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THE  
TRAVANCORE SURVEY MANUAL  
AND  
DEPARTMENTAL RULES

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COMPILED UNDER THE ORDERS OF GOVERNMENT

BY

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SUPERINTENDENT, LAND RECORDS.



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## PREFACE.

The Efficiency Audit Officer, Mr. M. Raja Raja Varma, observed that there was need for compiling a Survey Manual for the guidance of the several officers of the Survey and Land Revenue Departments. The Government approved of the proposal and ordered, in their letter R. O. C. No. 537 of 22/Revenue dated the 15th November 1922, that a Survey Manual should be compiled on the lines of the Madras Survey Manual. The work was entrusted to me and I commenced the work in April 1923. It was completed in May 1924.

In compiling the Manual, I have more or less followed the Madras Survey Manual. I have also referred to the Roorke's Survey Manual and Clancey's book on Surveying. I have also, with my experience in the Madras Survey, Cochin Survey, and in the Travancore Survey introduced some additions and alterations to suit local requirements.

The Manual contains two parts.

Part I consists of 17 Chapters and deals chiefly with the several processes of work to be attended to, both in field and in office, in Cadastral Survey, Resurveys, and Revision Surveys, and Town Surveys. It also contains brief description of the several Survey and Drawing Instruments, in use.

Part II consists of 6 Chapters useful for the officers of the Land Records, Survey and Revenue Departments.

Besides these, there is an Appendix in which all the Rules and Circulars, issued from time to time for the guidance of the several officers, have been embodied.

M. RAGHAVA AIYANGAR.

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## INTRODUCTION.

The earliest survey of which there were any accounts was one made in 948 M. E. and comprised all the cultivated lands ; but it lays no pretensions to "any accuracy as it professes to be simply a " *செய்தல்* " or "a record of what was heard" i. e., such information as was gathered by a personal conference with the holders of the land. After 30 years, or in 978 M. E., there was a second survey, also of all cultivated lands which, however, unlike its predecessor, professes to have been a " *செய்தல்* " or "a record of what was seen" which is probably on that account more reliable. There were two more surveys in 993 and 1012 which embraced only garden lands.

As these records were found to be defective, it was thought very necessary to have an accurate if not a scientific survey and that it should be conducted on the basis of the Revenue Survey adopted in the Madras Presidency. It was therefore resolved that the work should be entrusted to an experienced and scientific officer, practically acquainted with the Madras Survey. Accordingly, the services of a professional officer having experience in the Madras Survey were secured for the Superintendence of the operations. At the commencement it was arranged that the Settlement Department should do the demarcation, and the Survey Department should then undertake the survey. The method of survey, first adopted, was the 'Tak' system.

A Boundary Regulation (III of 1058) based on the lines of the British Indian Enactment was passed on the 13th Karkadagom 1058 M. E. in order to facilitate the work of boundary demarcation and survey.

Early in 1060 M. E., it was discovered that the work of demarcation was a needless burden on the Settlement Department and interfered with the far more important operations of classification and settlement. The subject was therefore reconsidered and as a tentative measure the demarcation also was handed over to the Survey Department. The experiment having succeeded, the Settlement Department was finally relieved of all demarcation work in 1060 M. E.

The Boundary Regulation (III of 1058) was amended during the year by Regulation II of 1060 with a view to remedy certain defects discovered in the course of actual working.

A new system of survey, (the system of "Base lines and Offsets"), introduced in the Madras Presidency was adopted in Travancore in the year 1063 M. E. as the same was reported

another, (as may be seen on the head of a cross-staff) or when one straight line meets another and makes the adjacent angles equal, each of the angles formed by the intersection or the meeting is called a right angle. (Figures 2 & 3).

9. If the angle made by the inclination of two straight lines is greater than a right angle, it is called an *Obtuse angle*, if less than a right angle, an *acute angle* "*Oblique angle*" is the common designation of both acute and obtuse angles. (Figures 4 & 5).

10. If the sum of two angles is equal to a right angle, one is called the *complement* of the other. (Figure 6).

11. If the sum of two angles is equal to two right angles one is called the *supplement* of the other.

12. A *Re-entrant angle* is one which is more than two right angles in magnitude. (Figure 7).

13. One straight line is called to be *perpendicular* to another when it meets or cuts this other at right angles.

NOTE:—The perpendicular to a straight line from a point outside of it is the shortest distance from the point to the line.

14. Parallel lines are straight lines in the same plane which do not meet, and will not meet even if produced to any distance both ways. (Figure 8).

NOTE:—If two straight lines in the same plane are so situated, that a straight line drawn at right angles to one of them is also at right angles to the other, then the two straight lines can be declared to be parallel to each other.

15. *Vertical lines* are such as are parallel to the position at rest assumed by a plumb-bob freely suspended in a still atmosphere.

NOTE:—All vertical lines are parallel to each other.

16. *Vertical Plane*. If two or more vertical lines be drawn so as to be in the same plane, then the plane containing them will be a vertical plane.

NOTE:—Any plane containing a vertical line will be a vertical plane; and all lines in the plane drawn parallel to this vertical line will also be vertical.

17. *Horizontal lines* are perpendicular to vertical lines and can be easily and accurately determined by the level indicated by water, spirit, etc.

18. *Horizontal planes*. A horizontal plane is one in which every straight line drawn is a horizontal line.

NOTE:—(i) If in a plane it is possible to draw two horizontal straight lines which intersect, *i. e.*, which are not in the same straight line, then the plane is horizontal, *i. e.*, every straight line in it is horizontal.

(ii) All horizontal planes are parallel to each other.

19. A straight line is said to be perpendicular to a plane when it makes a right angle with every straight line cutting it in that plane.

NOTE :— (i) All vertical lines are perpendicular to all horizontal planes.

(ii) Straight lines which are perpendicular to the same plane are parallel to one another ; for instance, upright staffs planted on level ground.

20. An *inclined plane* is one which is neither horizontal nor vertical.

NOTE :—A number of parallel horizontal lines can be drawn on a vertical or on an inclined plane, but not intersecting horizontal lines. These latter can exist only on a horizontal plane. A vertical line can exist only in a vertical plane.

21. The intersection of two planes is a straight line.

N. B. :—If two vertical planes intersect, the intersection must be a vertical line. If a horizontal plane intersects a vertical or an inclined plane, the intersection must be a horizontal line.

22. The inclination of two planes which intersect is the angle contained between two straight lines drawn from a point of the common line of intersection, at right angles to this line, one in one plane and the other in the other.

NOTE :—All vertical planes are at right angles to all horizontal planes.

23. *Plane figures* are those which are bounded either by straight or curved lines in the same plane.

24. The perimeter of a figure is the sum of the lengths of all the sides of the figure.

25. A *triangle* is a plane rectilinear figure of three sides and three angles. (Figure 9).

26. If all the sides of a triangle are equal to one another it is called *Equilateral* (2) ; it is called *Isosceles* when only two sides are equal ; and *Scalene* (3) when the sides are all unequal. (Figures 10, 11 & 12).

27. When one of the angles of a triangle is a right angle it is called a *Right angled triangle* (4) ; when one of the angles is obtuse, it is called an *Obtuse angled triangle* (5) ; and when all three angles are acute, it is called an *Acute-angled triangle*. A triangle which is not right-angled is also called an *Oblique-angled triangle*. (Figures 13 & 14).

28. In a right angled triangle, the side opposite to the right angle is called the *Hypotenuse*, and the other two sides are called the *Perpendicular* and the *Base*.

29. A *plane rectilinear quadrilateral* is a plane rectilinear figure of four sides and four angles. When the opposite sides of such a quadrilateral are parallel, it is called a *Parallelogram*. (Figure 15).

(2) If one angle of a parallelogram is a right angle, all its angles are right angles and it is called a *Rectangle*. (Figures 16 & 17)

(3) If at the same time all its sides are also equal to one another, it is called a *Square*. (Figure 18)

(4) A rectangle whose length is not equal to its breadth, is called an *Oblong*. (Figure 19)

(5) If all the sides of a parallelogram are equal to one another, but none of the angles is a right angle, the parallelogram is called a *Rhombus*. (Figure 20)

(6) If none of the angles is a right angle, and the length is not equal to the breadth, the parallelogram is called a *Rhomboid*. (Figure 21)

NOTE:- (i) If a figure has been proved to be a parallelogram, it is enough to prove that one of the angles is a right angle and declare it a rectangle.

(ii) If a figure has been proved to be a rectangle, it is enough to prove that two adjacent sides are equal, to declare it a square.

30. A quadrilateral two only of whose sides are parallel, is called a *Trapezoid*. (Figure 22)

31. When no two sides are parallel, the quadrilateral is sometimes called a *Trapezium*. (Figure 23)

32. A *Diagonal* is a straight line joining one corner of a closed rectilinear plane figure to any other corner except the two adjacent ones. BD is the diagonal. (Figure 24)

33. A *Polygon* is a plane rectilinear figure having more than four sides. (Figure 25)

34. A *Regular Polygon* is that which has all its sides equal to one another, and also all its angles equal to one another. (Figures 26 & 27)

35. *Similar rectilinear figures* are such as have the angles of the one severally equal to the angles of the other, taken in order, and the sides about the angles of the one in the same proportion as the sides about the corresponding equal angles of the other also taken in the same order. (Figure 28)

NOTE:- Triangles which are equiangular to one another are also similar; but quadrilaterals or polygons which are equiangular to one another are not necessarily similar.

36. The *Altitude* of a triangle is the perpendicular drawn from the vertex of the triangle to the base; and the altitude of a parallelogram is the perpendicular drawn to the base from any point of the opposite side. (Figures 29 & 30)

37. A *Circle* is a plane figure bounded by a continuous curved line called the *Circumference* which is everywhere equally distant from a point within it called the *Centre*. (Fig 31)

38. A *Diameter* of a circle is a straight line passing through the centre and terminated at both ends by circumference. (Figure 31)

39. A *Radius* of a circle is a straight line from the centre to the circumference and is equal to half the diameter.

40. An *Arc* of a circle is any part of the circumference (Figure 32)

41. A *Semi-circle* is one half of a circle, bounded on one side by a diameter and on the other side by one half of the circumference. (Figure 33)

42. A *Quadrant* is a quarter of a circle and is bounded by two radii at right angles to one another and the part of the circumference intercepted between them. (Figure 34)

43. *Ratio* is the abstract arithmetical number or fraction expressing what multiple or part one thing is to another of the same class or kind.

*Example:-* (i) 12 acres are three times 4 acres.

Here the abstract number 3 expresses the ratio of 12 acres to 4 acres.

(ii) 4 links is  $\frac{1}{2}$  of 8 links.

Here the abstract fraction  $\frac{1}{2}$  expresses the ratio of 4 links to 8 links.

(iii) 10 links is 2 times 5 links.

(iv) 1 chain is 10 times 10 links.

(v) 4 links is  $\frac{1}{25}$  of a chain.

**NOTE:-** In the first three examples the things compared are of the same kind and of the same denomination. In examples 4 and 5, things of the same kind, though not of the same denomination, are compared. It will, of course, be meaningless to compare things of different classes or to speak of their ratio.

44. *Proportion* is the equality of two ratios; that is to say when the ratio *i. e.*, the number or fraction showing the relative magnitude of two things of the same kind, is equal to the ratio showing the relative magnitude of two other things of the same kind then the four things constitute the numbers of a proportion.

**NOTE:-** It would be noted here that the two things whose relation is expressed by the first ratio of a proportion may be of a kind different from that of the two things whose relation is expressed by the second ratio.

*Example:-*

(i) 20 links : 40 links :: 16 feet : 32 feet.

(ii)  $2\frac{1}{2}$  cents : 1 acre :: 3 annas :  $7\frac{1}{2}$  rupees.



## PROBLEMS.

## PROBLEM No. 1.

*To divide a given straight line into any number of equal parts.*

Let AB be the line which is required to be divided into five equal parts. (Figures 35 and 36).

*First Method*:—Draw the line AC making an acute angle with AB.

From A set off on AC points 1, 2, 3, 4 and 5 at equal distances.

Join 5B, and through the points 4, 3, 2 and 1 draw lines parallel to 5B, cutting the given line at G, F, E and D respectively.

Then AB is divided into 5 equal parts at the points D, E, F and G.

*Second Method*:—Having drawn the line AC and set off on it the points 1, 2, 3, 4 and 5 at equal distances, as above, draw the line BD parallel to AC.

Set off on BD points 1, 2, 3, 4 and 5 at the same equal distances as on AC.

Draw straight lines from A to 5, 1 to 4, 2 to 3, 3 to 2, 4 to 1 and 5 to B.

Then, these lines, where they cut AB, divide it into five equal parts.

## PROBLEM No. 2.

*To construct a triangle equal to a given quadrilateral.*

Let it be required to construct a triangle equal in area to ABCD. (Figure 37).

Draw the Diagonal DB.

Draw CE parallel to DB and meeting AB produced at E. Join DE.

Then the triangle AED is equal to the given quadrilateral ABCD.

## PROBLEM No. 3.

*To construct a triangle equal in area to a given Polygon.*

Let it be required to construct a triangle equal in area to ABCDE. (Figure 38).

Draw the diagonals DA and DB.

Draw the lines EF and CG parallel to DA and DB respectively and meeting AB produced both ways at F and G. Join DF and DG.

Then the triangle DFG is equal to the given polygon ABCDE.

PROBLEM No. 4.

To lay off on the ground with the chain only, a line at right angles to a given line from a given point in it.

Let AB be the line and C the point. (Figure 39.)

From C lay off CD, 40 links, along the line AB.

Then, holding one end of the chain at C and the index mark for 80 at D, pass an arrow through the ring at the index mark 30, and pull out these 80 links of the chain to E, so that CE and DE may form two straight lines.

Then CE will be at right angles to AB.

Because, CD=40, CE=30, ED=50, and  $50^2=40^2+30^2$ , therefore, ECD is a right angled triangle of which ED is the hypotenuse and ECD the right angle. (Theor.)

PROBLEM No. 5.

To find the length of the perpendicular from the apex of a triangle to the base and the lengths of the segments into which the base is divided.

First Case: (Figure 40.)

$$\begin{aligned} DC - DB &= \frac{AC^2 - AB^2}{DC + DB} \\ &= \frac{(AC + AB)(AC - AB)}{BC} \\ &= \frac{(572 + 436)(572 - 436)}{831} \\ &= \frac{137081}{831} \end{aligned}$$

$$DC - DB = 165$$

$$DC + DB = 831$$

$$DC = 498$$

$$\begin{aligned} AD^2 &= AC^2 - DC^2 \\ &= 572^2 - 498^2 \end{aligned}$$

$$AD^2 = 281$$

Second Case: (Figure 41.)

When AD falls outside the triangle ABC. To find the length of the perpendicular and the length to which the base is to be produced.

$$\begin{aligned} BD + DC &= \frac{AB^2 - AC^2}{BD - DC} = \frac{(AB + AC)(AB - AC)}{BD - DC} \\ &= (\text{Present case}) \frac{(831 + 436)(831 - 436)}{572} \end{aligned}$$

$$\begin{aligned}
 &= 500465 \\
 &572 = \text{say } 875 \\
 \text{BD} + \text{DC} &= 875 \\
 \text{BD} - \text{DC} &= 572 \\
 \text{BD} &= 723.5 \text{ say } 724 \\
 \text{AD}^2 &= \text{AC}^2 - \text{CD}^2 \\
 \text{AD} &= 408
 \end{aligned}$$

PROBLEM No. 6.

*To measure a line impeded by an object obstructing the sight.*

Let AB be the line the measurement of which is obstructed by a row of trees. (Figure 42.)

*First Method*:—As near as possible to A select a point C from which A and B are visible and straight lines can be measured to them.

By means of the cross-staff, offset the point A on the line CB, *i. e.*, erect the perpendicular CA, shifting the point C as may be necessary.

Measure  $\sphericalangle$  AC and CB

ACB being a right-angled triangle.

$$\text{AB} = \sqrt{\text{AC}^2 + \text{CB}^2}.$$

NOTE:—When AC is less than one-twentieth of CB, AB will differ from CB by only about one link in distances up to 12 chains, and the difference being negligible, the measurement of CB, itself may in such a case be taken as that of AB.

*Second Method*:—Having constructed the right-angled triangle ACB, continue the measurement of the straight line AC to D, until CD is equal to AC. (Figure 43.)

Measure DB.

Then DB is equal to AB.

PROBLEM No. 7.

*To measure a line impeded by an object not obstructing the site.*

Let AG be the line the measurement of which is impeded by the pond B. (Figure 44.)

*First Method*:

Measure AC in the direction of AG, and at or near the edge of the pond set up the cross-staff and lay off the line CD at right angles to AC.

Measure in the direction of CD so that the line DE, measured at right angles to CD, may pass clear off the pond.

Set up the cross-staff at D and lay off the line DE at right angles to CD and measure as far as E so that EF measured at right angles to DE may pass clear off the pond.

At the point E set up the cross-staff and lay off the line EF, so that it shall be exactly equal to DC.

F will be in the straight line ACG.

Now, because EF is equal and parallel to DC, the distance CF is equal to DE.

Measure FG.

Then  $AC + DE + FG = AG$ , the measurement required.

*Second Method:* (Figure 45.)

Choose any point C from which straight lines can be measured to both A and G.

Measure AC and prolong it in the same straight line to D, making CD equal to AC (Fig. 1.)

Do the same with GC, making CE equal to GC.

Then ED is equal to AG.

NOTE:—It is not absolutely necessary to make CD and CE equal to AC and GC respectively. It will be sufficient if CE is made to bear the same ratio to GC as CD bears to AC. (Figure 2.)

Thus, if AC and GC are 402 and 360 respectively and CD is, say, 134 or 1/3rd of AC, CE should be 1/3rd of GC (360), *i. e.*, 120.

Now, because the triangles ACG and DCE are equiangular therefore, ED will be 1/3rd of AG *i. e.*, AG is equal to 3 ED.

#### PROBLEM No. 8.

*To measure a line obstructed by a house, etc.*

Let AB be the line, measurement of which is obstructed by a house. (Figure 46.)

Select a point C so that A and B are visible and lines CA and CB can be measured.

Measure CA and CB and mark off in them points D and E, so that CA and CB are the same multiples of CD and CE; that is, if CD is  $\frac{1}{3}$  of CA, then CE should be  $\frac{1}{3}$  of CB, or, if CD is 1/3rd of CA, then CE should be 1/3rd of CB. Measure the line DE.

Now, ACB and DCB being equiangular, when  $CD = \frac{1}{3} CA$ ,  $DE = \frac{1}{3} AB$ , *i. e.*,  $AB = 3 DE$ . When  $CD = \frac{1}{3} CA$ ,  $DE = \frac{1}{3} AB$ , *i. e.*,  $AB = 3 DE$ .

## PROBLEM No. 9.

*To measure a line across a river.*

Let  $AB$  be the line required to be measured.

Set up the cross-staff at  $A$  and lay off  $AC$  at right angles to  $AB$ . (Figure 47.)

Measure  $AC$ , say 2 or 3 chains, taking care to see that  $B$  is visible from  $C$ .

Continue the measurement in a straight line to  $D$  making  $CD$  equal to  $AC$ .

Set up the cross-staff at  $D$  and lay off  $DE$  at right angles to the line  $ACD$ . Measure in the direction of  $E$ , all are in one straight line.

Measure  $EC$ .

Then, the triangle  $ECD$  and  $BCA$  being equal to each other,  $DE$  is equal to  $AB$ , the line across the river.

NOTE :— $CD$  need not necessarily be made equal to  $AC$ .

Let  $AC$  be 200 links and  $CD$  80 links. (Figure 2.)

Then, the triangles  $ECD$  and  $BCA$  being equiangular, and consequently similar,  $AB$  can be calculated from the following proportion :—

$$AB : DE :: AC : CD$$

$$AB = \frac{DE \times AC}{CD} = \frac{144 \times 203}{80} \text{ or } 360.$$

## PROBLEM No. 10.

*To find the distance between two visible but inaccessible points.*

Let  $A$  and  $B$  be two points on one bank of a river visible from the other bank but not accessible. (Figure 48.)

Measure any line along the near bank and mark thereon by the cross-staff, the points  $C$  and  $D$  such that  $CA$  and  $DB$  may be at right angles to  $CD$ .

Mark off  $E$ , the middle point of the line  $CD$ .

Measure  $CG$  and  $EG$  in the direction of  $AC$  and  $BE$  respectively until they meet at  $G$ .

Measure off  $EF$  in the direction of  $AE$  and  $BD$  respectively until they meet at  $F$ .

Measure  $GF$  and it will be equal to  $AB$ .

*Proof:—*

In the triangles ECG and EDB, the angles ECG and GEC being respectively equal to the angles EDB and BED and the side EB being equal to the side ED, the side GE is equal to BE.

Similarly, in the triangles ACE and FDE, the side EA is equal to EF.

Now, in the triangles FEG, and AEB, FE and EC being equal to AE and EB respectively and the angle FEG being equal to the angle AEB, the side GF is equal to the side AB.

**PROBLEM No. 11.**

*To survey a small field covered with prickly-peer and unsuited for chain triangulation.*

Let ABCDEFGH be the field to be surveyed.

*First Method:—*(Fig. 49).

By forming a triangle round the field.

Form a triangle XYZ outside the field.

Take off-sets from the sides of the triangles to the field bends.

**NOTE:—**To facilitate the plotting of the village map, the points x, y and z should, if possible, be field trijunctions. Where this is not possible, the points selected should be field bends and they should each be connected by not less than three tie lines from the nearest field trijunctions.

*Second Method:—*(Fig. 50).

Run a line between two field trijunctions and offset the bends of the field in question.

**PROBLEM No. 12.**

*To find the height of a point on an inaccessible hill without the use of instruments.* (Fig. 50 A.)

Drive a picket 3 or 4 feet long at H, and another at L, where the top of a long rod FD is in a line with the object S from the point A (the heads of these pickets being on the same level); mark also the point C where the head of the rod is in the same line with S, from the top of any other picket B, and measure AF and BC; lay off the distance BC from F to b, and the two triangles ADb and ASB, are evidently similar, whence,

$$\frac{PS}{DF} = \frac{AS}{AD} = \frac{AB}{Ab} = \frac{HI}{HO} \quad \text{and} \quad \frac{AP}{AF} = \frac{AS}{AD} = \frac{AB}{Ab} = \frac{HI}{HO}$$

$$\therefore PS = \frac{DF.HI}{HG} \quad \text{and} \quad AP = \frac{AF.HI}{HO}$$

## Chapter II.

### SURVEY INSTRUMENTS.

#### *Chain.*

1. The chain is used for measuring distances required in a survey. There are three kinds of these instruments (i) the hundred feet chain, (ii) the sixty-six feet or Gunter's chain and (iii) the fifty feet chain. The hundred feet chain is the longest standard of the three given above, and is consequently more conducive to accuracy. It is employed in Engineering Surveys and Levels, because measurements are given in the usual unit employed by the Public Work Department viz., feet. In Survey Departments and especially in the Revenue Surveys, where extent of land and acreage is required, Gunter's chain is employed. It is sixty-six feet long and is divided into one hundred links, each link being  $66$  foot or  $7.92$  inches. It is convenient for measuring lands, as a square chain is equal to one-tenth of an acre. In Railway and Road work where miles and furlongs have to be marked, it is used, as ten chains equal to 1 furlong. The fifty feet chain is used in Engineering Surveys on hills, where a great deal of stepping has to be resorted to and a hundred feet chain will become unwieldy to use.

2. The feet chain is one hundred feet long, and is divided into 100 equal divisions, called "links", each link being one foot long. The links are usually made of strong iron or steel wire; about  $1/6$ th of an inch in diameter; each end of the link is bent round and joined to the next link by two or three small rings which render the chain less liable to twist and get entangled. The rings may be removed or more added when necessary. The last link at each end of the chain is shorter than the others, and has a swivel with a brass handle attached to it; and this handle, being counted as part of the link, makes its length the same as that of the others. The 100 links composing the chain are marked at every 10th link by pendants of brass with prongs to enable the surveyor to readily count the number of links measured.

The centre of the chain or 50th link is marked by a circular pendant while 10, 20, 30, 40 links counting from each end of the chain to the centre are indicated respectively by 1, 2, 3, 4 prongs cut on the brass pendants. These pendants are called the "*index marks*". In counting off the links in field, it must be borne in mind that the 20th link from one

end of the chain is the 80th from the other and the 40th from one end is the 60th from the other, and so on. (Figs. 50&51).

3. Each chain is provided with ten iron pins, called "arrows", by which to mark on the ground each chain's length as it is measured. The arrows are made of the same wire as the chain. They are about 12 or 15 inches long, and are pointed at one end so as to be easily driven into the ground, and turned at the other end so as to form a ring to serve as a handle.

4. As the chain is liable to stretch by use, it is of great importance that it should be tested daily.

5. To test the chain, stretch it pretty tightly on a level piece of ground and fix two strong wooden pegs at each end in the handle of the chain. Commencing from the outer edge of the handle at one end, lay down carefully the two standard rods, the ends touching each other; then, keeping the second rod stationary take up the first and place it beyond the second, touching it but not moving it; next, keeping that stationary, take up and place the second beyond it, and so on, until the end of the chain, or distance of ten rods, is reached. The total distance thus measured is the correct length of the chain.

6. This process will, where the chain is incorrect, necessitate the removal of the pegs at the other end of the chain to mark the correct chain's length. Smaller pegs should also, at the same time, be driven at the every tenth link, to denote the correct position of the index marks. This precaution saves the delay that would otherwise result, if the whole process were to be repeated daily.

7. The error in the chain is then rectified by removal and insertion of rings wherever necessary, so that the ends of the standard rods always coincide with the centres of the index marks as denoted by the aforesaid smaller pegs and with the outer ends of the handles at the two ends of the chain.

8. Before commencing his daily operation the surveyor should stretch out his chain between the stout pegs and see that the handles and index marks correspond with the pegs.

9. To measure a line, two men, a leader and a driver, are necessary. The rear chainman or driver is responsible for the direction and for the chain being straight. The front chainman or leader acts under the driver's order.



10. The leader grasps in his left hand the handle at one end of the chain and the 10 arrows with their points turned outward and proceeds in the direction of the line to be measured, while the driver remains at the starting point with the other end of the chain.

11. The driver then, by motion of his hand, puts the leader in an exact line with the forward flag and first shaking the chain, so as to get any knots or bends out of it, calls out "down", and holds both his hands on the ground both hands having hold of the handle of the chain, the handle touching the starting point.

12. The leader, when "down" has been called, adjusts the chain to make it quite straight and putting both his hands on the ground gives a steady pull on the chain, about as much as would lift 10 lbs., and then, freeing his right hand, draws one of the arrows out of the left hand and sticks it in the ground close to the handle of the chain. If the ground is hard, he makes a cross on the ground in the place he attempted to drive in the arrow, and lays the arrow across the mark.

13. When the arrow has been put in firmly or when a mark has been made, the leader rises, turns round, makes one step to the left of the direction in which he is going, and with his left hand throws the chain to the driver's left, so that it may be clear off the arrow when it is dragged to the front.

14. The leader then turns his left hand upwards so that the points of the arrows may still point outwards, and drags the chain steadily to the front towards the forward flag.

15. The driver rises when the leader rises and follows just fast enough to keep the chain a little loose and to prevent unnecessary drag on the hand of the leader. He should keep a sharp look-out on the chain and stop the leader if the chain gets entangled in anything. If the chain should be entangled, he steps forward and clears it; directly it is clear the driver calls "forward", and the leader moves on as before.

16. When the driver arrives within a pace of the arrow left by the leader, he calls out sharply "halt", on which the leader turns round and faces the driver directly, and if he is out of the line moves so as to be in a line with the driver and

the back flag. The driver motions with his hand any correction in the position of the leader that may be necessary, shakes the chain and calls out "down", as before.

17. The same process as before is gone through by the leader.

18. On the leader rising, the driver, holding the chain in his left hand, pulls up the arrow with his right and places it in his left hand with the point turned out.

19. When all the arrows in the leader's hand have been exhausted, the driver carries those in his hand to the leader, and counts them over audibly before delivering them to him. Every charge of arrows should be noted by the Surveyor.

20. On the leader arriving at the closing point, he invariably pulls the chain past that point till the driver calls "halt".

21. Neither of the chainmen should leave his position to come to the closing point.

22. The Surveyor sees how many arrows the driver has and counts them himself. The two numbers so counted should total ten.

23. The surveyor then reads the chain, and enters the result in his field book, thus:—the number of arrows in the hand of the driver (denoting so many 100 links) added to the old links on the ground, and the number of changes (denoting so many 1,000 links) will make up the entire length of the line between the two points. Care should be taken that 70 is not read as 30 and 60 as 40, as the index marks are the same for both.

24. The Surveyor should keep a continual watch over the chainmen while measuring lines. To do this, his position must be just in rear of the chain; but, occasionally, when chaining a long line, he should change his place to the front of the chain and see that the chain has not got out of the direct line.

25. When chaining boundaries with offsets, the leader must not move from his position till the surveyor orders "forward".

26. As the driver is the more responsible person of the two men, the more intelligent of them should be put on to do this duty. If inexperienced chainmen have to be employed the surveyor would do well to get them measure the distance

between any two points, and then remeasure it in the opposite direction. The difference of the two results ought to impress upon them the necessity for great care in chaining.

27. It often happens that a surveyor has to conduct his measurement up or down hill slopes or on land with marked undulations. It should be clearly borne in mind that the distance to be measured between two stations is horizontal and not the actual distance along the surface. When therefore the ground is uneven, the process described hereunder should be followed.

#### *Descent.*

(a) In descending a slope, the follower should hold one end of the chain at the starting station. The leader should hold a convenient part of the chain raising it a few feet over the ground on which he stands so as to keep it as nearly as can be judged horizontal. Holding the point of an arrow in the other hand, he should drop it vertically, making a mark on the ground where the arrow falls. He should wait till the follower reaches him, taking care not to let go the point in the chain at which he dropped the arrow. The follower then takes charge of the chain at the same point and the process is repeated as often as necessary till the bottom of the slope is reached. (Figure 52).

The sum of all these horizontal distances will be the total horizontal distance of the slope. This process is called "stepping" or "levelling" or "breaking" the chain. In the figure the process described above was repeated three times and the total horizontal distance between A and B is 72 links.

#### *Ascent.*

(b) In ascending slope a very similar process is performed. The follower holds one end of the chain vertically over the starting station at a convenient height and directs the leader who goes some distance up the slope until the chain or a portion of it is stretched horizontally. He then drops a pebble vertically over the starting station. If the pebble falls exactly in the middle point of the station, he instructs the leader to make a mark on the ground. If not, he signals to him to draw up or give in the chain until the pebble falls on the correct point. This process is repeated until the whole slope is measured. It is much easier to measure down, than to measure up a slope.

#### *Cross-staff.*

1. When the boundary of a survey has bends in it, as is generally the case, the best method of fixing the bends is to

run long straight lines from one principal bend to another and, when opposite to each bend, to measure the perpendicular distance, termed the "offset", from the bend to the chain line. The point at which the perpendicular from the bend meets the chain line is determined by the cross-staff.

2. The cross-staff consists of a block of wood, about 4 inches square and 2 inches in thickness, fixed on the end of a staff, 5 feet long, with an iron spike at its other end, for the convenience of planting it firmly in the ground. The square piece on the top, called the head, has two grooves *AB* and *CD* in it, about half an inch deep, at right angles to and cutting each other in the centre. (Figure 53).

3. The cross-staff being placed at any point on the chain line, if one groove be directed to the forward or back station, the other will give the direction of the perpendicular to the chain line at that point.

4. To test the accuracy of the cross-staff, set it firmly on the ground, noting two well-defined objects, one through each groove. Then turn the head of the cross-staff a quarter round so that the two grooves change places. If the said two objects still appear intersected through the grooves now directed towards them, the cross-staff is correct and not otherwise.

5. Incorrect cross-staves cannot be rectified and should be rejected.

#### *Offset Pole.*

1. The offset pole is a straight bamboo, generally 10 links long, with notches cut on it to mark the links and with iron ferrules at both ends. (Figure 54).

