

G-3

Ht-2

For Departmental use.

Survey of India.

Ht-2

DEPARTMENTAL PAPER—No. 2.

A REVIEW
OF THE
BOUNDARY SYMBOLS
USED ON THE
MAPS OF VARIOUS COUNTRIES

BY
CAPTAIN M. O'C. TANDY, R.E.
DEPUTY SUPERINTENDENT, SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF THE SURVEYOR GENERAL OF INDIA.



Dehra Dun:

PRINTED AT THE OFFICE OF THE TRIGONOMETRICAL SURVEY.

1913.

HC-2

For Departmental use.

Survey of India.

DEPARTMENTAL PAPER—No. 2.

A REVIEW
OF THE
BOUNDARY SYMBOLS
USED ON THE
MAPS OF VARIOUS COUNTRIES

BY

CAPTAIN M. O'C. TANDY, R.E.

DEPUTY SUPERINTENDENT, SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF THE SURVEYOR GENERAL OF INDIA.



Dehra Dun:

PRINTED AT THE OFFICE OF THE TRIGONOMETRICAL SURVEY.

1913.

A review of the Boundary Symbols used on the maps of various countries.

This note deals with boundaries and all cognate questions, it covers all scales of maps made by the department, includes an examination of the practice of foreign countries and considers all questions from the artistic, utilitarian and political points of view.

The questions involved in such an investigation are many and I propose therefore to divide them into several headings and to deal with them as follows:—

- (i). What we do at present, and why we do it. (paras 2 to 12).
- (ii). What foreign countries do. (paras 13 to 18).
- (iii). Deductions that can be drawn from the practice of foreign countries. (para 19).
- (iv). Consideration of local conditions affecting our adoption of foreign procedure in its entirety. (para 20).
- (v). Recommendations as to what we should do. (paras 21 to 34).

2. The form and size of boundary symbols for all scales of our maps are clearly and completely laid down in C.O.

What we do at present.
General.

No. 165 of 8-9-11, C. M. 1694 of 5-6-09, and S.M.P.'s order No. 39 of November 1909; all these symbols have been laid down with the sanction of the Government of India whose approval would have to be obtained to any change in them; with regard to the colouring of ribands along boundaries and the tints to be used on coloured maps the Government of India has issued orders which are embodied in our hand-book but which have been subsequently slightly modified or expanded. In the practical application of the above orders difficulties at times have cropped up which have been settled by rulings of the Surveyor General but there are still several points requiring settlement; I propose, therefore, after describing the main considerations which seem to have led to the adoption of our present form of boundary symbols, to deal exhaustively with each scale of map and give in detail our existing orders and practices.

3. Boundary symbols, with a few exceptions which will be noted later and which are not largely used, consist of a succession of bar lines or dots, or of a combination of bars and dots. The prominence of a symbol depends chiefly on the thickness and size of the bars or dots, but generally speaking a bar line has greater prominence than a line of dots, and of symbols combining bars and dots, provided the intervals between the bars and dots are kept the same the more dots there are between the bars the less is the prominence of the symbol.

4. In selecting symbols for different boundaries the first consideration is to ensure that the more important a boundary is the greater is its prominence; prominence can be given either by thickening the symbols or by using different kinds of symbols; on a map which only shows two or three kinds of boundaries all the requisite distinction can be obtained by using one symbol in 3 different thicknesses, but where there are several kinds of boundaries to be shown this is impossible as either the differences between the symbols would be imperceptible or the most important boundaries must be very heavy and unsightly.

5. When the general form of our new 1-inch and degree sheet mapping was under consideration the question of boundary symbols was carefully considered; the bar and single dot symbol was selected for the external boundary of India and for the boundaries of Provinces and States (being drawn slightly heavier in the former case), this symbol has less prominence than a single bar line of equal thickness but by changing the dot into a cross it can easily be adapted to show an undemarcated boundary; bar lines in two thicknesses were chosen for divisions and districts; and for minor boundaries such as tahsils and forests the less prominent dot symbol was selected, the dots being at equal intervals for tahsils and grouped in pairs for forests; in special cases when it has been found necessary to show a boundary of less importance than the tahsil boundary a symbol consisting of 2 bars and 2 dots, and in the special editions of maps showing village boundaries a symbol consisting of one bar and 2 dots, have subsequently been selected.

6. It was considered desirable to maintain absolute uniformity in the form of symbols on all scales of maps, but the inconvenience caused by the fact that the necessary omission on our very small scale maps of all the minor boundaries would leave us with unnecessarily heavy symbols for the few remaining boundaries led to the issue of S.M.P.'s order No. 39 of November 1909; the principle underlying this order is that the bar and dot symbol must always be used for the external boundary of India on all scales and that the least prominent symbol (*i.e.* the dotted one) should generally be used for the least important boundary on the map.


7. On 1-inch maps we now show the following symbols:—

1-inch maps.

External boundary of India*

* The Government of India has decided that an undemarcated external boundary of India is not to be shown by any symbol on maps on a scale larger than 32 miles = 1 inch.

