

## THE NEW ONE-INCH AND QUARTER-INCH MAPS OF THE ORDNANCE SURVEY

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**B**EFORE proceeding to describe the new One-inch and Quarter-inch maps, it will not be out of place to give a short historical description of these two maps.

The original 1-inch maps of the Ordnance Survey were commenced in 1791, and the first sheet was published in 1801. They were engraved in large sheets from military surveys on various scales, part of the work being done by civilian surveyors under contract. The engraving was done in the Tower of London. These maps continued in this form for nearly seventy years, though several improvements were carried out. In the year 1872 an entirely new series of engraved maps was commenced, based on a new survey. The whole of the United Kingdom was divided up into 695 sheets, and the series was known under the name of the Small Sheet Series of Great Britain and Ireland. The whole of the work—outline contours and hill hachures—was engraved on one plate.

After a time it was found that when it became a question of revising the detail on the plates, the method of scraping the matrices involved the scraping of portions of the hill hachures. As these were permanent features and not subject to revision, it was considered that eventual economy in engraving (not to mention the possible deterioration of the hill work itself) would be effected by having the hill hachures on separate plates. This work was begun in 1894, and the published engraved sheets from that time took two forms: (i) outline, water and contours (in black); (ii) as above, with hachures (in brown).

Until 1894 the Ordnance Survey had produced only maps in the engraved form, the point of view being that it was the duty of the survey to produce the best engraved article possible; a prejudice existed at this period against extending the work of the survey to lithography, and the attitude was that the survey was a map-producing rather than a map-publishing establishment. Of the excellence of the engraved maps there can be no question, but from a point of view of economy in production they cannot compare with maps produced by lithographic means. Each engraved impression required hand-inking and hand-printing. Moreover the method precluded the use of much colour.

In 1892 the War Office pressed for additional information to be shown on the 1-inch maps. This necessitated the adoption of lithographic methods. The engraved plates were used as a basis of the work, but it became necessary to separate the three features—outline, water, and contours—which up to now had been engraved together on the copper-plate.

This was done by the method known as "Scraping the Transfer," which consists of scraping out, with a fine penknife, work not required for the particular plate in question from an impression pulled in transfer ink on specially prepared paper. The transfer thus scraped was then laid down on stone. This method avoided the necessity of redrawing and allowed use to be made of the existing engraved work. It had, however, drawbacks, the chief of which was that during the period of scraping, the transfer became dead, and the resulting work on the stone required much "touching up." The time taken in scraping had also the effect of introducing slight distortions in the size of the transfer.

In 1906 it was decided to increase the size of the 1-inch sheets from 18 × 12 inches to 27 × 18 inches. This was carried out by re-transferring work from the small sheets on stone, but for the time being the engraved plates retained their old form. The new sheets became known as the Large Sheet Series of Great Britain. These lithographed impressions gave the following separate effects: outline in black; water in blue; contours in red; roads in sienna; woods in green; hachures in sepia.

They have been on sale for many years to the general public.

In 1912 the whole question of the 1-inch map again came into the melting pot. In the twenty years that had elapsed since the first O.S. lithographic maps had been begun, great strides had been made in reproduction methods. In particular the method of showing heights by tints known as the "layer system" had become popular and as far as O.S. work was concerned had been introduced only into the ½-inch map—a map which was made in response to W.O. demands, but which has since become familiar to the public. Moreover foreign countries were getting ahead of us in cartographic methods, and in particular the new French 1/50,000 gave results which were distinctly in advance of our then Large Sheet Series.

While the methods of improving the lithographic side of the 1-inch map was under discussion, two important steps were taken at this period: (1) A committee was appointed to consider what improvements might be made in the road classification shown on the 1-inch map. (2) It was decided to bring the size of the engraved copper-plates up to that of the L.S.S., viz. 27 × 18 inches. As regards (1), the committee, which sat at the W.O., was representative of both military and civil users of maps, and in particular motor traffic was considered.

The three main considerations now in force, in Road Classification, are: (a) width, (b) quality, (c) importance; of these (a) and (c) are shown by the engraved symbol, while (b) is shown on the coloured plates. The references at the foot of all 1-inch maps show the result of these several classifications.

