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# Survey of India

Director of Land Records and Surveys  
Bengal.

## FOREST SURVEYS AND MAPS ✓



This pamphlet forms Chapter IX of the Handbook of  
Topography, prepared by Colonel Gordon, I.A.,  
in 1911



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LIST OF CHAPTERS OF THE  
HANDBOOK OF TOPOGRAPHY,  
PREPARED BY COLONEL GORDON, I.A.,  
IN 1911

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- CHAPTER I. Introductory.
- " II. Constitution and Organisation of a Topographical Survey Party.
- " III. Triangulation and its Computations.
- " IV. Traversing do. do.
- " V. Plane-tabling.
- " VI. Fair Mapping.
- " VII. Trans-Frontier Reconnaissance.
- " VIII. Survey in time of War.
- " IX. Forest Surveys and Maps.
- " X. Map Reproduction.
- " XI. Geographical Maps.

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## CHAPTER IX

# FOREST SURVEYS AND MAPS

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## I. HISTORICAL RETROSPECT

1. Prior to 1910 forest surveys and mapping were carried out by a separate Forest Survey Branch of the Survey of India. Scales of survey and mapping were decided by the Superintendent of Forest Surveys in consultation with the Forest Department.

The cost of ordinary forest surveys and of the publication of the first edition of forest maps was borne by the Survey of India and the Forest Department in the proportions of 30 and 70 per cent; but, if work was required on particularly large scales or showing an exceptional amount of detail, the Forest Department bore the whole cost of both survey and publication. The cost of second and subsequent editions of all maps was borne by the Forest Department.

As a result of the reorganization of the Survey of India the Forest Survey Branch was abolished in 1910, the surveys of forest areas being subordinated to the systematic prosecution of a definite programme of topographical surveys.

Forest surveys were to be carried out as far as possible as part of the normal topographical programme, and survey parties would not be broken up into isolated detachments for the survey of forest areas: large scale surveys were to be avoided as much as possible, on the ground that they would hamper the progress of the topographical programme.

Forest surveys were then for the first time classified as *normal* or *special*. *Normal* surveys provided for survey and publication on the 2-inch to 1 mile scale, provided that the forest areas were situated within the topographical programme for the year. *Special* surveys comprised those on scales greater than 2-inches to 1 mile or surveys on any scale outside the topographical programme.

In the case of *normal* surveys, the cost of survey and of publication of the first edition of the two-inch map was borne by the Survey of India; for *special* surveys, the whole cost of survey and publication plus a surcharge of 4 per cent was debited to the Forest Department, as was also the cost of second or subsequent editions of the normal two-inch map.

These arrangements were decided on at a time when it was proposed that the scale of topographical survey should ordinarily be two inches to one mile, and that the maps based on this survey should ordinarily be published on the scale of one inch to one mile. It was subsequently decided, however, that the scale both of survey and of publication should ordinarily be that of one inch to one mile, while for undeveloped areas, the scale both of survey and publication was reduced to  $\frac{1}{2}$ -inch to one mile.

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## ALLOCATION OF CHARGES

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The general trend of later policy has been to increase the areas for  $\frac{1}{4}$ -inch survey, and in some areas still further to reduce the scale of survey and publication to  $\frac{1}{4}$ -inch.

In these circumstances the Government of India has found it necessary to revise the procedure in regard to forest surveys, and the new rules introduced are laid down in the sections which follow.

Circular No. 152-C dated 3rd December 1923 from the Inspector General of Forests to the Forest Service giving full particulars of the revised procedure is printed as Appendix I at the end of this chapter.

### II. ALLOCATION OF CHARGES

**2. Definitions.**—The amount to be charged against Local Governments for forest surveys depends on the extent to which such work aids the topographical programme for which the Survey of India is responsible. From this point of view forest survey work falls in three categories:—

- (a) *Normal*, when the work is automatically included in the ordinary topographical programme and no change of scale or extra work of any kind is involved in the forest survey. No extra charge will be made for this normal work.
- (b) *Special*, when although falling within the topographical programme immediately ahead of the party or in the area of its <sup>current</sup> ~~correct~~ work, a special scale for forest areas or special work in connection with forest boundaries, etc, are desired. In such cases only the extra costs will be charged, as explained below.
- (c) *Extra*, when the work is remote from the topographical programme and not likely to be of any use to it in the near future. Such work is inconvenient and undesirable from the survey point of view and the full cost of it, both for mapping and publication, will be charged. No percentages however will be added to the actual cost, in view of its contingent value to the normal topographical programme at some time or other. If however it has no such possible value, as in the case of a small boundary traverse, 4 per cent should be added.

**3. Special surveys**, namely those falling in the immediate or prospective programme of a party, should roughly be credited with their value to the topographical work, and only the *extra cost*, with the addition of 4 per cent (for instruments etc.) should be charged against the Local Government. Thus a theodolite traverse of a forest boundary is of practically no use to the topographical programme, so

## PRELIMINARY ARRANGEMENTS

its whole cost plus 4% should be charged; while a contoured plane-table survey on a larger scale will practically save the topographical survey of the area, and the average cost of plane-tabling on normal scale should therefore be deducted in order to arrive at the *extra cost*, which, with the addition of 4 per cent, will be the charge against the Local Govt. Again the whole cost plus percentage should be charged for special forest maps, since they are of no help to the topographical programme.

**4. Forest Surveys in Indian States.**—Forest surveys in Indian States will be treated on the same basis as the above, excepting that in the case of a State which is making a substantial contribution towards the cost of its normal topographical surveys, all percentages for *special* surveys may be dispensed with, under the sanction of the Surveyor General.

**5. Special Forest Parties.**—In cases where a special Forest Survey Party is maintained by a Province or State, only the cost of the party will be charged, without any percentage additions in view of the general topographical value of the work.

The cost of such mapping as is not carried out by the Forest Party (see para 55) and of publication will however be charged to the Province or State.

**6.** The above rules will only apply to future contracts and estimates, and will not affect work already in hand or whose cost has been decided under previous orders.

### III. PRELIMINARY ARRANGEMENTS AND RECOVERY OF COST

**7. Channel of communication between the Survey of India and the Forest Department.**—Except in regard to minor details, correspondence on forest survey matters should be addressed by Directors of Circles to the Conservator, or to the Chief Conservator in provinces where there is one; in Burma, to the Conservator Working Plans; in Madras, to the Board of Revenue, as the head of the Forest Department.