Province or State boundary	-----
" " " (undemarcated)	-----
Division boundary	-----
District and tribal boundary	-----
Tahsil or other sub-division boundary
Forest boundary
Pargana boundary in the U. P. or whenever a secondary sub-division boundary is required	-----
Village boundary on special editions	-----

In conformity with an old established custom of the department, the origin of which seems lost in obscurity, whenever the boundary represented by any of the above symbols is coterminous with a natural feature on the map, such as a road or stream, the boundary symbol is shown in the centre of the natural feature if there is room, or if not by placing the symbol alternately on different sides of it; in most of our old maps the actual boundary symbol was altered when it was necessary to place it on either side of a natural feature, thus the symbol ----- might become  in such circumstances, this no doubt was done in order to minimise the heavy effect caused by placing bar lined symbols along a natural feature; our present orders allow of no such change.

On 10 copies of all 1-inch and smaller scale maps which we send on publication to the India office the boundaries have to be coloured in accordance with Government of India orders; under these orders different widths of colour have to be used according to the importance of the boundary, and special colours are fixed for each Presidency or Province; for all native states and tribal areas, *i.e.* those areas coloured yellow on our approved specimen of the 32-mile map of India, the colour riband is yellow, but for the Presidencies and Provinces of India proper the colours are purely arbitrary and the only rule governing their selection is that adjoining provinces must never have the same colour.

Before the introduction of our new style maps printed in several colours it was the custom on the old maps printed only in black and brown to colour by hand such detail as water, roads, houses etc.; a foot-note was added on such maps quoting an extra price for hand coloured copies, and a special section of some 35 colourists was permanently employed on piece work in Calcutta colouring the maps; it was hoped that with the introduction of maps printed in colours the necessity for this hand colouring would cease; but although the work of the section, and the strength of the section, has decreased, we shall for a long time have

to issue our old maps, and to colour these; and the copies required by the India office still provides work for hand colourists; we have also recently received orders stopping the printing of a green colour riband along forest boundaries, and have added a foot-note to all our new maps stating that copies with hand coloured boundaries (including forest boundaries) can be obtained for a small extra charge, so that in the future we may continue to receive many orders for hand coloured maps. Green is the colour laid down for the colour ribands of several provinces and in these areas even if a slightly different shade of green is used for the colour riband of forest boundaries the latter will not have the same distinctiveness as in other provinces.

The Government of India attaches the greatest importance to the very exact delineation of the external boundary of India on our largest scale of map, and we have definite orders (in Maps II) to show on plane-table sections all boundary pillars of the external boundary and also of native states and tribal areas, and to show by a distinctive symbol those pillars which are not found at the time of survey; in the absence of definite orders it is presumably intended that the same orders should apply to fair sheets and the published maps, but the recent case of a state boundary has shown that it is not possible always to show all state boundary pillars, and the Surveyor General has sanctioned a selection being made in such cases.

For village trijunction pillars a special symbol Υ is employed, but these pillars are not always shown on our published 1-inch maps.

The boundaries of reserved forest lands are generally defined by a large number of pillars which it would not be possible to show on a 1-inch map, they are however shown on the 4-inch boundary traces or the 2-inch special forest maps which are often prepared for such areas.

8. Points which require explanation in the procedure followed in the case of 1-inch maps are the special village-boundary editions and the special treatment of forest areas.

The evidence given before the Survey Committee in 1904 seemed to show that most civilians insisted very strongly on the necessity for showing village boundaries on our 1-inch maps; these boundaries had been shown on many of our older 1-inch maps, and in many parts of the country where villages are fairly large they can be shown without undue interference with detail, but this is not the case when villages are very small; on the other hand military opinion was strongly opposed to showing these boundaries, but inasmuch as the military authorities have now decided against using our 1-inch maps for manœuvre or war purposes their objections no longer bear any weight, and so strong was the civilian opinion in favour of showing village boundaries that provision had to be made for the issue in special cases of separate editions showing village boundaries.

In the same way that civil officials insisted on the importance of village boundaries, forest officers insisted on the importance to them of forest boundaries; as one of the recommendations which the Survey Committee made was the abolition whenever possible of the special forest surveys which we had been making in the past, it seems that special deference had to be paid to the wishes of the forest department, and in return for the forest department agreeing to rest content in most cases with $1\frac{1}{2}$ -inch or 2-inch maps in place of the old 4-inch ones, we issued special orders as to the survey and delineation of forest boundaries.

9. As has been already stated it was considered, when our present 1-inch symbols were selected, that uniformity was essential on all scales, and the orders issued were to the effect that on degree sheets all boundary symbols were to be the same as on 1-inch maps but drawn slightly finer if necessary. What has been written above with reference to the placing of boundary symbols on alternate sides of natural features, and the colouring of 1-inch maps must therefore be considered as applying equally to our degree sheets. It is only recently, however that the first few of our new degree sheets have been coming in for publication and this has led to the discovery of minor points exemplifying the difficulty in always applying the rules for 1-inch maps to degree sheets.