As regards (2), the decision to increase the size of the copper plates did not involve re-engraving. The procedure adopted was as follows: The cutting lines of the 1-inch L.S.S. (which up till now had been made up on

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stone from the S.S.S. copper plates) were traced on the engraved S.S. matrix plates. These were then cut clean and the edges of the adjoining plates forming the now large sheet plate were likewise cut clean. The several portions were then carefully placed and rivetted together. In order to avoid unsightly joins, the work was "scraped" on both sides of the edges. From this patched-up matrix a new duplicate plate was made by electrotyping. On this duplicate the work was made up by re-engraving. From this (now the new original) a duplicate printing plate was made.

Whilst this work was in progress, it was also decided to take out the contours and water from the outline plate. This was done by scraping them out of the matrix, and these were then re-engraved on separate plates.

Quite recently it has been found expedient, for technical reasons of lithography, to abandon the separation of the outline and water, so that in future the engraved plates will consist of outline and water, contours, and hill hachures. In the mean time experiments were being carried out with a view of improving generally the cartography of the 1-inch lithographed maps.

A modified layer system, showing ground tints, was introduced, the new Road Classification was adopted, and a bolder method of showing rivers and streams was tried. The few maps published on this system were four in Ireland, including Killarney, and one in Scotland (Glasgow), but the intention was to extend this style of map to the whole of the 1-inch of the United Kingdom. The Great War, unfortunately, put a stop to this work, and for four and a half years all the resources of the O.S. were devoted to the production of war maps.

At the beginning of this year (1919), when things began to assume their normal course, the question of how to deal with the new 1-inch maps was again considered. It was soon seen that, from every point of view—economy and time required for production—it was impossible to extend the Killarney type of map to all the 1-inch Large Sheet maps. At the same time it was recognized that the new Road Classification and the new contour plates necessitated the making of new 1-inch sheets. The results finally determined on were that for the regular 1-inch Series the following types of maps should be published: A. The 1-inch Popular Maps; B. The 1-inch Outline Map; C. The Tourist District Map.

A glance at the specimens of the new Popular 1-inch maps will show the salient points of difference from the old coloured series. In the first place the Road Classification stands out in a very marked degree. There is no mistaking the first-class roads, and users of motor cars can easily pick out roads available for their use. Then it will be noticed that the contours, instead of being at 100 and 250 feet apart, are now uniformly at 50 feet vertical interval. The interpolated contours have been engraved from the 2-inch hill drawings and from spot levels. The old contour lines,

viz. 50 feet, 100 and every 100 feet up to 1000, and every 250 above that height, had been previously surveyed on the ground.

The next feature to draw attention to is the water. In the new maps the rivers and streams are drawn solid, whereas on the old maps they retained their engraved form. The sea is printed in a solid tint in contrast to the lined effect on the older maps.

Finally it will be observed that only county boundaries are shown on the new maps. Parish boundaries which caused so much confusion with footpaths have disappeared.

Outline maps on the 1-inch scale have been published by the Ordnance Survey for a long time. They were pulls from the outline copper plate. The new type of outline map is from stone, and is a combination of the outline, water and contours of the "Popular" Edition. They will, in future, be printed on stout paper similar to that in use for the 25 and 6 inch impressions, and it is hoped that this will make them more useful for engineering purposes.

The new Tourist District map is not yet on sale, and is, in fact, only in its infancy. A start has been made with the Snowdon map, a few copies of which are distributed for inspection. This map combines the features of the "Popular" with the coloured tints of the "Killarney" style.

The chief points to note are: (1) The increased size of the sheet; (2) The adoption of a broad layer system, printed in very transparent colours; (3) The small number of printings for the effects obtained.

Only one blue plate is used, and the woods are combined with the green tint of the first layer. The number of printings is eight. It will be noticed that the engraved hill hachures, which have been discarded in the "Popular," have been re-introduced in this map. Several popular touring centres are now in hand, and it is hoped to publish at least eight before next summer.

I now come to the quarter-inch map. This was commenced originally in 1859, but was discontinued and was resumed in 1884. In its original form it was engraved and published in 1882 "with its known imperfections." Its appearance raised a storm of criticisms, which is fully dealt with in the Dorington Committee Report of 1893.

In 1902 the revised quarter-inch was published in its fully coloured form in small sheets, and in 1912 it was produced in large sheets, ten sheets covering England and Wales.