2. It is used to measure offsets, *i. e.*, perpendiculars to the chain line from bends on a boundary.

3. The distance between the bend and the point on the chain is measured by one man by laying the offset pole flat on the ground with one end touching the starting point and the other end pointing directly to the closing point. Having thus measured the distance of one offset pole, the man raises the end of the pole at the point from which the measurement starts keeping the forward end on the ground; and turning the pole over again lays it on the ground in the required direction, so as to measure a second distance of an offset pole in length.

4. This process is repeated by the man until the whole distance has been measured. Each time that he causes the

poles to revolve, he should call out the number of offset poles measured by him.

5. Care should be taken that the offset man lays the pole horizontally on the ground each time. It will be found that, in order to avoid stooping and to be able to measure more quickly, the offset man will, unless looked after, turn over the pole at some distance from the ground thereby causing the offset measurement to appear longer than it ought to be.

6. For measuring offsets exceeding one chain, the chain should be used and not the offset pole.

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### *Theodolite.*

1. The Theodolite is about the most intricate and the most accurate angular instrument, that an ordinary surveyor may be called upon to use ; a thorough knowledge, therefore, of its various parts and how they gear together is essential to obtain all the accuracy that the instrument is capable of, with the least possible wear and tear.

2. In principle the Theodolite consists of a telescope furnishing a line of aim and capable of sighting objects at a distance ; the telescope has two distinct motions, one in a horizontal plane and the other in a vertical plane. The motion in the horizontal plane is measured by a set of verniers attached to the telescope and moving on a graduated horizontal circle. The motion in a vertical plane is measured on a graduated vertical circle by two vertical verniers attached to the Telescope ; or if the verniers are not attached but fixed independently, as is more frequently the case, the graduated vertical circle is attached, and the relative motion of the verniers and the graduated circle measures the motion of the telescope in a vertical plane.

3. There are different patterns of theodolites, *viz.*, the " Y pattern ", the " Everest " and the " Transit " etc. (Figs. 55, 56 and 57).

4. In revenue survey the Everest and the Transit Theodolites are generally used. The " Y " pattern theodolite is not very much used.

5. The difference between the Everest theodolite and the Transit theodolite is that, in the latter, the telescope can be rotated vertically end for end, the vertical circle is complete and is graduated through-out its circumference and both the horizontal limb and the vertical circle are graduated to a greater degree of minuteness.

6. The following is a detail description of the construction of the Theodolite. The figures are mainly progressive and show the various parts of the instrument as it is built up from the lower parallel plate, which screws on to the head of the stand, to the telescope which surmounts the instrument.

A *six-inch Transit Theodolite* has also been chosen for description here, as it is the most elaborate of the ordinary types of Theodolite, *viz.*, the "Y", the "*Everest's Double Arc*", and the "*Transit*".

7. The Theodolite may be described as consisting of two main parts, the lower and the upper. (Figure 57)

#### *Lower Parallel Plate.*

8. Fig. 58 shows the lower parallel plate of a six-inch Transit Theodolite. It has a circular flange and the boss of it is bored out to a dome section on top and a female screw is tapped on the lower part of the boss to screw on to the head of the stand.

#### *Upper Parallel Plate.*

9. Fig. 59 shows the upper parallel plate in gear with the lower. The circular flange is drilled to receive the foot screws and the boss has a conical hole bored through the centre to receive the vertical axis of the limb. The stem of the upper plate is rounded off at the bottom to form a ball and socket joint with the lower plate.

#### *Foot Screws.*

10. Fig. 60. The foot screws in two pairs work with their feet against the lower parallel plate in socket pieces driven into the holes for them in the flange of the upper plate. When the foot screws get slack and worn, fresh socket pieces newly tapped may be substituted for the worn out ones. By means of these screws the vertical axis of the limb can be set truly vertical.

#### *Vertical Axis of the Limb or Body Piece.*

11. Fig. 61 shows the body piece with its vertical axis truly fitting the conical bore in the boss of the upper parallel plate, and having itself a conical hole down the centre of its axis to receive the vertical axis of the vernier plate, or the central vertical axis as it is called. The circular flange at the top is tapped for four screws by which it is firmly fixed to the limb.

*Lower Clamp and Tangent.*

12. Fig. 62 shows the clamp *c* and tangent *t*. The clamp can be tightened or loosened round the axis of the body piece by a winged-head screw. The clamp is connected with the upper parallel plate by a tangent screw the bearing of which is screwed to the plate. The tangent works in a nut attached to the clamp. When unclamped, the body piece and limb it carries, can revolve freely on their vertical axis; and if the tangent be worked, only the clamp would rotate to the extent that the nut attached to it works on the tangent screw; but when clamped the motion given to the clamp by the tangent is also partaken of by the axis of the limb and body piece. This motion is of course slow, as it is measured only by the drive of the tangent in the nut attached to the clamp. By means of the clamp and the tangent, the body-piece and limb may be revolved on their vertical axis, brought to a stop or given slow motion to. The bearing and nut in which the tangent works revolve in a horizontal plane and so adjust themselves to the direction of the tangent screw and prevent any bending stress coming on the tangent screw which should be perfectly straight.

**THE LIMB.**

13. Fig. 63 shows the limb attached to the body piece by four screws. The limb is a brass circular plate, the outer edge of which is bevelled at an angle of  $45^\circ$ . This is covered with sheet silver, turned true, and graduated by machinery very accurately to degrees,  $\frac{1}{2}^\circ$  or  $\frac{1}{3}^\circ$ . The limb is fixed to the body piece so that the vertical axis of the latter is a true normal to the plane of the limb at its centre. The outer edge of the plate is under-cut at bottom to receive and guide the clamp which clamps the vernier plate to the limb. When the vertical axis of the limb is set truly vertical by means of the foot screws, the limb is horizontal and revolves in a horizontal plane.

**LOWER HALF OF THE INSTRUMENT.**

14. Fig. 63 completes the lower part of the instrument and before proceeding further let us see how the parts of the instrument so far as described gear together. By means of the stand and foot screws the upper parallel plate may be so tilted as to make the vertical axis of the limb truly vertical and consequently the limb horizontal. The limb can be revolved in a horizontal plane, stopped by the clamp or given slow motion to by the tangent.

### VERTICAL AXIS OF THE VERNIER PLATE.

15. Fig. 64 shows the central vertical axis on which is performed the motion of the verniers and telescope in a horizontal plane. This axis is conical and fits perfectly in the bore of the axis of the limb for about half an inch at the top and bottom of its length. The central portion is chambered back to reduce the frictional surface of contact. It has a shoulder turned on top by which it rests on the vertical axis of the limb and is prevented from being drawn out of its bearing by a washer and screw at bottom. A hook for a plummet line to centre the instrument on a station point is screwed into the head of the screw, or an eye drilled vertically through the screw. It is absolutely essential that the bore in the boss of the upper parallel plate, the vertical axis of the limb, both externally and internally, and the vertical axis of the vernier plate should all be turned perfectly concentric, and should fit perfectly to allow of no other but a turning motion in a horizontal plane *on a common central vertical axial line.*

### VERNIER PLATE.

16. Fig. 65 shows the vernier plate attached by four screws to the flange at the top of its vertical axis. It has two or three verniers denoted A, B and C screwed to it and sprung down to gently touch the graduated circle of the limb. The verniers are silvered like the limb and set at the same angle and graduated to read  $\frac{1}{2}$  minutes or 20 seconds. To this plate is attached two reading microscopes set normal to the plane of the verniers and capable of adjusting their distance from the vernier by slipping in or out of collars in which they are set.

### VERNIER CLAMP AND TANGENT.

17. Fig. 66 There is a threaded nut which overhangs from a bracket piece attached to the vernier plate and a bearing carried on the clamp through which the tangent screw works. The tangent is therefore the link that connects the clamping pieces to the vernier plate. The clamp consists of two pieces which are cut to fit the circular edge of the limb and which are made to bite on to it by a mill-headed screw which passes through both of them and brings them together against a square shoulder turned on its shank. When unclamped, the vernier plate is free to revolve and drags round with it the clamp and tangent and if the tangent be worked, the clamp moves relatively to the vernier plate; but when clamped, the only relative motion between the vernier plate



and the limb is through the tangent screw, and that, to the extent to which it may be worked. The nut in which the tangent works is a split nut the tightness with which it works on the tangent may be regulated by a cross screw which passes through the lips of the split.

#### THE BOX COMPASS.

18. Fig. 67 shows the compass box fixed to the vernier plate by means of four screws. For a detailed description of this vide chapter on magnetic surveying. The North and South line of the compass box is set at right angles to the transit axis of the Telescope.

#### STANDARDS OR A-FRAMES.

19. Fig. 68 shows the standards or A-frames which carry the Telescope and which are screwed on firmly to the vernier plate and compass box. The standards have 2 Y's cut at their top, which receive the transit axis of the Telescope. One of the Y's is in some of the best instruments made in a separate piece moveable vertically by means of a pair of adjusting nuts, which work on a screw at the bottom of the Y piece. By means of a strident level which is placed on the trunions of the transverse axis of the Telescope, the axis may, by raising or depressing the moveable Y, be adjusted at right angles to the vertical axis of motion. The standards also have two tongue pieces on their inner face about 2" from the vernier plate to which the clipping arm that carries the vertical verniers may be clamped.

#### SPIRIT LEVELS.

20. Fig. 69 shows two spirit levels one attached to the vernier plate and the other across one of the A-frames a little above the vernier plate. The ends of the levels or bubble tubes as they are called are adjustable by means of capstan-headed screws. By means of these levels, which are at right angles to each other, the vertical axes of motion are set truly vertical and consequently the limb and vernier plate horizontal.

#### TRANSIT AXIS OF THE TELESCOPE.

21. Fig. 70 shows the transit axis of the Telescope revolves in a vertical plane. The ends of the axis are turned perfectly true and ground to the same diameter, so that they may be reversed end for end in the Y's without altering the direction of the axis. The boss in the centre receives the Telescope tube to which it is soldered, the optical axis of the

telescope being set at right angles to the transit axis. A hole is drilled through the centre of transit axis at one end to admit a ray of light from a lamp on to a small reflecting disc screwed in to the centre of the Telescope from the bottom. To a flange on the opposite side of the axis is attached the vertical circle by 3 or 4 screws. The axis is secured in the Y's by locking pieces and clamping screws. Owing to the weight of the vertical circle and verniers being nearer one trunnion than the other, a counterpoise weight is some times put on the other side.

#### VERTICAL CIRCLE.

22. Fig. 71. The vertical circle has its graduated rim carried on 4 arms that radiate at  $90^\circ$  from the central boss. The graduated rim is silvered and graduated to  $\frac{1}{2}^\circ$  or  $1/3^\circ$ , as in the case of the limb and the verniers attached to it read to  $\frac{1}{2}$  or  $1/3$  minutes. The circle is graduated from a zero line, which is fixed parallel with the optical axis of the Telescope, up to  $90^\circ$  to the top and bottom of the zero line, the limit of a vertical angle being  $90^\circ$ . The plane of the circle is set normal to the transit axis. A flanged collar fitted round the boss of the vertical circle is fixed with it by screws to the flange turned on the transit axis. This collar receives the boss of the arms of the verniers and of the clips.

#### VERNIER AND CLIPS.

23. Fig. 72. The centre line of the vernier arms which are fixed to the clipping arm by 3 screws, is set at right angles to the centre line of the clipping arm. The verniers are bevelled and silvered and graduated as in the case of the verniers attached to the vernier plate on the horizontal limb. To the clipping arm is attached a bearing in which the tangent screw works, and two slots in the clipping arm give room for the play of the tangent nut attached to the clamp end of the clamping screw. The bottom of the clipping arm is bifurcated and terminates in two nuts through which the clipping screws bite on to one of the tongue pieces which protrude from the A-frames.

#### *Microscopes.*

24. Fig. 73. These are two in number carried by two arms which radiate in a straight line from a central boss working round the transit axis in front of the verniers. The distance of the microscopes from the vertical circle and the verniers is regulated by collars fixed in the arms,

in which the microscopes slide and can be adjusted to get a clear reading. A flange collar fixed to the transit axis by three or four tiny screws fits against the boss of the microscope arms, keeping them in their place and acting as a guide.

#### *Vertical Clamp and Tangent.*

25. Fig. 74. These are similar to the clamp and tangent attached to the vernier plate. When the vertical circle is unclamped the clamp alone works up and down on the tangent screw to the extent to which the latter is turned. When the circle is clamped and the tangent worked, the clamp carries with it the vertical circle giving a slow motion between the clipping piece and the verniers attached to it, and the vertical circle and telescope to which it is screwed.

#### *Telescope.*

26. Fig. 75 shows in detail the various parts of the Telescope. The Telescope consists of two tubes perfectly cylindrical the one fitting in the other exactly. The inner tube carries the object glass or lense shown in section, the outer carrying the diaphragm. At the diaphragm end is fixed the eye piece, a microscope capable of sliding in or out and making the webs on the diaphragm clearly visible. The object glass is driven forward or backward, in focussing the Telescope, by a pinion working in a collar—attached by 4 small screws to the outer Telescope tube, and gearing with a rack soldered to the inner tube. The diaphragm is held and adjusted in the outer tube by 4 capstan-screws in two pairs at right angles to each other working in slots in the outer tube and capable of moving the diaphragm up, down or side-ways and of admitting also of a slight revolving motion. The eye piece slides in or out of a socket screwed into a cap covering the diaphragm. By adjusting the eye piece the webs are made clearly visible. The object end of the telescope is fitted with a ray shade and swivel cap. The lense consists of two glasses one plano-concave and the other, in front of it perfectly fitting, convex on both faces.

#### *Principle Level.*

27. Fig. 76. The principle level is shown in Fig. 19, and is mounted on the telescope. It is adjusted by a pair of nuts at either end, one on either side of a tongue piece at each end of the bubble tube. Two screws fixed on the

Telescope at either end pass through the tongue piece and the nuts by means of which either side of the bubble tube may be raised or depressed on the screw to the extent required.

#### *Lantern.*

28. Fig. 77 shows a small bull's-eye lantern which sends a ray through the bored transit axis of the telescope on to a reflector which is screwed in through the bottom of the telescope and by means of which the cross hairs on the diaphragm are illuminated for observations at night. The lantern is set on a tray let into the A frames.

#### *Dark Glasses.*

29 Fig. 78.—These are provided to fit on the eye-piece for observations of the sun.

#### *Strident Level.*

30. Fig. 79 shows a level mounted on two standards the lower ends of which are cut to a V shape to admit of the level being placed astride on the pivots of the transit axis. The bubble of this level is adjustable by capstan screws which raise or depress one and or give lateral motion to the bubble tube at the other. By reversing this level on the pivots the transit axis can be tested and set by the moveable Y truly at right angles to the vertical axis of motion.

#### *Upper Half of the Instrument.*

31. Fig. 80.—This completes a description of the upper half of the Theodolite. Let us see how these parts gear together and with the lower half. If the vertical axis of the theodolite be set truly vertical by means of the foot screws, the vernier plate resolves on the limb in a horizontal plane, and as it carries the telescope above, the motion of the telescope in a horizontal plane can be measured by the relative motion of verniers on the limb. The motion in this plane can be set free, stopped, or slowed by means of the upper clamp and tangent screw. By the adjustment of the Y's the transit axis of the telescope can be set at right angles to the adjusted vertical axis, so that the motion of the telescope on its transit axis may be in a vertical plane. This motion again can be measured on a vertical circle attached to the telescope by means of a pair of verniers attached to the standards by the clips. Again by a clamp and tangent

action this motion can be freed, stopped or slowed. The verniers may also be so adjusted by the clips that when the line of aim or collimation of the telescope is horizontal, the verniers may read zero on the circle. The line of aim in the telescope is itself adjustable by shifting the diaphragm by the collimating screws. If the line of collimation be set at right angles to the transit axis of the instrument, it will describe a vertical circle. The principal level is also adjustable and may be set parallel to line of collimation in the telescope.

32. A *Theodolite* measures the angle in a horizontal plane subtended by two or more objects at various elevations. It also measures the relative elevations or vertical angles subtended by these objects above or below a horizontal plane.

33. These are done by two distinct motion of the line of aim in the Theodolite, one in a horizontal plane and the other in a vertical plane. Corresponding to these two motions of the line of aim, there are two axes, the vertical axis on which the motion in a horizontal plane is performed and above it, the horizontal or transit axis on which the motion in a vertical plane is performed.

34. The vertical axis should therefore be truly vertical and (2) the transit axis truly horizontal, (3) the line of collimation or aim should also be at right angles to the transit axis, (4) further, considering that vertical angles have to be measured from a horizontal plane, the verniers should be so set, that when the line of collimation is horizontal, the verniers read zero on the vertical circle attached to the telescope.

35. The manipulation of the following parts of a theodolite, used in the adjustment of the instrument will be useful.

- (i) Stand.
- (ii) Foot Screws.
- (iii) The Lower Clamp and Tangent.
- (iv) Upper Clamp and Tangent.
- (v) Screws at the end of lower bubble tubes.
- (vi) Capstan nuts of the moveable Y.
- (vii) The Clipping screws.
- (viii) Vertical tangent and clamp.
- (ix) Collimating screws.
- (x) The nuts at the ends of the level mounted on the telescope.

36. The adjustments of a Theodolite are of two kinds :—(1) *Permanent*, which are only needed when the instrument has newly come into the hands of the surveyor or when he has reason to suspect the displacement of the adjustments, (3) *temporary*, which are necessary every time the instrument is set up for use.

37. The temporary adjustments of the theodolite are :—

- (a) Centering ;
- (b) Horizontal Levelling ;
- (c) Vertical Levelling ;
- (d) Obtaining distinct vision of the wires and eliminating parallax, or focussing.

38. *Centering*.—Place the tribed stand over the station of observation, with its legs wide apart, so as to give a firm base, and with its head as nearly level as the eye can judge, so as to avoid bringing undue strain on foot-screws ; suspend the plummet by the string from the hook at the bottom of the instrument and, by moving the legs of the stand, bring the plummet exactly over the plummet hole on the top of the station, observing at the same time that the theodolite continues to be roughly level.

In the latest pattern of theodolite, final centering is facilitated by what is called the self-centering arrangement which admits of the tribrach system being mounted to allow of lateral movement of the whole instrument and of being clamped when the desired position has been reached.

39. *Horizontal Levelling*.—Place the horizontal level parallel to any two foot screws, and bring the bubble to the centre of its run by moving them both either inwards or outwards according as the bubble should move either to the right or to the left.

Then turn the instrument 90° in azimuth or a quarter round. If the bubble is not in the centre, bring it to the centre by moving the third foot-screw inward or outward.

Then bring the instrument to its first position and if the bubble does not continue to be in the centre, the instrument must again be levelled by means of the first two foot-screws.

The above process should be repeated until the bubble remains stationary in the middle during the whole revolution. If it does not, it indicates that the horizontal level requires permanent adjustment.

40. *Vertical Levelling*. The horizontal levelling being complete, the vertical levelling can be completed by bringing

the bubble of the vertical level approximately into the centre of its run by the clips and then proceeding exactly as described in the preceding rule. If the bubble does not remain steady, in whatever direction the telescope may be pointed, it indicates that the vertical level requires permanent adjustment.

41. *Eliminating parallax and obtaining distinct vision of the wires.*— This adjustment consists in bringing the rays of light from the object-glass and the eye-piece to meet at a common focal point on the diaphragm. If the rays do not come to a point as the diaphragm, then the object observed would appear indistinct, and to change its position in relation to the wires as the eye is moved. To effect this adjustment, turn the mill-headed screw of the eye-piece until the threads of the diaphragm are seen sharply defined against the sky, point the telescope at some well-defined distant object, and bring to the proper focus of the mill-headed screw near the object-glass.

To test the accuracy of this adjustment, intersect the object accurately by using the tangent screws, with the centre of the wires in the diaphragm. Now move the head laterally at the same time watching the intersection of the object with the wires which should remain steady if the adjustment is perfect.

42. The permanent adjustments of the Theodolite are:—

- (a) Setting the horizontal level parallel to the horizontal plate to indicate the verticality of vertical axis ;
- (b) Collimating in azimuth ;
- (c) To make the vertical and horizontal wires respectively vertical and horizontal ;
- (d) Setting the vertical level parallel to the zero of altitude of the vertical arcs, and determination of value of one division of the level scale.

43. *Setting the horizontal level.*—After levelling the instrument as described above, place the level parallel to any two foot screws and by turning them both inwards and outwards, bring the bubble to the centre of its run. Then turn the upper plate  $180^\circ$  in azimuth, *i. e.*, half round so as to bring the level over the third foot-screw. If the bubble is then in the centre of its run, the level is correct, if not the bubble must be brought to the centre by correcting half the difference by the same foot-screws and the remaining half by the capstan-headed screws at the ends of the level.

Again turn the upper plate  $180^\circ$  in azimuth, *i. e.*, bring it to its first position. If the bubble does not continue to be in the centre, repeat the process as before until the bubble occupies the centre.

Occasionally, turn the upper plate a quarter round, *i. e.*,  $90^\circ$  and adjust the level by the third foot-screw alone.

44. *Adjustment for collimation in Azimuth.*—A Theodolite is said to be collimated in azimuth, when the line of collimation, *i. e.*, the imaginary straight line joining the intersection of the wires and the optical centre of the object-glass, cuts the transit axis or axis of vertical motion at right angles.

In the figure 81 let  $tt$ , represent the transit axis, then when the line of collimation, which for shortness call  $c$ , coincides with the perpendicular to  $tt$ , or the line  $PP_1$ , the instrument is in collimation; and if the telescope be made to describe a semi-circle in its  $Y$ 's, its line of collimation produced will pass through the zenith, describing a great circle. But if  $C$  be represented by  $OW$ , then the semi-circle traced out will be represented by  $OO_1$ , the false zenith being  $Z_1$ , while the arc described will be that of a small circle. In other words, by changing face, the object end, or  $O$  will arrive at  $O_1$ , while the wires  $W$ , will describe a similar small circle and reach  $W_1$ . Whence if any object on the horizon give a horizontal reading at face left of  $A^\circ$ , and then the pivots of the instrument be changed and the telescope be turned sufficiently in azimuth to intersect the object, the two readings thus obtained will disagree by  $OW_1$ . The error in collimation will, therefore, be  $\frac{OW_1}{2} = OP$ .

45. *The two methods of collimating in azimuth* generally in use are :—

(a) *By changing pivots.*—The process would be used for all small theodolites, the telescope of which cannot revolve through a complete vertical circle.

(b) *By changing face.*—Applicable to transit theodolites whose telescopes can revolve through a complete vertical circle.

*Collimating by changing pivots.*—Throw open the cleats and see that the clip-screws of the index arm are barely biting their shoulder and no more. Intersect the object azimuthally, and note the reading, taking care that the clamps are holding firmly. Next release the clip-screws,



raise the telescope gently and revolve the transit axis through  $188^\circ$  so that the level comes underneath, leaving the index arm and clip-screws upwards. Re-place the telescope gently with the pivots changed and with the object-glass still pointing towards the object.

If the wires in the second position of the telescope still intersect the object, the instrument is in collimation ; if not, complete the intersection by the tangent screw of the upper plate and note the second reading.

Set the instrument to the mean of the two readings, and then, looking into the telescope, move the diaphragm by its collimating screws until the wires again intersect the object. Repeat the process until the intersection becomes constant on changing pivots, remembering that half the apparent is the real error.

*Collimating by changing face.*—Intersect and note the reading of any fixed object, change face, intersect and read again. The two readings should differ by exactly  $180^\circ$ . If they do not, the error is corrected as above.

In collimating by changing face, any errors that may exist in the graduation of the limb are involved in the process. In collimating an instrument it is desirable that the object selected for intersection should be at such a distance that the object glass be set to the focus which will be employed during the subsequent observations, as the line of collimation is liable to be distorted when the focus is altered.

46. *To make the vertical and horizontal wires respectively vertical and horizontal.*—As the correct positions for these wires are cut on the diaphragm by the maker so that the lines cut each other at right angles, it follows that to adjust one wire is to adjust both.

Level the instrument with care, intersect any small well-defined object with the vertical wire, and see if it continues bisected along the wire when the telescope is moved in a vertical plane. If this is not the case, the collimating screws must be slaken sufficiently to allow the diaphragm to be revolved until this condition is secured, when they must be again tightened. It will now be found that the horizontal wire, if properly placed by the maker, will continue to bisect an object on which it has been placed when the instrument is turned in azimuth.

47. *Setting the vertical level parallel to the zero of altitude.*—After having performed the two previous permanent adjustments, bring the bubble of the vertical level into the centre by means of the clip screws, intersect an object and read the vertical angle.

Change face, level the instrument as before, intersect the object and read again the vertical angle.

If there is no difference between the two readings, the vertical level is correct. If there is a difference, take the mean of the readings and set the vertical vernier to that quantity by the vertical tangent screw. The object will now be above or below the intersection of the wires and intersection must be made by means of the clips.

The resultant dislocation of the bubble must be corrected by the capstan-headed screws of the vertical level and the process must be repeated until an identical reading of the vertical angle is obtained on both faces.

*Determination of value of one division of the level scale.*—By means of the clip-screws move the bubble up to one end of its run, say, towards the object end, so that the object end of the bubble corresponds approximately with the extreme reading of the scale. Intersect with the wire some convenient object for observing. Read and record one end of the bubble, say, the object end, and the vertical angle. Now, by means of the clip-screws, bring the bubble back towards the eye and as far as possible, taking care that it is really floating and within the graduations of the scale. Re-intersect the same object as before, and record the vertical angle, and the reading of the object and of the bubble in its new position. The difference between the two readings on the arc brought to seconds, divided by the difference of the two readings of the object end of the bubble gives the value of one division of the level in seconds of arc.

Thus :—	<i>Object end of bubble divisions.</i>	
	<i>Elevation.</i>	
First Observation ...	7°-3'-28"	16
Second Do. ....	7°-0'-00"	6
Difference ...	0°-3'-28"	12
Value of one division ...	208/12 = 17.3"	

The operation must be repeated several times to get a good mean value.

The bubble of a level is very susceptible to changes of temperature (cold lengthens and heat contracts it). So care must be taken that it is not exposed to such changes while this operation is being performed. Should there be any chance of the bubble altering its length while determining the value of a division on the scale, it will be necessary to read and record both ends of the bubble.

48. *To apply level correction to theodolite vertical angles.*—The readings of both ends of the bubble must be recorded for each observation. To apply the correction the rule is as follows. Divide the difference between the sums of the readings of the object end (*O*) and eye end (*E*) by the *total* number of readings, and the result will be the dislevelment in terms of divisions of the scale. Multiply this result by the angular value of one division of the scale found as above, and the result is the angular correction for dislevelment to be applied to the mean vertical angle. If the readings of the eye-end are in excess, the correction must be subtracted from an elevation and added to a depression. If those of the object-end are in excess, the procedure is reversed.

49. Before observing an azimuth it is necessary to level the theodolite with great care. The following method gives better results than that described above, which is however accurate enough for ordinary purposes.

*To level the Theodolite.* Bring the three levelling screws to about the middle of their run and level the instrument as nearly as possible by the legs. Unclamp the upper plate, place it so that one of the levels, is in a line with two foot-screws, and bring it to the middle of its run by these two foot-screws, then bring the other level, at right angles to the first, to a central position by turning the third foot-screw. Instead of the second level the first one only, can be used if necessary by levelling it over two screws and then turning the instrument through  $90^\circ$ , and levelling it again with the the third screw. *Next with the clip screws-alone*, bring the long level on the vernier arm into such a position that both ends of it can be seen when the instrument is turned round in any direction. All this, so far, is preparatory to the final and accurate levelling which is now effected by the long level on the vernier arm, as follows:— Place this level over two foot-screws, and by these bring it exactly into the middle of its run noting the divisions, at which the level stands when it is central. Next turn the level through  $180^\circ$  and note

how many marks it is out of its central position. Bring it back to the centre of its run, half by turning the clip-screws and half by the two foot-screws used before. Now turn the instrument through  $90^\circ$  and bring the level again exactly to the middle of its run by the third foot-screw. Repeat the process if necessary until the instrument is level in any position.

50. *How to read an angle on the horizontal limb.* The horizontal limb of a theodolite is a complete circle with its circumference divided into 360 equal parts called degrees. Each degree is again divided into two, three or six equal parts, according to the size of the instrument, 5-inch Theodolites being generally graduated to half degrees and 6 and 7-inch Theodolites to one-third and one-sixth degrees. Every tenth degree on the limb is marked by figures, every fifth degree by a dot, every degree by a long line and fractions of a degree by short lines. The  $0^\circ$  or  $360^\circ$  is called the zero of the limb.

To ascertain the exact measure of angle to a minute or less on the limb, recourse should be had to the vernier. The length of a vernier in a 5-inch Theodolite which reads to half degrees is made equal to 29 of the divisions of the horizontal limb and it is divided into 30 equal parts, each part being, therefore, equal to  $29/30$  half degree. *i. e.*, 29 minutes. There is consequently a difference in length of one minute between a division on the limb and a division on the vernier. This difference indicates that an angle can be read off to a minute, although the limb is graduated only to half degrees. If the zero of the vernier, which is marked by an arrow, be moved from the zero of the limb, then the first coincidence that takes place of a division of the vernier with a division on the limb indicates the number of minutes passed over. Suppose the zero of the vernier to be set to any part of the horizontal limb, the degrees and half degrees are first read off. If the arrow coincides exactly with any of the divisions on the limb, the angle will be the degrees and half-degrees reckoned up to that division. If not, look along the vernier-plate and see where a division on that plate coincides with a division on the limb. The division on the vernier will indicate the number of minutes to be added to the angle read off on the limb.

In the above diagram, the arrow of the vernier is between the divisions which indicate the reading to be between

$36^\circ$ ,  $30'$  and  $37^\circ$ . The sixteenth division on the vernier is coincident with a division on the limb. The angle will therefore be  $36^\circ 30' + 16' = 36^\circ 46'$ .

Similarly where the limb is graduated to read  $20'$ , 59 such divisions are divided into 60 on the vernier to enable  $20''$  to be read off, or 39 such divisions are divided on the vernier into 40 parts to read of  $30''$ . Generally, if  $a$  be arc measure of one division of the limb and the united distance of  $N$  such divisions be taken of on the vernier, then one division on the limb-one division on the vernier  $-\frac{a}{N+1}$  in arc.

51. *How to observe a horizontal angle.* Having performed the temporary adjustments, intersect the back station remembering that the circuit being surveyed should always be to the left of the observer. Record the reading, unclamp the upper plate, intersect the forward station and record the reading. The difference between the two readings will be the angle required. The process must be repeated if the second angle obtained differs from the first by more than the minimum graduation of the theodolite and continued until angles in agreement are secured.

When reading vertical angles adopt that set of numbers increasing from zero on the limb to zero on the vernier.

52. *To read the micrometer of the Theodolite.* After having made contact on an object on the central cross wires of the Telescope in the usual manner with the tangent screw, look through the microscope of the micrometer and notice the position of the "V" shaped indicator "A" which serves the same purpose as the arrow on a vernier.

53. In the case shown, it is clear that the reading is somewhere between  $9^\circ 30'$  and  $9^\circ 40'$ . Next turn the mill-headed screw, attached to the micrometer drum,  $e$ , until the two fine wires,  $c$ , are made to include exactly the ten-minutes division of the arc scale preceding the indicator,  $a$ , (*i. e.*, the division reading next *less* than the indicator,  $a$ ) which in this case would be  $9^\circ 30'$ . Now, read the minutes and seconds on the drum of the Micrometer, which, added to the  $9^\circ 30'$ , giving the reading required. The complete reading in this case would be  $9^\circ 35' 15''$ . The Micrometer is so arranged that one complete turn of the drum equals  $10'$ , or in passing the wires,  $c$ , from one ten minutes mark on the scales to another, the drum is turned exactly once round.

