads, but the hills are not easy to cross and the valley of the River Ouse, which cuts through them, is of outstanding importance as a passage-way. In this *water-gap* stands Lewes, an excellent example of a gap town.

It is interesting to contrast the lack of surface drainage on the hills and the abundance of streams in the plains, which in the south-east are even over watered. Although the Ouse and some of its tributaries flow south from regions beyond the limits of the map, many of the streams of the plain rise within our area. In the north-west, within a distance of 3½ miles, eight streams flow north from the foot of the escarpment, their springs occurring at about 250 feet above sea-level. This spring line is marked by a number of farms and *spring-line settlements*.

In other ways also the Downs and the plains can be contrasted. Whereas trees are few on the hills, occurring generally as isolated clumps on the highest crests, in the lowlands woodlands are scattered everywhere. The few farms and unfenced roads of the hills suggest a land that is agriculturally poor, while the lowlands appear rich with their many farms and villages and enclosed land.

The distinctive character of the Downs is due to the nature of the chalk of which they are composed. Chalk is a limestone and is both soluble and very porous. Beneath the chalk and outcropping at the foot of the escarpment to the north is a thin band of sandstone, but this too is porous. Thus on the hills rain sinks in readily and leaves the surface streamless and dry. As chalk is slightly soluble in rain-water, no depth of soil accumulates, and the surface soil is thin and poor in plant food. On the other hand, the plains are

composed of clay, which is impervious to water and abounds in surface streams. Soil here is deeper and heavier and, if adequately drained, makes rich farmland. At the foot of the escarpment, where the porous rocks overlie the impervious clays, the water that sinks into the hills escapes as a series of springs.

THE CHALK LANDS OF ENGLAND

FIG. 25

Figs. 26 and 27 represent some of these features diagrammatically. In Fig. 26 an attempt has been made to show the relationship between the surface slopes of the ground and the disposition of the layers or strata of the chalk. The diagram does not represent any special area, and no sandstone layers are shown below the chalk.

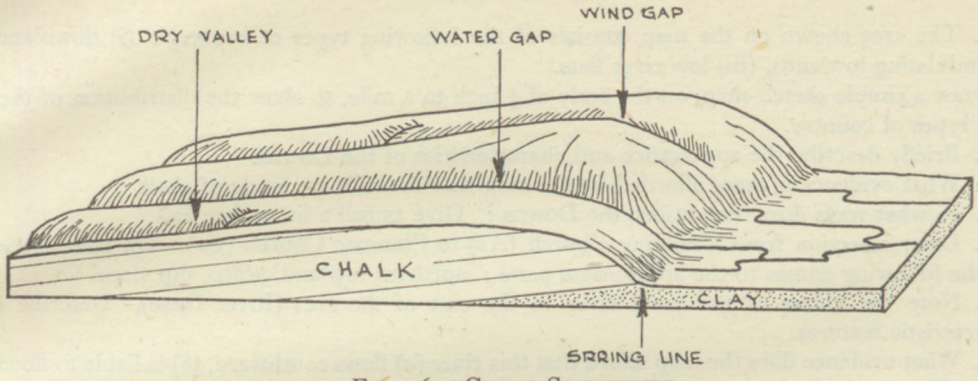


FIG. 26.—CHALK SCARPLANDS

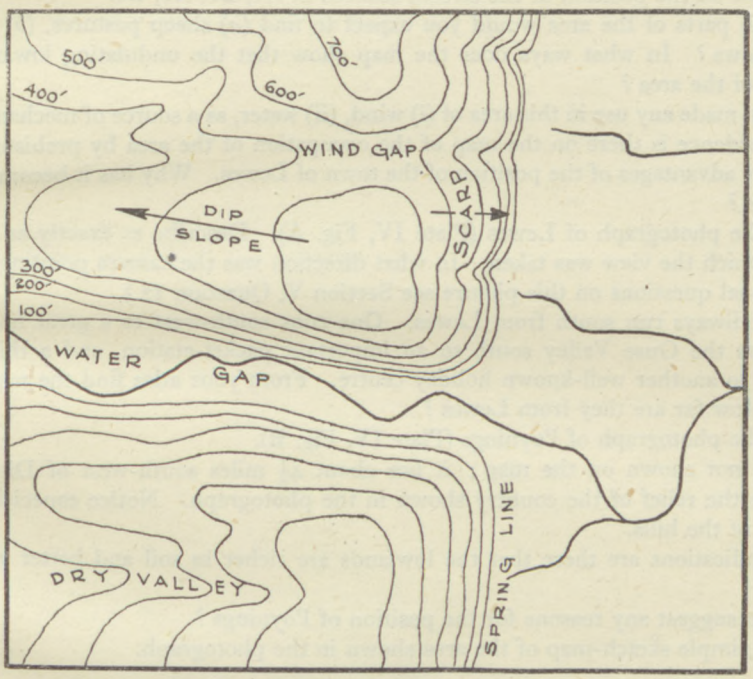


FIG. 27.—CONTOUR SKETCH-MAP OF CHALK SCARPLANDS

EXERCISES

1. The area shown on the map consists of the following types of country : (i) downlands, (ii) undulating lowlands, (iii) low river flats.

Draw a simple sketch-map, on the scale of ½ inch to a mile, to show the distribution of these three types of country.

2. Briefly describe the appearance and characteristics of the Downs.

3. What evidence is there afforded by the map that the hills are made of chalk ?

4. In what ways does man utilize the Downs ? Give as full a list as you can.

5. Draw a section from Ditchling Church (A1) to Stanmer Church (C1). On your section add the following names to the appropriate parts : northern lowland, scarp, dip slope.

6. Note the course of the main river in the east of the area (River Ouse). Describe its characteristic features.

7. What evidence does the map afford that this river (*a*) flows southward, (*b*) is liable to flood ?

8. What important geographical factors have influenced the courses of the main roads and railways ? Draw a sketch-map to illustrate your answer ; and mark on it a water gap, a wind gap, and a region subject to floods.

9. What do you notice about the character and position of the roads that cross over the Downs ?

10. Comment on the position of the stream sources in A1, B1, A2, B2.

11. In which parts of the area would you expect to find (*a*) sheep pastures, (*b*) arable land, (*c*) damp meadows ? In what ways does the map show that the undulating lowlands are the best farmlands of the area ?

12. Has man made any use in this area of (i) wind, (ii) water, as a source of mechanical power ?

13. What evidence is there on the map of the occupation of the area by prehistoric man ?

14. State the advantages of the position of the town of Lewes. Why has it become the largest town in the area ?

15. Study the photograph of Lewes (Plate IV, Fig. A). Describe as exactly as you can the position from which the view was taken. In what direction was the camera pointing ?

(For additional questions on this picture see Section V, Question 12.)

16. Three railways run south from Lewes. One runs south-west to a great holiday resort, a second follows the Ouse Valley south to an important packet-station, and a third branches south-eastward to another well-known holiday centre. From your atlas find the names of these three towns. How far are they from Lewes ?