This map was never satisfactory. It was far too crowded in many parts, and in particular the roads were badly shown. The water, which was on the original outline engraved plate, has always given trouble, as the blue was overprinted on the black rivers and streams, and registration was difficult. There were no contours, and the hill shading in certain sheets was very generalized and misleading. These hill plates were made from brush drawings, which were screened and photographed.



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This year two sheets of the new "Quarter-Inch" have been published. This is an entirely new map prepared as follows :

(1) The outline, water and contours were drawn on "blues" on the half-inch scale.

(2) These were then photographed down to the quarter-inch scale.

(3) From the negative a photo-etched copper plate was made of the three drawings—outline, water and contours.

(4) From these stones were prepared by transfer.

(5) From "offsets" the various road and layer plates were made.

The chief points to note about this new quarter-inch map are: The abolition of the hill shading and the substitution of contours; the introduction of the "layer" system; the comparative clearness of the detail; only main roads are coloured; no green wood symbol; the water, being on a separate plate and not overprinted, is much clearer.

Before I close I would like to draw the attention of those interested in Ordnance Survey maps to the new types of covers which have recently been introduced. They are the work of Mr. Ellis Martin of the Survey.

Specimen portions of the three new maps are reproduced, by permission of the Director-General O.S., on the folding plate at the end of this *Journal*.

Before the paper the PRESIDENT said: Colonel Johnston is well known as having been head of the Overseas Branch of the Ordnance Survey in France, and he is especially interested in the processes of printing maps. He has kindly consented to give us a paper this evening, to which we shall all listen with interest.

*Colonel Johnston then read the paper printed above, and a discussion followed.*

Colonel WHITLOCK: In the first place I have to express Sir Charles Close's regret that he is not able to be here this afternoon to hear this most interesting lecture. There is one point he asked me to emphasize: the classification of the roads on the new one-inch map. Those roads were considered by a committee of representatives from the War Office, Road Board, the Automobile Association, and an officer from the Ordnance Survey, and on their recommendations the present system of road classification was adopted. If you will refer to the reference on the southern margin of the Popular Edition map you will see there are ten different classes of road; but the main roads are easily seen, and I think that the map is one that will appeal to motorists and cyclists and other people who use the road. Another point Colonel Johnston did not mention, is that the new one-inch popular edition is squared with two-inch squares. This enables any one to judge distances pretty accurately. One other point in connection with the map that Sir Charles Close would like me to bring forward is the question of the distribution. Lately the distribution by a wholesale agent has been abolished, and besides getting all the maps on the bookstalls of Smith's and Wyman's, we now have a system by which we hope every reputable bookseller will be an agent also. It may be Utopian, but we hope as the maps get more generally known, people who are going on tours will ask for the maps of the district they are visiting as naturally as they will ask for the ticket to get

there. By making these maps more popular as well as easily obtainable—I am afraid they have not been very easy to get in the past—the Director-General hopes that the Survey will go a long way towards being self-supporting, and all I can say is that it will be the endeavour of all connected with the Ordnance Survey to reach that goal as soon as they can.

Sir THOMAS HOLDICH: I should like to express my admiration for the finish and clearness, as we seen them to-night, of the Ordnance Survey maps. I think we may fairly say they compare very favourably indeed with the maps turned out by any country in the world. I used to consider the Swiss maps the most artistic, but obviously it is quite impossible to compare the mapping of two countries which differ so entirely in their general topography as do Switzerland and England. There is one small technical question which in the interests of another department I should like to refer to Colonel Johnston's opinion. Although I was for many years employed on the Indian Survey I never was directly connected with any of the map-producing offices; but I remember that the great difficulty they experienced in any process which involved successive printings was that of accurate registration. In spite of the efforts of the reproducing staff it would occasionally happen—in fact, constantly did happen—that one would find little minor streams wandering about over the tops of the hills instead of adhering to their own particular valleys. Here I see a new tourist map, on which the chief point to note is the number of printings for the effects obtained. I understand that the number of printings is eight. In India we were unable to cope successfully even with two printings. Here are eight, and the results you see before you. The registration appears to me to be perfect. I should like to ask if there is anything in the method of printing, or in the quality of the material used, which leads to such perfect registration. There is a great deal of difference between the climate of India and England, and that very probably is at the bottom of the difficulty. During the process of printing in India there is no doubt a liability for paper to twist or expand or change its shape, and consequently to destroy perfect registration, just as there is in the actual business of plane-tabling when the plane-table is made of wood—or indeed of any other material. There is always a tendency in districts where there is great humidity for unequal expansion and contraction which entirely destroys the accuracy of the original projection, so I think it may possibly be that it is the climate which affects the material used in India for map printing. For that reason some time ago I made an effort to persuade the Survey authorities to have their small-scale maps brought out in England instead of in India; but that suggestion was not adopted, and there is, so far as I know, the same difficulty at present that there always was. There is a want of perfect registration, although it is much better than it used to be.

