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RECENT PRODUCTIONS OF THE ORDNANCE SURVEY

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Read at the Meeting of the British Association, Southampton, in Section E (Geography).

THE title chosen by the President of this Section for his address suggests that map-making may be regarded from two distinct standpoints—the scientific and the artistic. One of the chief preoccupations of the cartographer should be to reconcile these two aspects; to produce a beautiful map which is also accurate and legible. Just as good literary style is of the utmost practical value in the presentation of scientific facts in a book or pamphlet, so good cartographic style enhances the practical value of a map besides converting it from a dry statement of facts into a thing of beauty.

In modern times there has been a tendency all over the world to lose sight altogether of the artistic aspect of maps, and most of the productions of the present day compare very unfavourably with those of the sixteenth and seventeenth centuries in this respect. Perhaps it is because the tradition of the old map engravers has been preserved, to some extent, in the Ordnance Survey that the sheets of the 1-inch map still have an æsthetic appeal. Mr. Aldous Huxley recognizes this in a recent article in which he advocates their use purely as pieces of decoration; after

speaking of the beauty of the work of the mediæval mapmakers he says, "It is possible to make a charming decoration out of the most accurate and efficient of modern maps. The Ordnance Survey printed in five colours is a beautiful thing to look at, and one can imagine a panel, or a whole wall of a study richly and interestingly adorned with a slice of England reduced to the scale of an inch to the mile." I think he refers to the Popular Edition of England and Wales; what he says sets one thinking over what it will be possible to do in future to make the 1-inch a still more "beautiful thing to look at."

The style of the Ordnance Survey small-scale maps is traditional; their evolution can be traced direct to the sixteenth century, and beyond that to the Middle Ages. The first maps produced by the Department were those of the south of England on the scale of 1 inch to 1 mile, which were prepared and published during the first two decades of the nineteenth century under Colonel Mudge in the Tower of London. One has only to glance at them to realize that they are a product of a well-established tradition, the work of expert craftsmen who worked in a style which has already become set. It is a fascinating study to trace the development of this tradition from Christopher Saxton in the latter half of the sixteenth century on through the successive generations of English cartographers—John Norden, Ogilby, John Cary, and the rest—to the foundation of the Ordnance Survey and so to the present day. It is interesting to note the influence of methods of reproduction on the style. For instance, although the script used in the sixteenth century was engraved, it still retained the character of the letters written with a reed pen; gradually the engraver converted it into a type of script writing better suited for engraving. The beautiful Roman letters which had been used by earliest map makers underwent a similar change, the serifs or capitals became exaggerated, the up-strokes became fine "hair" lines and the character of the letter was entirely changed by the end of the eighteenth century. So long as copper-plate printing was employed as the only means of reproduction there was very little scope for further development. As engraved maps these 1-inch and early 6-inch sheets are very complete, and one feels that any alteration would destroy their balance and spoil them.

The introduction of lithography revolutionized everything. It became possible to print maps in many colours, and the demand for coloured maps was insistent. The engravers' tradition remained, however, and, although the large-scale plans were lithographed direct very soon after the introduction of the process, the 1-inch map was still engraved and the transfers pulled from the copper plates were laid down on the lithographic stones or zinc plates. The present 1-inch map of England and Wales has been produced by this method, and is therefore a compromise between engraving and the newer process.

Perhaps the strongest reason for the retention of the copper plate as the basis of the map is that it constitutes a permanent record, practically

indestructible, the size and shape of which remains stable, and upon which alterations and additions can be made; but the process of transferring from copper to stone has not been found altogether satisfactory. In order to make the various colour plates the contours and water had been separated from the outline on the copper plates, and great difficulty was experienced in securing the perfect fit or register of the zinc plates, for although the copper plates themselves measured correctly, the transfers which were on paper were liable to expansion and contraction. In addition to this it was realized that a map primarily designed for copper-plate engraving was not adapted for reproduction by the zincographic process. Much of the very fine work was coarsened, or failed to appear on the zinc after the process of transferring, whilst the adjustments, slight as they were, which had to be made to secure register affected the accuracy of the map, and as time goes on greater accuracy is required, especially for military purposes. Accordingly it has been decided, at last, to abandon engraving altogether and to draw the map for direct reproduction by the process of helio-zincography.

We are feeling our way with the new 1-inch series of Scotland, four sheets of which have already been published. These are the latest production of the Survey, and as the smaller scales, $\frac{1}{2}$ inch, $\frac{1}{4}$ inch, 10 mile, and $1/1,000,000$ are all derived from the 1-inch, the character of these Scottish sheets will largely influence that of all the future small-scale maps of this country.