The smallest administrative area the boundary of which is always shown on 1-inch maps, is the tahsil or taluk or first sub-division of a district however named, this is generally about 500 square miles in area and would therefore cover some 30 square inches of paper on the $\frac{1}{4}$ -mile scale, there seems therefore no reason why any of the administrative boundaries shown on 1-inch maps down to and including the tahsil boundary need be omitted from degree sheets on account of the reduction of scale; forest reserves, however, are of all sizes and often consist of small isolated areas, and the question of whether it is possible or advisable to show their boundaries on degree sheets has still to be settled; another question remaining for settlement is what boundary pillars should be shown on degree sheets. It must be remembered that our degree sheets are at present the war and manœuvre maps of the country and while they remain so we must in preparing them pay special attention to the requirements of the military authorities; also that if it is decided to employ layers on degree sheets some modification may be necessary in the rules for colouring boundary ribands.

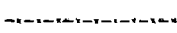
10. On $\frac{1}{M}$ maps the boundary symbols are the same as on 1-inch and $\frac{1}{4}$ -inch maps except for the omission of tahsil and forest boundaries; the average district of about 2,500 square miles covers about 10 square inches of paper and is therefore quite the smallest administrative area which can be shown.

The placing of symbols on alternate sides of natural features is insisted on in all cases. On this and smaller scale maps it is of course impossible to show boundary pillars.

It is on this scale of map that we are confronted with the difficulty of dealing with the boundaries of certain minor states of small area, these maps are the strategic maps of the country not only from a military but also from a civil point of view, that is to say they are the maps which local governments and the heads of such departments as deal with railways, canals, etc., require to plan and illustrate their large projects. For the purposes of civil strategy, if the term may be used, it is undoubtedly of importance to show all native states, and possibly also, but in a less degree, it is desirable from a military point of view. In certain areas, particularly in Kathiawar where the states are very small and much broken up, the attempt to show all state boundaries in detail must tend greatly to interfere with the general usefulness of the maps; this was realised when sheet 46 was under preparation and I prepared a trace illustrating the confusion which would be caused by showing these boundaries in detail, pointing out at the same time that they would be even more confusing on sheet 41, I asked for permission to leave out some of the boundaries separating small states from one another and to generalise boundaries when necessary, but this proposal was not sanctioned. On our old 1/M maps the orders for hand colouring boundary ribands were the same as for larger scale maps; but as these maps always include portions of several provinces the colouring on them of the boundary ribands is of greater importance than on larger scale maps and it was ordered that the ribands should in future be printed and not hand coloured; on the first few 1/M sheets the shade of the printed colour ribands was made the same as on the 32-mile map approved by Government, but this was found to interfere with the detail and to make the general appearance of the maps very heavy, and we now while using exactly the same colours print them in slightly lighter shades.

As it has been decided to issue future 1/M maps with coloured altitude layers the question of the issue of more than one edition of the maps owing to the mutual interference of layers and colour ribands may have to be considered.

11. The fourth edition of our 32-mile map is of importance as during its preparation the Government of India subjected the classification of the native states, the tribal areas, and the areas partly under their control to the very closest scrutiny, the distinctions between these areas are shown by colour tints and colour ribands; as finally approved the colouring of this map is therefore accepted as authoritative.

The boundary symbols employed are the same as on the 1/M maps except that Divisional boundaries are shown by the same symbol as District boundaries and that on this and on all smaller scale maps the undemarcated symbol  is used for the undemarcated portions of the external boundary of India; the placing of symbols on alternate sides of natural features is insisted on except for minor boundaries (*i.e.* district and tribal) for which it is optional to place the symbol on the most convenient side of the feature.

We have no orders either departmental or from the Government of India as to what maps are to be printed with colour tints or with colour ribands along boundaries, the only definite orders we have are that when tints or colours are used the colouring of this 32-mile map is to be accepted as our guide.

12. The boundary symbols used on the 64-mile and smaller scale maps are given below, they are of the same form as those used on larger scale maps, but for the reasons mentioned in para 6 they are not always used for the same purpose and the placing of symbols on alternate sides of natural features is not insisted on in the case of minor boundaries.

	64, 80 and 96-mile maps.	128, 192 and 256-mile maps.
External boundary of India ...		
" " undemarcated		
Province or State ...		
" " undemarcated		
District and tribal ...		

The rules for colouring these maps are precisely the same as for the 32-mile map; we have, however, published with the sanction of the Government of India a 64-mile map on which the official colouring of the 32-mile map has not been followed, but distinctive and arbitrary colour washes have been used to distinguish different Provinces.

A difficulty that is felt in hand colouring our smallest scale maps is that although the boundary symbols of minor states are omitted on the maps we are still forced to conform to the 32-mile map and colour the states yellow, we have therefore to enter *by hand* the boundaries of minor states on our office copies, and when issuing hand coloured copies of the maps the correct colour washes are shown but without any boundary symbol enclosing them.