17. Study the photograph of Poynings (Plate IV, Fig. B).

Poynings is not shown on the map ; it lies about 4½ miles south-west of Ditchling (A1). Briefly describe the relief of the country shown in the photograph. Notice especially the characteristic slope of the hills.

18. What indications are there that the lowlands are richer in soil and better watered than the hills ?

19. Can you suggest any reasons for the position of Poynings ?

20. Draw a simple sketch-map of the area shown in the photograph.

BUXTON

TOURIST EDITION

Scale of one inch to one statute mile = $\frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 1 2 3 miles

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(6) LIMESTONE TOPOGRAPHY OF THE SOUTHERN PENNINES

Tourist Map of the Ordnance Survey. Part of the Peak District Sheet

See Note at p. 10

THE region chosen is part of the lofty carboniferous limestone moors of Derbyshire. This limestone builds country as distinctive as that of the chalk lands already studied, but different from them in many respects.

Carboniferous limestone is older, harder, and less porous than chalk ; moreover it is both well bedded and strongly jointed. Its hard, compact character makes it resistant to weathering, and it builds bolder and harsher uplands than does chalk. Nevertheless it readily dissolves in rain-water, and surface cracks and joints are widened by solution and may form deep fissures and openings.

As the rock is less porous than chalk, rain is not so easily absorbed ; however, it perco-

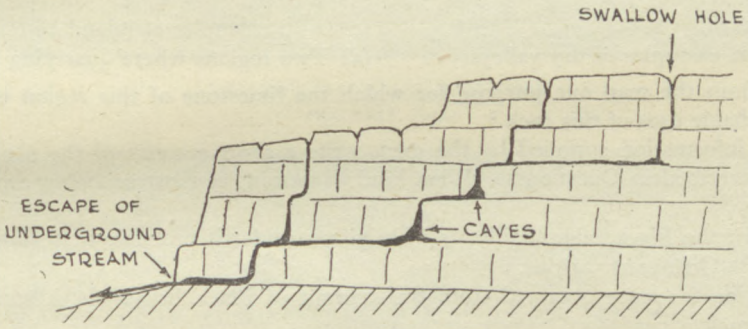

FIG. 28.—UNDERGROUND DRAINAGE IN JOINTED LIMESTONE

lates through the enlarged cracks and joints, and sinks far below the surface, which is left characteristically dry. Especially large holes down which surface streams may plunge are called *swallow* or *swallet holes*. The underground water continues its course through passages and caves formed by solution along bedding and joint planes, and the whole limestone upland may become honeycombed with such channels, and enormous caverns may be formed (Fig. 28).

Generally the underground water reappears lower down the slopes of the limestone highlands, and flows from an opening in the rocks as a stream of considerable size. Some streams may reappear many times at the surface only to sink again underground.

The rivers that cross limestone highlands usually flow in deep and narrow valleys, for though the river has deepened its bed there has been no corresponding weathering of the valley sides. These therefore remain as precipitous walls, and the gorges of Derbyshire are famous for their lofty crags.

All the surface features that have been described are well illustrated in the region

shown by the map facing p. 49. It is evident that the limestone rock is of value to man, but the map suggests that the limestone soils do not support a rich vegetation and that farms are few.

EXERCISES

1. Describe (i) the relief, (ii) the drainage, of the region that lies east of a north-and-south line through Dove Holes (A1).

2. Make a list of those features of the area that are characteristic of limestone regions.

3. Draw a contour sketch-map of the valley that extends from A3 to Millers Dale (C4). Make notes on all the important features shown and explain the nature of its drainage.

4. Study Plate V, Fig. A. Describe the view. What features characteristic of the region does it illustrate ?

5. Write short notes on the following and state the probable origin of each name :

(*a*) Ravenstor (C4).
(*b*) Great Rocks Dale (C3).
(*c*) Dove Holes (A2).
(*d*) Water Swallows (B2).
(*e*) Black Edge (B1).

6. Locate, and if possible, name :

(*a*) A cave.
(*b*) Two examples of dry valleys.
(*c*) Two examples of inland cliffs.
(*d*) Two regions where quarrying is carried on.

7. Find from the map one purpose for which the limestone of this region is used. What are other probable uses of this rock ?

8. Using information supplied by the map, write a short account of the natural vegetation of the area described in Question 1. What kind of farming is most probably carried on in this area ?

9. Describe the Black Edge highlands. Do you consider it probable that they are composed of limestone ? Give your reasons.

10. Describe the view obtained from the summit of Black Edge. Is Allstone Lee visible from this summit ?

11. (*a*) Draw a section from Taddington Church to Tideswell Church. Mark High Dale and Millers Dale on the section.

(*b*) Describe the course of the second-class road between the two villages. How long is it ?

12. About 8½ miles of first-class road link Taddington and Dove Holes. Briefly describe the course of this road and contrast its three main sections.

13. Study Plate V, Fig. B. What indications are there that Buxton is a residential town ? It is a famous health and holiday resort. What advantages does it possess ?

14. Note the cricket-ground in the foreground, the station in the middle distance, and the Wye Valley and Fairfield beyond. Identify these features on the map. Over what part of the town was the aeroplane flying when this photograph was taken, and in what direction was the camera pointing ?

15. What characteristic of the fields north of the Wye Valley is shown in the photograph ?

PLATE V

FIG. A

MILLER'S DALE, NEAR BUXTON

Photo Will F. Taylor

FIG. B

BUXTON

Photo Aerofilms Ltd.