My reason for dwelling on the history of the 1-inch map and its development is that to-day we are at the parting of the ways. The next edition of England and Wales will be re-plotted and drawn *de novo*. It is hoped to produce a map designed to be drawn on paper and adapted for reproduction by the helio-zincograph process, which will retain the traditional style, which is a good one and thoroughly English, adapting it to modern requirements and to the new process where necessary, but making no violent break with the past.

The adoption of the new method has rendered it possible to make some improvements, which have increased the value of the maps. For instance, each sheet has been made to overlap its neighbours 1 inch in all directions. This is a great convenience which will be appreciated by all users of the series.

Hitherto the 1-inch maps of Scotland have been on Bonne's projection and based on the meridian of 4° W. of Greenwich. The new map has been transferred to Cassini and the meridian of Delamere $2^{\circ} 41' 3''$ W. of Greenwich, on which the maps of England and Wales are drawn. This has made it possible to carry the sheet lines of the English series through into Scotland and to avoid all overlapping and confusion on the border.

In considering the details of the construction of a map it is convenient to divide the features into two classes; Natural and Man-made. Among

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the former the representation of land-forms is necessarily of the utmost importance, and there has been, and still is, considerable difference of opinion as to the best system. The method of indicating relief has undergone great changes; the first geographers depicted hills as a series of humps, drawn in perspective; gradually these pictured hills gave way to hachures, the hills being shown in plan with their slopes shaded to indicate varying degrees of steepness; this method lent itself peculiarly well to engraving, and held the field throughout the nineteenth century. After the introduction of contours the hachures were still printed in addition to the contour lines; they appear on the current edition of the Scottish map and on the large-sheet series of England and Wales, which has just been superseded. They have now been discarded and the latest 1-inch sheets show contours only, or for the Tourist District Maps, contours with layer colouring.

One cannot help regretting the passing of the hachured hills which did so much to enhance the beauty and usefulness of the old engraved maps, and which have proved effective even in combination with contours, shading, and layer colouring; but contours have a certain beauty of their own, and they serve to indicate the land forms more precisely than the pictorial method could do. On the new map they are drawn at vertical intervals of 50 feet from sea-level to the summits instead of at 100-foot intervals up to 1000 feet and thence at 250-foot intervals as on the present Scottish map. When the contours were left without the support of the hachures on the maps of the Popular Edition of England and Wales it was found that the ground forms were very often difficult to follow, but this defect has been overcome on the latest maps by thickening the lines at 250 feet, 500 feet, and so on at 250-foot intervals. This device brings out the shapes of the hills and facilitates the reading of the contours in a remarkable way. Another minor improvement is the provision of more contour figures than has been customary of late years.

Up to the commencement of the present revision, water was shown by means of engraved "water lining"; this was abolished, as it was found to be confusing when used in combination with sea-bed contours, and on the Popular Edition of England and Wales rivers are shown by a thick blue line which was inferior in appearance to the water-lined streams which it superseded. On the new map inland water is outlined in blue and filled with a blue tint, which gives a pleasing effect and clear definition to the streams.

Most of the ornamental features of the engraved map have been retained, and the draftsmen have been successful in depicting sand, rocks, woods, marsh, moorland and parks even more clearly than their predecessors, the engravers. Several of the draftsmen employed on this work are ex-engravers who have exchanged their engraving tools for the pen quite recently.

Physical features change little; it is with man-made features that

the revisers are principally concerned. The enormous development which has taken place during the past forty years has rendered the task of mapping the country on the small scale of 1 inch to 1 mile an increasingly difficult one. The danger of overcrowding the maps is very great, and much judgment has to be used in the selection and generalization of material.

All houses on the new map are blocked in, in solid black. The advantages of this over the former method of hatching are that the shapes can be better defined, that the streets in towns stand out more clearly, that the towns themselves tell out on the map in a manner which approximates to their relative importance. With the growth of motor traffic the showing of the roads and their classification has become a consideration of the first importance. It has been thought by some critics that we have over-emphasized the main roads. Possibly they are right, and these roads, coloured a strong red as they are, are a little too wide and tend to overpower the surrounding detail.

The great alterations and additions to the road system since the revision of the South of England was carried out necessitated the making of a special road revision. This has just been completed for the London area and the South Coast, and future reprints of the 1-inch, $\frac{1}{2}$ -inch, and $\frac{1}{4}$ -inch sheets will show the new arterial and other roads open for traffic or under construction and all alterations to classification of the old highways. The special sheets London North and London South with this information have already been published.