Colonel JOHNSTON: As regards Sir Thomas Holdich's remarks about registration, I think Colonel Hedley will perhaps say something about the facts in India, because he was for some years in the Calcutta printing branch; but for ourselves we naturally find climate plays a very great effect, and we found one of the principal things is first to calender your paper. I have known paper go out as much as a quarter of an inch. A great deal must be left to the printer. If the paper goes out, the printer stops at once and waits until it comes back right. As regards the accuracy of register, the chief point is to have your key plates. Build up from your outline, and do not try to draw your roads on transfer tracing-paper. Do as much as you can on zinc which has already got the key on it, then you are certain if your paper is right your register is going to be right.

Sir THOMAS HOLDICH: You have not any specially prepared paper?

Colonel JOHNSTON : No.

Colonel Sir COOTE HEDLEY : I happened to be at the Ordnance Survey in 1898 when they were first making efforts to introduce lithographic printing, and I quite remember that some of their first endeavours were rather primitive—a thing they realized themselves. They were in the position of learners for many years, but lithography has made great advances, and it is very gratifying to see the beautiful results now turned out. India also was in the position of a learner for many years. I went out to India myself from Southampton to help in the reproduction of maps, and I think I may say they had a great deal to learn. Now, however, in Calcutta they habitually print their one-inch and half-inch maps in four and five printings, and they print their 1/M maps on the International system, in something like seven or eight printings, and the results are very satisfactory. There are, of course, difficulties arising from the climate, but they are not insuperable. The important thing is to keep your paper always in the same condition, and especially to put it through the machine (calender it) before you put on your first impression. We may now say that the maps now printed in India are excellent. The Surveyor-General and all the officers take a great interest in the map reproduction, and do not consider their work is finished when the topographical field-sheet has been completed. As far as the Ordnance Survey maps of England are concerned, I and the War Office like the one-inch popular map very much. For military purposes we regard it as perfectly satisfactory. Nobody could help liking the tourist district map ; it is a beautiful production, but we must recognize the fact that we are not going to get that map all over England, but only just for the popular tourist districts. For the rest of the country we shall merely have the popular edition. It is an excellent and useful map, but there will be many people who will regret that for the great majority of the country the beautiful old engraved edition is going to disappear altogether. There are many people who actually prefer the old engraved edition with the hills in black or brown, to the most beautifully coloured map. It gives an impression of the hill features which you do not get on the popular edition, but on the popular edition the accurate information is there if you look for it. I like the new quarter-inch map. The only criticism which occurs to me is that, although it has been redrawn, I think the old tendency to accentuate roads in comparison with railways has not been corrected to quite the extent it might have been. On the one-inch map you will see that the roads are much more prominent than the railways. I have always thought that a mistake, which, however, it was impossible to correct when once the map was engraved. Personally I should have liked the railways a little more accentuated in comparison with the roads.

Major MASON : There is one question I should like to ask. When it was mentioned that the light was assumed from the north-west and the shade thrown on the south-east side of the mountain, it seemed to me that in the northern hemisphere you ought to have the light coming from the south, and in the southern hemisphere the light coming from the north. In these days, when we fly over mountains, would it not be much easier to pick up your position if the shade were shown in the correct place ?

Colonel JOHNSTON : As for the oblique incidence of light on maps, the light always has come from the north-west corner ; the only sheet in which we have prepared special light plates is on this Ilkley sheet ; it does not appear on the Snowdon sheet.

The PRESIDENT ; We have heard a good deal from the map-makers. I do not know if the map-users would like to ask any questions.

Mr. REYNOLDS: I should like to ask if there will be any alterations and additions of names, particularly on the tourist district maps? Will there be any additions? For instance, on the old maps of the Lake District there were many well-known peaks that were not named.

Colonel JOHNSTON: There will be no extra names as far as I know; that depends on what is on the engraved plates. Those tourist plates are made up from our one-inch outline plates.