PLATE VI

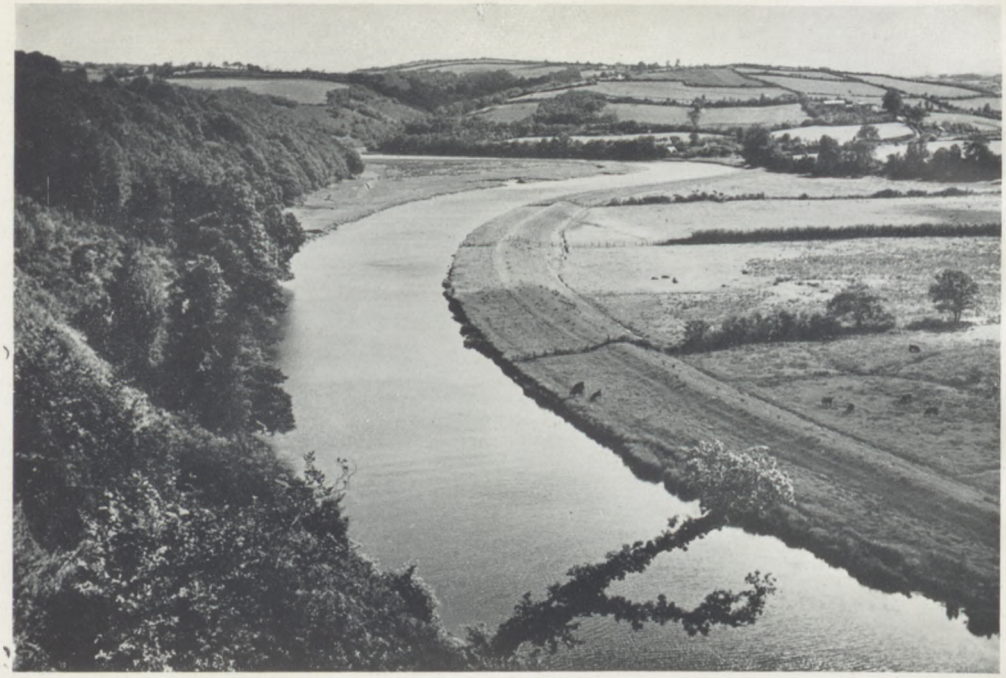

FIG. A

RIVER TORRIDGE, NEAR LANDCROSS

Photo H. B. Wood

FIG. B

RIVER TORRIDGE

Photo H. B. Wood

(7) RIVER VALLEYS

One-inch Map of the Ordnance Survey. Fifth Edition. Part of Sheet 127

See Note at p. 10

In the British Isles running water is by far the most important agent of denudation. Frost, rain, and wind all play a part in breaking up the earth's surface or transporting loosened fragments, but the work that they do is slight compared with the earth sculpture accomplished by rivers and their tributaries.

The erosive power of a stream depends upon the load of rock fragments and boulders that it rolls along its bed or carries suspended in its waters. This load varies with the speed and the volume of the stream ; thus a large stream carries more than a smaller one, a swift stream more than a slower one. It is clear that the speed and volume of rivers must change, as they generally flow over increasingly gentle slopes and receive the water of many tributaries. Therefore their powers of erosion will vary in different sections of their

Fig. 29

course, and it is possible to divide most river valleys into several tracts or stages, each with its individual characteristics.

Youthful Stage

A stream generally originates as a spring on a mountain- or hill-side. Down this slope it falls tempestuously and may form many small cataracts and waterfalls. It fluctuates greatly in volume, and after heavy rain may be swollen to a rushing torrent. Because of its speed it is capable of transporting a considerable load of gravel and stones—even boulders in time of flood—and with these it deepens its hill-side furrow and carves out for itself a valley (Fig. 29A). Frost, rain, and other weathering agents wear away the valley walls until ultimately these are V-shaped in section.

The map of part of the South Wales coalfield shows many torrent streams. Some of these are so small that they have made little impression as yet on the hill-side over which they flow, and on the map these streams are shown crossing the contour-lines at right angles. But the larger streams flow in deep and narrow valleys with typical V-shaped profiles.

Mature Stage

When the stream reaches lower ground and its speed slackens it loses some of its impetuosity, flowing round rather than over obstacles and so beginning a winding course. Its valley is now characterized by interlocking spurs (Fig. 29B). As soon as the river begins to wind, the current becomes stronger on the outer concave curves and here the banks

are strongly eroded, while the slacker current of the inner convex curves permits the deposition of silt and gravel. As this continues the curves become more and more accentuated and the outer curves eat into the valley walls. But the river attacks most vigorously the downstream bank of the outer curves. Thus all the river loops tend to move downstream, and in so doing they eat away the spurs that project into the valley. The valley now is wide and open, with a flat silt-covered *flood plain* over which the river meanders (Fig. 29c). A diagrammatic representation of some of these facts is given in Fig. 30. The river swings in great curves from side to side of the valley into which three spurs project, a^1, a^2, a^3. The outer curves are eating into the valley walls, as is shown by the crowding of the contours at b^1, b^2, while at c^1, c^2, on the inner convex curves, the gentle slopes and small river flats suggest that sediment is being deposited. Each spur is strikingly steep on its upstream side, and the river presses closely at the foot of this slope. Erosion is clearly active here, and the spur is in process of destruction.

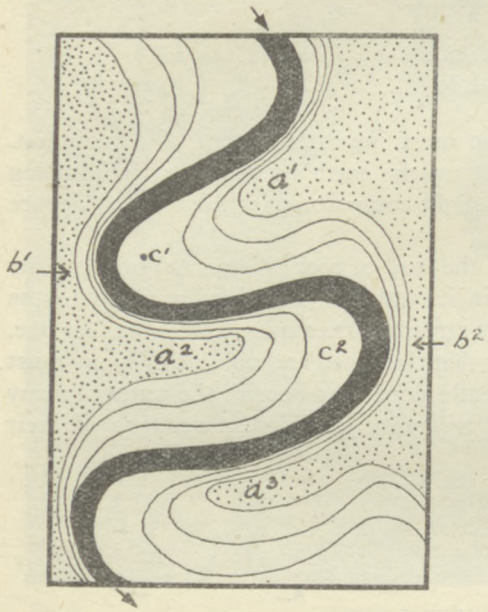

FIG. 30

A study of the Torridge Valley shows precisely these features. The river is widening its valley, eating away the valley spurs, and building a flood plain. The effects of its destructive attack are clearly indicated on the upstream sides of the seven spurs south-east of Great Torrington. The tributary valleys have not reached the same stage of development. They are narrow and steep, but they too have many small interlocking spurs. Notice the small stream that joins the Torridge a mile below Great Torrington.

Old-age Stage

In its old age the river meanders slowly over the alluvial plain that it has built. Its complicated loops may become almost circular (Fig. 31A) and eventually the river will cut across their narrow necks as at 'X' and then follow a shorter straightened course. The abandoned meanders form stagnant lakes (Fig. 31B) that finally fill with vegetation and disappear. Such lakes are called *oxbow lakes* or *mortlakes*. Before it reaches the sea the river may flow on a bed that has been raised by deposition above the level of the surrounding country. In this case its waters are enclosed within natural embankments.

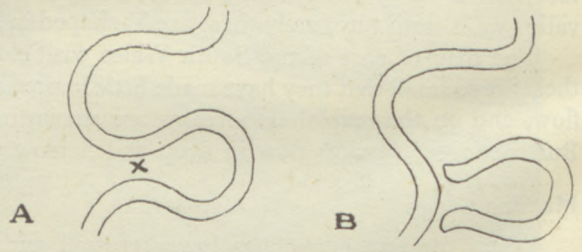

FIG. 31

PART OF RIVER TORRIDGE, NEAR BIDEFORD

FIFTH EDITION

Scale of one inch to one statute mile = $\frac{1}{63360}$.

PART OF SHEET 127

Printed by W. & A.K. Johnston, Limited Edinburgh & London.

8 7 6 5 4 3 2 1 0 1 2 3 miles

In order to prevent disastrous flood, these embankments are usually strengthened by man.

Both the Ouse (South Downs map) and the Axe (Weston map) are in their old-age stage and meander across alluvial plains. The course of the Ouse should be studied for some excellent examples of oxbow lakes, and the Axe for its embankments or levees. In both cases man has drained the plains by an elaborate system of water channels.

EXERCISES

1. Describe the general relief of the area.

2. What do you notice about (i) the density and distribution of the population, (ii) the position of the chief villages ?

3. Study the roads of the area. Can you suggest any reason why they seem to avoid the valleys ? Comment upon the gradients of the roads to the west of Landcross (A1, B1).