The archæological information on the recent maps has been revised by the Archæology Officer, and the 1-inch in this respect has been much improved. Mr. Crawford is dealing with this matter in the paper he is reading to this Section, and I shall not dwell upon it.

For the smaller scales derived from the 1-inch, the detail is selected, generalized, and exaggerated in order to suit it for reduction. Last year the publication of the new $\frac{1}{4}$ -inch map of Great Britain was completed, by drawing in black over prints in blue of the $\frac{1}{2}$ -inch map. The detail to be shown on the $\frac{1}{4}$ -inch scale was selected and exaggerated sufficiently to stand reduction to half, and all the names were re-written larger to ensure their legibility.

Although this map may be regarded as the standard motoring map of the country, the main roads being emphasized and coloured red, the contours and layer colouring, together with the sea-bed contours, convert it into a useful physical map which can be adapted to a variety of uses. It has been much used by airmen, as the scale is very convenient for flying, and it serves as a basis for the special air map which is being prepared. Attention is now being paid to the delineation upon it by means of special symbols of aerodromes, seaplane stations, landing grounds, air lighthouses, wireless stations, and other features bearing upon its use as an air map. A large special sheet—South Central England—has

been prepared ; it covers London, Birmingham and Bath with the South Coast. This sheet has been found valuable for many purposes.

The first sheet of the new map on the scale of 10 miles to 1 inch is now being printed. It is designed primarily as a road map. The whole of Great Britain will be covered by three sheets, and a liberal overlap of 6 inches is provided. Sheet 3 includes the whole of Wales and England south of the Humber. The contours, which are drawn at 200 and 400 feet and thence at 400-foot intervals, together with the layer colours, emphasize the relief without obscuring the roads and detail. The coast-line is printed in blue, with the water—as is done on the International 1/1,000,000 maps. This makes it possible to separate the complete physical map from the black plate which carries the detail and names, and thus will facilitate the use of the series for special maps showing distributions and special classes of information. For instance, the two southern sheets will be used for a more detailed map of Roman Britain than the one on the 1/1,000,000 scale which was published last year. The Roman information will be incorporated on new black plates, which will be used with the Water and Contour plates instead of the present outline. The 10-mile map is being drawn on blue prints of the 1/4-inch sheets.

When designing new editions of the small-scale maps it is necessary to keep constantly before one the variety of uses to which they will be put. On each scale as much detail as is possible of all classes is shown, and after military necessities have been met the balance between the civilian claims must be kept—the motorist, pedestrian, engineer, administrator, archæologist, each naturally prefers a map which emphasizes the particular features which interest him ; but a National Survey must act impartially and give that prominence to each object represented which its relative importance warrants, and thus indicate its true relation to its surroundings.

It is for the specialist who requires certain data to be emphasized at the expense of the general topography of the country to use the national maps as a basis and to draw or overprint upon them the specialized information he requires. The geological maps of the country are produced in this way, and are the most striking examples of the use of overprinting. Recently this device has been used extensively for administrative, scientific, and other purposes. The 1/2-inch series prepared and printed by the Survey for the Ministry of Transport is a good example. The outline of the regular Ordnance Survey 1/2-inch series is used without contours or any relief colouring, and the roads and road numbers are overprinted boldly in red and green, thus adapting a general topographical map to the specialized use of the motorist and of the various administrative bodies responsible for the roads of the country.

The Ministry of Health has recently carried out a very complete survey of the water resources of England and Wales based on the Ordnance

Survey maps. Through the courtesy of Mr. Sandford Fawcett, the Chief Engineer, who conceived and directed the survey, I am able to show a set of specimens of the maps which have been prepared. The information relating to Water and Water Supply is strongly emphasized. The data are classified and each feature indicated by a symbol and numbered, and the country divided according to catchment areas. The system of references to a card-index makes the whole scheme very complete.

A series of maps on varying scales is used, the smaller scales giving a general view of the water resources of the country and at the same time serving as index diagrams to the larger more detailed maps. By means of these maps and the card-index the record of the complicated mass of information relating to the water supply of the whole country is made simple, and reference to any particular object is easy. The system is one which can be studied with advantage by every one interested in practical map work.

Many Ordnance Survey maps showing archæological distributions have also been published; and although much has already been done, there are practically unlimited possibilities for the development of the use of the maps in this way.

To sum up, the aim of the Survey is to give as true and detailed a picture of the country as the scale of each of the maps permits, to improve the cartographic style and legibility of the sheets, to adapt their traditional character to modern methods of reproduction without sacrificing their æsthetic qualities, and above all to secure the degree of scientific accuracy which is required at the present day.



From Ellis Martin's cover design for Ordnance Survey "Town Maps"