13. I have made an examination of the boundary symbols of such English and foreign maps as are available in our office; the examination has been rather laborious as very few of the maps have symbol tables showing what boundary symbols are employed, this omission has not only entailed a careful examination of each sheet but in many cases it must be the case that boundary symbols which do not appear on any of the sheets I have examined may be employed on neighbouring sheets, I may therefore be guilty of faults of omission. The maps I have examined are on various scales from $\frac{1}{50,000}$ downwards, it is, how-

What foreign countries do.

ever, impossible to pick out any particular maps for comparison with any one of our own as we cannot be certain that they are meant to serve the same purpose, thus one cannot say whether the Italian $\frac{1}{200,000}$ or the Bavarian $\frac{1}{250,000}$ maps are the tactical war maps of these countries and therefore comparable to our degree sheets on the $\frac{1}{253,440}$ scale, all that I think it is safe to do is to divide the foreign maps into 2 groups, field and general maps, including in the former all maps on about the $\frac{1}{4}$ -inch or larger scales, and in the latter all maps on scales smaller than the $\frac{1}{4}$ -inch.

The first point to note with regard to boundary symbols on these maps, and a point which is unaffected by the scale of the maps, is that while all the symbols used on our maps are also used on foreign maps they are never used for the same purpose by different countries, the diversity of opinion in the value and use of symbols is very remarkable.

14. A second point that is noticeable, but is I think susceptible of explanation, is that generally the European maps seem to show very few boundaries. Thus, taking examples of field maps.—

	No. of Symbols	Symbols
The German ($\frac{1}{50,000}$ about)	2	-----
" $\frac{1}{100,000}$	1	-----
" $\frac{1}{250,000}$	2	-----
The French $\frac{1}{80,000}$	2
" $\frac{1}{320,000}$	3	-----
The Swiss $\frac{1}{100,000}$	1	-----
The Italian $\frac{1}{200,000}$	3
The Bavarian $\frac{1}{250,000}$	1	-----
The Baden $\frac{1}{200,000}$	3	-----
The Denmark $\frac{1}{50,000}$	1	-----
The Turkey $\frac{1}{250,000}$ (English general staff map)	1	-----

		No. of Symbols	Symbols
The English	$\frac{1}{63,360}$	2	-----
"	$\frac{1}{126,720}$ & $\frac{1}{253,440}$	1

I think the explanation of this fact is that in all these countries larger scale property maps of scientific accuracy are available, when this is not the case the number of boundaries on the maps seems generally to be larger; this is exemplified below:

The American 1/63,360 shows 8 symbols and is the largest scale official map of the country.

*Township and section	State	Country	Civil township	Reservation
----- -----	-----	-----	-----	-----
Land grant		City, village, and borough		Park or Cemetery
-----		-----		-----

The Canadian $\frac{1}{63,360}$ and $\frac{1}{126,720}$ show 3 symbols—

Province	Country	Township
-----	-----	-----

The French map of Tunis $\frac{1}{50,000}$ shows 4 symbols—

State	Department	Arrondissement	Commune
+++++	+++++	-----

The Cape Colony $\frac{1}{250,000}$ shows 3 symbols—

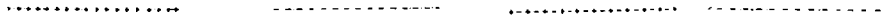
International	Colonial	District
-----	-----	-----

The Egyptian $\frac{1}{50,000}$ shows 4 symbols—

Mudira	Markaz	Town	Village
-----	-----	-----

* Boundaries follow parallels and meridians I think.

An old Dutch East Indian map $\frac{1}{100,000}$ 4 symbols—



† French maps of France $\frac{1}{50,000}$ 5 symbols—



The symbols shown above as used on the Cape Colony map are those approved and used by the English general staff on all their maps.

15. We have not got a very large selection of foreign general maps to refer to, but on those we have only important boundaries are shown.

On the International 1/M maps of course the only symbols used are those laid down by the International Conference.



The introduction of this international symbol must have been due, I think, to French and Italian influence at the Conference, and the English general staff on their 1/M Mesopotamia, their 1/2M Northern Nigeria, and their $\frac{1}{4,055,040}$ Persia and Afghanistan continue to use their own symbols.

16. The above paras give examples, I think, of most of the boundary symbols used on foreign maps (I have seen a symbol >>>>>>>>> but cannot lay my hand on the map), the discussion of them may be reserved till later, but other points with regard to which these maps must be examined are (i) the colour printing or hand colouring of boundaries, (ii) the showing of boundary pillars, (iii) symbols for undemarcated boundaries, (iv) boundaries running along natural features, (v) the showing of such minor boundaries as those of villages and forests.