4. Describe the course of the railway that crosses the area from north to south, and show how its course is related to physical features.

5. Great Torrington is by far the largest town in the area. Comment upon its position. Where is the nearest railway station ? Why was it not built nearer to the town ?

6. What do you notice about all the other stations shown in the area ? How can you reach the station from Little Torrington, Monkleigh, Langtree ? Why does not the railway serve these villages more directly ?

7. Much of the area is under cultivation and appears as a patchwork pattern of fields. But there is also much rough pasture-land and woodland, and some damp meadows. Draw a simple sketch-map of squares B1 and B2. Show the chief streams, and by means of the colours of the Land Utilisation Survey indicate the distribution of woodland, rough pasture, and meadowland.

8. Describe the River Torridge. Is it a tidal river ? How can you tell ?

9. Draw a simple contour sketch-map of a short length of the river valley (about 2 or 3 miles). Mark on it : (i) a spur, (ii) a steep slope overlooking an outer curve of the river, (iii) a flood plain. By a cross, mark one region where the river is ' eating away ' a spur.

10. What is the meaning of the dotted line along the course of the River Torridge ? Half a mile to the south of Landcross the river and the dotted line do not coincide. Can you suggest any explanation of this ?

11. Study the two views of the River Torridge (Plate VI). For each view state the position of the photographer and the direction in which he was looking.

12. Notice the steep valley sides overlooking the outer concave curves of the river. What vegetation covers them ? Is this typical ?

13. How does man utilize the flood plains ? Is there any indication that he (i) drains these plains, (ii) protects them from flood ?

14. In Fig. A (Plate VI) identify the little wooded valley in the background. Find and name (i) the small settlement on the hill-slope to the right of this valley, (ii) the settlement at the base of the hill on the river-bank. What kind of road links these two settlements ? (A small part of it is shown in the photograph.)

15. Study Fig B (Plate VI). Three physical features, typical of the area, are illustrated in this view. What are they ?

16. Find the bridge in the middle distance of this view. (*a*) Notice the houses to the right of the bridge. Are they safe from flood ? (*b*) Can you suggest why the road was carried across the river at this point ?

17. Immediately below the steep wooded slope to the left of the bridge a single line of cottages flanks the road and river. Find these on the map. When spring tides coincide with a strong westerly gale and heavy rain this stretch of road is flooded and impassable, find another stretch of road that might be similarly affected.

18. Does the photograph give any indication of :

(i) the time of year ;
(ii) the time of day ;
(iii) the state of the weather ;
(iv) the state of the tide ?

(8) SOME LAND-FORMS DUE TO GLACIATION

Tourist Map of the Ordnance Survey. Part of the Snowdon Sheet

See Note at p. 10

ALTHOUGH no glaciers are found in the mountains of Britain at the present time, and in summer snow only lingers in the highest gullies of the Scottish Highlands, most of our mountain regions show evidence of glaciation in the past. In days long before history the climate of our region was infinitely colder than it is now. During this cold period, or Ice Age, snow accumulated to enormous depths over all the northern regions, and glaciers filled the valleys and spread out and coalesced in the plains. At their greatest development the whole of Britain as far south as the Thames Valley was covered with ice and snow, as Greenland is to-day ; but long after the ice sheet had melted and disappeared from the lowlands, individual ice tongues or glaciers persisted in the mountain valleys and left an enduring imprint.

The mountains of the Snowdon district show many distinctive features that are considered to be partly or wholly the work of these glaciers. The main valleys are seen to be abnormally open, deep, and steep-sided. Tributary valleys open high up in the main valley walls, down which their streams fall in cataracts. When these valleys are followed into the highlands they end in precipitous amphitheatres which forbid further advance. Sometimes these amphitheatres or *corries* back so closely to one another that there is nothing but a narrow knife-edged ridge between them. The number of lakes is remarkable both in the mountains themselves and along the length of the main valleys.

The enlargement and deepening of the valleys is considered to be the work of the Ice Age glaciers as they crept down to the plains. Their tools were the sharp-edged rock fragments that the ice enclosed, and with these the floor and sides of the valley were scraped and scoured and all projecting spurs removed. To this powerful erosion the over-deepened valleys owe their characteristic ' U ' shape.

The tributary glaciers were smaller and less powerful, and their valleys were not deepened to the same extent as those of the main glaciers. Thus when the ice melted, their valley mouths opened far above the main valley floors. The diagrammatic sketch in Fig. 32 shows the appearance of these *hanging valleys*, as they are called, and the map in Fig. 33 their characteristic contour-pattern.

The presence of great rock amphitheatres high up in the mountain slopes is easily recognized on the map by the steep cliffs of their encircling walls. These corries, or cirques, as they are called, have been compared to giant arm-chairs (Fig. 34). The ' seat ' of the arm-chair is often hollowed, and frequently contains a rounded lake. Corries mark the heads of former glaciers, and ice has hollowed the floor and eaten away the base of the walls, forming precipices.

Not only are lakes found in the corries, but long, narrow *ribbon lakes* occupy many of the valleys. These must either be due to the hollowing out of the valley floor or the

damming of the valley. In most cases it has been found that the valleys have been blocked by glacial débris left behind when the ice melted.

NOTE.—Although all geologists agree that ice erodes, there is some difference of

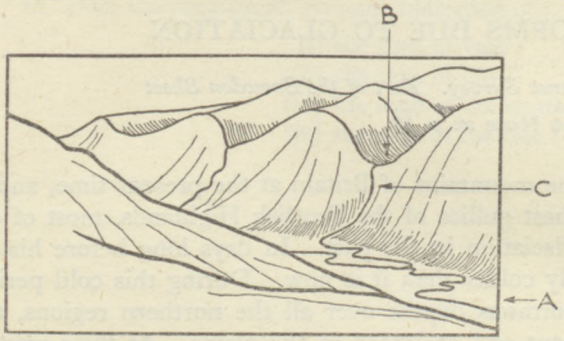

FIG. 32.—DIAGRAM TO ILLUSTRATE HANGING VALLEYS

A, Main valley with swinging river.
B, Hanging tributary valley.
C, Torrent falling precipitately from tributary valley to floor of main valley.

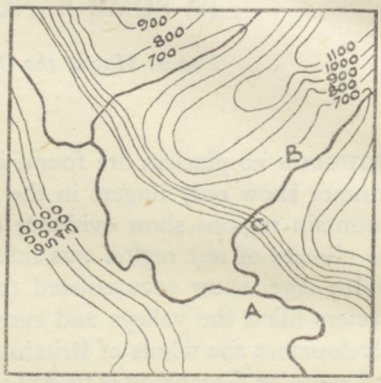

FIG. 33.—CONTOUR SKETCH-MAP OF HANGING VALLEYS

opinion as to whether ice possesses greater or less erosive power than running water, and some of the land-forms described above have been attributed to ice protection rather than to ice erosion.