Colonel WHITLOCK: I think it will probably depend on how much room there is in which to put the names.

Mr. HINKS: The point is, would you add any information for tourists?

Colonel JOHNSTON: No; the tourist map will be a replica of the one-inch popular or the regular one-inch series. There will be no additional names; but the convenience is in combination of sheets. For instance, take the sheet of Loch Lomond. To get the same area you would have to buy six regular series sheets, so that it saves a tourist a great deal of money.

Major-General Lord EDWARD GLEICHEN: Do I understand you to say that these "popular" one-inch maps are approved of for military purposes? It occurs to me that one does not grasp the lie of the ground anything like as quickly as one does on the 11kley sheet, or even on the old one. This one seems at first sight merely to give a pink tinge, and does not differentiate the hills and valleys like the other. I understood you to say it is highly approved of?

Colonel HEDLEY: It has been accepted by the War Office.

Colonel W. PITT: Do I understand that the boundaries are to be omitted in future on the one-inch map? I have always found the Parish boundaries pretty useful. I think if they are left out it will be rather inconvenient. It is perfectly true it is not easy always to distinguish between a Parish boundary and a footpath. Still, I think to a good many people Parish boundaries are extremely useful.

Colonel JOHNSTON: I think there is no question about it. The Parish boundaries have gone for good out of the one-inch map. Changes like that are bound to inconvenience people, but on the other hand the consensus of opinion was that the boundaries should only be shown on the large-scale maps, the six-inch maps.

Colonel HEDLEY: There are several maps provided for the very purpose Colonel Pitt wants, showing the whole of the county, urban district, and rural district boundaries on the half-inch scale, called the Local Government Board diagrams.

Colonel PITT: Might I ask if the colours on these map covers would be fast, because when issued in red covers the great trouble was that if they got wet the colour came off?

Colonel JOHNSTON: Yes.

The PRESIDENT: We are much indebted to Colonel Johnston for his interesting account of the development of the present map from the original engraved map, which was certainly beautifully and finely executed. One is always rather suspicious that the engravers may allow their pens to run away from themselves in depicting mountains, but I believe it really is accurate as well as beautiful. The whole tendency of map-making has been in the direction of greater practicality. But these latest maps, while they are of more practical use than the old map, have not sacrificed their beauty. Perhaps some may think that the old engraved map was more beautiful; still, there is a great deal of beauty too in the latest. We are impressed by the anxiety shown



by the Ordnance Survey to meet the wishes of the public by inquiring very carefully into their actual needs and satisfying them as far as they can. We are glad to hear that the Ordnance Survey 'are making it their aim, as far as possible, to make the Ordnance Department self-supporting. Speaking as an Anglo-Indian, I know how very poor the old Indian maps were, except that quarter-inch engraved map, which was a very beautiful one. The first lithographic maps were certainly very rough and disgraceful altogether. The ones that have been recently turned out, though not up to the standard of the Ordnance Survey—for it is more difficult, on account of the climatic conditions in India to reproduce maps—are certainly an improvement. And those conditions are being mastered, so perhaps some day the Indian map will be equal to the English. I will only ask you to accord a very hearty vote of thanks to Colonel Johnston for his most interesting lecture.

Colonel JOHNSTON : In regard to the question of the engraved maps, it has been pointed out that the public particularly love an engraved map, but it is an interesting fact that of the two engraved forms, that is to say the outline and the outline with the hills, seventeen of the former were sold to one of the latter ; and please do not forget that the engraved form of map will still exist in the outline edition, which will, however, be printed from stone and not from the copper plates.

N.B. -- As originally published, this paper was accompanied by a folding plate. This plate has been omitted from the present reprint, partly because of the difficulty of reproducing it satisfactorily, and partly because of the relative familiarity of the maps illustrated. The plate illustrated the following, (in order from left to right):

- (1) front cover for 1-inch England and Wales New Series "Popular Edition" sheet 91, "Abergawenny", with red surround.
- (2) '1" Tourist Map', of Snowdon (1920)
- (3) '1" Popular Edition', an extract from sheet 91 (1919)
- (4) '1/4" New Series', an extract from Third Edition sheet 10 (1919)

(2), (3) and (4) were included in A Description of Ordnance Survey Small-Scale Maps, (n.d., ?1920)