54. *To adjust the Micrometer.* When the "V" shaped indicator, *a*, is exactly opposite a whole degree or ten-minutes mark, and the wires are made to include this mark, the reading on the drum should be "0". See, if this is the case, and if not, make the drum read 0 by unclamping the screw, *f*, which clamps the drum, and turn the drum, being careful to clamp it firmly again after the adjustment has been made. It is perhaps as well for the *B* Micrometer to read a few seconds more than the *A*. Sometimes the indicators themselves are out of adjustment. To test this, set the indicator of the *A* Micrometer to a whole degree mark on the arc, and then see if that of the *B* Micrometer reads a whole degree, or a difference of exactly  $180^{\circ}$ . If it does not, it must be made to by the small screw arranged for the purpose under the Micrometer. Before moving this screw it is necessary to slacken the screws fastening the eye-piece and the part of the Micrometer carrying the indicator, *a*, to the rest of the instrument.

55. *How to find the true bearing of a line by observation to the sun.* The Theodolite should be set up over a village trijunction and levelled as directed above. The observation should be confined to a single line at the end of which is the referring object R. O. This R. O. should be about a mile distant. The following is the method. Intersect R. O. left face and read and record horizontal angle on both verniers.

Turn telescope to sun, fix dark glass, and place sun in first quadrant of the diaphragm. See illustration.

Take time when the sun's disc is tangential to both wires read and record, positions of both ends of the bubble of the vertical level, and the vertical and horizontal angles on both verniers. Do the same with the sun in second quadrant. Remove dark glass and intersect R. O., again to see there has been no movement of the instrument. Turn Telescope to right face, intersect R. O., replace dark glass and repeat observations with sun in third and fourth quadrant, remove dark glass and close on R. O. Then read by repetition angles between R. O. and back and forward stations. Record angle observation in the form given below.

Three sets of observations must be taken.

56. The form below shows how the readings taken during an observation for azimuth should be recorded.

## Survey Party.

### RECORD OF OBSERVATION FOR AZIMUTH OF LINE.

Mean time of observation

Object observed : Sun

Approximate Latitude N.

Approximate Longitude E.

Magnetic bearing.

Forward angle.

Back angle.

Forward distance.

Back distance.

(Value of one division of level, 10")

Parent no. or object.	Face.	Vertical angles.						Level.		Watch Time, T.	(Horizontal angles for azimuth only.)												
		Vernier C.		Vernier D.		Mean of C. & D.		E.	O.		Vernier A.		Vernier B.		Mean of A. & B.		Ang. difference of R. O. and sun.	Mean of pairs with R. O.		Mean of Faces.			
		°	'	°	'	°	'	°	'		°	'	°	'	°	'	°	'	°	'	°	'	
L. O.	L	...	...	...	...	...	...	...	...	h	m	s	75	56	30	36	40	75	36	33	} 94 05 10	} 98 53 48	} 94 13
O.	L	20	34	00	22	40	20	23	50	9	20	8 01 05	169	41	20	41	50	169	41	35			
O.	L	20	28	50	22	40	20	23	45	9	10	8 03 22	160	18	40	19	20	169	18	00	} 93 42 30	} 94 13	} 94 13
R. O.	L	...	...	...	...	...	...	...	...	...	...	75	26	30	36	30	75	26	30				
R. O.	R	...	...	...	...	...	...	...	...	...	...	255	16	40	27	00	255	36	50	} 94 45 16	} 94 33 07 1/2	} 94 13	
O.	R	22	11	40	12	00	22	11	50	8 5	10	8 08 43	350	22	00	22	10	350	22				05
O.	R	22	07	20	07	40	22	07	20	8 5	10 5	8 10 25	349	27	40	58	00	349	27	50	} 94 21 00	} 94 13	} 94 13
R. O.	R	...	...	...	...	...	...	...	...	...	...	255	36	40	27	00	255	36	50				

36.

36.

57. The entries in the azimuth observation form should be examined before leaving the ground. An example and the method to be followed is described below.

*Horizontal angles.* The change in azimuth between the two observations taken to the same *limb* of the sun is  $(94^{\circ} 5' 15'') - (94^{\circ} 05' 00'') = 40' 15''$  or  $40.25'$ . The corresponding change in time is  $(8h. 08m. 53s.) - (8h. 01m. 05s.) = 7' 48''$  or  $7.8'$  and the change per minute is  $\frac{40.25}{7.8} = 5.16''$ .

The increase in azimuth corresponding to the increase in time between the two observations of the sun in the same face is then worked out.

The increase in time =  $(8h. 03m. 22s.) - (8h. 01m. 05s.) = 2m. 17s.$ , and the corresponding increase in azimuth =  $2m. 17s. \times 5.16'' = 11' 4''$ . The azimuthal arc corresponding to the approximate altitude, *viz.*,  $20^{\circ}$  is  $34'$  (*vide* subjoined table). This is to be subtracted from the increase as the forward limb of the sun was first intersected and then the hind limb  $(94^{\circ} 05' 00'' + 11' 4'') - 34' = 93^{\circ} 42' 47''$  expected against  $93^{\circ} 42' 30''$  obtained.

*Vertical angles.*—The rate of change per minute is  $(23^{\circ} 11' 50'') - (20^{\circ} 23' 50'') = 108'$ .  
 $\frac{108'}{7.8} = 13.85$ . The time  $(8h. 08m. 53s.) - (8h. 01m. 05s.) = 7.8'$  between the two observations on face left is  $(8h. 03m. 22s.) - (8h. 01m. 05s.) = 2m. 17s.$  Being a morning observation, the corresponding increase in altitude is  $2m. 17s. \times 13.85 = 31' 37''$ , since the upper limb of the sun is first intersected, the mean diameter of the sun, *viz.*,  $32'$  is subtractive from the increase in altitude. The second reading should therefore be  $(20^{\circ} 23' 50'' - 31' 37'') - 32' = 20^{\circ} 23' 27''$  and the actual reading is  $20^{\circ} 23' 45''$ .

If a difference of more than  $3'$  be noticed between the the observed and computed angles, horizontal or vertical, the observation is not likely to close and should be rejected.



Table showing the azimuthal arc covered by the sun's disc at different altitudes.

Altitude.	Azimuthal arc.	Altitude.	Azimuthal arc.
15°	33'	35°	39'
17½°	33½'	37½°	40'
20°	34'	38½°	41'
22½°	34½'	40°	42'
25°	35'	42°	43'
27½°	36'	43½°	44'
30°	37'	45°	45'
32½°	38'		

58. *Measurement by using a subtense bar and a Theodolite.* When the ground to be traversed is very broken, better results can be obtained by using a subtense bar than by chaining. The principle of subtense work consists in the fact that distance between any two points can be computed by reference to the angle subtended at one of them by a short measured line set up at the other. Suppose A—B to be a bar placed horizontally, "C" the centre of the bar "O" the position of the observer. Let AB be at right angles to OC and let AOB= $a$ , and AB= $b$ .

$$\begin{aligned} OC &= AC \cot AOC. \\ &= \frac{b}{2} \cot \frac{a}{2} \end{aligned}$$

Hence if AB is known, the measurement of AOB is sufficient to determine the horizontal distance of the bar from observer.

Figure 87 shows a subtense bar with two discs adjustable to 8 and 10 feet apart:—

59. Angles should be read by repetition. Up to 10 chains, with an instrument reading to 20", ten repetitions should suffice, between 10 and 20 chains, twenty repetitions are necessary and beyond 20 chains the results are unreliable. The repetition should be done in the following manner. Set each tangent-screw back to the commencement of its run and when intersecting, be careful to turn the screw against the spring. Intersect the disc at the left hand end of the bar, read and record angles on all verniers. Intersect disc at right

hand end of bar by means of the upper plate tangent screw and read off and record angle on one vernier to give an approximate value of the subtended angle. This will be useful as a guide against gross errors. Next, with the lower plate tangent screw, intersect the left disc, then with upper plate screw the right disc and repeat the process as often as necessary, keeping count of the number of repetitions, and finishing on the right disc. Finally read and record all the verniers and divide the difference of the means of the first and last readings by the number of repetitions. This gives the value of the subtended angle.

To find a distance, divide 2,062,648 by the subtended angle, reduced to seconds, when using the 10 foot disc and 1,650,118 when using the 8 foot disc.

60. Observations should be recorded as in the specimen form below. When the subtense bar is used only occasionally, the mark "*Vide* S. T. bar observations attached" should be recorded in the traverse field book against each distance computed by the subtense bar.

Subtense bar observations as station No. 15 to station No. 14. (See Figures 88 & 89.)

Length of the bar.	Group No.	Particulars of readings taken.	Observed angles.			Mean of A, B & C.	Difference of zero and the last angle	No. of repetitions in the group.	Mean of each group.	Mean of the groups	Distance in feet.	Distance in links.	Diagram with station.					
			Vernier A.	Vernier B.	Vernier C.													
10 feet.	I	Zero ...	156-52-30	52-60	..	156-52-40	3-09-30	5	0-37-54	0-37-53	907-34	1,374.76						
		First Reading ...	157-30-10	..	..	..												
		Last Reading ..	160-02-10	02-10	..	160-02-10												
	II	Zero ..	209-48-50	49-10	..	209-49-00	3-09-20	5	0-37-52									
		Last Reading ..	212-58-10	58-30	..	212-58-20												
	III	Zero ..	326-45-50	46-00	..	326-45-55	3-09-30	5	0-37-54									
		Last Reading ..	329-55-20	55-30	..	329-55-25												
	8 feet.	I	Zero ..	60-45-30	45-40	..	60-45-30	2-31-40	5					0-30-20	..	906-66	1,373.73	
			First Reading ..	61-15-40	..	..	..											
Last Reading ..			63-17-00	17-20	..	63-17-10												

Observed and recorded by

Surveyor.

61. The latitude of a place can be obtained to within a probable error of  $10''$  by observing circummeridian altitudes of the sun. At least six readings should be taken about the time of transit.

In the figure 90 the plane of the paper is supposed to coincide with the plane of the meridian.

Mean altitude of sun  $HOS$  or  $NOS$ .

Zenith distance  $G=S=OZ$  or  $SOZ$ .

Declination of sun  $=S=SOE$  or  $SOE$ .

Latitude of place  $=P=EOZ$ . viz.,  $G-G$  or  $G-G$ .

It is evident that the latitude of a place is equal to the declination of the zenith  $EOZ$  or to the altitude of the pole  $NOP$ .

62. In using the theodolite, the following precautions should be observed :—

(i) Never employ force in the manipulation of the instrument. Delicate touch is essential, and the instrument should not strike against the sides of the box.

(ii) As soon as the box is opened and before the instrument is taken out of it for use, the surveyor should carefully note the positions of the eye end and object end of the telescope and the face of the instrument and mark with pencil on the side of the box the letters  $E$ ,  $O$  and  $F$  corresponding to the eye-end, object and face of the instrument.

(iii) When lifting the instrument out of the box, or when replacing it in the box, hold it firmly by the  $Y$ 's or by the lower horizontal plate.

(iv) Use the instrument gently, handling it by its substantial parts and seeing that the clamp is loose before you attempt to turn any part.

(v) See that all screws are in the middle of their runs each time the instrument is set up for observation. But when using for the subtense bar, the tangent screw should be set back to the commencement of its run.

(vi) Be careful not to turn the tangent screw too far or you will damage it. When it has been turned till it has arrived near the end of the space allowed for its play, loosen the clamp and turn the screw back till it is in the centre of its run.

(vii) Be careful not to fasten the clamping screws too tight.

(viii) Before leaving the station, see that the spring or the clamping screw of the stand is fast and that the levelling screws are equal in height.

(ix) The Theodolite should be carried by a man and never in a cart.

(x) Always displace the needle of the magnetic compass off its pivot when not actually using it. But when the instrument is put by out of use, the magnetism of the needle is materially preserved by leaving the needle on its pivot and by so placing the box of the instrument that the needle may take its true bearing.

(ix) Keep every exposed part of the instrument perfectly dry, and brush off all dust carefully with a feather or camel hair brush, both on commencing and leaving off work.

(ix) Oil is not to be applied to any part of the instrument by the surveyor under the idea that it will work easier. A new instrument may perhaps work stiffly at first, but a few days' use will rectify that. If oil is necessary, it should be applied by an officer not below the grade of Sub-Assistant, who should wipe off the excess oil leaving just sufficient for the purpose of lubrication. An excess of oil only attracts dust, which wears out, if it does not do worse damage to the instrument.

(xiii) When placing the instrument in the box, see that the clamps are free.

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### *Prismatic Compass.*

A magnet has the property of attracting or being attracted by iron ore, iron or steel, and when allowed to swing freely over a pivot, to point to the poles.

2. A magnetic needle is made to swing freely over a moveable graduated circular card having a pair of sides attached to it, with the aid of which any object may be aligned. As the magnetic needle always points north-south, the angle at the point of observation through which the card and sides have turned to align the object, gives the direction of that object with regard to the meridian passing through the point of observation, which is indicated by the needle. Or if the circular card were attached to the needle, and were kept in a constant position pointing north always, the motion of the sides alone round the graduated circle can easily be read, just as the motion of the hands on the dial of a clock is read. The reading will be the graduation on the card which is intersected by the line passing through the sides.

3. A meridian is a circle passing round the earth and through the poles.

4. The bearing of a line is the inclination of the line to the direction of the meridian. The magnetic bearing of a line is its inclination to the magnetic meridian or to the line indicated by the direction of the magnetic needle.

5. The *Prismatic Compass* (see Figure 91) consists of a brass compass box B, with a fine steel point in the centre, on which a circular card or circular rim of platinum graduated all round from  $0^{\circ}$  to  $360^{\circ}$  swings freely. On the line  $0^{\circ}$  to  $180^{\circ}$  is fixed the magnetic needle having at its centre a little agate cap to fit on the steel point and leave the needle and card free to revolve. Thus when at rest the zero line of the graduated circle will always point North. The prism P through which the observer looks in taking the bearings of objects is fixed at the side of the compass box with a hinge-joint on which it can be turned down. The sight vane has a fine thread or horse-hair stretched along it opening vertically, and made to bisect any object by turning the box round horizontally. The vane also turns on a hinge-joint so that it can be laid flat on the box when the instrument is carried. It has a mirror M which slides along it, and may be made to incline at any angle to reflect the image of an object the bearing of which is required, when the object is much above or below the horizon. When the compass is employed to observe the azimuth of the sun, coloured glasses G are interposed. These can be turned down with the prism over the side of the compass box.

6. To check the vibrations of the card, a spring is used which can be pressed by the finger. A stop is placed under the vane so that the needle may be thrown off its centre by turning down the vane when the instrument is not in use.

7. The compass box is generally screwed on a stand, the top of which is provided with a ball and socket joint, so that it may be placed horizontal when bearings are taken. When taking the bearing of any object, the prism is raised, the object is bisected with the horse-hair seeing through the slit, and the graduation under the prism is read off. Owing to the prism being placed on the opposite side of the box, when the needle points north, the zero point of the graduated circle is under the prism: the graduations are numbered in the direction of the hands of a watch, so that the bearing read through the prism may be the bearing of the object observed. The graduations are generally made to degrees and half

degrees ; further subdivisions the eye can judge with sufficient accuracy.

8. By means of the prismatic compass the surveyor can measure horizontal angles to within a quarter of a degree. It is particularly useful in filling in the details of a survey, for sketching along a road or river or any continuous line of military works. It is useful also in town surveys where a chain survey will be difficult as the country cannot be broken up into triangles.

9. The prismatic compass can be used in the hand without a stand.

10. In using the instrument it should be placed as nearly as possible over the station, and the box made as level as can be by the eye ; otherwise, the ring may not play but may adhere to the side or top of the box. Raise the prism in its socket till the divisions on the silver ring are visible through the slit. Turn the compass round till the hair of the sight vane intersects the object to be observed. As soon as the needle is at rest, follow the reflection of the hair downwards till it meets the graduated ring. The division of the latter thus met by the hair is the magnetic bearing of the object looked at from the spot where the instrument stands.

11. The magnetic bearing of the back station should be observed as well as of the forward one. There should be a difference of just  $180^\circ$  between the two bearings. For instance, the reversed or back bearing of  $48^\circ$  would be  $228^\circ$ , and of  $228^\circ$  would be  $48^\circ$ .

12. It is commonly believed that when a complete circuit is surveyed with the prismatic compass, the accuracy of the bearing observed can be proved by deducting angles therefrom, and seeing whether the total of the angles equals twice as many right angles as the circuit has sides minus four right angles. This is a mistaken belief. The angles will prove even though the bearings may be entirely wrong. The real check on the bearings is that afforded by the reverse or back bearings, or by the plotting of the circuit with the measured distances, or the computations of the latitudes and departures of the circuit with the observed bearings and the measured distances.

13. No great reliance can be placed on work performed with the prismatic compass, as the local attraction of iron in the neighbourhood neutralises, to a great extent, the polar

attraction. There is also an error inherent in this instrument known as the "variation of the compass". The variation of the compass or the needle is the angle which the magnetic north makes with the true north, at any point. The direction in which the magnetic needle points is called the magnetic north and differs from the true north by sometimes several degrees east or west of it, the difference depending chiefly upon the geographical position of the country where the needle is set up.

14. Owing to the defects noticed above, the compass is used only occasionally for surveying minor circuits and laying down topographical details, such as roads, foot-paths or streams running through waste land.

In Revenue Surveys, the Prismatic compass is not very much used.

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### *Plane Table.*

1. The Plane Table consists (Figure 92) of an ordinary drawing board A of teak, or other seasoned wood that will not warp, from 15 to 24 inches square, mounted on a tripod stand. The table revolves on an axis horizontally, and may be clamped to the stand by a nut B underneath it. A compass C is attached to the table. E is the alidade, a flat rule made of brass or wood, about the length of the diagonal of the table; at its ends are sights F, F; one of the edges of the alidade is bevelled. A sheet of paper is stretched on the board and attached to it with drawing pins or some other means.

2. The plane table is an instrument used for filling in the interior details of a survey, when trigonometrical stations and other points, fixed by a theodolite survey, have been previously projected on the map.

3. When using the plane table in field, the surveyor sets up the stand, with the legs wide apart so as to give a firm base, and screws on the table at some fixed point which has been projected on the board, placing that part of the table on which the station is plotted immediately over the said station. This is done by dropping a pebble from the corresponding point from the underside of the table. He then makes the table as level as possible by the eye, and lays the bevelled edge



of the alidade, along the line joining station A and any other distant but clearly visible station B. Holding the alidade firm, he turns the table round until the vertical wire of the alidade intersects the flag at B. He then clamps the table and verifies the position of the alidade and the intersection of the flag. This is called setting the plane table.

4. In surveying with the plane table, particular attention should be paid to the following instructions:—

(i) As the paper mounted on the board is affected to a large extent by the state of the atmosphere, see that the scale of the map is drawn on the paper. The scale will thus contract or expand with the paper and the measurements will always be correct.

(ii) See that the legs of the stand are not shaky and that they rest on firm ground.

(iii) See that the clamping screw is tight before beginning work.

(iv) In soft ground, see that the legs of the stand are well pressed in

(v) Always keep the pencil sharp.

(vi) *Never use a pin* as an aid to alignment of the alidade. Place the fiducial edge of the alidade just touching the point from which the ray is to be drawn and in rough alignment with the object to be intersected, keeping the alidade in position by placing the second finger of the left hand against the outside edge of the alidade and the first finger and thumb on the top of it. Then stoop and accurately intersect the object as low down as possible on the eye and object sight-vanes by a gentle lateral movement of the alidade with both hands. With a little practice, alignment should be made without greatly displacing the fiducial edge of the alidade from the point on the board. Contact and alignment should then be made by a combined forward and backward and lateral movement of the alidade, as in using a parallel rule, so that its altered position may be parallel to its former position. With a little practice, alignment should be obtained in this manner in a few seconds.

(vii) When drawing a ray from a point, set the pencil into the point first so as to get the correct angle at which the pencil should be held when drawing the ray along the fiducial edge of the alidade.

(viii) On completion of each day's work, the plane table should be covered with water-proof cloth which should not be removed except when the table is required for work. Some clean sheets of paper should always accompany the table to keep dirt off the plan.

5. The plane table is not also used in revenue surveys.

### SCALES.

1. When anything which has to be represented on paper, is so large that it would be inconvenient to make a full-sized drawing of it, the drawing or map, is made to another scale, that is, each line in the plan, using this word as a general term, is made with a fixed and known proportion to the line it represents.

2. Suppose, for example, that in a drawing of a house a line one inch long represents in plan a wall 100 feet long. Then, if the drawing is "drawn to scale", every other detail of the house will be represented by lines drawn in the same proportion. This proportion is called the scale of the drawing, and in this case the drawing is said to be drawn to a scale of 100 feet to an inch. Further, it is evident that the actual length of each piece of the building is 1,200 times the length of the line which represents it in the drawing; or every line in the drawing is  $1/1,200$  the part of the corresponding line in the object.

3. This fraction which represents the proportion of the drawing to the object is called the "*Representative Fraction*" and this fraction should be entered in a conspicuous place on every plan.

4. It should be clearly understood what is meant by the representative fraction, to find which the number of units represented by one inch in plan should be reduced to inches.

5. This will be denominator of the fraction. The numerator will invariably be 1.

For example:—

Find the representative fraction of scale of 1 furlong to an inch.

The denominator is then  $12 \times 3 \times 220 = 7,920$ , and the representative fraction is  $1/7,920$ .

6. In addition to the representative fraction, some means must be given by which any distance on the plan may be measured off, and the real length of the object it represents may be ascertained. This is done by means of a graduated straight line called the *Scale*.

Scales of equal parts are of three kinds, viz. Simple scales, Diagonal scales and Vernier scales.

7. *Simple scales.* A simple scale consists of any extent of equal divisions which are numbered and reckoned forwards from the second division on the left hand to the right, 0 (zero), 1, 3, 5, etc., and from the same division backwards to the left 0.50 (see Figure 93).

8. The primary division on the left is generally subdivided into ten equal parts. If the subdivisions be taken as units, each to represent 1 mile, for instance, the primary divisions will be so many tens of miles; if the subdivisions are taken as tens, the primary divisions will be hundreds; and if the primary divisions be units, the subdivisions will be tenths.

9. The measure of the unit to which a simple scale can be constructed to read depends upon the size of the scale, *i. e.*, upon its representative fraction, and also upon the greatest number of subdivisions that can be drawn with distinctness in a primary division. An inch of space cannot conveniently be divided into more than sixty equal parts.

10. *Diagonal scales.* When it is required to ascertain the length of a line up to fractions of a unit which are too minute to be drawn distinctly on a simple scale, it is usual to have recourse to a diagonal scale. (Figure 94)

11. In the diagonal scale, the primary divisions and subdivisions are the same as in the simple scale, but there are, in addition, parallel and diagonal lines as described below.

12. The ten equidistant lines run parallel to the line on which the primary divisions and subdivisions are marked. Through each of the primary divisions run perpendicular lines cutting all the 11 parallels. In the lowest parallel, the primary division to the extreme left is subdivided as in the highest, *i. e.*, first parallel. Diagonal lines run from the subdivisions. The first diagonal is from zero in the lowest parallel to the first subdivision in the highest parallel, the second diagonal from the first subdivision in the lowest to the second in the highest, and so on to the end *i. e.* the diagonal from the ninth subdivision in the lowest parallel to the tenth on the highest parallel.

13. Since these diagonal lines are all parallel, and consequently everywhere equidistant, the distance between any two of them in succession measured upon any of the 11 parallel lines which they intersect is the same as the distance

measured upon the highest or lowest of these parallel lines, *i. e.*, as one of the subdivisions mentioned above. But the distance between the perpendicular which passes through the starting or zero point and the diagonal through the same point, being nothing on the lowest parallel and equal to one of the subdivisions on the highest parallel, is equal to one-tenth of a subdivision on the second parallel, or to two-tenths of subdivision on the third parallel and so on; so that this, and consequently each of the other diagonal lines, as it reaches each successive parallel, separates further from the perpendicular through the zero point by one-tenth of the extent of a subdivision or one-hundredth of the extent of a primary division.

14. *Vernier scales* The vernier scale, invented or brought into practical use by Pierre Vernier, a native of Burgundy, about 1631, is an ingenious contrivance for measuring parts of the subdivisions of a simple scale. (Figure 95.)

15. A vernier scale consists of two parts, one, the principal scale and the other, the vernier scale. The principal scale is the same as the simple scale described above, but with all the primary divisions subdivided instead of only one as in the simple scale. The vernier scale is divided into parts, which, in number, are one more or one less than those contained in an equal space on the principal scale.

16. In a principal scale in which a primary division measuring, say, one inch, is divided into ten equal parts, if it be required to measure hundredths of an inch, it may be done by means of a vernier scale whose length may be either nine-tenths of an inch and divided into ten equal parts, or whose length is eleven tenths of an inch and divided into ten equal parts. For in either case, the difference between a subdivision of the vernier scale so made and one on the principal scale is the hundredth of an inch.

17. If ten subdivisions on the vernier cover the same space as nine subdivisions on the principal scale each subdivision on the vernier scale will measure one-tenth less than that of a subdivision on the principal scale. Therefore, one subdivision on the scale will be 1—1 or .9 subdivision on the principal scale; two subdivisions on the vernier scale will be 2—2 or 1.8 subdivisions on the principal scale; and so on, 10 subdivisions or the whole length on the vernier scale will be 10—1 or 9 subdivision on the principal scale.

Where 10 subdivisions on the vernier scale cover the same space as 11 subdivisions on the principal scale each subdivisions on the vernier scale will measure one-tenth more than a subdivision on the principal scale. Therefore, one subdivision on the vernier scale will be  $1+1$  or  $1\cdot1$  subdivisions on the principal scale ; two subdivisions on the vernier scale will be  $2+2$  or  $2\cdot2$  subdivisions on the principal scale, and so on ; 10 subdivisions or the whole length on the vernier scale will be  $10+1$  or 11 subdivisions on the principal scale.

18. The general principle of a vernier scale, is that if  $a$  represent a subdivision on the principal scale, and, if the vernier should read to  $\frac{a}{n}$ ,  $n$  being any number above 1, then  $x$ , representing a subdivision on the vernier, will be equal to  $(a + \frac{a}{n}) + (\frac{n+1}{n}) a$ ; i. e., if  $(n+1)$  divisions of the principal scale be taken and divided into  $n$  parts, the vernier is obtained.

19. The methods of constructing simple, diagonal and vernier scales are explained below.

20. In constructing a scale, it should be considered what will be a good length for it, so as to be able to take off it, at one stretch, long lines, though not necessarily the longest on the map. The scales are first drawn in pencil and then inked in.

21. *Construction of simple scales.*—To construct a simple scale of 5 chains to an inch to read chains and tens of links, up to 30 chains at a stretch.

As one inch represents 5 chains, 30 chains will measure 6 inches.

Draw 2 parallel lines 6 inches in length and one tenth of an inch apart, taking the measurements from a box-wood scale of inches.

Divide the parallel lines into 30 equal parts or primary divisions and subdivide the first primary division to the extreme left into 10 equal parts.

Each of the primary divisions will be one chain or 100 links and each of the subdivisions will be one-tenth of a chain or ten links.

Beginning from the second primary division which should be marked zero, number the primary division to the right 1, 3, 5 etc., to 29 and the subdivisions to the left 50 and 100, see diagram. Write chains at the extreme right and links at the extreme left.

Now, to take off 1,680 links, *i. e.*, 16 chains and 80 links, place one leg of the plotting compasses on the primary division denoting 16 and open the other leg on to the 8th subdivision mark from zero or the third beyond the subdivision numbered 50. The length included between the points of the compasses will be 1,680 links.

22. *Construction of Diagonal scales.*—To construct a diagonal scale of 2 chains to an inch to read chains and links up to 10 chains at a stretch.

As one inch represents 2 chains, 10 chains will measure 5 inches.

Draw a line 5 inches in length. Divide it into 10 equal parts or primary divisions.

Draw 10 equidistant lines parallel to the first, say one-tenth of an inch apart from one another.

Through each of the primary divisions, draw perpendicular lines cutting all the 11 parallels.

Beginning from the second primary division, which should be marked zero, number the primary divisions to the right, 1, 2, 3, etc., to 9 above the highest parallel, diagram.

Write the numbers 0, 2, 4, 6, 8, and 10 upwards at the left hand ends of the alternate parallels.

Subdivide the first primary division to the extreme left into 10 equal parts, both on the highest and the lowest of the 11 parallels. Number the subdivisions to the left 0, 2, 4, 6, 8, and 10 below the lowest parallel.

With the parallel rule, draw the diagonal lines from 0 in the lowest parallel to the first subdivision in the highest parallel, from the first in the lowest to the second in the highest, and so on until the diagonal from the ninth in the lowest parallel to the tenth in the highest parallel is drawn.

Now to take off 768 links, or 7 chains and 68 links, place one leg of the plotting compasses on the point where the eighth parallel cuts the sixth diagonal and open the other leg on to the point where the same parallel cuts the 7th perpendicular.

23. The number of parallel lines to be drawn will depend upon the fraction of a subdivision that is required to be read off.

24. The general rule for taking off any measurement to three places of figures upon a diagonal scale is:—On the

parallel indicated by the third figure, measure from the diagonal indicated by the second figure to the perpendicular indicated by the first.

25. *Construction of Vernier Scales.*—To construct a vernier scale of one mile to an inch to read miles and tenths and hundredths of a mile, to 5 miles at a stretch.

As one inch represents one mile, 5 miles will measure 5 inches.

Draw two parallel lines 5 inches in length and onetenth of an inch apart, see diagram.

Divide the parallel lines into 5 equal parts or primary divisions and subdivide all the primary divisions, into tenths.

Beginning from the second primary division, which should be marked O (zero), number the primary divisions to the right, 1, 2, 3, 4 below the lower parallel.

Take off with the compasses nine of the subdivisions set this extent off backwards from the end of the first primary division, *i. e.*, from the place marked O. Now subdivide the space thus set off into 10 equal parts, numbering the divisions above the upper parallel, 2, 4, 6, 8, 10 to the left, commencing from O of the primary division.

Now to take off 2.53 miles or 2.53 inches, place one leg of the compasses at 10.3 or the seventh division on the vernier and extend the other leg to 25—(7.1) or 1.9 or 1.9 on the principal scale.

26. The following is the general rule for taking off measurements on a vernier scale up to three places of figures in the case just described, *i. e.* when the vernier is divided into parts which in number are one more than those contained in an equal space on the principal scale.

Deduct the third figure from the total number of divisions on the vernier indicated by the number thus obtained. Deduct from the first two figures the number of the vernier division obtained as above less one, and the balance will give the number of the division on the principal scale to which the other leg of the compasses should be extended.

When, as in diagram, the vernier is divided into parts which in number are one less than those contained in an equal space on the principal scale, the rule will be as follows :—

Place one leg of the compasses on the division of the vernier indicated by the third figure, and extend the other

leg to the division on the principal scale indicated by the number obtained by deducting the third from the first two figures,

27. The above two rules apply when the numbering of the divisions on the principal scale commence from the second primary divisions, but if the numbering commences from the very extreme left as in diagrams, the following rules should be observed.

To take off 2·53, place one leg of the compasses at 3 on the vernier and extend the other leg to 25·3 or 22 or 2·2 on the principal scale.

28. When, as in diagram, the vernier is divided into parts which in number are one more than those contained in an equal space on the principal scale, deduct the third figure from the total number of divisions on the vernier. Place one leg of the compasses on the division of the vernier indicated by the number thus obtained. Deduct from the first two figures the number of the vernier division, thus obtained less one, and the balance with the addition of one to the first figure will give the number of the division on the principal scale to which the other leg of the compasses should be extended.

To take off 2·53, place one leg of the compasses at 10·3 or the seventh division on the vernier and extend the other leg to 2·9 on the principal scale which is obtained thus. 1 deducted from 7 is 6. Subtract 6 from 25. To the first figure of the balance, i. e., 19, add 1, and the result will be 29 or 2·9 on the principal scale.

29. When, as in diagram, the vernier is divided into parts which in number are one less than those contained in an equal space on the principal scale, place one leg of the compasses on the Division of the vernier indicated by the third figure. Deduct the third from the first two figures and the balance with the addition of one to the first figure will give the number of the division on the principal scale to which the other leg of the compasses should be extended.