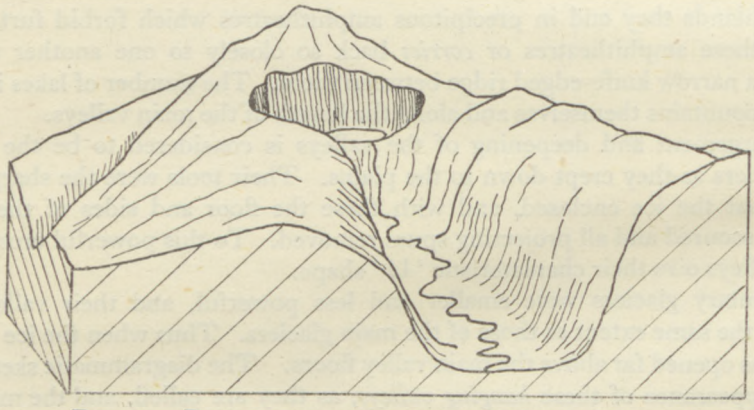

FIG. 34.—DIAGRAM TO ILLUSTRATE A MOUNTAIN CORRIE

EXERCISES

1. By what methods is relief represented on the map facing p. 58? Do you consider these methods effective?

2. Write an account of the general character and appearance of the mountains of this district.

3. What evidence is there on the map of the kind of rock of which these mountains are composed?

PLATE VII

VIEW FROM THE SLOPES OF CARNEDD DAFYDD

Photo G. P. Abraham, Keswick

PLATE VIII

A VALLEY IN NORTH WALES

Photo G. P. Abraham, Keswick

4. How has relief affected communications in this area ?

5. Study the main roads in D3. Briefly describe (*a*) the main road south from the Pen-y-Gwrhyd Hotel. How does its course differ from that of the neighbouring third-class road ? (*b*) the main road west from the Pen-y-Gwrhyd Hotel. What is the greatest height attained on this road ? Where on this road will there be very extensive views ? Briefly describe these views.

6. Make a sketch or tracing of squares D3 and D4 to show (i) the 1000 contour, (ii) the chief streams. On this sketch-map mark by a bold dotted line the watersheds separating the basins

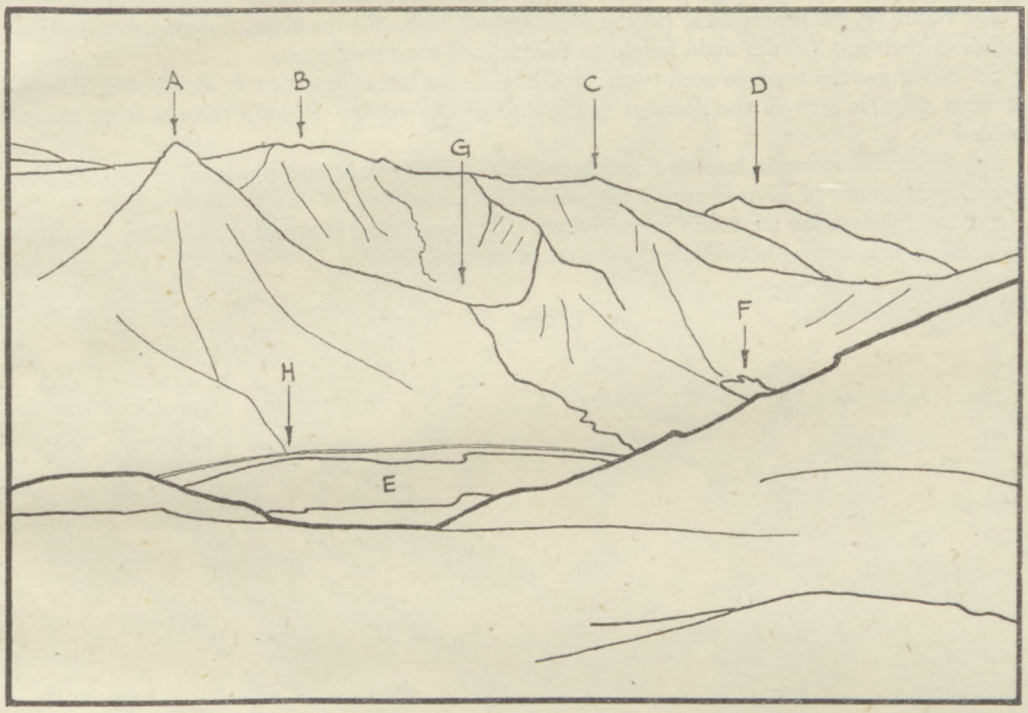

FIG. 35.—DIAGRAMMATIC SKETCH OF VIEW FROM CARNEDD DAFYDD

of the rivers Nant Peris, Nant Cynnyd, and Nant-y-Gwrhyd. Make crosses where main roads cross watersheds.

7. Study the Snowdon railway. What kind of railway is it ? How long is it ? What is its average gradient ?

8. What other railways are there in this district, and what purpose do they serve ?

9. How do you account for the absence of normal railroads ?

10. Compare the ascent of Snowdon (by foot) from Llanberis (B1) and Pen-y-pass (D3). Which route would you prefer, and why ?

11. What evidence does the map afford that the region has comparatively little to offer to man ?

12. Make as full a list as you can of the ways that man has utilized the region. How can you account for the presence of hotels in so scantily peopled a region ?

13. What evidence is there of the former glaciation of the region ?

14. Name a ' U ' shaped valley, a corrie or cirque, a corrie lake, a ' hanging ' valley.

15. Describe in general terms the character of the rivers in this area.

16. Notice lakes Padarn and Peris in B1, C1. At what height are these lakes ? How do you account for the flats at the head of Lake Peris ? The two lakes were once united. Can you account for the formation of the flats that now separate them ?

17. Study Plate VII. It shows a view from the slopes of Carnedd Dafydd (A4). Identify all the features indicated in the diagrammatic sketch of this view (Fig. 35). Give the names of A, B, C, D, E, F, G ; what is H ?

18. Plate VIII shows a valley in the area shown by the map. Identify this valley. Name the height from which the photograph was taken. In what direction was the camera pointing ?

19. Name (i) the nearer lake, (ii) the more distant lake, (iii) the river, (iv) the main height to the left of the view, (v) the main height to the right of the view.

20. What are the terraces seen in the distance on the left of the view ? From your atlas find out what town is seen in the distance at the end of the valley. Beyond the sea what island is visible ?

21. What difference in level is there between the valley floor and the level of Llyn Ogwen ? Where is the outlet of Llyn Ogwen ? Describe this outlet.

22. Briefly describe the roads in the valley. The main road is a new road. Can you suggest any reasons why it does not follow the course of the old road ?

PART OF THE SNOWDON DISTRICT

TOURIST EDITION

Scale of one inch to one statute mile $= \frac{1}{63360}$.

8 7 6 5 4 3 2 1 0 — 1 — 2 — 3 miles

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REVISION EXERCISES AND EXAMINATION QUESTIONS

Mapping of Described Areas

1. Draw simple contour maps, measuring 3 inches by 4 inches, to display the relief characteristic of any three of the following, adding in each case a scale of miles :

(*a*) a peninsula with cliffs ; (*c*) a volcano ;
(*b*) a deep valley containing a lake ; (*d*) a wind gap.