**8. Indian State Forests.**—In the case of forests in Indian States which are leased to the Forest Department, correspondence regarding surveying and mapping will be addressed by Directors of Circles to the Chief Conservator or Conservator concerned.

In the case of State forests that are not leased to the Forest Department, particulars will be decided in consultation between the Director of the Circle and the State officials through the Resident or Political Agent of the State.

**9. Forest surveys to be shown in programme.**—Work to be undertaken for the Forest Department should be included



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## PRELIMINARY ARRANGEMENTS

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in the general programme of operations submitted to the Surveyor General.

In this programme, *special* or *extra* surveys should be shown as a separate item.

**10. Government sanction required.**—*Special* or *extra* forest surveys, in that they affect the progress made with normal topographical surveys, require the sanction of the Government of India.

**11. Forests, an important factor.**—The existence of reserved forests should be held to be of considerable importance when a choice has to be made between alternative schemes for the year's programme of topographical operations.

**12. Framing of programme.**—For the purpose of framing survey programmes, Directors of Circles should, during April of each year, communicate with the Chief Conservators or Conservators of forests concerned regarding the forests that will come under survey during the ensuing field seasons.

**13.** The Director should send to each Conservator (in Burma to the Conservator Working Plans) an index map showing the area in his particular Forest Circle (or Province in the case of Burma) which it is proposed to triangulate during the next field season and inform him of the scales adopted for the topographical survey and maps.

The Conservator should be requested :—

- (a) to give a list of the reserved forests falling within the area to be surveyed.
- (b) to show approximately on the index map the positions of these forests.
- (c) to give their respective approximate areas.
- (d) to state the forests for which *special* surveys are required and to give the following particulars :—Nature and scale of survey, whether of whole area or of boundary only. Particular reasons for *special* survey and a definite statement that the Forest Department will meet the cost.
- (e) to supply copies of the original notifications declaring the areas to be reserved forests together with copies of all subsequent notifications affecting these areas.

**14. Reference to Forest Map Office.**—On receipt of the information specified in the last para, the Director of the Circle should send to the Officer in charge, Forest Map Office :—

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## PRELIMINARY ARRANGEMENTS

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- (i) a copy of the index map showing the positions of the forests.
- (ii) a copy of the list of these forests giving the approximate area of each, stating those for which *special* surveys have been asked for and on what scale.
- (iii) a list of references to the different notifications which concern these forests, forest by forest, and should enquire from the Officer in charge, whether any of the reserved forests of which maps are desired have been surveyed already and, if so, on what scales and at what date and what maps have been published of the areas in question.

**15. Furnishing of Estimates.**—On receipt of a reply from the Forest Map Office, the Director of the Circle will furnish the Conservator or Chief Conservator with an estimate of the cost of carrying out the *special* survey, and also of the drawing and publication of the special forest map for acceptance by the Local Government. (The charges for the drawing, if this is to be done by the Forest Map Office, and for publication will be ascertained from that office).

If sanction is accorded this should be at once communicated by the Conservator or Chief Conservator to the Director of the Circle and the latter will then arrange to include the *special* survey in his programme.

**16. When Extra Surveys are required.**—The Conservator or Chief Conservator should ascertain from the Director of the Circle in which the area lies, at what date they can be undertaken and at what estimated cost to the Local Government. He will then communicate this information to the Local Government and apply for sanction to the work being done. If sanction is accorded, this should be communicated by the Conservator or Chief Conservator to the Director of the Circle. The latter officer should then submit, to the Surveyor General, for the approval of the Government of India, a scheme for the execution of the work, giving particulars of the agency by whom the survey is to be done, the date at which it is to be commenced, the area involved, the scale of survey, and its estimated cost, communicating at the same time the Local Government's sanction to the expenditure which the latter will ultimately have to bear (see para. 2).

**17.** Major detail outside forest limits *i. e.* towns, villages, main roads and streams should be shown on all forest maps. In the preliminaries to *special* and *extra* forest surveys, the Conservator of Forests should be asked to state whether areas outside forest limits are to be surveyed, or whether the detail in such areas should be enlarged from the topographical map on 1/2/2-inch scale and in either case, the distance from the forest limits to which such outside areas should extend.

**18. Special Surveys, ahead of normal programme.**—It is generally preferable to save delays in the publication of sheets to

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## FRAME-WORK

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execute any *special* surveys that may be required of forest areas, at least one season ahead of the normal topographical survey of the same area.

**19. Supplementary Survey.**—When forest areas of which special forest maps are available, occur in the programme of a party for any year, a supplementary survey of these areas will be made in that year for topographical purposes as described in Chapter V, (1925) of the Topographical Handbook.

**20. Special Surveys, statement of charges debitable to Local Governments.**—The Officer in charge of a party carrying out *special* or *extra* forest surveys will submit a statement of the cost of the same debitable to each Local Government concerned, along with his monthly accounts to the Director of the Circle who will submit a combined statement for his Circle, each month, to the Accountant General, Central Revenues, sending extracts from the same to the Conservator concerned.

The same procedure will be followed for the recovery of the cost of drawing when this is done by the Party or in the Circle Office.

For recovery of the cost of publication and of drawing done by the Forest Map Office (see para. 74).

## IV. FRAME-WORK

### TRIANGULATION

**21.** If a *special* or *extra* survey of a forest is to be undertaken, the approximate position of this forest should be shown on the field chart of triangulation so that the triangulator may arrange to fix such extra points as may be required for the purposes of the *special* survey, and to connect his triangulation with any traverse that has already been carried out, or that it is intended to carry out in connection with the forest areas.

**22.** If it is possible to do so, the general lie of the lines along which traverses are to be carried should, with the help of sketch maps supplied by the Conservator (see para. 34), be indicated on the triangulator's chart before the triangulation is commenced. This will enable the triangulator to fix points in positions where they will be of advantage to the traverser.

**23.** The triangulator should be alive to the possibility of determining in some cases the positions of boundary pillars by intersection from stations of his triangulation. When, however, the fixing of positions by this method threatens to lead to an otherwise unnecessary elaboration of the triangulation, a rough consideration of the relative costs of triangulation and traverse should be made before undertaking the work so as to make sure that the additional triangulation will not

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## FRAME-WORK

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be more expensive than the traverse work of which it is intended to take the place.