To take off 2·53, place one leg of the compasses at 3 on the vernier, and extend the other leg to 3·2 on the principal scale, which is obtained thus. Subtract 3 from 25. To the first figure of the balance, i. e., 22, add 1, and the result will be 32 or 3·2 on the principal scale.

30. In all the above four cases, a primary division on the principal scale having been taken to represent units, the



subdivisions denoted tenths and consequently the vernier read hundredths. If it be required to construct a vernier scale to read any other fraction, say  $1/12$ th of a subdivision of the principal scale, *e. g.*, if the subdivision on the principal scale denoted feet and it was required to read inches, the vernier should occupy the space of either 11 or 13 of the subdivisions on the principal scale, and be division into 12 equal parts—vide diagrams. Then, for taking off measurements from scales so constructed, the four rules given above will apply, with the proviso that the number of inches to be read off, whether they consist of one or two digits, will be reckoned as the third figure.

31. A vernier scale is preferable to a diagonal scale, because, in the latter, it is extremely difficult to draw the parallels, perpendiculars and diagonals with accuracy, while in the former, the uniform manner in which the strokes of one scale separate from those of the other is evidence of the accuracy of both.

32. Theodolites and other instruments for reading angles are provided with moveable verniers with which to read angles up to one minute, 30 seconds or 10 seconds, according as the horizontal circle or limb of the instrument is divided into half degree or 30 minutes, one-third degree or 20 minutes and one-sixth degree or 10 minutes. The method of reading angles by means of verniers is explained above under the head of "Theodolite".

33. *Plotting scales.*—The plotting scale is a straight rule of ivory or box-wood, above 12 inches long and  $1\frac{1}{4}$  inch broad. It has a scale of equal parts, decimally divided, placed upon its edges which are made sloping so that the graduations marking the divisions may be close to the paper. There is a double set of number, the upper one commencing from the left and reading 1, 2, 3, *etc.*, to the right, and the lower commencing from the right and reading 1, 2, 3, *etc.*, to the left.

34. At the middle of the scales are generally cut numbers such as 10, 20, 50, which denote the number of equal parts into which an inch of space on the scale is divided, and the names of the scales are derived from them. These are the four scales generally used in the Survey Department.

In the scale of 10, each inch is a primary division denoting a Gunter's chain. The primary divisions are divided each into ten subdivisions, each subdivision, therefore, representing one-tenth of a chain or 10 links. This scale is

generally termed a scale of 1 inch = 1 chain, or 80 inches = 1 mile.

In the scale of 20, each inch consists of two primary divisions; each primary division denotes a chain and is divided into ten subdivisions, each subdivision, therefore, representing one-tenth of a chain or ten links. This scale is generally termed a scale of 1 inch = 2 chains or 40 inches = 1 mile.

In the scale of 33, the entire length of scale is divided into 40 primary divisions, each of which is subdivided into ten parts. If each primary division is reckoned as one "feet chain", each subdivision will represent ten feet; if each subdivision is taken to indicate one foot, one inch of space containing 33 subdivisions will represent 33 feet. This scale is generally termed a scale of 1 inch = 330 feet, *i. e.*, 16 inches = 1 mile, or 1 inch = 33 feet, *i. e.*, 160 inches = 1 mile.

In the scale of 50, each inch consists of five primary divisions or chains. Each primary division is divided into ten parts, each subdivision, therefore, representing one-tenth of a chain or ten links. This scale is generally termed a scale of 1 inch = 5 chains, or 16 inches = 1 mile.

35. For the sake of convenience, graduations for the scale of 50, *i. e.*, 16 inches = 1 mile and of 20, *i. e.*, 40 inches = 1 mile are both marked on the same scale, one on each edge.

36. *Offset scales*:—With each plotting scale is used a smaller scale called the offset scale, which is made of the same material as the plotting scale and is similarly divided. The offset scale is about 2 inches long and is graduated to read up to 2 chains in a scale of 10, 4 chains in a scale of 20, 6 chains in a scale of 33 and 10 chains in a scale of 50.

The offset scale is used to set off the offsets from the chain line in the map along which one of the bevelled edges of the plotting scale is laid.

37. *Straight edge*:—When distances beyond the length of the plotting scale have to be measured off plans, or have to be plotted on them, the instrument, called the straight edge, is used together with the beam compass.

The straight edge is a flat piece of metal, the shortest used being 2 feet in length and the longest 4 ft. It is bevelled on one edge and is graduated to inches and tenths. Diagonal scales are placed at both ends to read tenths and hundredths.

## PROTRACTOR.

1. The protractor is an instrument used to protract or lay down an angle containing any number of degrees, or to find how many degrees are contained in any given angle. It is also used to protract the bearings of lines.

2. There are two kinds of protractors, one in the form of a semi-circle and the other in the form of a rectangle, (see Figure 96).

3. The semi-circular protractor, which is made of brass or electrum, is generally six inches in diameter. The semi-circle is divided into 180 equal parts or degrees, which are numbered at every tenth degree each way for the convenience of reckoning either from the left towards the right, or from the right towards the left, or the more easily to lay down an angle from either end of the line. The edge is the diameter of the semi-circle, and the mark in the middle points out the centre.

4. The rectangular protractor, which is now most in use as being more convenient than the semi-circular protractor, is made of ivory or box-wood and is six inches broad. Three sides of it are graduated to degrees, and the graduations bear two sets of numbers from the right towards the left, the upper or first set from 0 to 180 and the lower or second set from 180 to 360. The fourth side represents the diameter of a circle and the mark in the middle points out the centre.

5. *To protract an angle.* Lay the diameter of the protractor exactly along the line from which the angle is to be set off, making the mark in the centre coincide with the given point on the paper. The protractor should be placed to the right of the line when the angle is less than  $180^\circ$ , and to the left when it is more than  $180^\circ$ . Then, with a fine pointed pencil, make a mark on the paper close to that division on the protractor which corresponds to the number of degrees in the given angle. Remove the protractor and draw a line from the given point to the point just marked in pencil, and the angle will have been protracted.

6. *To find the number of degrees contained in a given angle.* Place the diameter of the protractor exactly along the line from which the angle is to be measured, making the mark in the centre of the protractor coincide with the point at which the angle is to be measured. The protractor should

be placed to the right of the line, when the other line forming the angle is on the right, and to the left when the other line is on the left. The division on the protractor that is cut by the other line, produced if necessary, will denote the number of degrees contained in the given angle.

7. *How to protract the bearing of a line.* Through the starting point of the line whose bearing has to be protracted, draw a line due north and south to represent the meridian. Lay the diameter of the protractor along the meridian, making the mark in the centre coincide with the starting point. Place the protractor to the right or left of the meridian line according as the bearing of the line is less or greater than  $180^\circ$ . Make a pencil mark on the paper close to the division on the protractor corresponding to the number of degrees in the given bearing. The line drawn from this mark to the starting point will be in the direction indicated by the given bearing.

8. When this line is the first of a circuit surveyed with the prismatic compass, and it is required to plot the circuit lay off from the starting point the total length of the line as measured. The end of the line will mark the position of the second point or station of the circuit. Through this station, with the parallel rule, draw a line parallel to the first meridian line and proceed to protract the bearings and lay off the distances as above for the remaining stations of the circuit until the starting point is reached.

9. When a circuit has been surveyed with the theodolite or Stanley's Circumferenter and the angles at all the stations and the bearing of any one line are available, the circuit can be plotted with the protractor. The line of which the bearing is given is plotted first as explained in rule 7 above, and then the succeeding lines in the manner explained in rule 5.

10. Protractors are generally graduated to degrees only. When the angles or bearings to be protracted contain minutes, the nearest fraction of a degree which they represent should be estimated by the eye and the protraction made accordingly.

11. Even when a circuit has been correctly surveyed, a plot of the survey may not close owing to the defects inherent in the process of plotting with the protractor. When this is the case, the error should be adjusted as explained below.

12. Let ABCDE be the boundary lines plotted according to the given bearings and distances ; and suppose that the last distance comes to E instead of closing at A, as it should.

The error must be distributed among all the lines, in proportion to their lengths. Each point B, C, D, E, in the figure must be moved in a direction parallel to EA, by a certain distance which is obtained thus :—

Multiply the distance EA by the distance AB and divide the product by the sum of all the distances. The quotient will be the distance BB'. To get CC', multiply EA by AB + BC and divide the product by the sum of all distances. To get DD', multiply EA by AB + BC + CD and divide the product as before. So, for any distance, multiply the amount of error by that distance *plus* the distances preceding it and divide the product by the sum of all the distances.

Join the points thus obtained, and the closed polygon AB'C'D'A' will thus be formed and will be the most probable plot of the given survey.

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#### PANTAGRAPH.

1. The pantagraph is an instrument used for copying, enlarging or reducing drawings. There are two kinds of this instrument, one called the "English Pantagraph," and the other, the "French Pantagraph."

##### *English Pantagraph.* (Figure 98.)

2. This consists of 4 arms, AB, AC, DF and EF (see Figure.) made of stout brass.

3. The two longer arms, AB and AC, are connected together at, and have a motion round, a centre A.

4. The two shorter arms, DF and EF, are in like manner connected with each other at, and have motion round F'. They are also connected with the longer arms at, and have motions round, D and E.

5. The shorter arms, being equal to each other and also to the portions AD and AE of the longer arms, form with the latter a rhombus, ADFE, in every position of the instrument.

6. Several ivory castors support the instrument parallel to the table, and, working with swivels, allow the instrument to move freely over the table in all directions.

7. The arms AB and DF are graduated and marked  $\frac{1}{2}$ ,  $\frac{1}{3}$ , etc., and have each a sliding index, which can be fixed at any of the graduations, by mill-headed clamping screws H, G.

8. The sliding indices and the longer arm AC have each of them a socket adapted to receive a pin rising from a heavy metallic weight called the fulcrum, and a sliding holder with a pencil or a steel tracing point, as may be required—vide H, G and C in the diagram.

9. The pencil holder is surmounted by a cup, into which sand or shot may be put, to press the pencil, when necessary, more heavily on the paper intended to receive the copy.

10. There is also a small iron pin to push down the pencil, whenever, owing to undue pressure, it recedes into the socket.

11. When the instrument is correctly set, the tracing point, pencil and fulcrum will be in one straight line, as shown by the dotted line CGH in the diagram.

12. The motions of the tracing point and pencil are then each compounded of two circular motions, one about the fulcrum and the other about the joints A and F. The radii of these motions form sides about equal angles of two similar triangles CHA and GHD. The distances passed over by the tracing point and pencil, in consequence of either of these motions, have then the same ratio and, therefore, the distances passed over, in consequence of the combination of the two motions, have also the same ratio, which is that indicated by the setting of the instrument. Thus, if the instrument is set to  $\frac{1}{2}$  reduction, HG will be half of HC; if set to  $\frac{1}{3}$  reduction, HG will be  $\frac{1}{3}$  of HC. In other words the distance between the fulcrum and the pencil will bear the same ratio to the distance between the fulcrum and the tracing point as that represented by the magnitude of the reduction or enlargement to which the instrument is set.

13. The diagram represents the pantagraph in the act of reducing a drawing to a scale of half the original.

14. For this purpose, the sliding indices should be first clamped at the divisions marked  $\frac{1}{2}$ , taking care to see that the lines indicating the middle of the indices coincide with the divisions concerned.

15. The tracing point is then fixed in the socket at C and the original drawing below it; the pencil is placed in

the socket at G and the paper to receive the copy below it ; and the pin of the fulcrum is fixed into the socket at H.

16. The stem provided with an ivory ball at the top should be fixed to the small bar attached to the end of arm AC.

17. The fine thread, represented as passing from the pencil round the hinges at D and A to the tracing point at C, enables the draftsman at the tracing point to raise the pencil from the paper whilst he passes the tracing point from one part of the original to another, and thus to prevent false lines from being made on the copy. The thread should be fastened at the hinge between the tracing point and the ivory ball, just tight enough to allow sufficient play to the pencil. The left hand should work the thread, the right hand holding the ivory ball and guiding the tracing point.

18. The instrument being now ready for use, if the tracing point at C be steadily and delicately passed over every line of the original, a true copy, but one-half the scale of the drawing, will be marked by the pencil on the paper beneath it.

19. If the reduction required is to a scale of one-third of the original, the fulcrum, pencil and tracing point should occupy the same position as before, but the indices should be moved and clamped at the divisions marked  $1/3$ .

20. To enlarge the drawing to double its scale, the positions of the tracing point and pencil should be reversed, *i. e.*, the tracing point should be placed at G and the pencil at C.

21. When the enlargement required is three times the original, the positions of the tracing point and pencil should remain the same as described in the preceding rule, but the sliding indices should be moved to the divisions marked  $1/3$ .

22. If the copy required is to be of the same scale as the original, the sliding indices should be clamped at the same divisions as for half reduction, *i. e.*, at the divisions marked  $\frac{1}{2}$ , but the fulcrum should be placed at the middle socket at G, and the pencil and tracing point at either of the other two sockets H and C.

23. For reductions to half scale and below half, the fulcrum should occupy the position of H in arm AB, the pencil that of G in arm DF and the tracing point that of C in arm AC, and the indices clamped at the divisions concerned.

24. For reductions to scales above half, the fulcrum, pencil and tracing point should occupy the positions G, H and C respectively.

25. For enlargements, the fulcrum, pencil and tracing point should occupy the positions H, C, and G respectively.

26. The English Pantagraph contains divisions marked  $1/2, 2/5, 1/3, 8/10, 1/4, 1/5, 1/6, 1/8$  and  $1/9$ . Between the divisions  $1/2$  and  $1/3$ , there are further divisions marked  $11/12, 10/11, 9/10, 8/9, 7/8, 6/7, 5/6, 4/5, 3/4, 2/3$  and  $3/5$ .

27. The divisions at which the instrument should be set and the positions which the fulcrum, pencil and tracing point should occupy for the various reductions and enlargements, are shown in the subjoined statement :—

Reduction or Enlargement.	Magnitude of reduction or enlargement required.	Division at which the instrument should be set up.	Position to be occupied by		
			Fulcrum.	Pencil.	Tracing point.
Reduction ...	$\frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \frac{8}{10}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}$	$\frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \frac{8}{10}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}$	H	G	C
Do.	$\frac{11}{12}, \frac{10}{11}, \frac{9}{10}, \frac{8}{9}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{3}{5}$	$\frac{11}{12}, \frac{10}{11}, \frac{9}{10}, \frac{8}{9}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{3}{5}$	G	H	C
Do.	$\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{9}$	$\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{9}$	H	G	C
Enlargement.	2, 3, 4, 5, 6, 7, 8, 9.	$\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{9}$	H	C	G
Do.	$\frac{11}{12}, \frac{10}{11}, \frac{9}{10}, \frac{8}{9}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{3}{5}$	$\frac{11}{12}, \frac{10}{11}, \frac{9}{10}, \frac{8}{9}, \frac{7}{8}, \frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{3}{5}$			
Copy to scale.	...	...	G	H or C	C or H

**FRENCH PANTAGRAPH.**

28. The chief points of difference between this pantagraph and the English pantagraph, described above, are the following :—

(i) One of the four arms of the French pantagraph B 'A' (see Figure. 99) is not permanently jointed to the other arms of the instrument, but is removeable and is kept separate from the other arms when the instrument is placed in the box. When the instrument is fitted up, this removeable arm is attached to the arms DB and CA by means of its sliding indices B' and A'.



(ii) The movements of the joints at C and D, before the instrument is set up, are not limited but admit of the arms DB and CA being turned right round their axes.

(iii) Three arms, DB, CA and B 'A' are graduated and not two as in the case of the English pantagraph.

(iv) The graduations on the three arms are similar and are in regular descending order from  $\frac{3}{4}$  to  $\frac{1}{20}$  commencing from the ends marked D, C and B' respectively.

(v) The ivory castors are loose and are fitted on when setting up the instrument.

(vi) The sliding indices B', A', C', and the slides P and K do not have lines, indicating their middle cut on them, but their ends are bevelled on one side so as to allow of their being correctly set to the divisions required.

29. Being more delicate in its construction than the English pantagraph, some care is necessary in handling the French pantagraph.

30. The directions given below for lifting it from its box and placing it in proper position for use should be carefully observed:—

(1) Before lifting the instrument from the box, the positions which the various parts occupy should be carefully noted. Letters A, B, C, D and K, corresponding to those cut on the instrument, should be noted in pencil in the box.

(2) Then, with the right hand, take hold of the extremities P and K, raise them and slide the left hand under the arms to the other extremities B and C, lift the instrument bodily from the box and place it on the table.

(3) With the right hand hold the arm K and with the left the arm P, open and expand the arms until the axis at C forms a right angle with P and K.

(4) Then by means of the side B' of the removeable arm attach it to the arm DB keeping the small clamping screw (of the slide) on the outside to the right.

(5) Remove the slide P from the arm CA and by means of the other slide A' of the removeable arm, attach it to the arm CA, keeping the small clamping screw on the outside to the left. Replace the slide P.

(6) Fix the ivory castors, one near the central axis C, one each on ends of arms CA and DB, another near the slide K and the spare castors, if any, wherever they may be required, to support the arms.

(7) Then lift the arms A', B', and attach to the slide P or C', as may be necessary, the metallic weight or fulcrum, by means of the pin screwed to it.

(8) Then pass the thread around the instrument in the same way as has been explained for the English pantagraph.

31. To obtain a reduction, the sliding indices, at A', B', and C' should be moved and clamped at the divisions required; and the slides P and K should be clamped at the zero lines cut on the arms. The fulcrum should be attached to the socket in the slide P, the tracing point to the socket in the slide K and the pencil to the socket in the sliding index C'. The diagram shows the instrument in this position.

32. For obtaining an enlargement, the positions of the fulcrum and the pencil should be reversed, *i. e.*, the fulcrum should be placed at C' and the pencil at P.

33. There are graduations in the French Pantagraph for obtaining enlargements to  $1\frac{1}{2}$  times, double and treble the scale only of the original.

34. If the copy required is to be of the same scale as the original, the sliding indices should be clamped at the divisions marked  $\frac{1}{2}$ , the positions of the fulcrum and the pencil remaining the same as for an enlargement.

35. If in the position set for an enlargement, the indices are clamped at the divisions less than half, the result will not be an enlargement but a reduction as shown in the following table:—

Reduction or Enlargement.	Magnitude of reduction or enlargement required.	Division at which the instrument should be up.	Position to be occupied by		
			Fulcrum.	Pencil.	Tracing point.
Reduction ...	$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}$	$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}$	P	C	K
Do. ...	$\frac{1}{11}, \frac{1}{12}, \frac{1}{13}, \frac{1}{14}, \frac{1}{15}, \frac{1}{16}, \frac{1}{17}, \frac{1}{18}, \frac{1}{19}, \frac{1}{20}$	$\frac{1}{11}, \frac{1}{12}, \frac{1}{13}, \frac{1}{14}, \frac{1}{15}, \frac{1}{16}, \frac{1}{17}, \frac{1}{18}, \frac{1}{19}, \frac{1}{20}$	O	P	K
Enlargement	3, 2, $\frac{1}{2}$ .	$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ .	O	P	K
Copy to scale	$\frac{1}{2}$ .	$\frac{1}{2}$ .	O	P	K

36. Whenever enlargements or reductions are made by a pantagraph, squares must be drawn in pencil both on the original map and on the paper which is to receive the enlarge-

ment or reduction. The side of a square in the enlargement or reduction required should bear the same ratio to the side of a square in the original as that which the enlargement or reduction bears to the original. The following table gives the size of squares most convenient for various scales of maps :—

Scale of original inches to a mile.	Enlargement.	Reduction.
	Side of square to be drawn in original and enlargement.	Side of square to be drawn in original and reduction.
64	$\frac{1}{4}$ mile.	$\frac{1}{4}$ mile.
32	$\frac{1}{2}$ "	$\frac{1}{2}$ "
16	$\frac{3}{4}$ "	$\frac{3}{4}$ "
8	1 "	1 "
4	$1\frac{1}{2}$ "	1 "
2	2 "	2 "
1	2 miles.	4 miles.
$\frac{1}{2}$	4	8
$\frac{1}{4}$	8	16
$\frac{1}{8}$	16	32

37. To secure correct results, the pantagraph should, as a rule, be worked by two men, one standing at the tracing point and the other at the pencil.

38. Of late years, the photographic camera has largely taken the place of the pantagraph in obtaining reductions, enlargements or copies of drawings.

#### *Computing scale.*

1. This is an instrument for obtaining from maps the areas of fields and other enclosures. (Figure 100.)

2. The computing scales used in the Revenue Survey are graduated to suit the scale on which the maps are generally drawn, viz., 16 inches = 1 mile, or 5 chains to 1 inch, and read to acres and cents.

3. The 16-inch Computing scale, which is graduated to a length of 20 inches, reads 10 acres in one sweep and that graduated to a length of 10 inches reads 5 acres in one sweep.

Each main division on this scale denotes 1 acre, each minor division one-tenth of an acre or 10 cents and each subdivision one-hundredth of an acre or 1 cent.

4. There is also the 1 inch = 2 chains, or 40-inch Computing scale which is graduated to a length of 20 inches and reads 2 acres in one sweep. Each main division on this scale represents 10 cents, each minor division 1 cent and each subdivision  $\cdot 2$  or one-fifth of a cent.

5. Along the centre of each computing scale is an undercut groove, into which is fitted, so as to move freely along it, a tongue or slide of brass or steel. To this slide is attached a projecting frame which passes over the side of the scale and lies flat upon the paper on which the scale is placed when in use. A handle fixed to the slide enables it and the frame to be moved with facility along the graduated scale. The frame has a fine hair or platinum wire fixed across its centre at right angles to the scale.

6. To apply the computing scale to the measurement of areas there should be a piece of transparent paper with lines drawn on it, intersecting each other at right angles and forming squares.

7. In the area square paper to be used for computing areas from 16-inch maps, the lines should be one-fifth inch apart each square representing 10 cents. In the paper to be used for 40-inch maps, the lines should be one-fourth inch apart, each square representing  $2\frac{1}{2}$  cents.

8. Most of the lines on the area square paper are in black, but for the sake of convenience, the first line and every tenth line from it are in red, and the sixth and every tenth line from it are in blue in the 16-inch area square paper. In the 40-inch area square paper, the first line and every eighth line from it are in red, and the fifth and every eighth line from it are in blue.

9. The area square paper should be placed on the map as shown in the diagram. It should be so placed that most of the lines on the map fall obliquely to the ruled lines on the tracing paper.

10. The slide should be set to zero and the instrument placed on one of the lines A, so that the hair fixed to the frame may equalize the left side of the upper portion of the field falling within two of the lines a, b, on the area square paper. The slide should then be moved until the hair equalizes that portion of the right side within the same horizontal

lines. The slider remaining fixed in position, the scale should be moved downwards to the next line B until the hair coincides with or compensates the left hand boundary as before. The coincidence or compensation being established, the sliding frame should be moved to bring the hair to coincide with or compensate the right-hand boundary. This process should be repeated until the slider has passed over the succeeding lines on the area square paper for the remaining portion of the field.

11. If the area of the field be less than that represented by the entire length of the scale, the division opposite the hair will indicate the area of the field in acres and cents. If the area be more, as soon as the slider reaches the end of the scale, a mark should be made on the area square paper lightly in pencil, just below the hair. The scale should then be removed. Readjusting the slide to zero, the scale should be placed over the area square paper so that the hair coincides with the pencil mark already made. The process described above should be repeated until the entire area of the field is obtained.

12. In computing the area of offsets, those on the side of the chain line are scaled first which appear to be of the greatest area, and those on the other side are then scaled backwards without shifting the slide back to zero. The object of working the slide in the reverse way is to obtain the difference of area between the offsets and insets; and this difference is entered in the area list, as *plus* or *minus* according as the area of offsets outside or inside the chain line is the greater.

13. Care must be taken to see that the area square paper does not slip during the process of computation of the area of any field. This is best secured by placing a weight over the area square paper in such a position as not to interfere with the movement of the scale.

14. The area square paper is apt to expand or contract according to the temperature. A set of standard ruled lines should therefore, be kept on card-board with which the paper should be compared every day, both before and after work. The paper should, on no account, be folded or rolled.

15. The computing scale and area square paper intended for use on the 16-inch map should not, as a rule, be used on the 40-inch map and vice versa. But when they are so used, and when areas have to be computed from maps plotted on other than the scale of 16 inches or 40 inches to the mile,

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the area read off the computing scale should be multiplied by the square of the proportion of the scales in order to obtain the true area.

16. Thus, if the area obtained by using the 16-inch computing scale and area square paper on a 40-inch map be 9.50 acres, the true area will be  $9.50 \times (16/40)^2 = 9.50 \times (2/5)^2 = 9.50 \times 4/25 = 9.50 \times .16 = 1.52$  acres.

If the area of a map plotted on scale 1 inch = 1 mile, be computed with the 16-inch computing scale, and the area read off is found to be 6.20 acres, the true area will be  $6.20 \times (16/1)^2 = 6.20 \times 256 = 1,587.20$  acres or  $6.20 \times \frac{16 \times 16}{640} = 6.20 \times .4 = 2.48$  square miles.

#### *Area square.*

1. The area square is a transparent piece of paper or tracing cloth designed for obtaining areas from maps without the aid of the computing scale. The area square is generally used for taking areas on field maps plotted on scale, 1 inch = 2 chains. On the area square are neatly drawn or printed in black, lines intersecting each other at right angles and forming squares with sides of half an inch or one chain. Each square represents 10 cents and is divided into 10 rectangles by lines drawn or printed in red. Each rectangle represents one cent.

2. The area square is laid over the map so that the boundary of the field is clearly visible and the extreme west or east point of the field is at the corner of one of the ten-cent squares. The area is then calculated from north to south by counting the number of squares and rectangles. In counting the rectangles, half a rectangle or more should be reckoned as one cent and less than half a rectangle rejected.

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## Chapter III.

### BOUNDARY DEMARCATION.

1. Before commencing the boundary demarcation, a sufficient number of stones should be stocked in convenient centres.

2. For demarcation of Division boundary, the Peishkars of both the divisions should be asked to depute some Revenue Official to point out the correct boundary. Before demarcating the Taluk boundary, the Tahsildars of both the Taluks should be requested to point out the correct boundary. For demarcating the Pakuthy boundaries, the village officers should be asked to be present and point out the boundaries. For the Edavagai pakuthy, the proprietor of the Edavagai must be written to and requested to attend in person or by duly authorised agent. The village officers of the adjoining pakuthies should also be asked to be present.

In demarcating the State Boundary, the boundary line which has been settled and accepted by the two States should be strictly followed. If any additional demarcation stones have to be planted for field boundaries, they should be planted exactly on the accepted true boundary.

3. The surveyor will commence at the junction of three or more villages and fix theodolite stations at convenient distances apart on the village boundary. The stations should be planted, if possible, on field trijunctions, and with a view to their being utilised later as starting points for Khandom lines.

4. Each station must be, as far as possible, away from the next one but must be clearly visible from it. The further the stations are apart, the less will be the effect produced by bad centering of the theodolite or flag over the plummet holes on the stations. It may sometimes be advisable to fix what is called an interpolated station between two theodolite stations to avoid heavy line clearing. This should be a third class stone, on which a plummet hole should be cut, and should be, if possible, on the village boundary and always on a field boundary.

5. A straight line drawn from one station to the next must in no place be more distant than 5 chains from the true boundary.

6. Every stone must be firmly imbedded. Not more than one third of its length should be visible above the ground. The pit to receive the stone should be made slightly larger than the stone and a small quantity of earth put in at a time and well tamped.

7. There should be sufficient level space round each station stone to allow of the theodolite being set up.

8. When a rock other than laterite is found conveniently situated it should be utilized as a station, the shank mark and the plummet hole being cut on it.

9. When a river forms the village boundary, Khandom station stones should be erected on each bank, and the middle of the river bed will be considered the true boundary, provided, however, that existing rights are not interfered with.

10. On completion of demarcation of the village boundary the village should be divided into Khandoms of from 100 to 200 acres. In open country the larger size should suffice.

11. Khandom boundaries should be chosen so as to avoid line clearing, but must follow existing and natural boundaries.

12. A sketch should be prepared, in duplicate, showing the stones fixed on the village and Khandom boundaries.

13. The symbols to be used are  $\Delta$  Village trijunctions,  $\square$  Village boundary station,  $\circ$  Khandom boundary station, and  $\pm$  rock mark station.

14. The Khandoms should be numbered consecutively beginning at the north-west corner of the village. On the upper part of the sketch should be written the number and name of the village the names of the villages adjoining, and the names of any reserved forests that may touch the village boundary, should be written in the appropriate places.

15. The surveyor will sign the sketch in the lower right hand corner and enter the dates of commencement and completion of demarcation. An abstract of the number of each kind of stone fixed should also be shown.

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## Chapter IV.

### TRAVERSE SURVEY.

1. A Taluk is generally divided into two or more main circuits each containing about 70 or 80 square miles and running along pakuthi boundaries.

2. To begin with, the Taluk boundary is traversed with Theodolite. After this, the main circuit boundaries should be traversed with theodolite. Then the boundaries of the several pakuthies included within each main circuit, should be traversed with theodolite.

3. The above is done on the important principle in all surveying operations, that it is well always to work from whole to part, and rarely from part to whole.

4. Each Surveyor will be given a theodolite, two Gunter's chains, one 100 feet chain, a steel tape and a number of blank field books.

5. The handles of one of the 100 links chains should be painted red, and it should be used only as a standard for daily comparison with the other being tested now and again with steel tape.

6. After the angles have been taken at a station, the distance between it and the next station should be measured twice once with the 100 links, and once with the 100 feet chain. The result should be compared, and the line rechaind, if there is a difference of more than one per thousand.

7. All entries in the main circuit field book must be in ink. They may be recorded in pencil while in field, but if so, the entries in ink should not be written over the pencil figures but apart from them. If a correction is made, the original entry must be scored through, not erased, and should be distinctly visible. The correct entry should be complete in itself; thus, if one of three figures needs correction, the three correct figures should be entered, not one only.

8. The main circuit surveyor should observe the angles to Khandom stations adjoining the village boundary, but he need not measure the lines to these. The survey of the Khandoms will be done by another surveyor.

9. The nature of the ground, whether level or uneven, should be noted in the field book, and the names and Taluk

number of villages on each side of the main circuit boundary should be entered.

10. If the distance between two stations cannot be chained, it must be triangulated from two separate bases, and the bases must be chained twice. Alternately, it may be measured by using the substance bar.

11. The main circuit traverse should be connected with as many principal or secondary Great Trigonometrical or Survey Trigonometrical stations as practicable. A descriptive list of the Trigonometrical stations to be connected will be furnished to the main circuit surveyor.

12. Azimuths must also be observed at intervals of 40 or 50 stations throughout the main circuit boundaries. Village trijunctions should, as a rule, be selected for this purpose.

13. Observations for azimuth should be taken by a senior Head surveyor or by the Sub-Assistant in charge of the traverse section.

14. Village boundaries should be surveyed by theodolite surveyors in the same way as the main circuit boundary. On Khandom boundaries no re chaining nor observation for azimuth is needed.

15. High and low water levels should be surveyed at the survey of maritime villages. Surveyors should be in a position to fix the high water level with accuracy by personal observation at new moon or full moon. It should be noted that low water levels should be indicated by dotted lines but in black ink.

16. The boundaries of these villages along the coast will be the line the tide reaches at full or new moon and should be marked when the moon is full.

17. It should be off-setted in the same way as any other village boundary but should not be demarcated with stones which would soon be covered up by sand or washed away by exceptionally high tides.

18. The line of low tide, that is, the line the tide reaches about six days before full or new moon, should also be surveyed, but not demarcated, and should be shown in the village map by dotted lines. It will, of course, run outside the high tide line, which should also be shown by dotted lines.

19. The work should be done by the A. B. Section Officer or by a Head Surveyor. The high tide line should be surveyed the morning after it is marked and the same Head Surveyor or A. B. Section officer should go again to the village five days before new moon to mark and survey the low tide line. Separate offset field books for high and low tide levels should be submitted for each maritime village.

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## Chapter V.

### TRAVERSE COMPUTATION.

1. The traverse computation of main circuits and of the village circuits adjoining should precede that of the other circuits.