17. An examination of the colouring of boundaries on the available foreign maps would lead one to assume that nearly always a plain black symbol without any colour is considered sufficient to give the requisite emphasis to the boundaries. We have several maps prepared recently by the English general staff on which coloured tints or hatchings are placed along boundaries and also one or two foreign maps similarly treated, such as the old Dutch East Indian map $\frac{1}{100,000}$ which has 3 colour ribands and the Italian $\frac{1}{200,000}$ which has a broad purple tint along the International boundary; but although these are exceptions it would not be safe to base any general deductions on them or on the fact that most of our foreign maps do not employ colours to emphasise boundaries, for nearly all the foreign maps we have are engraved

* In these symbols alternate crosses or the dots are printed in red.
 † I do not know whether this is the largest scale map prepared by the French Military staff or not.

maps, and while the use of colours on maps has increased very greatly in recent years they do not seem so much used on engraved as on heliozincographed maps; most of the engraved foreign maps form part of series of maps which have been in use for years and the absence of colour on them cannot be understood to indicate that colour would not be used if new series of maps were now to be prepared; the only deduction which it seems really safe to make is that English opinion is not opposed to the use of colours to give emphasis to certain boundary symbols; on some of the maps prepared by the English general staff the less important boundary symbols* are printed in colours as well as having a colour riband.

18. The American 1-inch symbol table shows a symbol for boundary pillars but with this exception I have not seen any foreign maps on the 1-inch or smaller scale on which boundary pillars are shown†.

In para 14 it is shown that certain foreign maps on the scales of $\frac{1}{50,000}$ or $\frac{1}{63,360}$ show boundaries of administrative areas corresponding to our villages, but on the specimens of these maps which I have seen these areas are not as small as Indian villages sometimes are.

On the French map of Tunis $\frac{1}{50,000}$ forest areas whether shown by green tree symbols or by a green tint are surrounded by a narrow green line, on English 1-inch maps walled in woods are surrounded by a black line, with these exceptions I can find no trace of forest boundaries being used on foreign maps‡, in many countries this may be accounted for by the fact that there may not be any reserved forest areas in the way there are in India.

I cannot find on any foreign map on the 1-inch or smaller scale a boundary symbol for undemarcated boundaries, nor any example of boundary symbols being placed on alternate sides of a natural feature. There are, however, several variations in the treatment of boundary symbols which coincide with natural features; thus on Swiss and German maps the symbols ----- and are generally

Fig. (i)



omitted where the boundary obviously follows a natural feature, as shown in the margin fig. (i); this is sometimes con-

* The same symbols printed in black being used for a more important boundary.


† Nor have I seen a boundary pillar on any American map in spite of there being a symbol, and it is evident that pillars on minor boundaries are not shown.





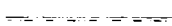
‡ Green forest tints are sometimes bounded by black dots or green bars, but I think these are rather to give a finish to the tint or ruling than to indicate a boundary line.

Fig. (ii)



fusing and hard to read; sometimes on other maps short lengths of the symbol are shown

at wide intervals along a natural feature, as in fig. (ii); on several of the German maps the symbol  is drawn very much finer along natural features

and becomes ; whilst on the German ($\frac{1}{50,000}$ approx.) map the  symbol seems generally to be omitted along natural features but when running along a double lined road the symbol forms one of the lines of the road, roads are shown by the  and  symbols, or if also a boundary thus .

On the American maps the boundaries generally seem to run in straight lines but when they do happen to coincide with natural features such as streams they are printed on top of them, *all* streams being in blue and the intervals between the bars of the symbols being fairly large the result is not confusing. In the Canadian maps boundary symbols are also printed between the lines of double lined roads which they entirely block up, the effect is not good.

19. With reference to the form of boundary symbols it must be admitted

Deductions that can be drawn from the practice of foreign countries.

that there is no general recognition of the superior merits of any particular symbols, not only do the symbols used by different countries differ very widely but each country seems to vary the symbols employed on different scale maps, we cannot therefore notice any universal custom which would support any change in our own symbols.

It would seem that continental nations, which have large scale property maps, are unanimous in thinking that minor boundaries should not be shown on maps on the 1-inch and smaller scales, and that for information about such boundaries and all boundary pillars recourse should be had to larger scale maps; all countries seem unanimous in thinking that on such maps it is unnecessary to attempt to indicate whether a boundary follows the centre or one side of a natural feature which is shown by a single line or symbol.

The evidence as to the desirability of using colour ribands along boundaries is inconclusive. In continental countries there are probably few undemarcated boundaries, but the absence of any symbol for such boundaries on any foreign maps seems to show that it is not considered necessary to make such a distinction on 1-inch and smaller scale maps.

20. In comparing our 1-inch maps with the corresponding maps of foreign

Consideration of local conditions affecting our adoption of foreign procedure.

countries we must always bear in mind that generally speaking our 1-inch maps are the largest scale maps the scientific accuracy of which is guaranteed by the depart-

ment; this is an important point, for it may result in our having to show details on our 1-inch maps which other countries would show on a larger scale but would omit on a 1-inch map.