### TRAVERSES

**24. When required.**—Traverses may be necessary :—

- (i) For the accurate survey of a boundary.
- (ii) To provide a frame-work of points for the plane-table in country where triangulation is impossible.
- (iii) For the determination of an area.
- (iv) For filling in the detailed survey, where the ordinary methods of plane-table survey cannot be followed.

**25. General.**—Except in the plains, vertical as well as horizontal angles must be observed. Particular care should be taken in the observation of these vertical angles, which must be closed on as many outside heights as possible. Connections should be made to any lines of levelling which run through or near the areas of survey as well as to triangulated points.

It should be remembered that in dense forest the plane-table will have great difficulty in obtaining heights for his contouring and will often have to run a series of vertical angles from one traverse line to another by plane-table traverse. (See para 27.j Chap. V, 1925).

**26.** Traverses should be connected to as many trigonometrical points as possible, either by actual measurement, by subsidiary triangles, or by theodolite interpolation. They should also be connected to all village trijunction marks, and any other permanent marks or stations of old traverse surveys in or near the area of survey.

**27.** Observations for azimuth should invariably be made at opening and closing stations of a theodolite traverse line, and when connections to trigonometrical or other traverse points are impracticable azimuths should be observed at intervals of not more than 30 stations. (See para 31 Chap. IV, 1924).

**28** The traverser must fix a sufficient number of well marked points for the plane-table who will follow him. He should fix all pillars, culverts, and conspicuous objects along his line by offset or intersection, and mark all his stations with substantial stakes. (See para 48 Chap. IV, 1924).

**29. Reduction to sea-level.**—When comparing traversed with triangulated determinations of distance, it must be remembered that the data of the triangulation are already appropriate to sea-level whereas those of traverse are not so, and, in mountainous country, it may be

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## FRAME-WORK

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necessary to reduce traverse values to sea-level before comparing them with the triangulated.

As an indication of the magnitude of reductions to sea-level and as a guide when considering the necessity of effecting such reductions, the following figures are given :—

At 3000 feet above sea-level,					the reduction amounts approx-
					imately to 1 in 7000.
At 5000 feet	do.	do.	do.	do.	1 in 4200.
At 8000 feet	do.	do.	do.	do.	1 in 2600.

The amount of the reduction varies directly as the height above sea-level, and the comparison can be made either by reducing the difference of co-ordinates derived from traverse, or increasing those derived from triangulation.

**30. Boundary traverse.**—For the survey of a boundary line, the traverse should be run as close to the actual boundary line as possible. The surveyor who carries out the traverse generally completes the survey of the line at the same time and should be given a diagram or map signed by the officer in charge showing the traverse lines he has to run. As a rule, only the outer boundaries of reserved forests and notified exclusions should be traversed. Boundaries between blocks and exclusions need not be specially traversed.

The traverse for the survey of a boundary may be executed either by plane-table traversing or theodolite traversing according to circumstances. Plane-table traversing is necessarily of limited accuracy, as it depends either on setting by the back ray or by the magnetic compass, and it is only suitable for the survey of a boundary line, where it is possible to close on reliable plane-table fixings, triangulated points or theodolite traverse stations at intervals sufficiently short to ensure accuracy (see para 25 Chapter V, 1925). As a rule, 8-inches on the paper is the maximum interval permissible between closing points. In very dense forest, where traverse legs are frequently only 1 to 3 chains in length, the permissible interval should be taken at 4-inches on the paper.

A boundary traverse where these conditions cannot be obtained must be carried out by theodolite traversing and the methods described in Chapter IV (1924) must be strictly followed.

**31. Frame-work of points.**—To provide points for the plane-tablers in reserved forests where triangulation is not possible, a theodolite traverse should be run round the exterior boundary as described in the last para, and traverses should be run across the reserve to form a network. The traverse lines must be sufficiently close together to enable the detail to be filled in by the surveyor at the time of the detailed survey, without appreciable error. The distance between the lines may

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## DETAIL SURVEY

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vary from about 4-inches on paper in the case of very dense forests to 8-inches or even more where the forest is comparatively open and a certain number of plane-table fixings are likely to be obtainable.

The traverse lines should as far as possible be run along existing roads and paths, natural clearings, fire lines and open beds of streams in order to reduce the expense of line clearing. The traverser should be given a diagram or map on which the general lay out of the lines required is marked.

Theodolite traversing being costly and slow and in steep hills being liable to large errors should not be resorted to if an accurate survey with the aid of points trigonometrically fixed is possible. The officer in charge of the party should keep the length of the traverse lines down to the minimum necessary for the accuracy of the survey.

**32. Areas.**—It is very rarely that in forest survey a traverse is required for the purpose only of determining areas, but where a traverse is required for this purpose, it should be run closely along the boundary and the boundary surveyed from it. The area can then be computed and the plus and minus areas between the line and the boundary taken from the map.

**33. Detail to be shown in Traverser's field-book.**—In a boundary traverse field-book entries should show:—all boundary pillars with their numbers: all points where the boundary changes direction: all trijunctions on the boundary when marked on the ground: where a forest boundary is conterminous with cultivation, field numbers at intervals especially at changes of direction of the boundary: crossings of all roads, paths and streams: such detail in the immediate vicinity of the traverse line as will permit of this line being replaced on the ground from the plot in the event of disputes. (See paras 29 and 47 Chapter IV, 1924).

## V. DETAIL SURVEY

**34. Material available in district forest offices.**—Rough sketch maps of most forest reserves are available in the district forest office and copies or traces of these should be obtained by officers in charge of parties before the commencement of the survey.

In the Madras Presidency, the boundary plots of all forest areas in the plains districts are usually available in the Madras Survey Department. These should be obtained through the Circle Director for insertion on the plane-table sections prior to the commencement of the survey of the area.

**35. Requirements of Forest Department.**—In carrying out *normal* surveys of forest areas, the requirements of the Forest Department should be kept in mind, and as it is important that the map

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## DETAIL SURVEY

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should afford sufficient detail to enable the forest officer to lay out internal boundaries and lines with adequate accuracy, endeavour should be made to survey the maximum amount of detail possible on the scale adopted.