2. As soon as the field books of a main circuit are received in the headquarter office, they will be numbered and entered in a register.

3. The field books will be examined by the Head computer who will see that the deduced angles agree within the limit of the minimum graduation of the theodolite used.

4. Triangulated distances must be worked out by a computer and examined by the Head computer; and the computed distances should be entered in the field book in red ink and attested by the Head computer's initials.

5. The Head computer will note the result of his examination in the register mentioned in rule 2 above, and submit the same to the officer in charge for orders.

6. The true bearings of traverse lines for which azimuths have been observed will be computed by two different computers and the computations examined by the Head computer.

7. The traverse angles and distance from the main circuit field book will be copied into rough traverse sheets in which the reduced bearings will be entered in red ink.

8. The bearings of all the traverse lines will then be worked, and if the angular error between any two bearings be greater than 1 minute in 5 angles, the incorrect work will be sent out for examination.

9. The double measurements for each line will also be compared and all discrepancies greater than 1 link in a thousand brought to the notice of the officer in charge. If the rules for the guidance of the main circuit surveyor are attended to, such discrepancies will not be found. If any are found, the main circuit surveyor will be severely punished.

10. If the two distances agree within the above limit of error, the mean should be taken for the traverse.

11. When discrepancies in angles and distances have been adjusted, the computation in the main circuit traverse will commence on fair traverse sheets.

12. The main circuit is divided into portions. Each portion starts from a Trigonometrical station and closes on another Trigonometrical station. The angles and distances for each portion will be entered in the traverse sheets, as also the names, latitudes and longitudes of the Trigonometrical stations.

13. The deduced bearings of traverse stations will be worked from one bearing to another, the necessary small corrections being applied to close the angular work.

14. The latitude and departure of each station will be taken from the traverse table and entered on a sheet of paper which should be kept in the custody of the Head computer, while they are retaken by another man who enters them in the traverse sheets. The two computations will then be compared. If they do not agree, a third computation and, if necessary, a fourth computation, will be made and so on, until any two computations agree.

15. When the Head computer has satisfied himself that there is no error in the calculations, the latitudes and departures will be added up from one Trigonometrical station to another, and each portion of the traverse formed into a complete circuit by adding the co-ordinates between the two great Trigonometrical stations concerned.

16. If the difference between the northings and southings and between the eastings and westings does not in either case exceed 1 in 1,000 links, the traverse may be accepted as correct. If it be more, there must be error either in the measurements, or in the computations or in the identity of the Trigonometrical stations connected, and immediate steps should be taken to detect and rectify the error. Before sending out work for correction, the village circuits adjoining the main circuit should be set up to assist in locating the error.

17. The traverse sheets of all main circuits will be signed by the Officer as soon after they have been closed as possible, together with the traverse field books, sketches of connection of Trigonometrical stations and all other records connected with the computation of the main circuit.

18. The purpose of main circuit traverses which have no apparent connection with the work in hand is not difficult to conceive. Balancing the co-ordinates of a closed circuit is not sufficient by itself to determine its accuracy as the co-ordinates would agree, even had an inaccurate chain been used provided the chain was uniformly inaccurate and no mistake had been made in reading it. A combination with other points fixed independently is therefore needed, and this is secured by connecting the main circuit with Great Trigonometrical stations and by dividing and setting it up into as many lines as there are Great Trigonometrical connections each line starting from and closing on a Great Trigonometrical station. The Great Trigonometrical co-ordinates are fixed and the Revenue Survey co-ordinates should accord with them, differences less than 1 per 1,000 being allowed as negligible. Thus, while the accuracy of angular work is proved by azimuth observations, that of measurement is ensured by connection with Great Trigonometrical stations.

19. The registry of village and Khandom circuit field books and their examination by a computer should be done in the same manner as for the main circuit field books.

20. The traverses of village circuits will next be set up, the angles, bearings and distances common to them and to the main circuits being first copied into the traverse sheets.

21. The traverses of Khandom circuits will then be set up. The village boundary lines need not be copied in the Khandom circuit traverse, nor those of adjoining Khandoms already set up, but remarks will be made at the foot of the traverse, showing the lines added to form the Khandom into a complete circuit, thus: "Add village boundary from distance 1,083 to 842"; "Add second Khandom from distance 750 to 845".

22. The setting up will be examined and, if the error does not exceed 1 minute in 5 angles in village circuits and 1 minute in 2 angles in Khandom circuits, the angles will be closed by applying the required corrections.

23. When applying corrections, care must be taken that in each case, the corrections tend to close the adjoining traverses.

24. The bearings will then be worked and the traverse submitted to the officer in charge for initials.

25. The latitude and departures of the distances common to the main circuits will be copied into the village traverse

sheets and the same calculated for the remaining stations in the manner described in rule 14 above.

26. When the workings have been compared and the Head computer has satisfied himself that there is no error in the computations, he will have the work added up and submit the traverse to the Officer in charge with the amount of error noted at the foot.

27. In village circuits, the maximum error allowed is 1 link per 1,000 and in Khandom and minor circuit, 2 links per 1,000.

28. The distances of a village circuit should not be worked until the angular work of all its Khandoms has been proved.

29. It may occasionally be found inconvenient to carry out the above rule strictly. In cases where there can be no doubt that an error exists in a line common to two villages or Khandoms, the remaining portion of the traverse may be worked while the incorrect line is sent out for correction.

30. An examination of the traverses of adjoining villages and Khandoms will be of use in discovering where the error in a village circuit may lie. It will be a rule, therefore, that, before sending any traverse work for correction, the adjoining and included circuits must be set up and proved.

31. Faulty work must be shown and submitted to the Officer in charge for orders, or Manager in case the Officer in charge is in camp and must not be sent out for correction until orders have been obtained.

32. An error in distances may often be discovered by a careful examination of the field books.

33. When the angles are wrong, an extract from the field book showing only the distances will be sent to the Surveyor, and if the distances do not close, the angles only will be given. In both cases the Surveyor, who attends to the correction work, will retake the angles and remeasure the distances.

34. Correction field books will be bound up with the original field books, and reference to their number and date made in the traverse sheets and in the original field book by the computer who makes the corrections in them.

35. When the distances close within the allowed error, the necessary small corrections will be applied to the latitude

and departures, care being taken that, in each case, the corrections tend to close the adjoining traverses.

36. The corrected latitudes and departures will be entered in the traverse sheets, and plotting lines worked from the first station of the village traverse.

37. The traverse area will then be computed and the traverses initialled by the Officer in charge. They will then be handed over to the Head-Draftsman for plotting.

38. Traverse area computation may, if necessary, be deferred until the traverse plotting has been completed.

39. The computers will sign their names at the back of the traverse sheet in the space provided for this purpose.

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## Chapter VI.

### TRAVERSE PLOTTING.

1. Village maps are plotted to the scale of  $16'' = 1$  mile or 5 chains = 1 inch.

2. The plotting is done on sheets of drawing double elephant paper, 130 lbs.; size of whole sheet, 40 inches by 27 inches; size of half sheet, 27 by 20 inches.

3. The section or rectangle within a whole sheet will measure 32 inches by 24 inches and within a half sheet, 24 by 16 inches.

4. The number of sheets required is ascertained from the column of plotting lines in the village boundary traverse. The greatest northing *plus* the greatest southing and the greatest easting *plus* the greatest westing will give the height and base of a rectangular parallelogram that will exactly contain the polygon formed by the traverse. The number of sheets will be known by dividing the base expressed in inches by 32 and the height by 24.

5. If, in dividing the base, the quotient contains a fraction not exceeding half, a half sheet, base 16 inches and height 24 inches, may be used instead of a full sheet.

6. In arranging sheets to contain a village, the shifting must be by half sheets east and west and by whole sheets north and south.

7. A full sheet will contain 12 squares, four east and west and three north and south. A half sheet will contain six squares, two east and west and three north and south.

8. The position of the first station in the traverse has then to be fixed. This is done in the following manner:—

A diagram, 12 inches square, should be drawn on a paste board, on scale, 1 inch = 40 chains. The diagram should be divided into 12 rectangles, four from north to south and three from east to west. Each rectangle should be divided into twelve one-inch squares. The sides of the rectangles should be drawn in black ink and those of the squares in blue ink. In the diagram which represents 12 full sheets, the sheet margins are supposed to be cut off and the rectangles placed in contact. The rectangles should be numbered from west to east by Roman numerals and similarly the squares within each rectangle by Arabic numerals. A plot of the rectangular

parallelogram mentioned in rule 4 above should be made on tissue paper and so placed over the diagram that the opposite sides of the parallelogram may be equidistant from the adjoining sheet lines in the diagram. The greatest easting and the greatest northing laid off from the east and north sides of the parallelogram respectively and at right angles to the sides will, where they intersect, indicate where exactly, in the diagram of rectangles and squares, station A of the traverse will fall.

9. Whenever station A of the traverse placed in the most advantageous manner with reference to the number of sheets to be used falls within a short distance of an intersection of the 40—chain squares, it should be shifted to the intersection to facilitate plotting.

10. If shifting to an intersection would entail marked disadvantages, such as bringing small corners of the village into separate sheets and causing waste of paper, then the paper can be re-squared from station A as it falls in the rectangle of  $2 \times 1\frac{1}{2}$  miles.

11. The traverse will then be plotted from the meridian passing through the first station.

12. The distance on the meridian will be laid off above or below the first station according as the distance is north or south.

13. At each mark on the meridian line, another line will be drawn at right angles, and the distance on the perpendicular taken from the traverse set off to the right or left according as the entries corresponding to meridian distances are east or west.

14. The points thus successively fixed on the lines perpendicular to the meridian are the stations or angles of the polygon. As each station is plotted, the distance between it and the last will be tested.

15. If there should be more than one sheet for a village, a key map showing the arrangement of the sheets and their numbers should be drawn in the margin of each sheet. The rectangle denoting the sheet should be distinguished by hatched lines.

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## Chapter VII.

### FIELD DEMARCATION.

1. After a sufficient number of stones are stocked in a pakuthy, Field Demarcation will be commenced.

2. Generally, a Field Surveyor is employed on this work. A batch of five to seven Field Surveyors will form a range and they will work under a Deputy Surveyor who will be directly responsible for their work.

3. The Field surveyor will commence the demarcation on the north-eastern corner of the pakuthy. He will issue notice to the owners or occupiers of the lands he has to demarcate the next day.

4. The Field surveyor must go on marking the boundaries of fields according to possession, guided by the revenue accounts. In case there is a dispute, the field surveyor should make a complete enquiry, prepare a neat sketch for the disputed portion, and submit a report explaining the case to his Deputy Surveyor for orders.

5. The Field surveyor will arrange to have the stones planted without any loss of time. If however, an owner or occupier, fails to plant the stones within the prescribed time, the surveyor will arrange to carry out the work at Government cost.

6. An eye-sketch should be prepared for the lands demarcated and should be inked after all the stones are planted.

7. The demarcation and clubbing of revenue fields should be done in accordance with the demarcation rules to be framed by Government, to suit the requirements of each taluk.

8. In clubbing revenue fields, great care and judgment is required to avoid the boundaries of survey fields being irregular.

9. In demarcating fields existing limits of occupation should be adhered to and all bends should be carefully marked. The demarcation marks should be so placed on the boundary that there is no appreciable loss of land or of trees to either party.

10. When field boundaries are found to be very crooked, every endeavour must be made to induce land holders to consent to their being straightened. It must be explained that the saving in stones will be very great, and that they lose nothing, because just as much will be added to each field as is taken away from it.

11. If land holders agree to straighten their boundaries they must be asked to demolish the old and set up the new fence or bund at once. Unless they do this, the field boundaries will have to be marked as they exist.

12. When there are bunds or fences between fields, the centre of these will, as a rule, be considered to be the boundary unless there is evidence to the contrary.

13. The term "Poramboke" means land which is reserved for State or Communal purposes, as for example,

(1) River and streams, (2) Tanks, (3) Tank beds, (4) Channel, (5) Banks, (6) Fort, (7) Rail roads, (8) Burning and burial grounds, (9) Grazing grounds, (10) Forest, (11) Temples belonging to Government, (12) Public buildings and (13) Cart tracks.

14. These porambokes should be demarcated as separate survey fields if they are broader than 50 links, and as sub-divisions if they are less. When these porambokes occur in large blocks of waste land they should be treated as details to be fixed by measurement.

15. Encroachments on poramboke lands should be set back. For the existing encroachments, the necessary sketches should be prepared with full particulars of encroachment and should be forwarded to the Revenue Department for taking the necessary action.

16. Before demarcating the boundary of Reserve Forests, channels, roads and other public works, and lands of other departments or municipalities, notice must be sent to the respective local officers concerned to depute a responsible subordinate to attend and point out the boundaries of such lands. The subordinates deputed should certify to the correctness of the demarcation of the lands and the certificates should be filed with the survey records of the pakuthy. If there is any difference between the boundaries pointed out by them and by the ryots, the matter must be reported to the higher authorities for orders.

17. Large waste blocks fit for cultivation should be divided into ten-acre fields, following where convenient, easy

gradients for a cart track, which will be necessary and desirable, care being taken to secure regular field boundaries.

18. Where a road runs through Government waste, its limits should be marked at a maximum distance of 50 ft. on each side of the centre line of the roadway.

19. Before demarcating the boundaries of railway lands, the local railway authorities should be consulted and asked to produce copies of land plans that were prepared for the railway.

20. Railway lands may be divided into 4 classes A, B, C and D—first class A, land which the railway company received for permanent occupation; second class B, land provided for temporary occupation; third class C, land which the railway company require for actual execution of work; fourth class D, land which being required in consequence of the works of a railway still does not come directly into the occupation of the railway company at all.

21. Under class A is included all lands required for the permanent works of the railway, including the formation of the line with its side slopes, ridges etc., and for all stations, workshops, permanent store-houses and the like necessary for the line when opened.

22. Under class B is included all lands essential for the execution of the permanent works of the railway but not required after the completion of the line in part or whole.

23. The following cases are instances of lands contemplated in para 22—lands required for spoil banks, for excavations to make banks, or for the storage of materials held in stock by the Railway Company pending the construction of the line or their despatch to the works.

24. Under class C is included all lands which is required for the provision or preparation of materials, for purposes contingent on the actual execution of the works on the line or for other miscellaneous objects.

25. Under class D is included all lands required outside the company's boundary, for the diversion of roads or rivers and for the construction of roads which are made for public purposes but will not afterwards be maintained by the company.

26. Classes A and D should be marked as separate survey field and classes B and C as sub-divisions or as survey fields according to their area.

27. Long narrow fields, such as roads, cart tracks, channels, railways etc., should be split up into survey fields each measuring about 10 chains in length.

28. Cultivation within reserve forests, if recognised as enclosures, should be marked separately according to cairns put up by the Forest Department. If the area of an enclosure thus marked is more than that allowed at the forest settlement, the excess should be formed as a separate subdivision or survey field according to extent and the same reported for necessary orders.

29. Stones erected by the Public Works department on the banks of canals, roads etc., by the Railway Department to define A class land and by the Forest Department to define forest boundaries, should, with the consent of the departments concerned, be utilised as survey marks by cutting the shank mark on them.

30. From the boundary demarcation sketch of the pakuthy supplied to him, the surveyor will prepare a skeleton field demarcation sketch on convenient scale. As he demarcates the boundaries of survey fields and the included sub-divisions, he will sketch them in pencil in the skeleton demarcation sketch.

31. As each field is sketched, the surveyor will note in the sketch in pencil the old survey numbers or ozhuku numbers of each holding and other particulars necessary for writing up the land register.

32. The sketch must be neatly drawn so as to admit of every field and sub-division bend being clearly shown.

33. The pencil lines in the sketch should be inked as soon as the stones have been planted and not before. This is with a view to enable the Surveyor to show clearly where the arrears in stone planting exist.

34. The symbols to be used in the sketch for the different kinds of stones are:—



Village trijunctions.  
 Village boundary station.  
 Khandom Station.  
 Forest Cairn.  
 P. W. D. stone.  
 Rock mark.

35. Fields must be numbered consecutively throughout a village commencing from the north-west corner of the first

**Khandom.** The last field in the first Khandom must touch the boundary of the second Khandom and so on, so that there may be no break in the continuity of the numbers.

36. Sub-divisions in each survey field should be numbered consecutively commencing from the north-west corner of the field.

37. At the head of sketch will be entered the name of the taluk, the number and name of the pakuthy. The number and names of adjoining villages or the numbers of the adjacent Khandoms must also be entered in the sketch.

38. The Surveyor should sign the sketch in the lower right hand corner and enter the dates of commencement and completion of survey.

39. As demarcation proceeds, the land register should be prepared with all particulars in the form to be prescribed by Government.

40. In preparing the land register, the greatest care is necessary in noting the old ozhuku or survey number against the new survey numbers and subdivisions.

41. All the ozhuku numbers or old survey numbers must be accounted for in the register and entered opposite the survey numbers in which they are included. When portions of a Ozhuku or Survey number are included in several survey fields, the total area of the Ozhuku or Survey number should be entered against the first survey field number in which it appears. Against the remaining survey field numbers only the Ozhuku or Survey number should be entered, and for its area reference should be made in the last column of the land register to the first survey field number against which the same was noted.

42. The register must show distinctly for each property the tenure under which the land is held, the name of the Pattadar, the name of the present occupant and other particulars. In the case of poramboke fields, the nature of poramboke (Vide para 13 of this chapter) should be noted in the remarks column of the land register.

43. The Surveyor will initial every page of the land register and the last page will bear the full signature of the Surveyor.

44. As soon as the demarcation of a Khandom is completed, the necessary recovery statement for the stones planted at

Government cost should be prepared in the form prescribed and submitted without delay.

45. The stones planted at Government cost should be marked in the demarcation sketch by a square mark in red ink to denote that they have been planted at Government cost.

46. Every endeavour should be made by a Surveyor to minimise the submission of such recovery statements. If the registry holders are properly advised, it would be possible to get the major number of the stones planted by them.

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## Chapter VIII.

### *Field Measurement and Preparation of Plotted Sketches.*

1. The measurement of no survey field should begin until all stones have been fixed on its boundaries.

2. Fields should be measured in the consecutive order of their survey numbers. The distance from stone to stone on the field boundary and from bend to bend on the subdivision boundary should be measured first. In making these measurements, the *Surveyor should take care to see that the common boundary between two survey fields or two subdivisions is measured but once so that there may be no difference between the measurements recorded for such common boundaries.*

3. Each field should then be divided into triangles by chaining lines across from junction to junction of three or more survey fields, and offsets should be taken from the sides of the triangles to all bends on field and subdivision boundaries. The triangles should be so formed that the bends to be offsetted are not more than five chains distant from the sides.

4. Where it is not possible to chain lines from one trijunction to another, the triangles should be so formed with reference to the other demarcated points on the field boundary that not only can each field be plotted independently, but that a continuous series of triangles may be built up for the whole village so as to facilitate the plotting of the village map.

5. Long narrow fields, which cannot be plotted correctly if measured in triangles, should be measured by running a single line through the field. Small fields overgrown with shrub or prickly pear or otherwise unsuited for field triangulation should be measured by offsets from lines outside running between two field stones. Large fields of the latter class should be left to be surveyed with theodolite or prismatic compass.

6. Enclosures within reserve forests and other detached fields, whether situated within or outside the village boundary, should be connected with one another and with the main work by chain triangulation or by traverses run with the theodolite. When enclosures within reserve forests lie at a

considerable distance from a village boundary, they need not be connected and will be plotted in the margin of the village map with an explanatory note.

7. The position of all important topographical details, such as temples, public buildings, channels, streams, tanks &c. whether separately marked or not as survey fields or subdivisions, should be fixed by measurement.

8. Arrows indicating the direction of streams, rivers etc., should be inserted in the sketch. Care should be taken that the direction of the arrow shows the direction of the stream or river correctly.

9. The name of every village site, hamlet, tank, river, channel, or other topographical feature, which has a distinguishing name, must be entered in the sketch, and care must be taken to ensure its correct spelling.

10. As each field is measured, the same should be plotted in a field measurement sketch with the triangulation measurements and offsets. The ends of the G lines should be lettered and in the margin of the sketch the offsets taken on the chain lines should be noted. As a rule, the top of the page will represent the north, but when it does not, the north point line should be drawn.

11. The accuracy of the several measurements recorded on the ground should be checked on the plotting to see if they all close. The boundaries of the field and subdivisions should not be inked until the plotting has been so tested and found correct.

12. The scale on which the fields should generally be plotted will depend upon the area, thus :—

Up to 5 acres, 1 inch = 1 chain.

5 to 20 acres, 1 inch = 2 chains.

Over 20 acres, 1 inch = 5 chains.

The point to bear in mind is that the scale must be large enough to enable all measurements to be shown distinctly.

13. The fields must be plotted in the field measurement sketch in the consecutive order of their survey numbers. The scale should be noted either at the top or at the foot of each field map.

14. Not more than one field should be plotted on each page of the field measurement book, and one field should not occupy more than one page.

15. If a field cannot be plotted on the prescribed scale on a single page, as in the case of the long narrow strip of land such as roads, or channels, rivers etc., it may be plotted on a smaller scale, provided all measurements can be clearly shown.

16. Where, however, the field is too large to be plotted on one page on a sufficiently large scale to admit of all measurements being recorded legibly, it should be plotted on sheets of field measurement book form mounted on cloth allowing about half an inch margin for stitching, to fold to the field measurement book.

17. The field sketch should be neatly inked. The survey number boundary line should be broader than the subdivision lines. At a glance it should be seen which is the boundary of the field and which is the subdivision boundary.

18. The area of each survey field and of its subdivisions should be taken by the field surveyor with the area square paper from the plotted sketch of the field measurement book. It should be entered at the top in the column provided for entering the areas.

19. The field measurement sketch should be prepared in duplicate. The duplicate copy need not be plotted once over but it would be enough if the original plotting is placed over another paper and the several points pricked off.

20. At the foot of each page of the field measurement sketch the surveyor should sign his name in black ink with the date of measurement.

21. On completion of field survey, the surveyor must measure lines from one Khandom station to another along the Khandom boundaries offsetting all the points on the boundaries.

22. The following are the errors that could be committed in plotting fields :—

(a) Taking wrong distances off the scale.

(b) Mistakes in converting the measured distances to suit the scale on which the plan has to be constructed.

(c) Unconsciously opening or narrowing the space between the points of the pair of compasses after measurements have been taken off the scale.

(d) Plotting offsets or triangles on the wrong side of the 'G' or base line.

(e) Joining wrong points as 'F' lines.

23. Purlal measurement is one by which a long line is run across several fields and offsets are taken on both sides to give a base for plotting a consolidated map of the fields.

24. The purlal line is run as an independent and a very salutary check on the surveyor's work by calculating with the aid of the table of squares roots, the 'F' or 'G' lines between any two points offsetted on the purlal line and seeing whether the calculated distance is within allowable difference of the recorded measurement. (Vide pra 17—chapter XIV)

25. Such of the measurements as do not close will have to be sent out for correction in field.

26. Inspecting Officers should sign their names in full in red ink in the original field measurement book at the bottom of the map of each field inspected by them, noting above their signature the number of lines tested with total chainage remeasured. The surveyor's measurements should be ticked off in red ink if they agree with the measurements of the Inspecting Officers within the margin of error allowed. When the difference exceeds that allowed, the Inspecting Officer's measurements should be entered and attested in red ink in both copies of the field measurement book and the Surveyor's measurements scored out.

27. The offsets taken to all the points on the village boundary on the traverse lines should be entered in a separate field book. Similarly, separate field books should be prepared for the Khandom lines and the purlal lines. In the margin of the field book, a diagram showing the point to which offsets have been taken should neatly be shown.

28. The Deputy Surveyor in charge of a range will do the percentage of inspection prescribed for him and see that all the records have been completed in accordance with the rules issued on the subject.

29. The Deputy Surveyor will also keep the eye-sketch, field measurement sketch or book and the land register and compare if the sub-divisions in the one agree with the others,

## Chapter IX.

### *Plotting Village Maps.*

1. As soon as the original field measurement books and other records are received in office and before the plotting of the village map is taken up, they should be compared with each other.

2. The plottings of the field measurement sketches should be carefully tested by a draftsman.

3. The plotting of the village boundary should first of all be done. After this, the offsets taken on the Khandom lines should be plotted. When this is done, the offsets taken on the several purtal lines should be plotted.

4. The plotting of the fields should then be done in the map.

5. Fields should be plotted from the measurement in the field measurement sketches. *Sub-divisions should not be plotted in the village map.*

6. Enclosures within Forest Reserves and other detached fields situated outside the village boundary should be plotted in their correct relative position wherever possible. When they lie far off the village boundary, they should be plotted in the margin of the map without reference to their correct position and a remark to that effect made in the map.

7. When measurements appear to be wrong in any portion, the plotting in that portion had better not be continued but carried to it from some other direction.

8. With the help given by the points offsetted from purtal lines, and by the several theodolite station points, it should be possible to ascertain exactly in what line an error of measurement lies.

9. The draftsman will maintain a note book in which he should immediately note down the lines that do not close and will indicate in the map by a cross mark on the line itself.

10. The plotting of the 16-inch map should be tested by a superior draftsman and he should test 25 per cent of the plotting in each sheet of the village map. He should also examine the plotting of the field in which errors have been located by the original plotter.

11. A discrepancy list and a rough sketch showing the lines in which errors exist should be prepared and sent to the field for attention.

12. On receipt of the correction sketches from field with the remeasured distances entered in them, corrections will be applied in the map and in the field measurement sketch.

13. The field measurement sketch prepared by the Surveyor will not contain the fields traversed as minor circuits with the theodolite. A traverse plot of each of these fields should be prepared from the Surveyor's rough sketches and inserted in the field measurement book.

14. When the middle of a river or backwater forms the true boundary of the taluk or Village, the field map for them should be pricked off from the village map. The conventional lines denoting the boundary of the backwater or river portion should be shown in the field map by broken lines and the measurements for the lines should be obtained by scale from the village map. A note should be entered at the foot of the field map that the broken lines are conventional lines.

15. The village boundary should be compared with the boundaries shown in the maps of the adjoining villages, and correction lists prepared for adjustment of discrepancies after verification on the ground, if necessary.

## Chapter X.

### FINISHING VILLAGE MAPS AND AREA COMPUTATION.

1. After the map or after the plotting is completely tested, the field boundaries should be inked, the Village and Khandom boundaries being drawn slightly thicker than the field boundaries. The lines should be drawn evenly with a steady hand, and care should be taken to show the bends on field boundaries by well defined intersections of the lines constituting the boundaries to secure a clear delineation of these latter in the maps.

2. The field numbers should be neatly typed, the figures heading north, as a rule. When necessary, the numbers may be typed transversely, but such instances should be rare. To ensure clearness in the printed maps, the field numbers in the original map must be quite distinct. This can only be secured if the types are perfectly kept clean.

3. If the ordinary type for field numbers would overcrowd the map, smaller types should be used.

4. Where a field is too small or narrow to admit of its number being typed with clearness even by using small types, the number should be typed in the nearest open space and its reference to the field indicated by an arrow.

5. In the case of fields which are divided by the sheet lines and which consequently lie partly in one sheet and partly in another, the field numbers should be typed within the sheet which contains the larger portion of the field. In the other sheet which contains the smaller portion, the field number should be typed outside the sheet line in smaller type. When sheets are joined, only one number must appear in each field.

6. Small fields less than a quarter of an acre or narrower than half a chain should be plotted in the margin of the map on a larger scale.

7. After the inking of field boundaries and the typing of field numbers are completed, the areas of survey fields should be taken with the area square paper with a computing scale and noted in the area list.

8. These areas should be compared with the areas taken on the field measurement sketches to see if they agree

with each other. All entries which agree with the percentage of difference allowed, *viz.*, 5 cents up to 5 acres and one per cent for areas above 5 acres, should be tick-marked and passed.

9. A list of fields that do not agree should be given for a second computation which should be performed by a quite different computer.

10. When this is done, comparison of the field measurement area and necessary adjustments should be made.

11. The process of recomputation should be continued until the computing scale area taken from the 16-inch map agrees with the area taken from the field measurement book within the percentage of difference allowed.

12. After the entries in the two area lists have been carefully compared, the areas of fields should be totalled up. The final fair area list should then be prepared.

13. The areas of offsets on the village boundary should be computed with the computing scale.

14. The Area of offsets outside the traverse lines will be added to, and that offsets inside the traverse lines deducted from the traverse area. The result thus obtained will be the true area of the pakuthy.

15. This area should be compared with the total area of the pakuthy by fields, and the difference should not exceed one per cent. If the difference exceeds one per cent; it points to error in the computation of either traverse or field areas or both.

16. The traverse computation should first be examined, and then, if necessary, the field area computations and the difference adjusted.

17. When this has been done and the fair area lists are ready, the areas should be copied into the land register, and the abstract at the end of the register filled in. The areas of survey fields will, at the same time, be copied into the field measurement book.

18. The area lists, field measurement book and land register should be compared with one another.

19. The important topographical details noted in the eye-sketch should then be marked off in the plotted 16-inch map. This can be done easily with the help of the field measurement book.



20. The details should then be inked. All names and words should be printed so as to suit the map of the pakuthy when the sheets are joined together. Part of a name will, under this arrangement, often fall in one sheet and part in another. When this is the case, the continuation of the word or name should be printed in small type on the margin of the sheet in which it commences, and likewise, the beginning of the word or name on the margin of the sheet in which it ends.

21. The names of places from and to which roads etc., lead should be printed, the former at the northern and western and the latter at the southern and eastern boundaries of the pakuthy.

22. The names of adjoining pakuthies should be typed symmetrically across the blank space left on the sheets, but only once in the case of each pakuthy. The number of each sheet should be typed close to but outside the sheet line and above the right hand corner. The number should not extend beyond the east sheet line produced.

23. In a line with the sheet number will be typed the number and name of the pakuthy of which the sheet is a part. The numbers of the adjoining sheets should be typed outside the sheet lines on each side in the middle of their length. It is not necessary to add the words "adjoining sheet".

24. The heading of the map should show the names of the division and taluk, and the taluk number, name and traverse area of the pakuthy. The pakuthy name should be in larger type than that used for division and taluk names.

25. The heading should be placed in one of the upper sheets of the map, so that it may occupy a conspicuous position when all the sheets are joined or printed. The north point should be drawn close to the heading.

26. The scale of the map and the proportional linear magnitude, otherwise called the representative fraction, should be typed just below the area; and underneath the area, the scale itself should be drawn. Below the scale should be drawn a square representing one acre on the scale of the map.

27. Each topographical detail is distinguished by a symbol. Separate table of reference should be drawn on the pakuthy map for easy reference.

28. After the map has been inked and finished as above, each sheet should be carefully compared with the adjoining sheets to see that all bends and topographical details agree.

29. 16-inch maps should not be mounted, but, in order to protect the edges, tape or a strip of long-cloth should be sewn along each margin. The cloth is not to encroach on the rectangle drawn on each sheet.

30. The map and all other records should be finally examined by the respective section heads and by the officer and the result of their examination recorded in a final examination report. All the records should then be signed by the officer.

31. The survey records of a pakuthy will consist of the following :—

- (1) Boundary demarcation sketch.
- (2) Traverse field books.
- (3) Traverse sheets.
- (4) Field demarcation sketches.
- (5) Land register.
- (6) Copies of Field Measurement books.
- (7) Offset field books of the Village boundary, Khandom boundary and of the purtal lines.
- (8) 16-inch pakuthy map.
- (9) Fair area list.
- (10) Final Examination report.

32. On the completion of the survey and mapping of a pakuthy, the land register and the duplicate copy of the field measurement book should be sent to the Revenue Officers for taking the necessary action.

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## Chapter XI.

### RESURVEY.

#### *Preliminaries.*

1. If an area which has once been cadastrally surveyed has for any reason to be completely surveyed again, the new survey is called a Re-survey.

2. A Re-survey becomes necessary before a Re-settlement is undertaken.

3. Before the commencement of a Re-survey, a complete list of all sub-divisions to be made and the several registries in large minor circuits should be prepared *pakuthiwar* by the Revenue officers and handed over to the Survey Officers.