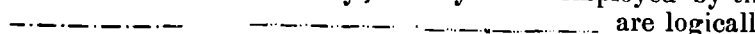
Another point to remember is that India is surrounded by, and includes, states which make no provision for accurate map making; our boundary with these states is sometimes undefined and as it may be politically undesirable to persuade the states to take part in a delimitation of boundaries and to give their formal acceptance to the resulting map, we have to take care not to show on our departmental maps boundaries which may subsequently give rise to misunderstanding.

The two considerations mentioned above should, however, only affect our largest scale of maps; even if we are forced to place more detail on our 1-inch maps than as map-makers we consider desirable, there seems no reason why such considerations should affect our smaller scale maps. In case of doubt as to boundaries, or to elucidate their minor details, it is only the largest scale of our maps to which reference should be made.

Another point which affects most of our maps is that the general public does not buy nor use our maps to the same extent as would be the case in an European country, and as the chief users of our maps are civil and military officials we often have to pay greater attention to their special requirements than would otherwise be the case.

Finally I think we should always bear in mind that we are dealing with a bigger area and one in which there are more varying conditions than is the case in European countries; uniformity is an excellent thing no doubt, but it is a mistake to make a fetish of it, and to leave out village or forest boundaries or some such detail which might easily be shown without disfiguring or confusing the maps of one area, solely because it is impracticable to show such details in another area many hundreds of miles away, seems to be subordinating the best interests of the map to a false idea of the value of uniformity.

The larger the scale of the map the greater should be the consideration paid to local requirements, and the less need is there to insist on an uniformity in detail which may be harmful to the maps of some other area.

21. Considering first the form of our boundary symbols, I do not think that any change is necessary, all our symbols (except that used for undemarcated boundaries) are used by other countries, and from the utilitarian, artistic and political points of view I think our application of them is suitable; many of the foreign boundary symbols which we do not use, such as the German  symbol, the Italian  symbol and its variations, are heavy and ugly and can only show the approximate line of a boundary; the symbols employed by the English general staff  are logically used and quite satisfactory, they could be applied with alteration of form to show

Recommendations as to what we should do. 1-inch maps.

any number of boundaries by increasing the number of dots between the bars, but I think for minor boundaries the symbols would be too prominent.

Our use of the symbols ----- and ----- for subdivisions smaller than a tahsil and for village boundaries is undoubtedly inconsistent with the principle that the prominence of symbols should decrease with the importance of the boundary; the tahsil boundary being a succession of dots all boundaries of lesser importance should also be of this form, our three minor boundaries can be arranged in the following order of importance (i) tahsil, (ii) forest, (iii) village or other subdivision of a tahsil, and the logically appropriate symbols for these would be tahsil, forest, village etc. ; it may be argued that these dot boundary symbols are not very suitable for showing the exact details of very complicated boundaries, this is so, but it must be remembered that our topographical maps are not property maps, and the same generalization must be expected in boundaries as is necessary in other detail and especially so in the case of minor boundaries.


22. I do not know of any country that has tried to evolve combined symbols to show such things as a boundary which is both a state and forest boundary, the only combined symbol I know of is that used on the English 1-inch map in which the symbols for country ----- and parish ----- are combined thus ----- ; nor have I been able to find any special symbol indicating whether the centre or one side of a natural feature forms the boundary, on the English large scale property maps the symbol \int is used to tie together fields, roads etc. whose areas have been abstracted as a whole, but such a symbol would of course be quite out of place on a 1-inch map.

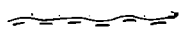
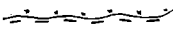
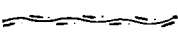
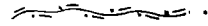
23. The next question we have to consider is what boundaries should be shown on 1-inch maps; although our 1-inch maps are generally the largest scale maps available of scientific accuracy, there are nevertheless considerable areas of which accurate large scale revenue maps have been made and for the settlement of boundary matters these revenue maps will always be the authority, and even when the revenue maps are not of the strictest accuracy it is still with their aid and not with that of our topographical maps that civil authorities will settle boundary disputes etc.; owing to their large scale these maps can easily show whether a boundary is meant to run along one side or the centre of a natural feature even if the alignment of the feature is not perfectly correct; as far as purely British boundaries are concerned we may in fact say that the local revenue maps are the property maps and on our 1-inch and smaller scale maps we need not attempt to show any boundaries or boundary details which we as map-makers consider inappropriate or confusing.

24. There is no doubt but that we must continue to show all boundaries down to and including the tahsil boundary and it is only in the case of boundaries minor

to the tahsil that opinions will probably differ. The evidence given to the Survey Committee showed that civilians wanted all boundaries including village boundaries shown, the military opinion was against showing village boundaries (this has lost its weight now that the military forbid the use of our 1-inch maps for tactical purposes); the Survey Committee laid down that village boundaries were *not* to be shown, and we only prepared symbols for boundaries down to the tahsil; but in spite of this exceptions have already been made in the case of Madras, the United Provinces and Coorg; this shows that we recognise that when it is possible and of value to show subdivisions of a tahsil or even village boundaries in one area it is absurd not to show them merely because they cannot be shown somewhere else. I think that we should accept the symbols shown in para 21 and that the Surveyor General on the advice of his Circle Superintendents must decide when and what subdivisions of a tahsil should be shown; if it is considered advisable to show more than one subdivision of a tahsil the single symbol will suffice if printed in black for one and in some colour for the other (this is done by the English general staff *vide* para 17).