**36. Important detail.**—The following are topographical details important to the Forest Department:—

- (a) Grass lands of 100 acres and more.
- (b) Waterfalls of 10 feet and more on small streams, all falls, rapids and other obstructions on large streams.
- (c) Cliffs, quarries and gravel pits.
- (d) Marsh lands.
- (e) Names of small hills and streams, though not ordinarily of sufficient importance to be entered on normal topographical maps, are often useful to forest officers.

**37.** In special forest maps the minuteness of detail that should be shown will depend on the nature of the forest and the "intensity" of its management. For a valuable teak forest, for instance, worthy of a systematic working plan based on an enumeration of the growing stock, the topographical details require to be shown with much greater minuteness than for a less valuable tract or protection reserve.

In making an enumeration for the more valuable forests, it is necessary for the forest officer to count out small plots scattered through the forest. The boundaries of these plots are usually small streams, ridges or spurs, and the omission or rough generalisation of such features may seriously impair the usefulness of the map to the Forest Department.

(For symbols to be used see paras 57 and 58).

**38. Method of Survey.**—Where it is possible to do so, the detailed survey should be executed by the ordinary methods of plane-tableing, but in dense forests and in flat ground plane-table traversing must as a rule be resorted to. Plane-table traverses should be closed on plane-table fixings, trigonometrically fixed points or theodolite traverse stations in the case of the surveyor's main traverse lines, but in dense forest and difficult ground this rule cannot be complied with in the case of many of the shorter subsidiary lines run by the surveyor from his main traverse lines or from the theodolite traverse lines, without unduly increasing the cost of the survey.

**39. Contour Intervals.**—The vertical interval between contours in the case of *special* and *extra* forest surveys on scales up to and including 2-inches to 1 mile should be the same as in surveys for the one-inch topographical map, namely 50 feet. On larger scales up to and including 4-inches to 1 mile, 25 feet. The contour interval to be

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 DETAIL SURVEY
 

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employed in *special* forest surveys on scales greater than 4-inches to 1 mile should be decided in each case by the Director of the Circle concerned.

In *special* surveys of forest areas in mountainous country where the contours, if at normal interval, would be so close on the plane-table section, as to make difficult the clear showing of detail important from the forest officer's point of view, the question of modifying the normal contour interval should be considered.

The attention of surveyors plane-tabling in forest areas should be called to para 25 of Chapter V (1925) regarding special difficulties and special methods of plane-tabling in dense forest.

Particular care should be taken to obtain heights for contouring as described in para 27 (j) of Chapter V (1925).

**40. Checking of work.**—The camp officer responsible for the execution of a *special* forest survey, should in addition to the usual tests of the accuracy of the work, carefully check it as regards:—

- (a) Boundaries. These should be in accordance with the description given in the notifications (see para 13e).
- (b) Boundary pillars and their numbers.
- (c) Limits of notified exclusions and enclosures and pillars on limits of areas open to the exercise of rights.
- (d) Names of places, streams, hills etc. referred to in the notifications. When villages etc. distant one or two miles from the reserve boundary are mentioned in the notifications, they should be shown on the map with the roads and paths, if any, leading to them.
- (e) Rights of way referred to in the notifications.
- (f) Fire lines, forest rest houses, timber depôts, ranger's quarters, etc.

**41. Recognition of urgency.**—The officer in charge of the party should, if he is informed that there is any special urgency for the publication of any special forest map, or topographical map containing forest areas, intimate the fact to the Circle Director who will do his best to arrange to meet the wishes of the Forest Department.

**42. Party register of forest surveys.**—For details of maintenance of these registers by parties see para 23 Chapter II (1923).

**43. Supply of P.T. sections and records to F.M.O.**—Except in cases where special forest maps are to be prepared by the party which carried out the survey (see para 55), plane-table sections and other



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## BOUNDARY SURVEYS

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necessary records of *special* forest surveys will be submitted by the officer in charge of the party to the Circle Director as soon as possible after such reductions, colour guides etc. as may be desirable for the purposes of topographical mapping have been prepared. The special forest plane-table sections and the necessary records will then be despatched to the Forest Map Office by the Director who should intimate at the same time the balance of funds available for drawing and publication in all cases where his original estimate of costs included these (see para 15).

### VI. BOUNDARY SURVEYS

**44. When required.**—Surveys of forest boundaries are often required to provide plots or maps as an accurate record of the boundary line, with sufficient detail as will enable the boundary to be clearly recognised on the ground, and of sufficient accuracy, that the boundary may be relaid from the map or plot if occasion demands.

It is obvious that a *special* survey will not be necessary for any boundary, or portion of boundary, which follows permanent and well defined natural features which are clearly shown on the normal topographical or *special* survey of the forest area.

The Conservator should be asked for a rough sketch of the forest under survey, on which should be clearly marked the length of boundary line that is to be surveyed, and all exclusions and interior boundaries which he wishes to be surveyed.

No special boundary survey would be necessary if any map exists or is under survey, which clearly shows the boundary line and all its marks in sufficient detail and with sufficient accuracy.

**45. Scale and methods of Survey.**—The most convenient scale on which to show individual boundary pillars is 4-inches to one mile; if pillars are far apart, a smaller scale would suffice. The boundary survey should be of accuracy sufficient to show no error on the scale selected; it is usually carried out by running a theodolite traverse close along the boundary line, the traverser fixing all boundary pillars and necessary detail by offsets and intersection, as described in paras. 24 to 33.

It is sometimes possible to produce an accurate boundary survey by plane-table only, with the help of triangulated points, but if the forest is at all dense it will be most difficult to obtain interpolated fixings, and rays of plane-table traverse would probably be very short, and chaining especially in hilly ground, would be liable to much error.

**46. Utilisation of Settlement Surveys.**—When a boundary plots are required, if the circumjacent villages have been recently surveyed by the Settlement Department, there may be no need for the

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## BOUNDARY SURVEYS

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Reserve boundary to be traversed again (see para. 33 Chap. V of 1925). The azimuths, angles, distances and co-ordinates of the 'sets-up' of the circumjacent villages can be extracted from the Settlement Survey records (obtainable from the Deputy Commissioner or Director of Land Records) to form a complete circuit for the Reserve. The co-ordinates of this circuit can be computed with any station in the circuit as origin, or the traverse may be connected with a trigonometrical station and the co-ordinates computed in terms of the centre of the degree sheet as origin.