4. When the theodolite work of the former survey is found satisfactory, it will be sufficient to replace missing theodolite stations with the help of the old angles and distances available. Replacement of missing theodolite stations must always be done very carefully and good amount of inspection should be made by superior officers.

Where, however, a station cannot be replaced in its former position, interpolation stations should be used and the new angles and distances noted in the field book.

5. In some cases, it may so happen that additional new traverse lines will have to be run, to suit the system of survey that has to be done.

6. For these lines, fresh field books will have to be prepared and the lines shewn in a key sketch.

7. If a *pakuthi* has to be split up, the new *pakuthy* boundary should be demarcated and traversed with theodolite. Similarly, if a *taluk* boundary has to be altered the revised boundary shall be traversed with the theodolite.

8. It might so happen that a few *pakuthies* of one *taluk* might get included in the adjoining *taluks*. In this case, the old *taluk* boundary will have to be revised and the old *pakuthy* boundary will have to be treated as *taluk* boundary.

9. Before resurvey proper or the demarcation and measurement of holdings is commenced, it is necessary that the revenue registry of these should be brought up to date.

To this end, preliminary land registers and necessary eye sketches showing the positions of field and subdivisions will have to be prepared by a special staff.

10. Subdivisions of survey fields should be numbered and not lettered. The numbering should, as far as practicable, follow that adopted in the revenue accounts, and should be departed from, only when such adherence would result in numbering not being controlled by contiguity. Where the numbering in the revenue accounts is irregular, the subdivision should be renumbered starting from the north-west corner of the field, so that each may adjoin the one bearing the next number.

11. Sufficient number of field stones should be stocked well in advance so that the surveyors may find no difficulty about stones. If there had been old stock of stones in the Pakuthy Cutcherries, they should be carefully examined and stones of proper size should be selected from among them. On no account, should under-sized stones be accepted.

12. Before commencing the survey, eye sketches should be got prepared in office from the old litho maps showing the boundaries of the several holdings. This eye-sketch must be in pencil. The old survey or revenue numbers should also be shown in pencil in the sketch.

13. Detailed rules with regard to the demarcation and survey should be drawn up for the guidance of the several officers.

## Chapter XII.

### RESURVEY.

1. After the preliminary arrangements as mentioned in the previous chapter had been made, Surveyors must be detailed for work in the pakuthies. They should take with them the eye-sketches, subdivision lists that had been prepared by the Special Staff or by the Revenue Department, and the other records required for the resurvey.

2. The holdings should be demarcated according to the existing state or ground, possession and enjoyment. It is not necessary to refix the boundaries between private holdings as per the original survey records. On the sides of porambokes, the boundaries will have to be laid down strictly in accordance with the original measurements.

3. Stones should be planted on the outer boundaries of survey fields and subdivisions whether they are registered lands or porambokes. Old stones which do not mark a boundary should be removed and utilised, and new stones wherever required should be planted.

4. In the case of village boundaries adjoining Edavaka Pakuthies, old survey measurements must be followed. The demarcation of the village boundary between Sirkar Pakuthies should follow enjoyment, provided the changes are not material. In cases where there are large deviations, orders of Government should be obtained as to how the demarcation should be done.

5. Sketches should be prepared for the encroachments detected on the porambokes. Complete information with regard to the name of encroacher and the nature of the encroachment must be given in detail.

6. The size of the survey fields to be formed in Nilams and Purayidoms should be regulated strictly in accordance with the demarcation rules passed by Government. After all the stones are planted, the Surveyor should commence the measurement of the survey field in the triangle and offset system.

7. The fields should be plotted on the prescribed scale.

8. The boundaries of the survey fields should be inked slightly thicker than the sub-division boundaries.

9. The areas should be taken with the area square paper and noted in the field measurement sketch.

10. In the eye-sketches, the side measurements should be entered. The sketches should also be inked and the old survey numbers shown in them.

11. After the eye-sketches are inked, the Range Deputy Surveyor should run the purtal lines and take offsets to the several trijunction points. He should also measure the Khandom boundary traverse lines and take off-sets to all the bends on the Khandom boundary.

12. The necessary field books should also be prepared for each Khandom separately.

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## Chapter XIII.

### REVISION SURVEY.

(1) If the survey of an area which has once been surveyed requires to be revised and brought up to date to suit the requirements of a Resettlement, the work is called a Revision Survey.

(2) Before starting a Revision Survey, sketches roughly to scale, should be prepared from a lithographed copy of a Pakuthi map. For each Khandom, separate sketches, showing all the survey fields and the subdivisions should be prepared. In the sketch, measurements should be entered from the field measurement sketches of the original survey.

(3) In the lithographed sketch, the points at which the field stones or sub-division stones are missing or require repair should be marked by red circles if missing, and by red crosses if requiring repair.

(4) The Surveyor should then issue notices to the land holders for executing the necessary repairs and renewals. If a land holder fails to execute the necessary repairs or renewals, the surveyor should have the work done departmentally and send up recovery statements in the prescribed form.

(5) In blocks of waste fields overgrown with jungle stones on the interior boundaries of the fields need not be verified.

(6) The first thing to be done, when a missing mark has to be restored, is to measure to its approximate position on the ground as per the existing occupation, the different lines which meet at that position from the nearest stones extent, and to compare the measured distances and those noted in the pentagraphed sketches. If the measured distances and those recorded in the pentagraphed sketch within a difference of not more than 5 links for distances of 5 chains and under, and of not more than 1 link per chain for distances over 5 chains subject, however, to a maximum differences of 10 links in nilam and 15 links in other places, the stone should be planted as per occupation and no alteration need, in that case, be made in the measurements recorded in the Khandom sketches: but the measured distances should be entered below

them in red ink. If 4 of the measured distances agree with the original survey measurements within the error allowed, no further measurement is necessary.

(7) Where the measured distances do not agree within the limit of difference mentioned in the preceding para, but the area involved is less than 5 cents, the stones should be planted as per occupation, the original survey measurements should be stored out, and the measured distances should be noted in the partagraphed sketches.

(8) Where the measurements do not agree within the limit of difference and the area involved is 5 cents or more, the missing stone should be replaced in strict accordance with the original survey measurements and the portions of the fields excluded from the demarcated limits should be treated as subdivisions of the fields in which they are included and the name of the occupier should be entered in the Land Register.

(9) Where the missing stone happens to be on the boundary between a Poramboke or waste field on one side and a patta land on the other side, if the measured distances do not agree with the original survey measurements within the limit of error allowed, the missing stone should be replaced in strict accordance with the original survey measurements.

(10) For all the encroachments, detected, necessary sketches and statements should be prepared. These sketches should be forwarded to the Revenue Department for taking necessary action. If the Revenue Department decide to register an encroachment, it should be demarcated with stone and incorporated in the survey records.

(11) If the original survey measurements are manifestly incorrect or the position of the missing stone would according to them fall in the bed of a river, or canal, or within a reserve Forest, the stone should be planted in accordance with the limits of the present occupation. All the lines concerned should be remeasured and the original measurements corrected in red ink in the Kandom sketch according to the measurements.

(12) Where to adjoining fields of the same description of soil and tenure are held by the same individual, stones missing at the bends on the common boundary



between the fields need not be replaced, but the fields should be plotted in accordance with the measurements of the original survey.

(13) The Surveyor will demarcate and measure all subdivisions listed and handed over by the Revenue Department.

(14) He will also measure,

1. New fields formed on account of occupation of waste lands left unsurveyed in the original survey. Where the fields are detached, they should be connected with one another and with the main work by chain triangulation or by traverses run with the theodolite.

2. New fields formed on account of changes, due to land acquisition for the opening of roads, canals, railways etc., that have come into existence subsequent to the original survey. In surveying these fields, the land acquisition plans should be consulted.

3. Fields of which portions have been washed away by rivers, sea or have been taken up for Forest Reserve etc.

(15) The boundaries of new survey fields should be demarcated with stones at all points, whether tri-junction or bends. The stones set up by the Public Works Department on the banks of the canals and on the sides of roads should be utilised as survey marks. Similarly the stones put up by the Railway authorities to define A class lands should be utilised as survey marks.

(16) Such of the fields as have to be measured on ground should be taken up for measurement in the consecutive order of their survey numbers.

(17) Important topographical details, such as Village sites, Public buildings, Channels, Streams, Tanks, wells, cart tracts, foot-paths etc., situated within a survey field but not treated as subdivisions should be shown in the sketch.

(18) For every new survey field measured on the ground, a plan thereof should be plotted by the Surveyor in a field measurement sketch. The boundaries should be inked and then the area should be taken with the area square paper.

(19) For fields not measured on the ground, the field sketches should be plotted by the Surveyor with the original survey measurements.

(20) The field measurement book should be prepared in duplicate and in triplicate.

(21) The scale on which fields should generally be plotted will depend on the area as shown below :

- Up to 5 acres, one inch = one chain.
- 5 to 20 acres, one inch = Two chains.
- Over 20 acres, one inch = Five chains.

(22) The fields must be plotted in the field measurement book in the consecutive order of their survey numbers, the exception being in the case of new fields measured in waste blocks. Though the numbers assigned to these new fields will be in continuation of the last field number of the Pakuthi, these field maps should follow immediately the map of the original number which one of the new fields will bear.

(23) Not more than one field should be plotted on each page of the field measurement book, and one field should not occupy more than one page.

(24) If a field cannot be plotted on the prescribed scale on a single page, as in the case of a long narrow strip of land, such as a channel or road measuring less than 5 acres it may be plotted on a smaller scale provided all measurements can be clearly shown.

(25) Where, however, the field is too large to be plotted on one page on a sufficiently large scale to admit of all measurements being recorded legibly, it should be plotted on sheets of field measurement sketch form, mounted on cloth to fold to the size of the field measurement book.

(26) The areas of all survey fields and subdivisions measured by the Field Surveyor should be taken by him with the area square from the plotted map in the field measurement book, and entered in pencil in the column provided for it.

(27) At the foot of each page of the field measurement book, the Surveyor should sign his name in black ink and enter the date of measurement or plotting as the case may be.

(28) The minimum amount of inspection expected of all inspecting officers taken together is 25 per cent of stones refixed and newly planted and of measurement made during the Revision Survey.

(29) Important topographical details should be noted in red ink in the lithographed copy of the Pakuthi map.

(30) As soon as the measurement and plotting required in each Khandom have been completed and the work has been inspected by the Range Deputy Surveyor the records should be sent to the Section Officer.

(31) The Section Officer will then complete his percentage of inspection and then forward the records to the Head Quarter Office.

(31) As the records of each Khandom are received in office the measurement and plotting of each field should be carefully checked.

(33) The original, duplicate, and triplicate field measurement books should be compared with each other and any discrepancies should be adjusted.

(31) The areas of all survey fields and subdivisions measured during the Revision Survey, should be taken in office with the area square from the field measurement book by two different computer. The computation should be compared by a third computer. The differences should be carefully adjusted in accordance with the standing orders on the subject.

(35) The areas of fields not measured during Revision survey should also be computed, and verified with previous survey areas.

(36) The numbers and areas of fields not measured during the Revision Survey should be entered in red ink and those of other fields and subdivisions in black ink.

(37) In view of the fact that the original areas of fields were obtained with the computing scale from 16 inch Pakuthi map, whereas the Revision Survey areas are taken with the area square from large scale field maps plotted independently, the original and Revision Survey areas will often differ. Area list should be prepared after adjusting all discrepancies. This will apply to the Taluks surveyed under the Tak system, and Base line offset system.

(38) The areas of subdivisions of a survey field, as per Revision Survey, should not be adjusted to agree with the original survey area, but should be totalled up and adopted as the Revision Survey area of the field.

(39) A fair copy of the area list should then be prepared for supply to the Settlement Department, showing all the survey fields and subdivisions and their areas as per the original survey or revision survey as the case may be.

(40) Areas of survey fields should be entered in the field measurement sketch and the land register.

(41) On the 16 inch skeleton map of the Pakuthi field boundaries and details should be traced from the 16 inch lithographed map of the original survey.

(42) All the new fields, formed during revision survey, should, then be plotted in their correct position.

(43) Land originally within the Pakuthi boundary but since excluded from it and formed into Forest Reserve should not be shown in the Pakuthi map; but the name of the reserve should be typed in the same way as that of an adjoining pakuthi.

(44) Enclosures within Forest Reserves and other detached fields situated outside the pakuthi boundary should be plotted in their correct relative positions wherever possible. When they lie far off the pakuthi boundary they should be plotted in the margin of the map without reference to their correct position and a remark to that effect printed in the map.

(45) The map should then be compared with the revision survey field measurement book and corrected where necessary.

(46) The field boundaries and details should then be inked, field numbers typed, names printed, and the map otherwise made ready for printing.

(47) Small fields, like roads or channels less than a quarter of an acre or narrower than half a chain should be plotted in margin of the map on a sufficiently large scale.

(48) The area to be entered in the heading of the Pakuthi map should be the traverse area, plus or minus offsets.

(49) The map and all other records should be finally examined by the several heads of sections and by the Office Assistant and the result of their examination should be recorded in the final examination report. The final examination report and all other records should be signed by the officer in charge.

(50) The revision survey records of a Pakuthi will consist of the following :—

1. The traverse field books.
2. Traverse sheets.
3. Khandom sketches (original and copy).
4. Land Register.
5. Field measurement book (in duplicate and triplicate).
6. Inspection reports.
7. Pakuthi map.
8. Fair area list.
9. Final examination report.

(51) The records should then be forwarded to the Settlement Officer.

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## Chapter XIV.

### INSPECTION OF FIELD WORK.

1. Inspection of field work is very important and should not be neglected.
2. There are two important items of field work that require careful scrutiny and they are—
  - (a) Theodolite surveys, and
  - (b) Field surveys.
3. Inspection of Theodolite surveys consists of :—
  - (i) Inspection of station stones planted by the surveyor.
  - (ii) Inspection of angles and distances.
  - (iii) Verification of the bills on account of line clearance charges and charges incurred in planting stones at Government cost.
4. Inspection of Field surveys consists of :—
  - (i) Inspection of demarcation and measurement.
  - (ii) Inspection of the entries in the Land Register.
  - (iii) Verification of the bills on account of line clearance charges and charges incurred in planting stones at Government cost.
5. The Inspector should see, while inspecting the Theodolite work
  - (i) that the station stones planted are of the prescribed size and dimensions and are also of durable quality.
  - (ii) that they have been firmly and properly planted.
  - (iii) that the bills submitted are correct.
6. The Inspector should see, while inspecting the Field survey
  - (i) that the eye-sketch has been neatly and correctly prepared.
  - (ii) that the stones planted are of the prescribed dimensions and of durable granite.
  - (iii) that the old stones that are on the ground are also of the prescribed size and dimensions.
  - (iv) that the entries in the land register are correct and in accordance with the revenue accounts.
  - (v) that the bills submitted are correct.

15. The purtal lines should be drawn in red ink in the khandom sketch, each point offsetted being numbered. The chain and offset measurements should be entered in the margin and the latter numbered to correspond with the sketch.

16. For inspection purposes, the Inspecting officer should have with him the Range Deputy Surveyor and the Field Surveyor.

17. Differences found in measurements should be classed as errors as follows :—

*Measurement of Diagonals and Field and Sub-division boundaries.*

In lines of 5 chains and under a difference exceeding 3 links is an error.

In lines of over 5 chains a difference of more than 1 link per chain is an error up to a limit of 10 links, but any difference over 10 links is an error.

*Measurement of Diagonal lines where the cross staff has been used, or offset measurements.*

In lines of 5 chains and under, a difference exceeding 4 links is an error.

In lines of over 5 chains, a difference of more than one link per chain is an error up to a limit of 10 links, but any difference of over 10 links is an error.

18. The quality of work will depend on the percentage of error either in the Land Register, demarcation or measurement. When the land register and demarcation are inspected at the same time, the items under each should be combined for valuation. Items inspected under measurement should be valued by themselves. Differences in measurement consequent on alteration of demarcation by Inspecting Officers should not be reckoned as errors in measurement.

19. The classification should be determined as follows :  
Number of errors per 100 lines measured

or per 100 items inspected under registry or demarcation.

	Quality of work.
Under 5	... Good.
From 5 to 10	... Fair.
More than 10	... Bad.

20. For the purpose of the preceding two rules, every measurement, whether 'F' line, 'G' line or offset, should be

counted as one line. But where in a 'G' line from which a number of offsets has been measured an error made in one chain line distances is carried forward to succeeding chain line distances, the errors in the latter should not be reckoned as such for classifying the quality of work.

21. Work classed as bad should, as a rule, be ordered for revision. But before doing so, the Officer in charge should satisfy himself that the nature of errors is such as to warrant revision. For example, if in 100 lines remeasured, there are 8 errors under 5 links and 4 errors under 10 links, revision of work should not be necessary. The Surveyor should be punished for indifferent work.

22. When measurements or items, checked by an Inspector are found incorrect, the other fields examined by him should be checked.

23. The Inspecting officers should sign their names in full in red ink in the original field measurement book, at the bottom of the sketch, of each field inspected by them, noting above their signatures the number of lines tested. If the Surveyors' measurements agree with the Inspectors' within the margin of error allowed, they should be ticked off in red ink. If this margin is exceeded, the Surveyors' measurements should be lightly scored through in red ink and the Inspector's measurements written above them with the Inspector's initials.

24. Inspectors should also compare the measurements and test the plottings of the fields inspected by them and also check the areas taken and recorded by the Surveyor.

25. The chain of the Surveyor who attends for inspection should be tested and the result noted in the diary. Chains found incorrect should be put right then and there before commencing inspection.

26. Every khandom must be inspected by a responsible Officer. The inspection should be distributed as widely as possible.

27. All the records of each Khandom should be examined carefully by the Officer in charge.

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## Chapter XV.

### BOUNDARY DISPUTES.

1. The investigation and settlement of boundary disputes are done under the provision of the Survey and Boundaries Regulation X of 1094.

2. The Government appoints Survey Officers under the Survey and Boundaries Regulation and they are empowered to settle all boundary disputes.

3. The settlement of disputes as to water right, easement, right of way &c., is not within the competence of Survey Officers.

4. The following are the classes of cases which Survey Officers will have to deal with :

(i) Disputes under Section 11 (2) of Regulation X of 1094.

(ii) Appeals under Section 12 (1) (a) from decisions under Section 11 (3) of the Regulation.

(iii) Appeals under Section 12 (1) (b) from decisions under Section 11 (1) or 11 (2).

(iv) Complaints under Section 16 of Regulation X of 1094.

5. Cases under class (i) will lie to the Survey Officer conducting the survey, those under class (ii) to a Survey Officer senior to the Officer who passed the original decision, and those under class (iii) to a Survey Officer senior to the officer publishing the notices under Section 11 (4).

6. Appeals under Section 12 (1) (a) or 12 (1) (b) must be presented within 3 months of the communication of the decision under Section 11 (3) or within 3 months from the date of the receipt of the notice under Section 12 (1), but the time taken to secure a copy of the decision and of the map shall not be included in the period of 3 months allowed for appeal, and the appellate authority may admit an appeal after the expiry of the said period on his being satisfied that the appellant had good and sufficient reason for not preferring the appeal within such period.

7. Original complaints and appeals preferred to Officers should bear a court fee stamp of half a rupee.

8. Unstamped or insufficiently stamped petition or appeal will be returned to the parties for resubmission duly stamped.

Petitions or appeals which do not clearly describe the survey fields in disputes and the nature of the dispute or which relate to more than one item of dispute will be returned to the party for amendment.

9. Appeals against orders passed by Survey Officers under Section 11 (3), if not accompanied by the order appealed against, will be returned for resubmission with a certified copy of the order.

10. When petitions or appeals had been entertained, the Officer in charge may himself enquire into and dispose of such of them as he may consider necessary and refer the rest to any subordinate survey officer for disposal or for enquiry and report. When complaints for appeals are so referred, they will be accompanied by extracts from the original survey records of measurements and such other papers and records as may be considered necessary for the disposal of the complaints or appeals. The proceedings of the Survey Officer in regard to the service of summonses, the summoning of parties and witnesses and enforcing their attendance, the examination of parties and witnesses, and the production of documents will be regulated, so far as may be practicable, by the sections of the Civil Procedure Code.

11. When a complaint is entertained, the Survey Officer should issue a notice to the plaintiff, mentioning the date and place fixed for hearing and requiring him to take out, in sufficient time before the date fixed for hearing, summonses to the defendant or defendants and to such of his witnesses as he wishes to be summoned by the Survey Officer. Complaints and appeals should, so far as possible, be disposed of in, or in close proximity to, the Pakuthies concerned. As a general rule, all complaints and appeals relating to a particular pakuthy should be taken up simultaneously at a station of which notice has been previously given to the parties concerned.

12. The notice should also require the plaintiff to deposit an amount sufficient to meet the cost of service of process, when a separate establishment is employed for that purpose, and of batta to witnesses.

13. The Survey Officer will fix the amount required for serving process to defendants and batta to witnesses that will be sufficient to defray the travelling and other expenses of

the persons summoned in passing to and from the place of enquiry and for one day's attendance.

14. The summons should be in duplicate and should be signed by the Survey Officer. The summons to the defendant should specify the time and place at which he is required to attend and should be accompanied by an abstract of the complaint.

15. Similarly the summonses to witnesses should specify the time and place at which they are required to attend and also state whether their attendance is required for the purpose of giving evidence or to produce a document or for both purposes;—and any particular document which the person is called on to produce should be described in the summons with reasonable accuracy.

16. When the defendant or witness is a Government servant, the summons should be served through the head of his office.

17. Where the dispute relates to Sirkar lands whose control is vested in the Public Works, Forests or other Departments, the Officers concerned should be addressed.

18. If on the receipt of a complaint, the Survey Officer finds that verification of the disputed locality is necessary, he may do the same on the date fixed for enquiry or at any time before that date; or he may depute one of his subordinates to inspect the ground and prepare a measurement sketch, to any convenient scale, of the disputed locality, showing the land claimed by each party as also the adjoining lands where necessary.

19. The subordinate may also be directed to submit his report on the facts of the disputes for the information of the Survey Officer, but the order of the Survey Officer should be based on evidence recorded by himself and not upon the report of the subordinate.

20. Summonses should be served ordinarily by the Pakuthy staff or by the process peon if one has been duly sanctioned and attached to the Survey Officer. The Pakuthy peon or process peon should take on the back of the original summons the signature of the person to whom the duplicate is delivered.

21. If the defendant or the witness refuses to sign the acknowledgment, or if, owing to his absence or other cause, the summonses cannot be served personally, the Pakuthy peon or process peon should affix a copy of the summons on the

outer door of the house in which the defendant or witness ordinarily resides and return the original summons to the Survey Officer with an endorsement thereon that he so affixed the copy and the circumstances under which he did so.

22. On the date fixed for the hearing of the case or on any other day to which the hearing is adjourned, the enquiry will begin by the plaintiff stating his case and producing his evidence in support thereof.

23. The statement of parties and the evidence of witnesses should be taken on oath and should be in the language with which they are familiar.

24. As the examination of each witness proceeds, the Survey Officer should, when he does not take down the evidence in his own hand, make a memorandum of the substance of what each witness deposes, and such memorandum should be written and signed by the Survey Officer with his own hand and should form part of the record.

25. The defendant will then be asked to state his case which will be recorded, together with the evidence of his witnesses, as explained in the preceding two rules.

26. If on the date fixed for the hearing of the case, the plaintiff fails to appear, the Survey Officer will, unless the defendant admits the claim, dismiss the complaint.

27. If the plaintiff appears but not the defendant though summons was duly served on him the Survey Officer will proceed with the case *ex parte*, with the aid of such records as are available.

28. The Survey Officer will pass his decision and record the grounds on which the decision was based.

29. The decision of the Survey Officer should be communicated to the parties concerned on the same day the order is passed. While communicating the decision, the parties should be informed of the time within which and the person to whom an appeal may be preferred.

30. In the case of an appeal preferred under Section 12 (1)(a) from an order under Section 11(1,2,3) notice, in duplicate, should be given to all the parties whose holdings may be affected by the proceedings in appeal.

31. After the parties have been heard and such evidence as may be necessary has been recorded, the appellate authority

will pass his decision and record the grounds on which it is based. All decisions should be communicated the same day they are passed and should be accompanied by a printed acknowledgment.

32. A copy of the order of the Survey Officer or of the decision of the appellate authority may be furnished to the parties on their application and at their cost. Where the decision is based upon a plan, sketch or diagram, a copy of such plan, sketch or diagram, should be supplied free of cost with the copy of the order.

33. The order of the Survey Officer or the decision of the appellate authority should be given effect to as soon as possible after the order or decision has been passed, and a certificate to that effect should be made in the records connected with the case, noting the date on which the order or decision was given effect to.

34. Copies of depositions and of documents filed in the course of the hearing of a dispute and of the memoranda of evidence made by the Survey Officer or the appellate authority may be granted to parties, whenever required and at their cost.

35. All the documents filed should be returned to the parties filing them, on completion of hearing and after an order or decision has been passed.

36. The Dewan Peishkar or Survey Officer may, with the consent of all the parties concerned, refer to arbitration any dispute as to a boundary.

37. The decision of the Dewan Peishkar or the Survey Officer passed in accordance with such award shall be conclusive between the parties to such arbitration and those claiming under them.

38. Any Survey Officer generally or specially authorised in that behalf or the Dewan Peishkar or any Officer to whom an appeal is preferred under any of the provisions of this regulation, may, for the purposes of any survey enquiry or other proceedings under this regulation, summon and enforce the attendance of any person, for giving evidence and for the production of documents or for the purpose of rendering assistance in the survey of any land in which such person has an interest.

39. The procedure prescribed in the Civil Procedure Code for summoning and enforcing the attendance of witnesses and

for the recording of evidence shall be followed as far as it can be made applicable.

40. In resurveys, the original survey records will form part of the documentary evidence for the Survey Officer to base his order or decision. Such records cannot, however, prevail against the prescriptive right acquired by a party by twelve years adverse possession in the case of Patta or Edavaga lands and 60 years adverse possession in the case of Government waste or Poramboke lands.

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## Chapter XVI.

### DUTIES OF OFFICERS.

#### *Assistant Superintendents.*

1. Assistant Superintendents are generally in charge of survey Parties and they are responsible to the Superintendent for the proper working, good order and discipline of the Parties under their control.
2. The chief duties of the officer in charge are:—
  - (1) to see that the provisions of the Travancore Survey and Boundaries Regulation are complied with strictly;
  - (2) to keep his Party efficient and in full strength;
  - (3) to see that every subordinate does his fair share of work and to reward diligence and punish idleness and neglect;
  - (4) to be constantly watchful that sufficient field work is in hand, to keep all branches of his office employed that the office work keeps pace with the field work and that all processes of field and office work follow one another in due order and without delay;
  - (5) to regulate the outturn of each process of work so that a uniform rate of progress may be secured monthly and the estimated outturn for the year realised within the limit of expenditure allowed;
  - (6) to see that all rules and orders of the Department are strictly carried out;
  - (7) to test field and office work and to satisfy himself generally that no incorrect record bears his signature;
  - (8) to dispose of promptly all reports and correspondence;
  - (9) to see that official correspondence is kept down as much as possible and to discourage any tendency on the part of his subordinates to increase clerical work;
  - (10) to examine and check the Cash book daily while at Head quarters and the cash balance monthly;
  - (11) to check the expenditure of stores and stationery and to see that instruments are kept carefully and in working order;
  - (12) to see that notifications of completion of Survey under the Regulation are published and that notices are issued promptly; and

(13) to see that all returns are submitted on the dates prescribed and that the figures given in the returns are correct.

3. The officer in charge must be careful in exercising his power of fining Surveyors. A stoppage of pay is a suitable punishment for short or bad work and it may be necessary sometimes to impose a fine for a specific fault, but a series of petty stoppage and fines inflicted on one individual can have no good effect. In no case should more than one third of a month's pay be stopped as a punishment. It will in most cases be preferable to warn the defaulter in writing once, or often if necessary, and if this had not the desired effect, suspension or reduction in rank should follow. The practice of withholding pay until a certain quantity of work has been performed is prohibited.

4. Clerks and other ministerial officers who are employed exclusively on clerical work, should not be fined. The forms of punishment that should be resorted to for the purpose of maintaining discipline in their case are official reprimand, stoppage of promotion, reduction of existing pay, entering in the Service Book of reference to record punishment and censures, suspension and in the last resort dismissal from the service of Government.

5. The Officer in charge should maintain a register for each Field Surveyor showing the monthly outturn, pay earned and passed, and the punishment if any awarded to him. The orders of the Officer in charge will be based not only on the record for the month, but also on the record for the previous months as disclosed by the register. Promotions and reductions should depend upon the conduct and capability of the Surveyor as shown by the entries in this register.

6. The Officer in charge should spend not less than 15 days a month in camp and inspect field work on at least 10 days.

#### *Sub Assistants.*

1. A Survey party is divided into three sections, two in the field and one in office, each under a Sub Assistant.

2. The field sections are divided into sub sections, each under a Head Surveyor. Each section consists of two sub-sections.

3. Each sub section is generally divided into 4 or 5 ranges each under a Deputy Surveyor. Each Range Deputy Surveyor will have charge of 5 or 6 field surveyors.



4. A Sub Assistant may have charge of a boundary demarcation and traverse sub section, or a field demarcation and field measurement section.

5. His chief duties are:—

- (1) to see that every Surveyor has a copy of the Survey Manual and is fully acquainted with the rules laid down for his guidance;
- (2) to see that his men do a fair amount of work and that the work is of good quality.
- (3) to see that the estimated monthly outturn required to realise the annual forecast is secured;
- (4) to bring to the notice of the officer in charge all instances, of idleness bad or dishonest work or misbehaviour on the part of the men under his orders;
- (5) to keep the Surveyors supplied with work and to arrange the distribution so that the least possible delay may be caused by travelling;
- (6) to watch the stone supply so that there may be no delay in work for want of stones and also that there may be no surplus in depots or villages;
- (7) to enquire into all complaints made by and against the men under his orders;
- (8) to submit with his remarks all reports from Surveyors addressed to the Officer in charge;
- (9) to transmit without delay the diaries of Surveyors and records of completed work;
- (10) to check the outturn of Surveyors as credited in their diaries with the records and to submit to the Officer in charge the necessary statements for drawing their pay;
- (11) to promptly distribute the pay and allowances to the Surveyors; and
- (12) to dispose of all land complaints and appeals against the Survey that may be referred to him by the Officer in charge.

6. The Sub Assistant is expected to devote the greater part of his time to field inspection in clearing the doubts of Surveyors and helping them in their difficulties and to making arrangements for work when it may be reported to have been delayed owing to the obstructiveness of the Pakuthy staff or land holders or from any other cause.

7. He should spend not less than 22 days a month in camp and inspect field work on at least 15 days.

The Surveyor's diary book should be examined to see that it is written up daily and that the Surveyor has prepared records for the outturn taken credit for by him. The Sub Assistant should initial the diary book and see that the Sub Section Officer and Range Deputy Surveyor have done the same at their inspections.

8. The records should be carefully scrutinised to see that they are neat and clean and prepared in accordance with the rules.

9. So called office work should rarely if ever, appear in a Sub Assistant's diary, as he is able to get through his office work in the afternoon.

10. The completed records should be carefully examined by the Sub Assistant and the result of his examination recorded in the field final examination report. The records together with the final examination report should be despatched to the Head Office with as little delay as possible.

#### *Head Surveyors.*

(1) A Head Surveyor will be employed on any of the following duties:—

1. Theodolite traverse survey ;
2. Enquiry and disposal of land complaints ;
3. Charge of a Sub Section.

(2) While employed on boundary demarcation or traverse Survey, a Head Surveyor will do independent work himself.

(3) While engaged as a Survey Officer in the disposal of land complaints, he should do the work in accordance with the rules laid down in the Boundary Regulation.

(4) As a Sub-Section Officer in charge of field demarcation and field measurement, a Head Surveyor's duties will be almost the same as those of a Sub Assistant or Section Officer.

(5) His Sub Section being one half of the Sub Assistant's section, the Head Surveyor should be able to be more in touch with the Deputy and field Surveyors of his Sub-Section and to scrutinise their work more closely.