25. For the reasons stated in para 8 we have to pay special consideration to the requirements of the forest department; the very exact and minute delineation of a forest boundary can have no value to anyone but the forest officers and the local inhabitants, the latter always know the exact position of such boundaries and even if they did not they are not sufficiently educated to seek assistance from our 1-inch maps, for the forest officials a large scale trace such as we supply should show the position of every boundary pillar and give such information as whether the centre or side of a natural feature constitutes the boundary, but having supplied this information to the forest officials it does not seem necessary to show it on our topographical maps. We must, I think, continue to show the boundaries of reserved forests on our 1-inch map, but generalization should be allowed and minute exactitude should not be expected.

26. For the reasons mentioned in para 23 I do not think that the information conveyed by our practice of putting boundary symbols on alternate sides of natural features can be of the slightest value in the case of boundaries for the delimitation of which the civil officials have larger scale maps or plans, and the custom often makes our boundaries heavy and unsightly and very difficult to follow; such boundaries are those of divisions, districts, tribal areas, tahsils, forests, subdivisions of tahsils, and all the internal boundaries of native states, and I think for them the custom should be abandoned. The cases of the external boundary of India and of the boundaries between native states and British possessions are different, and I feel sure the Government of India would insist on our showing these boundaries with the maximum of detail, these are the only boundaries shown by the bar and dot symbol  and to avoid the heaviness caused by placing the complete symbol on alternate sides of a natural feature I would suggest that the bar be placed on one side and the dot on the other, thus

 or if undemarcated  instead of  and .

27. Our use of an undemarcated boundary symbol is unique, but the Government of India attaches great importance to the use of this symbol and I doubt if we should be permitted to abandon it even if we wished to, the only question is the extent to which it should be used. On the 1-inch maps we are not allowed to show the external boundary of India by any symbol unless it has been properly demarcated, the only other boundaries for which undemarcated symbols are provided are those of Provinces and States, the symbol used is the same for both, but I do not think it was intended, and it certainly is not necessary, to use an undemarcated boundary symbol between two British Provinces, for these boundaries are never demarcated in the same way as the external boundary of India or of native states. I think the undemarcated symbol should therefore only be used for boundaries between native states and British possessions.

28. I think there is no doubt that as a general rule boundary pillars should not be shown on our 1-inch maps; along the external boundary of India Government will undoubtedly insist on their being shown, but pillars defining the limits of forests, and village trijunction pillars are quite out of place on topographical maps; the case of pillars along the boundaries between native states and British possessions is not so easy to decide, the demarcation of such boundaries has often been done in extreme detail and pillars have been built at such close intervals that it would be quite impossible to show them all, in such cases to make a selection and only to show some of the pillars is not only of little use but it might easily lead to the presumption that the only pillars that exist are those shown on the map, I also think that where demarcation has been carried out it will generally be the case that the boundary has been plotted and accepted by both parties on their larger scale revenue maps and there is therefore no necessity to show any pillars on our 1-inch maps; where no detailed boundary delimitation has taken place with a native state the only pillars along the boundary can be those defining the limits of the villages on either side of it, and although these may be locally accepted and there may be no dispute as to the position of the real boundary, such pillars are not state boundary pillars in the full sense of the term and should therefore not be shown on our maps. For these reasons I think we should never show boundary pillars between native states and British possessions or between two native states, or along purely British boundaries.

29. As already stated we seem to be the only country in the world which supplies hand coloured maps; I think the India office would object to any change in the existing custom of supplying hand coloured maps to it, this necessitates our colouring our office copies and a very slight increase in the staff required for this purpose is sufficient to supply maps with coloured boundary ribands in compliance with public demands; labour is cheap in this country and the small

extra charge we make for hand coloured maps covers the cost of the work. As it is open to anyone to obtain copies of our maps with hand coloured boundary ribands it does not seem necessary to print any of these ribands. Until recently we have singled out forest reserve boundaries for special treatment and have printed green colour ribands along them, I think it is hard to find any real justification for this practice; it is true that a reserved area is one to which access for game shooting or the manœuvring of troops is forbidden, but the same prohibition applies equally to native states; locally the boundaries of forests and states are well known and can always be pointed out to anyone using our maps in the field, and in showing a distinctive symbol for reserved forests and making provision for the supply of maps with hand coloured ribands I think we are doing all that is necessary. I would however make one suggestion that is I think practicable and reasonable and which should go far to satisfy those who advocate that special emphasis should be given to reserved forest boundaries; parties already have a wide discretion in the use of descriptive typing and if a forest boundary is rather confused or difficult to follow the words "reserved forest" might always be added along the boundary, these words might if necessary be repeated along and inside the *external* boundaries of reserved forests at intervals of $1\frac{1}{2}$ to 2 inches, as reserved forests necessarily contain but little detail in the way of roads and villages no interference with detail would be caused by such explanatory typing, especially if the type used is a small one; I would also suggest that the names of important forest reserves should be spaced in fairly prominent type (size according to spacing), not necessarily horizontally but so as to give the best idea of the area to which they refer, instead of being as at present typed horizontally in small unspaced type and in the centre of the large forest areas.