**47. Copies of Notifications for traverser.**—The surveyor actually carrying out the survey of the boundary, either by theodolite or plane-table, should be supplied with copies of the original notification declaring the area to be a Reserved Forest, and of all subsequent notifications concerning it.

**48. Boundary plots.**—The field party will prepare the plot from the theodolite traverse, or complete the plane-table section, whichever method of survey has been used. A trace of this plot is the only record of this boundary survey which reaches the local forest officer, and it is most important that it should be complete in every respect and show all information that the traverser has shown in his field book.

**49. Information to be shown on boundary plots.**—The plot, or completed field section will show :—

- (i) All traverse stations and the lines joining them. All boundary pillars, with their numbers, as actually surveyed.
- (ii) The boundary line as described in the notifications. All detail crossing the boundary line, such as streams or roads with names and destinations.
- (iii) All village trijunctions, worlies and gotas, and the names of the villages adjacent to the forest reserve.
- (iv) As much detail on both sides of boundary line as will enable the line to be relaid on the ground from the plot. Traverse stations and lines, and other survey data should be finely drawn in red, while the boundary, boundary pillars and other detail should be drawn firmly in black.

Portions of the boundary under survey, which have been omitted because they lie along well defined natural features, should be indicated on these plots, with a note stating why they have not been surveyed in detail with the rest of the boundary.

The boundary plots or plane-table sections, which are the final results of the boundary survey, should be signed by the officer in charge of the party, who should remember that they may have to be produced as evidence in a Court of Law.

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## FAIR MAPPING

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**50. Disposal of plots and data.**—The field party will submit the traverse field books, computations and completed plots (or the completed plane-table sections) to the Circle Director, who will supply one tracing to the Conservator of Forests (in Burma to the Conservator Working Plans) and another to the Divisional Forest Officer and will then forward the plots and all other papers to the Forest Map Office for record.

**51. Demarcation and Clearing.**—The correct demarcation and clearing of forest boundaries is the duty of the Forest Department and the importance of having them so demarcated and cleared before survey cannot be too strongly insisted on.

Officers in charge of Survey parties should ascertain definitely from the Divisional Forest Officer before the commencement of the field season, that the boundaries which are to be surveyed have been properly demarcated and cleared on the ground; until the boundary has been so prepared, survey operations should not normally be commenced. In such circumstances the officer in charge of the party should at once communicate with the local forest officer, pointing out the necessity of immediate action and what the consequences of failure to comply with the request to clear the boundaries will entail. In the event of further delay, the officer in charge of the party should report the matter to the Director of the Circle and ask for instructions as to whether the survey should be abandoned, at the same time furnishing the Director with full information and his own recommendations.

**52.** If a particular boundary pillar is difficult to locate from the boundary plot, either because it is not visible from the neighbouring pillars, or because it is separated from them by an obstacle difficult to measure across, the surveyor may mark its position by satellite marks.

Such marks may be blazed trees or other objects of permanent and conspicuous nature and should be shown on the plot. Trees must not be blazed without permission from the forest officer.

## VII. FAIR MAPPING

**53. General.**—The fair mapping of *normal* or topographical surveys is carried out by topographical parties (see Chapter VI of this Handbook 1922).

**54.** The Circle Director will note on the publication instructions of all sheets of the normal topographical series whether any special forest map of any portion of the sheet is required.

**55.** The fair mapping of *special* forest surveys may be carried out by any of the following agencies:—

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 FAIR MAPPING
 

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- (i) By the Forest Map Office.
- (ii) In Burma where a special Forest Survey Party exists, this party will prepare the maps of the area it surveys.
- (iii) At the discretion of the Director of the Circle, by the topographical Survey party that made the survey or by the Drawing Office of the Circle.

When forest maps are prepared by a Party or Circle Office, the Forest Map Office will be responsible for publication only. The fair sheets in these cases will be submitted to the Forest Map Office with necessary publication instructions as soon as completed.

**56.** Miscellaneous forest maps, plans and diagrams which Officers of the Forest Department require to have fair drawn and reproduced, or which are for reproduction only, should be sent to the Officer in charge, of the Forest Map Office at Dehra Dun.

The whole cost of the drawing and of publication of such forest maps, diagrams etc., will, as in the case of maps of *special* surveys, be charged to the agency ordering the work.

Estimates of the cost of drawing and reproduction of the required number of copies will be furnished to the Local Government or Forest Officer concerned by the Officer in charge of the Forest Map Office. Until such estimates have been accepted work will not be put in hand.

The Officer in charge of the Forest Map Office will be responsible for not undertaking any work that may seem to him uncalled for, having regard to the maps that are already available; and also for not undertaking work that he is not in a position to carry out punctually.

**57. Symbols on forest maps.**—The symbols used for Forest surveys and maps will be the same as those of the topographical maps of the Survey of India, supplemented when necessary by the additional symbols given in the table “special symbols for Forest maps”. (See page viii).

Size of symbols to be that laid down on the Conventional signs table ‘for reduction by one third’ except where otherwise specified in the next para or on page viii.

**58 Rules for preparation.**—In the preparation of Forest maps the following rules will be observed:—

- (a) The maps will be drawn on the scale of survey for reproduction.
- (b) As regards outline and contours the map will be drawn in the same style as the 1½” originals of 1” Survey of India maps.
- (c) The lettering for the body and border of the map will also be in the style laid down for the 1½” originals of 1” Survey of India maps, except in the details noted in paras (d) (e) (f) (h) below.

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 FAIR MAPPING
 

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- (d) The names of all Forest Ranges and Reserves will be in Doric No. 4 type (*i.e.*, Nos. 13, 14 and 15 of the departmental Type Table), the size depending on the space which is to be covered.
- (e) The names of Forest Reserves extending beyond the limits of the sheet will be entered in the border of the sheets in Doric No. 4 type, instead of the names of the subdivisions of districts.
- (f) The names of the sub-divisions of districts on the face of the map will be less prominent than on the  $1\frac{1}{2}$ " originals of the 1" Survey of India sheets.
- (g) Graticule lines on 2-inch maps will be drawn at  $2\frac{1}{2}$ -minute and on 4-inch maps at 1-minute intervals.
- (h) On all forest and topographical maps on which roads and water features are printed in black the following symbols will be used:—

Cart tracks will be shown on the map and also in the footnotes by the present symbol for unmetalled roads (*i. e.*, bars  $3\frac{1}{3}/60$ " long, with intervals  $1/60$ " long, on the scale of publication).