(*University of Cambridge School Certificate Examination, July* 1937.)

2. Draw three contoured sketch-maps, each within a square of 4-inch sides, to illustrate the following. Number the contours and show the compass points.

(*a*) A pass nearly 500 feet high cutting across a range of hills. These have their highest ridge 800 feet above sea-level and extend in a south-east to north-west direction.
(*b*) A spur extending south-eastward from a plateau 600 feet high.
(*c*) An escarpment 600 feet high trending east and west with the scarp facing north and crossed by a river flowing south. The river has one left-bank tributary flowing down the dip slope.

(*University of Cambridge School Certificate Examination, July* 1935.)

3. A narrow promontory nearly 8 miles long, running in a south-easterly direction, divides an estuary from a bay, the estuary being on the north-east and the bay on the south-west of the promontory. The promontory ends in an isolated hill, 450 feet high, which falls steeply to the sea but has a gentle slope on its landward side, and is surmounted by a lighthouse. The Lighthouse Hill is separated by a plain, some 2 miles in width and never rising above 70 feet, from a ridge running from north-west to south-east, the crest of which just exceeds 500 feet. The ridge descends gently towards the bay, but presents a steep well-wooded slope to the estuary.

Represent the above facts on a contour map (vertical interval 100 feet and scale 1 inch to the mile).

(*Oxford Local School Certificate Examination, July* 1931.)

4. What are contour-lines ? Draw contoured sketch-maps, with appropriate scales of miles, to show :

(*a*) A large irregular-shaped island which is 80 miles from north to south and has a high range of mountains rising steeply from the west coast, with river valleys opening to the east coast.
(*b*) A ridge of hills extending in an east-and-west direction for about 30 miles with an escarpment facing south. About the centre of the ridge a river flowing northward passes through a steep-sided gap which is also followed by a main road and a railway.

(*Oxford Local School Certificate Examination, July* 1933.)

5. Draw a contoured sketch-map, complete with scale of miles and a key to the symbols employed, to represent the following : An island in 55° S. Lat. and 75° E. Long. is 16 miles

from N. to S. and 9 miles at its greatest breadth from E. to W. A range of hills which runs throughout the length of the island has a steep slope towards the west coast but descends more gradually on its eastern slopes, leaving a coastal plain about 2 miles wide. The highest point in the range is situated in the south and reaches an altitude of 750 ft. above sea-level; about the centre of the range there is a gap which is only 220 ft. above sea-level, while farther north the height is uniformly just over 500 ft. Two streams flow into small inlets on the east coast, and on the more southerly inlet there is a landing-place 'A.' Another landing-place 'B,' also on a small inlet, is situated about the centre of the west coast. Indicate the easiest route for the construction of a road from 'A' to 'B.'

(*University of Cambridge School Certificate Examination, July* 1927.)

6. To a scale of 1 in. to 1 mile and with contours at 100-ft. intervals, draw a map of the area described in the following paragraph:

A wide valley, lying at an altitude of just over 400 ft., runs from east to west across the southern half of the area. This valley is drained by a large river Y, which flows in an easterly direction.

To the south of the valley the land rises steeply to the edge of a plateau, having an average height of 1000 ft. This plateau is trenched in the south-east of the area by an important dry gap X. Only the northern part of the plateau and of the gap come within the area of the map.

To the north of the valley the land rises gradually to an upland area, exceeding 800 ft. in height. These uplands are deeply cut by tributary streams of the main river Y. The largest of these tributaries, Z, joins the main river nearly opposite to the gap X.

Mark on your map a suitable position for a market town A.

(*Northern Universities School Certificate Examination, September* 1931.)

Interpretation of Contour-outline Maps

7. (In answering this question work exercise (*a*) on tracing-paper.) Study Fig. 36. The contour intervals are 100 feet. The figures near X and Y give the height in feet of the river at these points.

Two roads, A to B and C to D, cross the region.

(*a*) Shade the parts over 800 feet.
(*b*) Measure the distance *by river* from X to Y, and find the average fall of the river *expressed in inches per mile.*
(*c*) In what *general* direction is the river flowing?
(*d*) Describe *in detail* the course of the road from A to B. How does it differ from that of the road from C to D?

(*University of Cambridge School Certificate Examination, July* 1933.)

8. (In answering this question work exercise (*a*) and (*b*) on tracing-paper.) On map Fig. 37 examine the contours and the map scale. The contour interval is 200 feet.

(*a*) Shade all the land above the highest contour.
(*b*) Insert a river-system draining north-east.
(*c*) Join PQR. Calculate the average rate of fall in feet per mile from Q to P, and from Q to R.
(*d*) Draw a profile section from P to R.
(*e*) From your observations describe the relief of the land.

(*University of Cambridge School Certificate Examination, July* 1936.)