30. If we accept the principle that it is only on our largest scale maps $\frac{1}{4}$ -inch maps. that we have to pay especial attention to the claims which can be based on the fact that they *are* our largest scale maps, it follows that in considering the $\frac{1}{4}$ -inch and smaller scale maps we need only think of what is best for the maps, bearing in mind, however, that in some areas the $\frac{1}{4}$ -inch map may be the largest scale map we make, and also that the $\frac{1}{4}$ -inch map is at present the manœuvre and war map of the country.

I do not think that any improvement can be made in the actual boundary symbols we use on $\frac{1}{4}$ -inch maps. Boundary pillars are certainly quite out of place on such a scale and should only be shown on the external boundary of India in those areas for which no larger scale map is available. The placing of boundary symbols on alternate sides of natural features seems altogether unnecessary, but as the Government of India might hesitate to accept any generalization of the external boundary of India on this scale and because it will probably be in native states that our $\frac{1}{4}$ -inch maps will be the largest available maps, the procedure might be sanctioned provided it is strictly limited to the external boundary of India and the boundaries between native states and British possessions.

The external boundary of India when undemarcated is not shown on $\frac{1}{4}$ -inch maps, and if the undemarcated boundaries between native states and British possessions have already been shown on a larger scale it seems unnecessary to show them by a special symbol on $\frac{1}{4}$ -inch maps, but for the reason given in the last sentence it may sometimes be necessary to do so, and for the sake of uniformity the undemarcated symbol might always be used for such boundaries when separating native states from British possessions.

31. Forest boundary symbols seem quite out of place on a $\frac{1}{4}$ -inch map, for even if no larger scale map is available the amount of generalization that must inevitably be made would make it impossible to show details of the boundaries. Forest growth must undoubtedly be shown as it is of such great military importance, a green tint is the best way to show it; we should however try to make some distinction between (i) forest growth or jungle, (ii) such forest growth as is reserved by Government, and (iii) areas which although classed as reserved forests do not contain forest growth. I think this could best be done by using a green tint for (i), a fine green ruling for (ii) and the same ruling but only extending about $\frac{1}{10}$ inch inside the area for (iii). The question whether any symbol should be used to define the limits of such areas is an open one, we have foreign precedent (*see* para 17) for the use of small bars or dots in green or black, personally I think very fine black dots defining the limits of each of the 3 areas would give a finish to the tint or ruling and facilitate printing.

32. What has already been written with reference to the hand colouring of boundaries on the 1-inch map applies equally to the $\frac{1}{4}$ -inch, there would seem to be no reason why applicants should not be able to get hand coloured copies of the maps for a small extra charge; uncoloured boundaries may not always be easy to follow, but the indexes to districts which we print at the foot of our maps help to overcome the difficulty; I do not think there is any necessity to print colour ribands.

33. For $\frac{1}{M}$ maps I do not think that any change in boundary symbols is necessary, I would however suggest that the placing of symbols on alternate sides of natural features should only be insisted on for the external boundary of India. In accordance with Government of India orders the undemarcated boundary symbol must not be used for the external boundary of India and it seems quite unnecessary to use it for the boundaries of native states or provinces, as there will always be larger scale maps available. Orders have issued for future $\frac{1}{M}$ maps to be prepared with coloured layers to indicate altitudes; boundaries so frequently run along the crests of hills that the printing of colour ribands along them must seriously interfere with the layers, and if the Government of India wishes for maps with coloured boundary ribands we may have to print 2 editions of the maps.

One question that might be considered independently of the above is that of the internal boundaries of states and those between different states. I think it is probable that the orders mentioned in para 10 represent the wishes of the Government of India, and to get over the terrible confusion caused on some of these maps by the intricate network of minor state boundaries I would suggest that such boundary symbols should be printed in yellow instead of black and should not be given a colour riband either printed or hand coloured.

34. For these maps I do not think that any change in boundary symbols is required, but I do not think it necessary to use an undemarcated symbol for any but the external boundary of India, we could however continue to use a broken band of colour as at present instead of a continuous one along the undemarcated state boundaries*.

I think boundary symbols on alternate sides of a natural feature are unnecessary on any of these maps, and if retained at all should be confined to the external boundary of India. Layered editions of these maps will necessitate special orders for the colouring of boundary ribands but need not affect the symbols.

* On all scales of maps boundaries which are undemarcated, approximate or disputed should be shown by a broken band of colour when colour ribands are employed.