Unmetalled roads will be shown on the map and also in the footnotes by the same symbol as at present but with bars twice as long as at present (*i.e.* bars,  $6\frac{2}{3}/60$ " long, and intervals  $1/60$ " long, on the scale of publication) and are to be drawn distinctly heavier than for cart tracks.

Mines and passes should have the words 'Mine' and 'Pass' typed against their respective symbols both on the body of the map and in the footnotes.

Whenever there is any possibility of wells being confused with un-numbered boundary pillars, such wells should have the word 'Well' typed against them on the map, but the word 'Well' need not be typed in the footnotes.

The type to be used for 'Mine', 'Pass' and 'Well' should be the same as that used on the maps for Place-names (miscellaneous).

The rules in paras (d) (e) (f) (g) and (h) should also be followed in the preparation of 2" maps from  $1\frac{1}{2}$ " originals of 1" topographical sheets.

**59. Boundary pillars on maps.**—In selecting the boundary pillars whose numbers are to be entered on *special* forest maps, where owing to the closeness of detail all numbers cannot be shown, preference should be given to those situated at salients and re-entering angles.

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DISPOSAL OF PUBLISHED MAPS

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**60. Names on Forest Maps.**—In order to attain uniformity in the spelling of names of and in Reserved Forests, so that forest maps and notifications may as far as possible agree, the following rules should be observed, (not applicable to Burma):—

- (a) In the case of Reserved Forests which have neither been notified nor mapped, the Conservator concerned should send the draft notification to the Circle Director concerned to obtain the correct spelling of names. This rule does not apply to Madras where both the Forest and Survey Departments use the same lists for the spelling of names.
- (b) For Reserved Forests which have been notified but not mapped, the Survey will enter the correct spelling in all their maps and will notify the Conservator concerned of corrections to names which have appeared in the notification; an amended notification will be issued if the errors are numerous and serious.
- (c) For Reserved Forests which have been both notified and mapped, no action will be taken as regards forest maps, except that cases of incorrect spelling will be noted on the office copies of maps kept in the Forest Map Office, Dehra Dun; these corrections to be taken into consideration, should re-notifications take place.
- (d) In all cases the Survey of India will use correct spelling on their topographical maps of areas including Reserved Forests.

**61. Proofs.**—The Forest Map Office will send a proof in black and brown of all maps prepared from *special* forest surveys to the Conservator of Forests concerned (in Burma to the Conservator Working Plans) for verification and return before press order is given.

**62. Disposal of data.**—Original plane-tables of forest maps and also the field-books will be stored in the office of the Director of the Circle concerned; the office which carried out the fair mapping will return the plane-tables and field-books to the Director as soon as the forest map has been published.

All fair sheets will be retained by the Forest Map Office.

## VIII. DISPOSAL OF PUBLISHED MAPS

**63. Storage and Issue of Topographical Maps.**—The stock copies of sheets of the normal topographical series are stored by the Map Record and Issue Office, 13 Wood Street, Calcutta.

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## DISPOSAL OF PUBLISHED MAPS

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**64.** On first publication the above Office sends two complimentary copies of all one-inch topographical sheets of his Province to each Chief Conservator and of each of the sheets of his Circle to each Conservator.

Copies of these sheets required by forest officers can be obtained on payment by book-debit on the indents countersigned by Deputy Conservators or officers of superior rank.

**65. Storage and Issue of Special Forest Maps.**—The stock copies of special forest maps will, unless the Local Government concerned expresses a desire to take over the whole issue, be stored and issued by the Forest Map Office, Dehra Dun.

Copies required for the use of forest officers will be issued free on indents countersigned by Deputy Conservators or officers of superior rank.

Copies of special forest maps will be obtainable by officers of other departments on countersigned indents, on payment by book-debit, and by the public on cash payment.

**66.** If the Forest Officer who orders the preparation of a special forest map desires any complimentary copies to be issued from the stock printed, he should inform the Forest Map Office of the numbers to be issued and the designations and addresses of the recipients.

The above refers to maps prepared by the Forest Map Office. When maps are prepared by parties or Circle offices, the above information will be entered on the publication instructions submitted to the Forest Map Office with the fair sheets.

**67. Reprints, New and Revised Editions.** \*—A “reprint” implies that the map is printed again, merely to replenish stock, no corrections or additions being made to the information given on the map.

A “new edition” or a “revised edition” implies that the map has been reprinted with additions or corrections bringing the matter of the map up to date, a note being added specifying the authority for the additions or corrections.

When the alterations are few the sheet will be styled “new edition”, and when the changes are considerable “revised edition”.

## IX. REPORTS AND RETURNS BY SURVEY CIRCLES AND PARTIES

**68. Returns.**—As the Forest Department year now coincides with the financial year and not with the Survey of India year, the following rules will be observed in submitting reports and returns relating to forest surveys.

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\* For full particulars see para 14 Chapter VI. (1922).

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**FOREST MAP OFFICE—RULES AND ROUTINE**

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By the 1st of July in each year, Officers in charge of parties will submit to the Circle Director :—

- (i) a brief report on the survey operations carried out by their parties during the past field-season.
- (ii) Forest Department, Imperial, form No. 10 (see page iv) duly completed, showing in the case of *special* surveys, total cost, cost-rates and amount debitable to each Local Government.

In this form will be stated also the actual amount paid by each Local Government for the past financial year, ending March 31st, on account of *special* surveys.

The out-turn of survey will be given with respect to the whole field season and the cost of survey with respect to the financial year.

Forests which have been previously surveyed for the Forest Department on any scale, of which a revision survey on the 1-inch scale has been carried out in the course of the regular topographical programme, should not be referred to in Form 10.

- (iii) an index map on the scale of 1-inch = 32 miles showing the forest areas surveyed during the field season.

A copy of each of these returns should be sent at the same time to the Conservator of Forests concerned and the Circle Director informed that this has been done.

**69.** The Circle Director will forward copies of the reports mentioned in the above para to the Officer in charge, Forest Map Office.