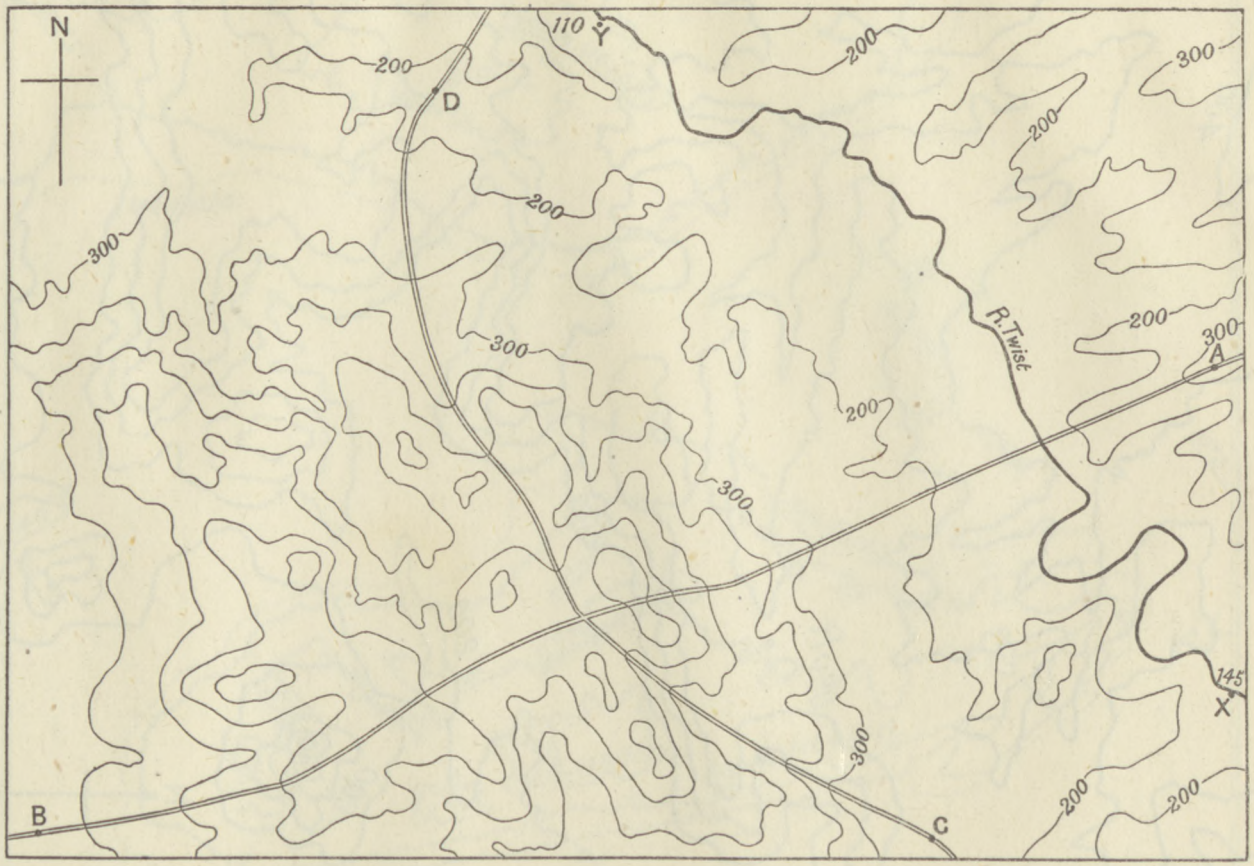

FIG. 36

(Scale reduced from 1–63,360)

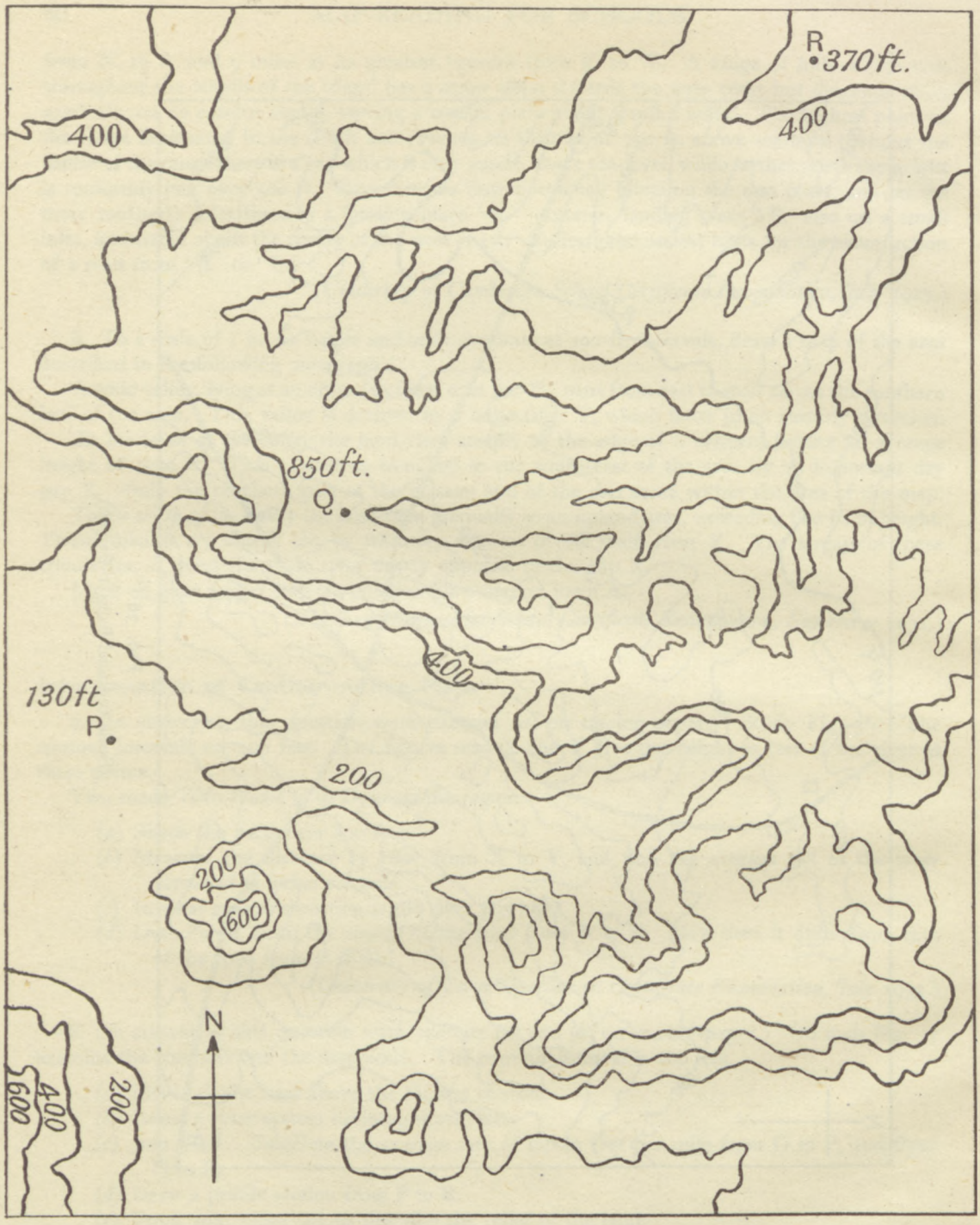

FIG. 37

(Scale : $\frac{1}{4}$ inch represents 1 mile)


15°S
A
500m. (1640ft)
10°S
40°E
20°S
100 faths.
40°E
25°S
100 faths.
10°S
500m. (1640ft)
50°E
1500m. (4921ft)
500m. (1640ft)
B.
25°S
50°E
20°S
15°S

FIG. 38

9. (Trace the outline of Fig. 38 in your note-book for the working of exercises (*a*) and (*b*).) On the map :

(*a*) indicate the points of the compass ;
(*b*) draw a scale of miles ;
(*c*) state how many miles it is from north to south of the island ;
(*d*) make a section from A to B ;
(*e*) name the island.

(*University of Cambridge School Certificate Examination, December* 1926.)

FIG. 39
(Scale reduced from 1 inch to 1 mile)

10. (Make a tracing of Fig. 39 in your note-book for the working of exercises (*a*) to (*d*).) The map provided (Fig. 39) represents a part of the coastlands of Britain. On the map :

(*a*) Mark a double-track railway from A to D using an embankment and bridge to cross the estuary from C to D.
(*b*) Shade the areas which would be converted into islands were the land submerged 100 feet.
(*c*) Mark the course of the river which flows in a narrow valley.
(*d*) Show the area to the north-west of D as marshy land.