(6) For seeing that the Surveyors of his Sub Section are well up in the rules laid down for their guidance, for securing from them the required amount of outturn of good quality and for bringing to notice instances of idleness, bad

or dishonest work or misbehaviour, the Head Surveyor is even more responsible than the Sub Assistant.

(7) The Sub Section Officer should carefully watch the work of the Range Deputy Surveyors and see that their inspections do not fall into arrears. He should also see that a uniform rate of progress is maintained in all the Ranges and submit proposals to the Section Officer regarding the redistribution of Surveyors among the ranges whenever necessary.

(8) The Head Surveyor is responsible for the quantity and quality of work done in his Section by the Surveyors under him.

(9) He should do twenty days inspection in a month and minutely scrutinise the field work and records of all Surveyors under him.

(10) In his inspection, the Head Surveyor should see whether the Surveyors have written their diaries up-to-date and prepared records according to their diaries. If the records are incomplete, they should be got completed immediately. The Surveyor's instruments should also be examined.

(11) On the 5th of every month, the Head Surveyor should obtain and check the records of the Surveyors in his Section and pass the outturn statements submitted by the Range Deputy Surveyors. He should also check the records of the Surveyors with their diaries for at least 3 days in the month.

He should also see in a general way whether the records have been prepared properly according to the instructions issued in the rules and circulars about them.

(12) The Head Surveyor should check the measurements of the Field Surveyors according to the percentage prescribed from time to time.

(13) Inspection of both E and F processes should be spread by the Head Surveyor all over a Pakuthi.

(14) The Head Surveyor should also inspect a percentage of the purtal lines measured by the Range Deputy Surveyor.

(15) The Head Surveyor should check completely the plotting and areas of 10 per cent of the total number of survey fields in a Pakuthi, exclusive of the fields inspected on the ground.

*Deputy Surveyors,*

1. A Deputy Surveyor will be employed on any of the following duties :—

- (1) Theodolite traverse survey ;
- (2) Field demarcation and field measurement;
- (3) Charge of a Range.

2. While employed as a Range Deputy Surveyor, his Chief duty will be inspection of field Surveyor's work.

3. As his Range will generally consist of five or six field Surveyors, he should visit each Surveyor at least once a fortnight to inspect his work and to assist him if necessary.

4. He should see that the Surveyors understand and carry out the rules and turn out the required quantity of work and that the monthly forecast for the Range is realised.

5. The Range Deputy Surveyor is responsible for the quantity and quality of the work done in his range by the Surveyors under him.

6. He should do twenty days inspection a month, and scrutinise the field work and records of the field Surveyors.

7. In his inspection, the Range Deputy Surveyor should see whether the field surveyor has written up his diary up-to-date and prepared records as per his diary. If the records are incomplete, they should be got completed immediately. He should also examine the instruments of the Field Surveyor and take steps for remedying the defects if any.

8. The range Deputy Surveyor should check the diaries and records of the Surveyors under him on the 3rd and 18th of every month. For this purpose, all the Field Surveyors should assemble at his camp on the above mentioned dates.

The Range Deputy Surveyor should see whether the records have been prepared according to the diaries, and also correctly and completely, according to the instructions issued

9. Rules and Circulars about them.

and area Range Deputy Surveyor should get the plotting Surveyor's computation of one Surveyor checked by another

10. The Range Deputy Surveyor should himself check the plotting and area computation of 10 per cent of the fields measured by each field Surveyor.

11. Minor errors noticed by comparing Surveyors or the Range Deputy Surveyors, should be rectified in red ink then and there in all the records concerned. If material errors are found so as to require replotting and recomputation, the Surveyor responsible should be made to re-do the work immediately.

If the Range Deputy Surveyor finds any of the Surveyors grossly negligent in his comparing, plotting, or area computation, the bad work should be reported for orders with details of the mistakes found.

12. The Range Deputy Surveyor should complete the above mentioned items of record checking in the fortnightly assembling of the field Surveyors. No extra time will be allowed later on for these items of work.

13. The Range Deputy Surveyor should check the measurements of each field Surveyor under him by inspecting 20 per cent of the fields measured by each. In the fields inspected, all the measurements should be checked by re-measurement or calculation. The F measurements should ordinarily be checked by calculation. The Range Deputy Surveyor should check also the plotting and area-computation of these fields.

14. The Range Deputy Surveyor should also inspect 25 per cent of the field and sub-division stones planted by each Surveyor exclusive of those tested during the checking of measurements. As many as possible of the stones planted at Government cost should be included in this inspection.

15. Inspection of both E and F processes should be spread by the Range Deputy Surveyor, all over a Pakuthi.

16. The Range Deputy Surveyor should inspect the work of each Surveyor while it is in progress; and satisfy generally that the work given by the field Surveyors has been really done before the outturn is credited.

17. As soon as a Khandom of a Pakuthy is completed in E, F processes, the Range Deputy Surveyor should take offsets from the Minor Circuit traverse line to all the stones (field bends and field trijunctions) on the minor circuit boundary and prepare an offset field book.

18. The Range Deputy Surveyor should also measure partial lines across each khandom and take offsets therefrom to all the adjoining field trijunctions. These measurements should be recorded in the same field work mentioned in para 17 above.

19. From the offsets taken on the *minor circuit* traverse and purtal lines, the Deputy Surveyor should calculate the lengths of the F lines and diagonals between the points offsetted, and check the field Surveyor's measurements with his own calculated distances.

20. The Range Deputy Surveyor should hand over the following records to the Head Surveyor for each Khandom, as soon as his inspections are complete as above described.

1. Field Measurement book (and rough Note book).
2. Land Register.
3. Demarcation sketch.
4. Area list.
5. Theodolite field book.
6. Khandam offset Purtal and minor circuit offset field books.
7. List of demarcation stones in the khandom.
8. Abstract statement of stones received and expended.
9. Detail statements of sircar stones planted in unregistered lands.
10. Detail statements of stones planted in Government cost for private properties.
11. Sketches of encroachments on porambokes, if any.

21. The Range Deputy Surveyor should submit his fortnightly diary to the Head Surveyor punctually on the 5th and 20th of every month.

On the 5th of every month, he should attend the Head Surveyor or any other higher officer, with his field surveyors for record checking, and submit the progress reports and other returns relating to the previous month.

#### *Field Surveyors.*

1. A Field Surveyor will be employed on boundary demarcation, or field demarcation and measurement.

2. The Field Surveyor should strictly carry out the rules contained in the demarcation rules passed by the Government. In all cases of doubt, he should apply to his Range Deputy Surveyor for instructions.

3. He should not commence the measurement of any field before all the stones on its boundary have been planted.

4. The Field Surveyor should himself follow the chain, count the number of arrows and read the chain before recording any measurements. These duties should never be left to measurers.

5. Before beginning his work daily, he should carefully test his chain. All the instruments also should be kept correct and in working condition.

6. The measurements made by the Field Surveyor for each field should be sufficient to plot it independently.

7. In measuring the common boundary between two fields, the Field Surveyor should take his measurements not only to the sub-division points of the field first taken up for measurement, but also to the sub-division point, if any, of the adjoining field so that it should not be necessary for him to remeasure the boundary when the adjoining field is taken up for measurement. Particular attention should be paid to this rule as this is the only means of preventing different measurement being recorded for the same line in adjoining fields.

8. All fields measured in a day should be plotted, their areas computed and the maps inked and otherwise completed that very day. On no account should this work be allowed to fall in arrears.

9. As each field map is completed, the field Surveyor should attest his signature with date at the lower right hand corner of the map.

10. He should bear in mind that neat execution in the drawing and inking of the field maps is as important as good and accurate field work. If a map is rendered untidy by correction and other causes, it should be reprepared.

11. Field Surveyor should write up his diary daily for the work he does.

12. The Field Surveyor should submit his fortnightly work reports to his Range Deputy Surveyor punctually on the 3rd and 18th of each month. On these dates he should also attend the range Deputy Surveyor with his records, for record checking.

13. The Field Surveyor should also attend the Head Surveyor or any higher officer with all records on the 5th of every month punctually for his checking the records and passing the outturn.

14. The Field Surveyor should give the monthly outturn that may be prescribed from time to time according to the nature of the locality. His pay will be passed only on the outturn he gives.

#### OFFICE STAFF.

##### *Office Manager.*

1. The Office manager who has charge of the office is under the orders of the officer in charge.

2. He is responsible for the order and discipline of the office, for the punctual submission of returns, and for the prompt and careful despatch of business.

3. The Office manager's chief duty is, however, to supervise the work of the Computer-Draftsmen in office. He is responsible for the distribution of work to the several hands of the office and for the quality and quantity of their work.

4. On the 1st of each month the office manager should submit to the Officer in charge an estimate of outturn for the month. The estimate should show not only the villages which are expected to be completed in every respect under all processes but all the pakhuties in which any sub process of Office work is expected to be done. In fact, the estimate should show how all the Computer-draftsmen are proposed to be employed during the month. The sufficiency or otherwise of the estimated figures should be carefully scrutinised every month with reference to the forecast of a year.

5. Whenever the Office manager finds that areas are accumulating in any sub section, he should transfer men from other subsections in which work may be slack. To this end, every computer-draftsman should be trained in all sub processes of office work.

##### *Head Clerk.*

1. Head Clerk is responsible for the correct and prompt registry and safe preservation of all correspondence, English and Vernacular.

2. He will maintain the necessary registers for papers received and issued.

3. The Head Clerk will keep an order book in which all orders of the officer in charge, verbal or written, should be entered. Each order must be initialled by the Head Clerk and the book must be taken to the Office Assistant daily for initials.



4. The Head Clerk should see that no delay is caused in communicating orders to the parties concerned.

5. At the beginning of each month, the Head Clerk will submit for the orders of the Officer in charge a list of unanswered letters received and issued.

6. Reminders should be sent to communications remaining unanswered for one month. Subsequent reminders should be sent fortnightly or earlier, if necessary.

#### *Head Accountant.*

1. The Head Accountant will be in immediate charge of the Account Section. He will prepare pay, contingent and Travelling allowance bills, and have custody of Government money.

2. He must be well acquainted with the Service Regulations, Account Code and Treasury Manual.

3. The Head Accountant should maintain the necessary registers prescribed in the several rules and orders.

4. All receipts and disbursements whether relating to pay, travelling allowance, contingencies, advances or otherwise should be entered in the Cash book daily.

#### *Store-Keeper.*

1. The Store-Keeper has custody of stationery stores, instruments, books and printed forms.

2. He is required to deposit as security the prescribed amount.

3. He will maintain separate registers for the stores and stationery. When stationery is received or issued, the necessary entries should be made without delay in the respective stock books and the balance struck.

4. The Store-Keeper will also maintain an individual ledger showing the instruments in the custody of each subordinate in field and in office.

5. The Store-Keeper is responsible that strict economy is observed in the expenditure of stationery and that no more than is necessary is issued.

6. The Store-Keeper will supply the quantity allowed monthly for each subordinate.

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## Chapter XVII.

### RULES FOR THE CONDUCT OF TOWN SURVEYS.

#### *Preliminaries*

1. Immediately the survey of a town has been ordered by Government, the Officer in charge of the survey should publish in three successive issues of the Gazette a notification. A similar notification should be posted in the Municipal Office as well as in the Village Chavady, or, if there is no Village Chavady, in some conspicuous place in the villages comprised in the town, as soon as the survey is about to commence.

2. Before commencing the survey, the Officer in charge should send special notices to the Municipal Chairman, Dewan Peishcar and the Tahsildar, intimating the date of commencement of survey.

3. The Officer in charge should obtain from the Survey Office maps and records of all surveys cadastral or topographical which may have been made of the villages included in the town. This is very important since, if the open fields in such villages have already been cadastrally surveyed, and the survey meets the requirements of the Revenue Department, all that is necessary during the Town Survey is merely to incorporate that survey in the Town Survey records carrying out only such supplemental survey as may be required.

4. With such cadastral and topographical maps of the town as are available, the Sub-Assistant or Head Surveyor, in company with the Municipal Subordinate whom the Chairman should be requested to depute for the purpose, should inspect the town and mark in the maps the boundaries of the Municipality and of the wards or divisions into which it is divided.

5. From these maps, a tracing or an enlargement, where necessary, should be prepared showing the municipal and ward boundaries and also the boundaries of the cadastrally surveyed fields in the pakuthies or portions of pakuthies included within the town.

6. The theodolite stations and field stones fixed during the cadastral survey should be noted in the tracing.

7. The blocks into which the town should be divided for survey should then be marked in the tracing. This tracing will be called the "index map".

8. The size of a block should be about 10 acres in crowded localities such as streets and bazaars, 40 acres in less crowded localities such as gardens and compounds and 160 acres in cultivated and more open localities such as paddy fields and waste lands.

9. The sides of the block should, as far as possible, be made equal, so that each block when mapped may not occupy more than one sheet, size 30 inches by 27 inches.

10. The block boundaries should follow streets, roads, rivers, etc., except in open localities where they should run along field boundaries.

11. Village and Khandom boundaries, traversed in the past should, as a rule, be adopted as block boundaries so that the amount of theodolite work required for the town survey may be reduced to a minimum.

12. As the marking of blocks proceeds, a rough estimate should be prepared of the stones required for demarcation. In town surveys, field stones will not be required to mark the boundaries of properties defined by masonry walls.

13. The stones should be of blue granite. They should be of three kinds as described below:—

*Theodolite Stations.*—Size 3 feet long by 9 inches square or 18 inches long by 8 inches square with a flat top on which the shank mark should be deeply cut. The plummet hole shall be as usual, cut in the middle of the top of the stone.

(*N.B.*—Stones of the larger size should be used for marking the boundaries of the Municipality and of open blocks. The smaller are intended for use in streets.)

*Chain Survey Stones.*—Size 1 foot long by 6 inches square with a shank mark on the top.

*Field Stones.* Size 24 inches long by 6 inches square with the shank mark cut on one side.

When these are used to demarcate sub-divisions, the letter 'S' should be cut on them at the time of planting.

14. The surveyors employed on town surveys should be specially selected men of experience and tried ability not below the grade of Deputy Surveyor.

#### *Boundary Demarcation.*

15. Having for his guidance the index map on which the block boundaries are shown, the Surveyor will demarcate

the boundaries of blocks fixing theodolite stations at points where three or more streets or roads meet and at important bends on block boundaries.

16. As the theodolite survey of the exterior boundaries of blocks will not afford sufficient data for plotting the fields in the interior thereof, additional points should be fixed along roads and streets within the blocks on straight lines between two theodolite stations.

17. The additional points should be marked with chain survey stones. If these stones are planted in roadways care should be taken to bury them at least two or three inches below the surface of the ground.

18. Where it is observed that any street, lane, etc., cannot be fixed in position, otherwise than by a theodolite traverse, theodolite stations should also be planted along such streets, lanes, etc.

19. In close or 10 acre blocks, the theodolite stations should not be more than 500 feet apart.

20. In medium and open blocks of 40 and 160 acres respectively, theodolite stations may be as far apart as possible, provided each station is clearly visible from the adjoining station on either side.

21. Where block boundaries run along roads or streets, the station stones must be planted at the sides of the roads or streets, not in the middle. They should be planted alternately on the right and left sides of the road so that the chain lines may, for facility of measurement, traverse the road diagonally; thus if station number 2 is on the right side of the road, stations numbers 1 and 3 will be on the left side. These stones should be buried two or three inches below the surface of the ground so as not to interfere with traffic.

22. In open localities, however, the stones should be fixed so as to be visible above the ground for one-third of their length.

23. A new station should be fixed at the point where a block boundary crosses a village or Khandom boundary already traversed if there is no theodolite station at the point already.

24. The distance between theodolite stations should be carefully measured with the hundred feet chain and recorded in a field book.

25. The position of each theodolite and chain survey station embedded in a road or street should be independently determined by measuring with the tape and recording to the nearest inch, in a field book, the tie lines to it from neighbouring permanent objects.

26. From the index map, a sketch map should be prepared for each ward roughly to scale 20 inches = 1 mile. The sketch map should show the block boundaries, distinguishing old theodolite stations from the new. The symbol for new theodolite stations will be a triangle, while for old ones the symbol shown in the cadastral survey maps should be adopted.

27. The sketch map should also show in approximate positions all important buildings, temples, tanks, rivers, railroads, etc.

28. The blocks in each ward should be numbered consecutively commencing from the north-west corner.

29. On the upper part of the sketch should be entered the names of the district and town and the number of the ward. The number of the adjoining wards should also be shown in the sketch.

30. The surveyor should sign the sketch in the lower right hand corner and enter the dates of commencement and completion of demarcation.

31. Traverse survey with theodolite will begin as soon as possible after the demarcation of the blocks has been inspected and passed by a superior officer.

#### *Traverse Survey.*

32. The Officer in charge will give notice to the Chairman each day of the streets to be surveyed the next day and the Chairman will close these streets to traffic, while measurement is in progress.

33. For his guidance the theodolite surveyor should be furnished with—

(1) A copy of the sketch map; and

(2) A copy of the field book referred to in rule 25 showing only the tie line measurements and no traverse distances.

34. The outer boundary of the town should be surveyed first. The survey should start from and close on old

traverse work. The angles and distances should be entered in their proper places in the tie line field books.

35. The ward boundaries should next be surveyed and then the block boundaries in the order of the numbers of the blocks as a rule.

36. Such of the boundaries as have been surveyed in the past should not be surveyed again, but the new traverses should be connected with the old ones wherever possible.

37. Trigonometrical stations, if any within the town, should be connected with the nearest traverse work.

38. The town and ward boundaries should be surveyed by a sub assistant or head surveyor. Their survey should be executed with the same precision and care as that of main circuits in cadastral surveys. The survey of block boundaries may be entrusted to first class deputy surveyors.

39. Each theodolite surveyor will be given 2 peons and 4 measurers and will be provided with a good 6 or 7 inch theodolite, two 100-foot chains, four flags, 100-foot steel tape and a spring balance.

40. He should carefully test his chain daily with the steel tape and correct it if necessary. At every station he should observe angles in accordance with the instructions. The observations should be made as far as possible to arrows not to flag staves, so that greater precision in observation may be secured.

41. After angles have been taken at a station the distances between that and the next station should be carefully measured. The surveyor must himself see that the chain follows the straight line between the two stations.

42. All the entries in the traverse field book must be in ink. If a correction is made, the original entry must be scored through, not erased and should be distinctly visible.

43. Observations for azimuth should be taken by the Officer in charge or by a sub-assistant at intervals of 40 stations on town and ward boundaries. But this will not be necessary where the available survey traverses are sufficient for checking the accuracy of the town survey traverses.

#### *Traverse Computation.*

44. Traverse computation should be done in general accordance with the instructions on the subject.

45. The town boundary and ward traverses should be dealt within the same manner as village boundary traverses and the block traverses as Khandom traverses in ordinary cadastral surveys, only the limit of error in distances in the former is 1 in 2,000 and in the latter 1 in 1,000.

46. Correction for convergency of meridian need be applied only if similar corrections have been applied in the connected old traverse work.

47. Co-ordinates from the origin of the traverse should be computed for each G. T. station mentioned in rule 37 supra.

#### *Traverse plotting.*

48. The traverse of each block together with the G. T. station contained in it should be plotted in a separate sheet, the scale of the plot depending on the area thus:—

10-acre or close block, scale 1" = 33 feet or 160 inches = 1 mile.

40-acre or medium block, scale 1" = 66 feet or 80 inches = 1 mile.

160-acre or open block, scale 1" = 132 feet or 40 inches = 1 mile.

49. The plot should be in duplicate, on sheets of drawing cartridge roll paper cut to size 30 inches by 27 inches and in it should also be shown the interior chain survey stations. The section or rectangle within the sheet will measure about 24 inches by 24 inches and will be divided into 16 squares. The side of each square on the 160" scale will measure 200 feet, on the 80 inch scale 400 feet and on the 40-inch scale 800 feet.

50. A triplicate copy of the plot should be pricked from the original or the duplicate, on royal double elephant, 80 lb paper to serve as the basis of the demarcation sketch referred to in rule 76 infra.

51. The traverse of each ward should be plotted on scale 40" = 1 mile, and that of the town on scale 16" = 1 mile.

52. These plots should be on full sheets of drawing cartridge roll paper cut to size 40 inches by 27 inches. The section or rectangle within the sheet will measure about 30 inches by 21 inches and will be divided into 12 squares. The side of each square will measure 1,000 feet on the 40-inches scale and 2,500 feet on the 16-inches scale.

53. The block boundaries should be plotted in the traverse plot of each ward and the ward boundaries in the traverse plot of the town.

54. The head draftsman should carefully examine the squaring of each sheet and also the scale drawn upon the map.

55. The traverse plotting should be examined and the stations inked in blue. The traverse lines should be drawn in pencil.

#### *Field Demarcation.*

56. Before field demarcation commences, the Officer in charge should obtain from the Municipal Chairman three separate lists showing :—

(i) streets in which street alignments are proposed to be laid down;

(ii) encroachments registered in the Municipal accounts; and

(iii) all Municipal lands including all roads and streets.

57. He should also obtain from the Tahsildar of the Taluk a list of Government lands together with a list of encroachments registered in the revenue accounts.

58. These lists should be furnished to the Officer in charge for the guidance of the surveyors in the demarcation of properties.

59. The demarcation and measurement of properties will be conducted by deputy surveyors under the supervision of head-surveyors and sub-assistants.

60. A batch of five deputy surveyors will form a head-surveyor's sub-section and four sub-sections will form a sub-assistant's section.

61. The surveyor will be furnished with the skeleton traverse plot and copies of the lists referred to in paras 57 and 58 supra.

62. The surveyor should ascertain the names of the owners and occupiers of properties which he has to demarcate and measure the next day and serve on them written notices.

63. The survey of the blocks in which street alignments have to be laid down should be taken up first and then the other blocks in serial order of wards and blocks.



64. The surveyor should commence his work from some convenient point on the block boundary.

65. The boundaries between streets, roads, etc., and private property should be ascertained and demarcated in accordance with accounts.

66. In the case of streets subject to the street alignment operations, all encroachments should be shown in the skeleton traverse plot and the triplicate copy of it for the information of the officer who disposes of them.

67. Every separate holding whether built upon or not to which a separate number is assigned by the Municipal or Revenue authorities, should be considered a separate property and be formed into and demarcated as a separate survey field.

68. Where property originally owned by a single person is now in the occupation of more individuals than one, each holding should be demarcated as a separate survey field, although the division of ownership is not recognised in either the Municipal or Revenue registers.

69. Roads, streets, lanes, rivers, canals, tanks and other Government and Municipal lands should be demarcated as separate survey fields.

70. The demarcation of all public lands other than streets, whether Municipal or Government, should be conducted with reference to Municipal and Revenue accounts and land plans if any.

71. In demarcating the boundaries between private properties, present occupation will be adhered to. Trifling disputes about the boundaries between neighbouring properties should, as far as possible, be amicably settled.

72. Where there is no distinct boundary between two properties which should be separately marked or where the boundary is disputed, it must be laid down according to the revenue or municipal records or as ascertained from the village officers and from such other evidence as may be available.

73. In the cultivated and more open parts of the town, boundaries of properties must be demarcated with field stones; but in the more crowded parts of the town field stones will not be required where permanent masonry structures define the boundaries.

74. Open localities falling within the limits of a municipality may be

Government lands once cadastrally surveyed but not resurveyed.

75. In such localities where old marks have disappeared, stones should be planted according to the existing limits of enjoyment, care being taken however to see that the resurvey field boundaries do not materially differ from those of the original survey. A comparison of the original survey village map with the ground will show where such material difference, if any, exists; and in those cases, the surveyor should restore the original survey field boundaries as far as may be practicable with reference to the pakuthy map. Missing theodolite stations should be replaced with only the chain and the cross staff except where they are contiguous to stations of the new town survey traverse, or are altered by reason of their falling in the bed of a stream etc.

76. On the triplicate copy of the skeleton block map referred to in rules 50, 61 and 66 supra should be shown in black ink the survey fields formed in that block. This will be called the demarcation sketch of the block. In this sketch, limits of encroachments on streets subject to street alignment operations should also be shown, but in the blue ink, to distinguish them from property limits as fixed at survey.

77. The fields should be numbered consecutively for each block by wards, and a rough field register should be prepared for the fields in each block.

78. The field register should be written from the revenue accounts, or revised B. Register prepared by the special revenue staff, as the case may be, of the pakuthies comprised within the town, and from the municipal accounts (i. e., house-tax registers.)

79. All old numbers should be accounted for in the field register in the column provided for the purpose.

80. The names of roads, streets, lanes, public offices and buildings, channels, tanks and temples should be legibly written in Vernacular in the remarks column of the register and also in the field demarcation sketch. Special attention should be paid to the correct spelling of names which should be carefully ascertained.

81. A list of all Government and Municipal lands in the block should be made out at the end of the field register.

82. The Surveyor should sign the register.

83. *Field Measurement* :—The measurement of all boundaries should be carried out at the same time of the demarcation and by the same surveyor. All measurements should be made with the 100 feet chain or with a measuring tape. Measurement should be recorded up to the nearest half foot in the case of streets and to the nearest foot in the case of boundaries between private properties, fractions of a foot being omitted in the latter.

84. Although, as stated in rule 83 above, measurements should be recorded generally up to the nearest foot, in the case of houses, however, it is necessary that measurements should be recorded in feet and inches as otherwise differences between the lengths of the common boundary of two adjoining rows of houses cannot be adjusted with accuracy—vide diagrams given below :

(25)	(26)	(27)	(28)	(29)	(30)
20' 6"	29' 6"	=136' 4" 19' 6"	20' 8"	30' 8"	15' 6"
30' 6"	19' 4'	25' 6"	35' 6"	25' 4"	
(31)	(32)	(33)	(34)	(35)	

The above explains how measurements should be made and recorded in the field demarcation sketch.—

(25)	(26)	(27)	(28)	(29)	(30)
21'	30'	=139' 20'	21'	31'	16'
21'	19'	26'	26'	25'	
(31)	(32)	(33)	(34)	(35)	

The above shows how measurements would be recorded by the surveyor if he disregards inches.

(25)	(26)	(27)	(28)	(29)	(30)
20'	30'	=136' 19'	21'	31	15
31'	19'	25'	36'	25'	
(31)	(32)	=136' (33)	(34)	(35)	

This is how measurements should be adjusted and recorded in the rough block map referred to in rule 96 below.

85. Open spaces included in house properties should be measured separately from portions occupied by buildings but small open court-yards inside houses need not be shown separately. Tiled and terraced portions should be distinguished from thatched portions, the symbol to be used for the former being cross lines from south-west to north-east and for the latter from the north-west to south-east. Whether a house is terraced, tiled, or thatched should be noted in the last column of the field register.

*N. B.*—Measurements relating to encroachments on streets subject to street alignment operations should be distinct from those of house properties.

86. The measurements taken for each house should show clearly whether they include or exclude the breadth of the wall enclosing the house. No doubt can exist about the front wall of a house; but as regards the other three walls, either one, two or all the three may belong to it or to the houses adjoining.

87. In order that the survey records may show what walls belong to each house, the surveyor should draw in the demarcation sketch a thin red line along the boundary of that house in which the wall is included vide diagram 101 A.

(i) The western and southern walls in each of fields Nos. 20, 21 belong to and are included in it.

(ii) Here the line to be drawn in red ink is indicated by thick black line.

88. The distance between theodolite stations and chain survey stations, must be carefully chained and offsets taken to the field corners on both sides of the chain lines. Offsets should also be taken to corners of encroachments on streets subject to street alignment operations.

89. The check line measurements to theodolite and chain survey stations referred to in rule 25 above should be verified and recorded to the nearest inch in the demarcation sketch.

90. There should be at least three check lines and from different directions.

91. Where there is not room enough in the map to enter the measurements legibly they should be recorded in the margin of the demarcation sketch—vide diagram 10. B.

92. Details, such as buildings, wells, telegraph posts, letter boxes, etc., should be fixed by measurement.

93. All measurements should be legibly entered in black ink in the demarcation sketch except those relating to encroachments on streets where street alignments are to be laid down which should be in blue.

94. In the skeleton traverse plot, furnished to him vide rule 61 the surveyor should first plot in pencil the street boundaries with the measurements recorded in the demarcation sketch. He should then plot the fields measured by him each day. The plotting should be checked by the outer boundary measurements and should on no account be allowed to fall into arrears.

95. The measurement of no new field should be taken up while the plotting of any field already measured is incomplete.

96. The plot completed under rule 94 will be called the rough block map. In it will be drawn in pencil the field boundaries by continuous lines and the limits of encroachments by dotted lines. The lines should be drawn very fine.

97. When the plotting of all the fields in the block has been completed, the field boundaries should be neatly inked and all measurements neatly and legibly entered in black ink, the boundaries and measurements pertaining to encroachments being drawn in blue.

98. Where chain line and offset measurements tend to over-crowd the map they should be recorded in the margin

of the map, the starting and closing points of each distance measured being distinguished by letters in the map and in the margin.

99. Theodolite stations and field stones fixed during the town survey should be distinguished by triangles and small squares respectively. Chain survey stones should be denoted by a circle with a dot in the centre. All other stones and details should be shown by their appropriate symbols.

100. The surveyor should sign the field demarcation sketch and the rough block map at the lower left hand corner and enter in both the dates of commencement and completion of survey.

101. As soon as the survey of a block is completed, he should forward the demarcation sketch, field register and rough block map to the sub-section officer.

102. Open localities falling within the limits of a municipality should be dealt with as directed in rules 67 and 68.

103. The fields so dealt with should be measured with a feet chain.

104. In the case of fields cadastrally surveyed, and not dealt with during the town survey, the measurements to be entered in the rough block maps should be those of the cadastral survey converted into feet, but measurements to details need not be entered.

105. *Field Inspection* :—The sub-section officer should inspect the work of the surveyors under his charge while the survey of each block is in progress and also after its completion.

106. He should inspect the blocks in which street alignments have to be laid in advance of other blocks so that there may be no delay in furnishing records to the special officer appointed for the purpose.

107. He should verify the entries in the field register for all the fields in the block and test not less than 15 per cent of the surveyor's work.

108. When verifying the entries in the field register he should see whether the red lines in the demarcation sketch correctly indicate the ownership of walls.

109. The sub-section officer's testing will chiefly consist of remeasurements of the outer boundaries of houses.

110. He should carefully examine the list of Government and Municipal lands and see that they have been correctly demarcated and measured.

111. He should see that all names which would appear in the map have been legibly written and correctly spelt.

112. The section officer should inspect 5 per cent of the work of the surveyors in his section.

113. His inspection, which will generally be made after the completion of each block, should be distributed so as to afford a criterion of the general accuracy of the survey. Blocks, the records of which have to be furnished to the special officer for laying down street alignments should be taken for inspection and completed before others.

114. No error of more than one foot should be passed by inspecting officers either in measurement or in plotting.

115. All errors should be neatly corrected in red ink in the field demarcation sketch and in the rough block map.

116. If the inspection of the sub-section officer discloses errors in more than 10 per cent of the lines measured in any block, the section officer should himself inspect that block, and if the two inspections combined should still indicate a similar percentage submit a special report to the officer in charge who will, after himself inspecting if necessary portion or portions of surveyor's work decide whether the work should be revised.

117. When revision is ordered the revision surveyor should be furnished with a fresh skeleton plot of the block, a copy of the field demarcation sketch without measurements and the field register.

118. The officer in charge should do not less than 20 days' inspection a month. At the rate of even one block a day, he should be able to inspect the work of 20 surveyors each month and from a correct idea of the quality of the work of each surveyor and get rid of such men as are not up to the mark.

119. All complaints under section 11 (2) of the Regulation i. e., disputes arising during the course of the survey

should be inquired into and disposed of by the sub-section officer.

119 A. The completed records should be finally examined by the Section Officer and the demarcation sketch and field register furnished without delay.

120. The records will then be finally examined by the section officer and the result of his examination recorded in the form prescribed.

### *Mapping.*

121. On receipt of the records of each block in office, the measurements recorded in the rough block map should be compared with those in the field demarcation sketch.