**70. Records Vol Table III.**—Circle Directors should arrange to send direct to the Officer in charge, Forest Map Office, Table III of their reports for the Records Volume so as to reach him not later than the 1st of November.

**X. FOREST MAP OFFICE—RULES AND ROUTINE**

**71. Responsibilities of F.M.O.**—The responsibilities of the Officer in charge of the Forest Map Office may be described generally as :—

- (i) the preparation of all special forest maps (except as stated in para 55).
- (ii) the storage and issue of all special forest maps (see para 65).



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FOREST MAP OFFICE—RULES AND ROUTINE

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- (iii) the maintenance of a portfolio copy of each special forest map and also of each topographical map containing forest areas (on the largest scale published), and its being kept up to date in accordance with all notifications received by him.

**72. Maintenance of Portfolio copies.**—For the purpose of keeping forest maps up to date in respect to forest details, the Forest Map Office will maintain :—

- (a) office copies of all forest maps,
- (b) a register showing, Province by Province, the distinctive number and date of each notification received. In this register, as well as on the notification and on the portfolio copy itself, an appropriate entry will be made as soon as the notified changes have been carried out on the forest sheets concerned.

**73. Forest Map Office to receive notifications.**—In order to enable the Officer in charge of the Forest Map Office to carry out his duties in connection with subhead (iii) of para 71, a copy of every notification constituting reserved and protected forests or modifying (by exclusion or otherwise) the boundaries of such forests together with an indicative tracing or sketch map, will be forwarded by Conservators, under the orders of the Local Governments, direct to the Officer in charge of the Forest Map Office.

**74. Bills.**—Bills of charges, debitable to Local Governments, for the drawing and publication of special forest maps prepared by the Forest Map Office, will be made out by the Officer in charge. The amounts will be recovered by book-debit and credited to Central Revenues (for credit to the Survey of India.)

**75. Consolidated Report to I. G. F.**—From the reports submitted by the Circle Director (see para. 69), the Officer in charge of the Forest Map Office will prepare a combined report for submission to the Inspector General of Forests, a copy of the same being submitted to the Surveyor General through the Director, Geodetic Branch.

**76. Forest Department Statement IV** (see page v) which is compiled by the Forest Map Office from form 10 and Table III Records Vol. should reach the Inspector General of Forests by the 1st of December each year.

**77. A Quinquennial Report** on forest survey operations carried out by the Survey Circles, and the work dealt with by the Forest Map Office during the past five years, compiled from the General Reports, should be submitted by the Forest Map Office to the Inspector General of Forests as soon as the reports referred to in paras 69 and 70 are received for the year ending the quinquennium under report.

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FOREST MAP OFFICE—RULES AND ROUTINE

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**78. Returns.**—The following returns will be submitted by the Forest Map Office :—

(a) *Annually.*

- (i) Tabular statement out-turn of mapping and publication (see page vi).

This forms an accompaniment to the Forest Map Office portion of the General Report Part 3, a copy of which will be submitted on 1st June to the Inspector General of Forests.

- (ii) Statement (see page vi) showing the progress made in mapping during the Financial year.

This will be submitted as soon as possible after 31st March to the Inspector General of Forests, all Chief Conservators and Conservators of Forests.

(b) *Quarterly.*

- (iii) List of maps published during the quarter (see page vii). This will be submitted to the Director, Geodetic Branch and to the Officer in charge, Map Record and Issue Office.

- (iv) Index maps on the scale of 32 miles to one inch, showing the forest maps published during the quarter. This will be submitted to the Director, Map Publication.

- (v) Return of work dealt with by the Forest Map Office during the quarter (see page vii).

This form will be submitted to the Surveyor General of India showing :—

Work in hand and work not yet taken up debitable to (1) Central Revenues (Forests) and (2) Provincial Revenues (Forests).

(c) *Monthly.*

- (vi) Statement showing the progress made in mapping during the month (see page vii).

This will be submitted to the Director, Geodetic Branch and to the Officer in charge, Map Record and Issue Office, and extracts only of such portions of the statement as concern Survey Circles to their Directors.

D. L. R's office, Library Copy  
To be returned when done with.

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## APPENDICES

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APPENDIX.—I.

Circular No. 152-C, dated the 3rd December 1923.

From—The Inspector General of Forests.

To—All Chief Conservators and Conservators of Forests, &c.

I have the honour to refer to this office circular No. 7, dated the 29th April 1910, regarding the procedure to be followed in connection with forest surveys and in obtaining forest maps. Owing to the normal scale for the topographical surveys having since been changed and owing to the orders issued by the Government of India regarding the adjustment of the cost of surveys, it is necessary to revise the instructions issued in this office circular letter already referred to. The procedure to be followed in future is explained below :—

1. The survey of forest areas is carried out as part of the topographical survey which is gradually being extended over the whole of India. The normal scale which has been adopted for the survey is 1-inch to 1 mile, but, in certain undeveloped parts of the country, it is  $\frac{1}{2}$ -inch to 1 mile, and, in some remote and sparsely populated regions, only  $\frac{1}{4}$ -inch to 1 mile, while, as a rare exception, in the case of very fully developed industrial districts, the scale may be larger than 1-inch to 1 mile. In each case, the maps are published on the scale of the survey and are obtainable by purchase or indent about a year after the survey has taken place. The Forest Department pays no share of the cost of the topographical survey and mapping which provide it with ordinary topographical maps showing the reserves and wooded areas on the scale adopted for the part of India in which the forests lie.

2. The ordinary topographical map is, however, not always sufficient for forest purposes; the scale may be too small and a map showing additional forest information, such as the interior boundaries of a reserve, may be required, or it may be necessary to make a special survey and record of a reserve boundary where it does not follow a natural feature.

When this is the case, a special survey can be carried out and a special forest map, or boundary map, prepared at the time of the topographical survey of the area in which the reserve is situated, provided, (a), that the Survey of India is informed of the special forest requirements before the month of March of the year in which the topographical survey takes place and (b), that the Forest Department is prepared to pay for the cost of meeting its requirements, that is to pay the difference between the actual cost of the survey carried out and that which would in any case have been incurred on the ordinary survey had the forests been surveyed merely to provide the ordinary topographical maps. The Forest Department will pay the whole cost of the drawing of all special maps.

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APPENDIX.—I.