PLATE IX

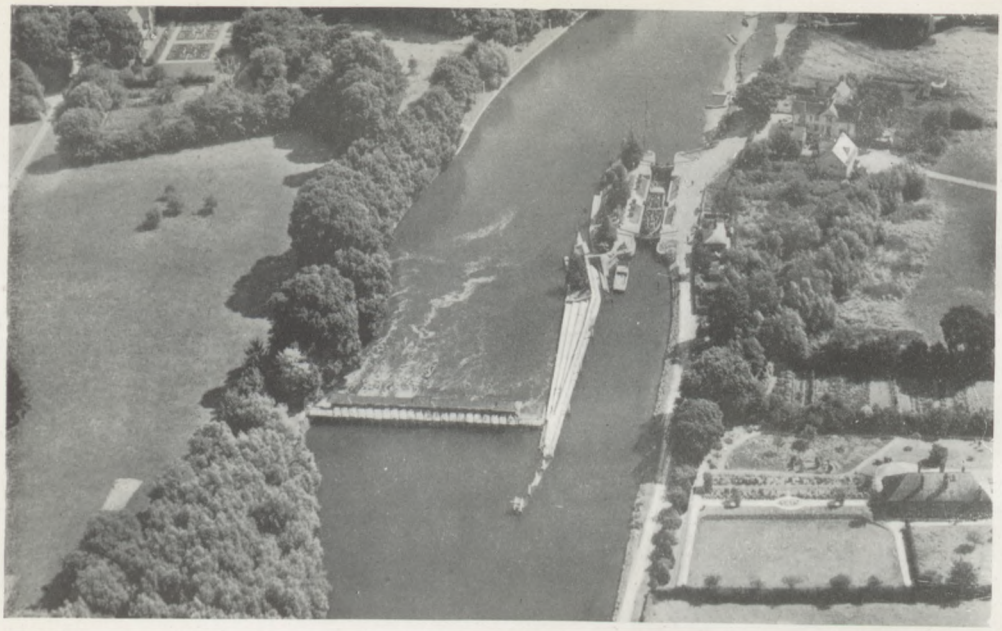

FIG. A

BELL WEIR AND LOCK, EGHAM, SURREY

Photo Aerofilms Ltd.

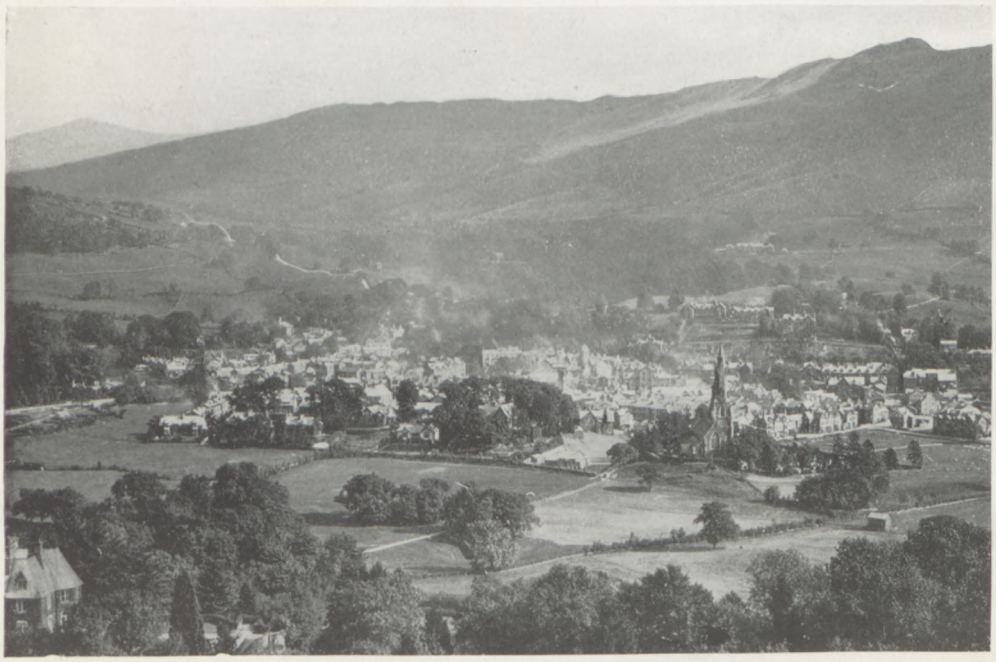

FIG. B

AMBLESIDE AND WANSFELL FROM LOUGHRIGG

Photo G. P. Abraham, Keswick

In your answer book :

(*e*) Give the greatest height of the sea-cliff.
(*f*) State, using about 20 words, what the observer at G sees, if he looks due south.
(*g*) State, with reasons, whether G is visible from H.

(*Northern Universities School Certificate Examination*, 1926.)

Interpretation of Ordnance Survey Maps

11. Study the ordnance map provided (facing p. 30) and answer the following questions :

(*a*) Describe the position of Weston-super-Mare and state what appear to be its advantages as a health and pleasure resort.
(*b*) Describe the physical conditions which help to explain :
(i) why the larger settlements in the Axe valley lie to the north rather than to the south of the River Axe ;
(ii) why there is no significant settlement along the estuary of this river.
(*c*) Give the geographical definitions of (i) the natural feature which extends from Crook Peak south-eastward to Dunnett Farm, (ii) the natural feature used by the railway and road in passing southward from C5 to D5.

(N.B.—*This feature is beyond the borders of the map.*)

(*d*) How does the coast on the south side of Brean Down differ in character from the coast in the neighbourhood of Brean ?
(*e*) Comment upon (i) the general absence of watercourses in the uplands extending from Uphill eastward across the map, (ii) the course of the River Axe between Crab-Hole and the western margin of C3.

(*Northern Universities School Certificate Examination*, 1932.)

Picture Interpretation

12. Examine illustration A (Plate IV, Fig. A) with which you are supplied, and which shows a view looking south, and then answer the following :

(*a*) Describe with the aid of a simple sketch-map the relief of the area and the situation of the town seen in the middle distance.
(*b*) Suggest with reasons the general type of climate, the season of the year, and the direction of the wind.
(*c*) Comment on the means of communication and their arrangement.
(*d*) What different forms of productive activity can be recognized ?

(*University of London Matriculation Examination, January* 1938.)

13. In connexion with Picture B (Plate IX, Fig. A) :

(i) draw a simple sketch-map of the piece of country shown ;
(ii) describe in a few sentences the piece of country shown ;
(iii) state any indications contained in the picture that a particular form of transport is used in the area.

(*University of London General School Examination*, 1935.)

14. Study the picture of Ambleside (Plate IX, Fig. B). The photograph is taken from a hill-side (Loughrigg) to the west of the town and the camera is pointing eastward. Ambleside lies in a valley which opens south to Windermere, and behind and a little to the south of the

town rises the ridge of Wansfell. To the north of Wansfell a steep valley leads to the Kirkstone Pass.

(*a*) Discuss the character and position of the town. On what grounds would you consider it to be a residential town ?

(*b*) How is man utilizing (i) the valley, (ii) the steep mountain-slopes ?

(*c*) Note the road that climbs the hill-side behind the town. What impression do you gain as to its suitability for fast or heavy traffic ? How would this road be shown on an Ordnance Survey One-inch map ?

(*d*) Draw a contour sketch-map of the area shown in the photograph. Give a key to all the symbols that you use.

(N.B.—*Ambleside is* 200 *feet, Wansfell* 1587 *feet, above sea-level.*)

(*e*) What evidence does the picture afford of :

(i) weather conditions ;

(ii) the season of the year, at the time when the photograph was taken ?