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provided that the Forest Department is prepared to pay for the additional costs of the work.

- (iii) When the survey of a forest or of a forest boundary is urgent and the Forest is situated outside the ordinary topographical programme, the Surveyor General will endeavour to make special arrangements for the necessary survey and mapping provided that the Forest Department is prepared to pay the entire cost of the survey and maps. Such special surveys, outside the ordinary topographical survey programme, require the sanction of the Government of India and no application should be made for them unless they are really urgent and necessary.

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APPENDIX.—I.

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3. If a survey is considered necessary for a forest which is situated in an area that will not come under topographical survey for some years to come and it is not desirable to wait for maps until the topographical survey takes place, or, if the forest is situated in an area which has already come under modern topographical survey and the existing maps do not meet forest requirements, it may be possible for the Survey of India to arrange for a special survey on any scale, provided the Forest Department is prepared to pay the entire cost of the survey and mapping.

Such special surveys of forests which cannot be carried out as part of a survey party's ordinary programme are necessarily expensive and seriously affect the normal operations of the Survey of India, so that they should only be applied for in really important cases.

4. The departmental rules of the Forest Department and the Survey of India provide for the necessary consultation between Conservators (or Chief Conservators) and Superintendents of Survey Circles, so that the former are kept informed of the progress and the immediate forecasts of topographical survey programmes, and the latter of the requirements of the Forest Department in regard to the surveys of forests which fall within their programmes for 2 years ahead. The Survey of India rules also provide for the preparation of estimates of the additional cost of making special surveys and maps to meet the requirements of the Forest Department in regard to the forests situated within the survey programmes and, in exceptional cases, of the cost of surveys and maps that may be required by the Forest Department outside the regular survey programmes.

5. The following rules which have been drawn up in consultation with the Surveyor General summarise the procedure to be followed in connection with the cost of forest surveys executed by the Survey of India.

- (i) Except when the Survey of India is asked to make a special survey of a forest, all forest areas will be surveyed on the scale adopted for, and at the time of, the topographical survey of the region in which they are situated, and will be shown on the Survey of India topographical sheets, which can be obtained by purchase or indent about a year after the completion of the survey.
- (ii) When the ordinary Survey of India topographical maps do not satisfy 'Forest' requirements, a special forest survey can be carried out and a special forest map prepared of any forest, or, of any forest boundary, situated within the ordinary programme of a topographical survey party,

Form No. 10.—Statement showing forest areas surveyed, and under survey by the Survey of India Department during the year.

Division	TOPOGRAPHICAL SURVEYS						ORDINARY SURVEYS NOT PAID FOR BY FOREST DEPARTMENT				BOUNDARY SURVEYS		Total area surveyed	Area remaining to be surveyed	Total area as performed	REMARKS
	SPECIAL SURVEYS PAID FOR BY FOREST DEPARTMENT															
	Previous		of the year		Cost		Previous		of the year		Previous	Of the year				
	4" = 1 m.	2" = 1 m.	4" = 1 m.	2" = 1 m.	Incurred during year	Total to the end of year	2" = 1 m.	Smaller scales	2" = 1 m.	Smaller scales						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	Sq. m.	Sq. m.	Sq. m.	Sq. m.	Rs.	Rs.	Sq. m.	Sq. m.	Sq. m.	Sq. m.	L. M.	L. M.	Sq. m.	Sq. m.	Sq. m.	

NOTE.—Columns 2, 3, 4, 5, 8, 9, 10 and 11 should show the work up to date. The total added to column 15 should equal the total forest area in column 16.

STATEMENT IV.—FOREST SURVEY OPERATIONS.

PROVINCE	Forest surveyed	NATURE OF SURVEY OPERATIONS						TOTAL AREA OF DETAIL SURVEY		Expenditure of the year including mapping and publishing charges debitable to Forests	REMARKS
		1" Detail Survey		2" Detail Survey		4" Detail Survey		1920- 1921	Total up to date		
		Area	Cost rate	Area	Cost rate	Area	Cost rate				
1	2	3	4	5	6	7	8	9	10	11	12
Bengal ...	{ Jalpaiguri ... Buxa ...	sq. m.	Rs.	sq. m.	Rs.	sq. m.	Rs.	sq. m.	sq. m.	Rs.	
United Provinces ...	{ Chakrata ... Haldwani ... North Garhwal ... South Garhwal ... Central Almora ... East Almora ... Ranikhet ... Naini Tal ... North Kheri ... Utilisation (Bareilly)										
	etc. etc.										
Total 19.....	...										
" 19.....	...										
" 19.....	...										
" 19.....	...										
" 19.....	...										



## APPENDIX.—II.

## TABULAR STATEMENT FOR THE GENERAL REPORT.

Class of map	In hand on 1st April 19.....	Received during the year	Drawn and sent for publication during the year	In hand on 31st March 19.....	Published during the year	Total number of copies printed
(a)						}
(b)						
(c)						
(d)						
(e)						
(f)						
Total 19.....						
Total 19.....						

- (a) Reprints of Forest maps on various scales.  
 (b) Maps of Forest Circles and Divisions.  
 (c) Maps to illustrate working Plans etc.  
 (d) Maps and diagrams to accompany Administration Reports.  
 (e) Forest maps from special surveys.  
 (f) Index and miscellaneous maps.

## Survey of India.

## FOREST MAP OFFICE

Statement showing the Progress of Mapping made in the Forest Map Office during the Forest year 192...-2... (1-4-2... to 31-3-2...).

Province	Circle	Division	Scale	No. of sheets			REMARKS
				Published	At Press	In hand	

No.

Dehra Dun.

The.....192 ..

Officer in charge, Forest Map Office

## APPENDIX.—II.

Form No. 40

Survey of India.

FOREST MAP OFFICE

List of maps published during..... 192....

TITLE OF MAP	Season of Survey	Scale of Publication	Size of Map	Price		REMARKS
				Rs.	a.	

Form No. 40 (a)

Survey of India.

Quarterly Return of Forest Map Office, Dehra Dun, for Quarter

ending.....192....

Scales	Description of Maps	Total No. of Sheets	REMARKS

Survey of India.

Progress Report of the Forest Map Office, Dehra Dun, for the Month of.....192....

.....Section

R. S. No.	Date of Receipt	Title of Map	Scale	No. of Sheets	REMARKS