122. The measurements for the common boundaries between adjoining properties and blocks should then be carefully examined to see whether they agree. There should be no difference between the measurements of the same lines in adjoining fields and blocks. Discrepancies, if any, should be noted and adjusted with reference to the measurements recorded in the field demarcation sketch or to the diagonal and offset measurements. If they cannot be so adjusted, the lines concerned should be sent out for remeasurement and the remeasured distance adopted.

123. With the measurements recorded in the rough block map, the fair map should be plotted on the second copy of the skeleton traverse plot. Where the plotting does not close, the errors will be shown in the map by a cross mark on the lines that do not close and also noted in a discrepancy list.

For such errors as cannot be rectified in office, sketches showing the lines where errors are suspected should be prepared and sent out to field for remeasurement.

124. Field boundaries and details should be neatly drawn in pencil. Boundaries of sub-divisions as per A, B, C registers prepared as per Rule 56 (1) should be indicated by broken pencil lines. The plotting should be examined and the shapes and details compared with those of the adjoining blocks.

125. For portions cadastrally surveyed the block maps should be plotted on the 40 inch scale.

126. The conversion of measurements from feet to links Rule 104 should be checked,



127. Fields, including cadastrally surveyed fields, should be numbered consecutively for each ward.

128. The field numbers in the field demarcation sketch, field register and rough map of each block should be corrected accordingly before they are typed in the fair block map.

129. The field and sub-division boundaries and details should then be inked—the sub-division boundaries—being thinner continuous lines than the field boundaries—and field numbers typed to suit photo reduction to half scale.

*Area computation.*

130. The area of each field should be recorded in acres and square feet. Areas of fields rectangular or nearly so should be calculated by the khasra method from measurements entered in the rough block map.

131. Areas of fields already cadastrally surveyed should not be recomputed except where they are broken up into new fields under rule 102 supra but should be converted to acres and square feet and recorded in the area computation sheet. The areas of the excepted fields should be computed in the field measurement book with the area square.

132. The areas of all other fields should be taken by computing scale.

133. The town survey maps will be on three different scales, viz.,

160 inches = 1 mile i. e., 1" = 33 feet.

80 inches = 1 mile i. e., 1" = 66 feet.

40 inches = 1 mile i. e., 1" = 132 feet.

134. The computing scales and area papers to be used for the three kinds of maps will be as follows:—

Scales of map— inches to a mile.	Computing scale to be used—inches to a mile.	Area paper to be used.
160 } 80 }	16	Paper with one- fifth inch squares.
40	40	Paper with one- fourth inch squares.

135. The 16 inch computing scale contains 10 main divisions, 100 minor divisions, 1,000 sub-divisions. For the sake of convenience each sub-division may be called a unit.

136. As stated in rule 135 above, the 16 inch computing scale contains 1,000 units. So, when using the 16 inch scale for computing areas in 160 inch map one sweep may, for the sake of convenience, be said to read 1,000 units.

137. To avoid confusion, the word 'acres' at the right side of the computing scale should be scored out and two ciphers added in black to each of the figures denoting the 10 main divisions hitherto read as acres.

138. With this alteration, the scale will read as follows :

Each sub-division '0001 acre or 1 unit.

Each minor division '0010 acre or 10 units.

Each main division '0100 acre or 100 units.

One sweep '1000 acre or 1,000 units.

139. The units as read on the computing scale should be entered in the field area computation sheet. The areas should be retaken by another computer and the two computations compared. The following difference is allowed:—

Up to 500 units ... 5 units.

Above 500 units ... 1 per cent.

140. Fields of which the difference exceeds the above limit should be issued for third computation and also for fourth computation if necessary, and so on, until any two computations agree within the limit of difference allowed,

141. Of the two computations which agree within the limit of difference allowed, a mean should be taken and entered in column 2 of the final field area computation sheet. Still the areas will be in units only.

142. The units read off from the 160 inch map should be multiplied by 4.36 in order to obtain the true area in square feet.

143. As stated in rule 136 above, the same computing scale containing 1,000 sub-divisions and the same area paper (with one fifth inch squares) as was used for the 160 inch map should be used for the 80 inch map also, and the readings (units) obtained should be entered in the area computation sheets. The difference allowed between any two computations on the 80 inch map will be the same as that allowed for computation on the 160 inch map. But in converting the readings to square feet in the final field area computation sheet the units read off from the 80 inch map should be multiplied by 17.4 in order to obtain the true area in square feet.

144. The 40 inch computing scale contains 20 main subdivisions reading 10 cents each. Each main division contains 10 minor divisions, each minor division reading one cent. Each minor division is again divided into 5 subdivisions each subdivision reading one-fifth or  $\cdot 2$  of a cent.

145. One sweep on this scale with area paper containing one-fourth inch square reads 2.00 acres.

146. The readings taken off this scale should be recorded in the area computation sheets in acres, cents and decimals of a cent. Thus,

Acre.	Cents.
1	52.6.

147. The difference between any two computations on this scale should not exceed the following limits:—

Up to 5 acres	...	5 cents.
Above 5 acres	...	1 per cent.

148. After the computations have been compared and closed they should be entered in the final field area computation sheet and converted to square feet by multiplying the cents by 435.6.

149. The conversion of units and cents to acres and square feet will be much facilitated by the use of conversion tables.

150. From the area calculation sheets for rectangular fields and the final field area computation sheets for the other fields, the rough area list should be prepared.

151. The area of offsets on the block boundaries should be computed with computing scale and entered.

152. The rough area list should be examined and compared with the traverse area of the block plus or minus the area of offsets. The difference between the two areas should not exceed one per cent or 436 square feet per acre.

153. The correct field areas will then be entered in the field register and the entries checked. The register should be compared with the fair map.

#### *Finishing.*

154. The map should be completed by printing the heading and all names. The area of the block should be entered below the heading.

155. The procedure prescribed under sections 11 (4) and 12 (1) of the Regulation and the rules framed thereunder should then be completed.

### RECORD OF MEASUREMENT AND FAIR REGISTER.

156. A record of measurement should then be prepared. For this purpose, a tracing will be made of the fair block map on bank post paper showing field boundaries, and theodolite and chain survey stations.

157. The walls of houses shown by red lines in the demarcation sketch should also be delineated in the tracing by thin black lines drawn close to, but not touching, the field boundaries. The tracing should then be inked.

158. Measurements of chain lines and offsets and of the outer boundaries of survey fields should be neatly copied from the rough block map.

159. Portions of villages included in the town survey area should be excluded from the pakuthy maps. Pakuthy maps showing this alteration should be sent to the survey office, whence corrected maps will be issued.

160. Field numbers and measurements should be written ; not typed.

161. Wherever it is not possible to enter the measurements of chain lines and offsets legibly in the body of the tracing, they should be entered in the margin. Buildings and their measurements should be omitted. The tracing must be neatly prepared for reproduction by the ferroprussiate process.

162. Headings and side names should be printed.

163. Names of streets should not be written or typed in the body of the tracing but a list of the streets with their corresponding survey field numbers should be printed at the bottom of the tracing or in the margin as space may allow.

164. The persons responsible for each item of mapping should sign their names in printed lists, which should be pasted on the back of the maps concerned.

### FINAL EXAMINATION.

165. The maps and all other records should be finally examined by a responsible officer and the result of his examination recorded in the final examination report. This report and all other records should be signed by the Officer in charge.

166. The following is the list of records to be sent to the Survey Office :-

1. Index map for the town.
2. Traverse field books.

3. Traverse sheets.
  4. Field demarcation sketches.
  5. Rough block maps.
  6. Field measurement books.
  7. Fair block maps.
  8. Inspection reports.
  9. Rough and fair area lists.
  10. Rough field register and fair register in duplicate.
  11. Record of measurement.
  12. Final examination reports.
  13. Traverse skeleton plots of wards.
  14. Traverse skeleton plot of the town.
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## PART II.

### Chapter I.

#### Measurement of Obstructed lines.

##### PROBLEM No. 1.

*Offsets having once been measured on a line, to relay them on the ground when the line becomes obstructed and the stakes to which the offsets were taken are also missing.*

Let CD, EF and GH be the offsets to be relaid on the ground.

*First Method*;—Select any point X so that A and B may be visible from it and the lines XA and XB can be measured. (See Figure 102).

On BX or BX produced, offset the point A and measure AX and XB.

In XB mark the points Y and Z such that XY and XZ may bear to XB the same ratio as AE and AG respectively bear to AB.

From the points Y and Z erect perpendiculars of which the lengths should bear the same ratio to XA as EB respectively bear to AB.

The extremities of these perpendiculars will mark the positions of the points E and G.

E and G having been fixed on the ground, the line AE and BG can be aligned and the offset distances CD, EF and GH can be easily relaid on the ground with the cross staff.

The accuracy of the points D, F and H should be checked by the recorded measurements of the lines AD, DF FH and HB.

Supposing it is given that—

$$AB = 850, \quad XB = 844, \quad XA = 100.$$

$$AC = 140, \quad AE = 370, \quad AG = 660.$$

$$CD = 150, \quad EF = 270, \quad GH = 200.$$

XY, XZ, YE, and ZG are calculated as follows:—

Because, XY should bear to XB the same ratio as AE bears to AB.

XY is obtained from the proportion

$$XY : XB :: AE : AB$$

$$XY = \frac{XB \times AE}{AB} = \frac{844 \times 370}{850} = 367$$

Similarly, XZ is obtained from the proportion

$$XZ : XB :: AG : AB$$

$$XZ = \frac{XB \times AG}{AB} = \frac{844 \times 660}{850} = 655$$

is obtained from the proportion

$$YE : XA :: EB : AB$$

$$YE = \frac{XA \times EB}{AB} = \frac{100 \times 480}{850} = 56.$$

Similarly, ZG is obtained from the proportion

$$ZG : XA :: GB : AB$$

$$ZG = \frac{XA \times GB}{AB} = \frac{100 \times 190}{850} = 22$$

*Second Method*:—AB is the obstructed line. Find a point E, visible from B and A so that BDA is a right angle measure BD, 95 links and fix a flag at D. Go to A from the right angle DAC and measure AC 95 links equal to BD. CD will be parallel to AB. Measure from C in the direction of D, offset A from E 94 links and place a flag at E. Start the chain against E and offset points 1, 2, 3 and B. EF will be equal to AB and the main line distance on EF offsetting points 1, 2 and 3 will be the same as if the offsets had been taken on AB. The offset distances to points on this side AB will be 94 minus the actual offset distances measured from EF, while on the other side of AB, they will be the actual distances measured minus 94. (See Figure 103)

#### PROBLEM NO. 2.

*To survey with theodolite a line that is obstructed.*

The easiest way of doing this is by interplotting a station as explained below. (See Figure 104.)

Let the line from B to C be obstructed.

Select any point E so that lines from it to B and C may pass clear of the obstruction.

Observe the angles ABE, BEC and ECD.

Measure the lines BE and EC.

Now, in the triangle CEB, the following three elements are known:—

- (1) Side BE.
- (2) Side EC.
- (3) Angle CEB — 60° — observed angle BEC.

The remaining three elements, viz.,

- (1) Side BC.
- (2) Angle EBC.
- (3) Angle BCE.

can be calculated by Solution of the triangle.

Then,  $ABE + EBC = ABC$ .

and  $ECD + BCE = BCD$ .

### PROBLEM No. 3.

*To refix a missing theodolite station, of which the sight from its adjacent stations is obstructed, by forming an equilateral triangle.*

Let B be the missing station of which the sight from A and G is obstructed. (See Figure 105)

Lay out the angle C A B and measure as far as D in the direction of AB.

At the point D, lay out the angle of  $120^\circ$ , if you would turn to the left, or of  $240^\circ$  if you would turn to the right of the line AD.

Measure in the direction of the line indicated by the angle until you reach any point F which will be clear of the obstruction.

Note the distance DF.

At the point F, lay out an angle of  $300^\circ$  if F is to the left, or of  $60^\circ$  if F is to the right of AD, and measure along the line indicated by the angle until FE is equal to DF.

Then DFE will be an equilateral triangle, DE will be equal to DF or FE and the point E will be in the line AB.

At the point E, lay out the angle FEB equal to  $120^\circ$  or  $240^\circ$  as the case may be, and measure in that direction a distance equal to  $AB - (AD + DE)$ .

B will be the position at which the theodolite station should be refixed.

Repeat the above process in respect of the line BG and if the measurements lead to the point G, station B will have been correctly refixed with reference to the recorded angles and distances.



## PROBLEM No. 4.

To refix a missing theodolite station, of which the sight is obstructed, by forming an oblique-angled triangle.

Let B be the missing station of which the sight from A is obstructed. (See Figure 116.)

Select a point E from which A and B are visible and can be measured.

Observe the angle EAC and measure AE.

Now, in the triangle AEB, the following three elements are known :—

- (1) Side AB.
- (2) Side EA.
- (3) Angle  $BAE = BAC$ —observed angle EAC.

The remaining three elements, viz.,

- (1) Angle AEB,
- (2) Angle EBA,
- (3) side EB

can be calculated by solution of the triangle.

From E lay off the computed angle AEB and measure the computed distance EB in that direction.

The point B will be the position of the missing station .

The accuracy of the work should be checked

- (1) by observing the angle GBE,
- (2) seeing whether the angle GBE and the computed angle EBA are together equal to the recorded angle GBA, and
- (3) whether the angle HGB and the distance GB agree with the recorded angle and distance.

*Note* :—Whether two consecutive theodolite stations are missing, the following is the method to be adopted for refixing them. (See Figure 117.)

Let B and G be the two missing stations.—

Then refix the station G by means of the recorded angle KHG and the distance HG.

Then refix the station B by forming the triangle GEB as explained above.

To check the accuracy of the points G and B, observe the angles EAC and AEB and measure the side AE. Solve the triangle AEB and see that—

(1) the observed angle EAC + the computed angle BAE = the recorded angle BAC,

(2) the computed angles GBE and EBA = the recorded angle GBA, and

(3) the computed distance BA = its recorded distance.

The chief point to be borne in mind in selecting the point is that it is visible from G, B and A and that the lines GE, EB and EA can be measured.

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## Chapter II.

### SURVEY OF OBSTRUCTED BLOCKS WITH CHAIN CROSS-STAFF ALONE.

Sometimes we come across fields which are so badly obstructed that no 'G' line can be measured within them. In such cases the survey may be done with chain and cross-staff only by measuring arbitrary 'G' lines chosen outside the fields in one of the following methods.

The following problems will be of material use in the survey of such blocks, not of abnormal size, with the chain and the cross-staff with accuracy to secure satisfactory results.

In almost all the methods given below, the selection of points and lines is arbitrary. But it will be advantageous to choose as many stones and lines existing in the locality and mapped as may be possible, for their subsequent identification and maintenance would then be comparatively easy. If the locality would permit, some trijunction stones or lines running between the trijunction stones or between two points at known distances on such lines may with greater advantage be utilized for the purpose.

#### *First Method.*

(See Figure 106.)

The field to be surveyed can be enclosed in a well-conditioned triangle arbitrarily formed by selecting convenient points outside the field, all the points on its boundary being offsetted on the most convenient of the sides of the triangle thus formed as the figure above. Although the 'F' measurements will afford a good check on the field and office work in this survey, it will be more advantageous if one or more points be offsetted on more than one of these arbitrary lines of the triangle, as these measurements would furnish data for an additional check on the accuracy of the work.

*Note.*—(1) It may, in the absence of a cross staff, be possible to measure something like oblique offsets to each point or otherwise triangulate each point on the arbitrary lines, but the work will be very tedious and the result shabby and uncertain and should never therefore be attempted.

(2) It will be found in practice that the formation of a triangle to enclose a whole obstructed field involves traversing a very large area and thus doing a great deal of additional and unnecessary work. In the case of long and narrow fields it will not also be possible to lay out well-conditioned triangles enclosing them. This method can therefore be resorted to only when the block is small and can be enclosed in a well-conditioned triangle.

#### *Second Method.*

If the field be a narrow one with all the points on its boundary within an offset distance of 3 or 4 chains from any line arbitrarily laid out, it will be easy to survey it by offsetting all the points on such a line as shown in the figure 107.

If there be several sharp turning in the field, or if it be not practicable to measure the offset lines direct from the line chosen, the points can be offsetted on a series of straight lines at right angles to each other in succession.

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#### *Third Method.*

If offsetting all the points on a single line is found impossible, two convenient arbitrary straight lines chosen at right angles to each other may be measured and all points offsetted on them as shown in Fig. 108.

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#### *Fourth Method.*

If two straight lines at right angles to each other are insufficient for offsetting all the points, a conventional rectangle may be formed and all the points offsetted on one or more of its four sides. This method should, wherever possible, be adopted in preference to any other as it has the special advantage of furnishing a useful and easy check in that (1) after laying the first three right angles, the fourth ought to be a right angle (2) the opposite sides should be equal to one another. To be sure that the observations of the chain and offset distances are correct it will be better also to offset one or more points on more than one of the sides of the rectangle. (See Figure 109).

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*Fifth Method.*

If after forming two right angles in the above side method we find difficulties in forming a third angle on account of other obstructions, we can close the quadrilateral by joining any 2 points on the 2 straight lines between which the fourth line could not be run at right angles to them as shown in the above figure and complete the survey by offsetting the points on the sides of the same.

Thus if it is found practicable to form right angles only at K and L and not at M and N, the line MN may be measured and the three field boundary points offsetted on it as shown in Figure 110.

*Sixth Method.*

If after forming the first right angle, it is not found possible to form a right angle even at the second point, we can lay out a quadrilateral by joining any one point on each of the two straight lines at right angles to each other, to any convenient point on the other side of the block as shown in figure above and close the survey by offsetting the points on its four sides. In this case, it is quite essential to check the work satisfactorily by offsetting some points on more than one line. (See Figure 111).

*Seventh Method.*

When the field is very crooked and badly obstructed all round as will sometimes be found in certain village sites of not considerable extent and the first six problems will not be suitable, it can be surveyed by forming a polygon of a number of sides at right angles to one another in succession excepting any consecutive three angles which need not be right angles as in the figure. The field in this figure is surveyed by enclosing it in a rectilinear figure A to I, with all its angles right angles except the three adjoining ones at L, K and H. In this case also, a few points should be offsetted on more than one line. (See Figure 112).

*Eighth Method.*

If we have to survey a long winding stream or path either for showing the detail or for the purpose of correctly plotting it and computing its area, the following method will

be useful. Offset the points on the boundary of the field on a series of straight lines at right angles to one another in succession and this can be plotted either as they were surveyed or better by transforming the offsets on two straight lines at right angles to each other. Thus the fields in the diagrams are surveyed by offsetting all their points on the straight lines AB, BB, CD, DE, EF, FG., etc., at right angles to one another in succession. (See Figures 113 & 114)

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*Ninth Method.*

If there should be a block which is not only obstructed but altogether unapproachable for the chain though flags are put up at the points showing the limits of the boundary such as a building in the middle of a tank, (നീരാഴിമദ്ധ്യം) a fort with trenches all round, or a minor prickly pear block specially wanted out of a larger one, it can be surveyed, and the position of the inaccessible point fixed in the plan by forming a rectangle outside the obstruction and offsetting each point on any two sides of the rectangle meeting at right angles to each other as illustrated in the figure. It will be advantageous if some points be offsetted on three lines. (See Figure 115).

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## Chapter III.

### REPLACEMENT OF MISSING STONES IN THE SEVERAL SYSTEMS OF SURVEY.

The replacement of missing stones is the easiest under this system. There are several checks to a stone and as such the replacement is easy. When a stone is found missing the position of the same should first of all be laid down with the help of the side measurements. After approximately determining the position, the several Tak measurements should be measured and the positions finally fixed. In the Figure 118, we shall take stone marked A as missing. Then the side measurement to A from the trijunction of survey Nos. 364, 540 and 450 should be measured and the point should be fixed. After this the side measurement between 364 and 375 should be measured from the trijunction of 364, 368 and 375 to point A and verify with the Tak measurements of survey No. 450 and 375 to point A. If there be slight discrepancy in the several measurements they should be adjusted with reference to the existing state of the ground. In refixing a stone the side measurements will have to be relied upon more than the Tak measurements.

If the missing stone is on the boundary of a village between two Pakuthies or between Khandom boundaries, the same should be refixed with reference to the chain line and offsets recorded in the traverse field books. This will be an additional check for correctly refixing a missing stone.

The replacement of missing stones under this system is much more difficult than in the Tak system as long lines will have to be measured for correctly refixing the position. We have to proceed from the plan to the ground, which means from a smaller to a larger similar figure. The utmost caution and scrupulous accuracy are necessary in laying out right angles and straight lines. The cross staff will be the chief instrument with which you have to range the lines and get the necessary offsets.

When a stone is found missing its position should be roughly fixed with reference to the side measurements entered in the original survey records. After this, the base line in which offsets have been taken to the stone that is found missing should be laid on the ground and the position

correctly refixed. It may sometimes happen that the chain line and offset measurement may not correctly agree with the position of the stone roughly fixed, as per the side measurement. In the Figure 119, the stone marked A is found missing. Then the side measurement from the trijunction of subdivisions 1, 2 and 3 of survey No. 565 should be measured to point A and the position should be marked roughly. Then the southern side measurement for subdivision 2 of survey No. 565 should be measured from the trijunction of survey Nos. 565/2, 565/5 and 566, to A and adjusted with the point already fixed roughly. Then the traverse line BC should be run and the offsets to A verified. Any slight discrepancies noticed should be adjusted with reference to the existing state of ground.

The replacement of missing stones under this system is not so difficult as in the base line and offset system. In this system we have to deal with shorter lines than in the base line and offset system. (See Figure 120.)

Triangles and offset system survey.

Replacement of a missing stone whose position has been fixed in the field measurement book by the vertex of a triangle which has been offsetted on the base.

If the stone at B is missing and the field measurement sketch shows that it has been offsetted on AC at D, measure from A or C in the line AC, a distance equal to AD or CD respectively, and lay off DB perpendicular to AC, with a distance equal to the recorded offset measurement. Then the position of the point B is fixed. This has to be checked by the recorded measurements of AB and CD and any small difference adjusted.

If in the above side triangle, the stones at the offsetted point B and one of the chain line station point A are present and other station stone C is missing, then on measuring and checking the positions of the stones at B and A with the known distance BA, the position of the point D can be found out on the ground by using the following formulae.

$$\frac{BD^2}{BA} = BE$$

$$\text{and } \sqrt{BD^2 - BE^2} = ED.$$

where DE is the perpendicular on BA from the point D. Having got the point D, put the cross staff at D, and check whether BD and DA are at right angles under the registered



lengths. On securing this point, if the line AD is produced to the registered length AC the position of the point D will be found out.

If only the three sides of a triangle are measured and one of the stones of such a triangle is missing.

*1st Method.*

By forming similar triangles :— (See Figure 121.)

If in the triangle ABC, the measurements of the three sides alone are given and the stone at the point B is missing on the ground, proceed thus :—

Let the distances be 750, 434 and 856.

- (1) Verify the distance between A and C.
- (2) Add the distances of AB and BC, *i. e.* the sides meeting at the missing point.  $750 + 434 = 1,184$ .
- (3) Divide the sum thus got by the largest division which will leave a quotient not more than 100.
- (4) Divide each sum by the divisor and note it down against each as shown in the figure.
- (5) Then standing at the point A (C may also be chosen if it be nearer or more convenient) lay on the line AC from A, the distance  $71 \frac{1}{3}$  (the quotient noted against AC) and mark the point D.

(6) Place the handle of the chain at A, and at D place the  $98 \frac{8}{12}$  point of the chain from the handle (the quotient of the sum of the distances AB and BC).

(7) Then take the  $62 \frac{1}{2}$  point from the handle and draw the chain tight making two men to hold the handle and  $98 \frac{8}{12}$  point at A and D firmly.

(8) Then a small triangle on AD will be formed with the point E as its vertex, and this point will be on the line AB. If AE be produced to the recorded length of AB, the position of the point B will be found.

(9) Owing to neglecting of fractions or wrong ranging of the line, there may be some slight difference and this should be adjusted and the final point fixed.

*2nd Method.*

By calculating segment and offset:—(See Figures 122, 123 and 124.)

If the three sides alone of a triangle are given and if one of the stones, say B, is missing then the segment of the available side and the offset of the missing stone may be

determined by the following formulae and the position of the stone fixed as explained above.

$$AD = \frac{AB^2 + AC^2 - BC^2}{2 AC}$$

$$BD = \frac{\sqrt{AB^2 - AD^2} \text{ or } \sqrt{BC^2 - CD^2}}{(AB + BC) (AB - BC) + AC}$$

$$\text{or } AD = \frac{AC}{2}$$

$$BD = \sqrt{(AB + AD)(AB - AD)} \text{ or } \sqrt{(BC + CD)(BC - CD)}$$

As this method of refixing is decidedly the most advantageous as enabling the location of the position of the missing stone by a direct route in all triangulated fields, the formulae for calculating the segment should be remembered by all concerned. They may be summarised as follows:—

(1) Square of the base + square of the side adjoining the required segment = square of the opposite side, the whole divided by twice the base = segment of the base.

(2) Divide the product of the sum of the two sides adjoining the vertex and their difference by the base, and add to the quotient thus obtained the length of the base. Half of this sum will be the length of the longer segment, i. e., that which adjoins the longer of the two sides meeting at the vertex.

In all cases where the point, in respect of which the segment of the base and the offset are to be calculated is any one of the angular points of an acute-angled triangle, or that at the obtuse-angled triangle, the offset will fall within the triangle itself and no difficulty will be experienced in working out either of the two segments of the base. But if the point be at either of the acute angles in an obtuse-angled triangle, as in the figure, the perpendicular will fall outside the triangle and on the base produced. The formulae for calculation of the segment enunciated above will be workable arithmetically in these cases only if that extremity of the base, which is farther from the point at which the offset falls, is taken as the starting point. The result of the working will then give the total distance on the chain line from the starting point to the place where the offset falls on it and it must be greater than the length of the base.

The perpendiculars from A and C in the triangle ABC fall outside the triangle and on the bases CB and AB produced respectively. The arithmetical calculation of segment

will be possible only if C or A be taken as the starting point and the result arrived at will be CD and AE. If, on the other hand, B be taken as the starting point, the result arrived at will be a negative quantity.

*Survey by Diagonals with offsets.*

(a) If a stone is missing and if it has been offsetted on a 'G' line between two stones which are on the ground in their correct places, the position of the missing stone is easily found by erecting a perpendicular of the offset distance at the point indicated by the chain distance and on the proper side of it.

(b) If one of the stations of the 'G' line is missing while the other stone and one of the stones offsetted on the 'G' line are present.

*1st case.*—(See Figure 125.)

When the existing offsetted point is one adjoining the existing station point.

If the stone at the point N is present and those at A and C are missing, measure BN and verify if the points are correct. Then by the formulæ.

$$NQ = \frac{PN^2}{BN} \quad \text{and}$$

$$PQ = \sqrt{PN^2 - NQ^2}$$

the segment NQ and the offset PQ on BN can be found. Then erect at the point Q, the perpendicular QP and this will determine the point P. Put the Cross-staff at P and see if PB and PN are at right angles to each other. If so, produce the line BP to the required distance BA from B; the position of the point A will then be determined. All the points offsetted on AB can then be easily refixed.

*2nd case.*—(See Figure 126.)

When the existing offsetted point is remote from two existing station points, i. e., when there are intermediate F points offsetted on the line, which have also disappeared.

The station point B and the yonder offsetted point M are present while the station point A and the offsetted points N and O are missing. With the chain and offsetted distances BR and RM, calculate BM and check its distance on the

ground. Then with the distances  $BM$  and  $MR$  find out  $MS$  and  $RS$  by the above quoted formulæ. Then finding out the position of the point  $R$ , set up the cross-staff there and see if  $RB$  and  $RM$  are at right angles to each other at  $R$ . Produce  $BR$  to  $A$  to the required distance and the position of the point  $A$  will be fixed. The offsets  $N$  and  $O$  can then be relaid easily.

(c) When both the station stones are missing and offsetted stones only are present.

*1st Case.*

When two adjoining offsetted stones on the same side are present.—(See Figure 127.)

If the points  $N$  and  $O$ , two offsetted stones, alone are present, while the station points  $A$  and  $B$  and the other offsetted stones are missing, measure and verify the distance  $NO$ . By the difference of  $RN$  and  $SO$ , the distance  $XN$  is found and with that and the distance of  $NO$ , find out  $NY$  and  $YX$  by the above said formulæ and by laying the perpendicular  $YX$  at  $Y$  on  $NO$ , the position of the point  $X$  is fixed and this will show the direction of the line  $NXR$ . Produce  $NX$  to  $R$  making  $NR$  equal to the recorded offset distance of  $N$  from  $AB$ , after verifying that  $NXO$  is a right angle. Now fixing the cross-staff at  $R$ , direct one of the grooves towards  $N$  when the other groove will indicate the direction of  $AB$  which should be measured both ways from  $R$  to get respectively the points  $A$  and  $B$ . The correctness of the line thus laid out can be verified by seeing if the observed offset distance of  $O$  from it is the same as that already recorded.

*2nd Case.*—(See Figure 128.)

When two offsetted stones not adjoining each other on the same side of the 'G' line are present while the intermediate offsetted stone and the station stones are missing.

Let  $M$  and  $O$  be the offset stones existing on the ground. Measure the line  $MO$  and check it with the distance of the line got by calculation. Then taking the difference of the offsets  $MT$  and  $OS$ , find out the point  $W$  on  $MT$  and fix it on the ground with reference to its calculated chain and offset distances from  $MO$  and produce it to  $T$  making  $TR$  equal to the recorded offset distance of  $M$  from  $AB$ . At  $T$  place

the cross-staff and range one of its grooves to M when the other will show the line AB and the position of the points A and B can be fixed on it.

*3rd Case.*—(Figure 129.)

When both the stations are absent and two offsetted stones one on each side of the 'G' line are present.

Let O and Q be the offset stones existing on the ground, check the actual distance between O and Q got by measurement with either the registered distance, if any, or the calculated distance got by the chain lines and offsets. By the undermentioned properties find out the distance of OH and QH, H being the point where the 'G' line cuts the line OQ.

$$\begin{aligned} QH &= \frac{QO}{QL + OM} \times QL \\ LH &= \frac{LM}{QL + OM} \times QL \\ OH &= \frac{OQ}{QL + OM} \times OM \\ MH &= \frac{ML}{QL + OM} \times OM \end{aligned}$$

Then calculate the segments and the offsets for L and M in the triangle QLE and OMH on the bases QH and OH and fix the points L and M on the ground. If the working be correct, the points L, H and M must be in the same straight line. Produce the line both ways to the recorded length and fix the points A and B.

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## Chapter IV.

### FORMATION OF FURTHER SUBDIVISIONS AND THEIR MEASUREMENTS.

The formation of subdivisions becomes necessary in a completed survey on account of Pokkuvaravu, Land Acquisition, Karampathippu, etc. This process will vary in the different system of survey adopted in Travancore.

In the Tak system, each survey field with the subdivisions in them will have to be measured and plotted. In the base line and offset system, each revenue field should be measured and plotted with all the subdivisions in them. In the case of triangles and offset system, or otherwise called Diagonal and offset system, the whole survey field with all the old and new subdivisions in them should be measured and plotted. Detailed measurement and the preparation of plotted sketches or field maps becomes necessary as there are no plotted sketches for each survey or revenue field. In the resurveyed taluk of Nedumangad there are field maps for each survey field with all the subdivisions in them. To form further subdivisions in them, is very easy and no elaborate measurement is necessary. When further subdivisions have to be made in the survey fields surveyed under this system it is enough if the accountant takes a tracing of the map of the field in which a fresh subdivision has to be formed. He should then take the necessary offsets in the 'G' line or check line already measured.

2. If the recorded measurements for a survey field and of its sub-division are satisfactory with sufficient independent check in itself, the function of making further subdivisions therein is nothing but to localise and measure between the new points demarcated permanently or temporarily on account of the new subdivisions. The following instructions should always be kept in view in making further subdivisions:—

(a) If a new subdivision is made and its boundary closes on an 'F' line, the point should be demarcated on the 'F' line after relaying this line even where it should be obstructed.

(b) The areas of the subdivisions should be separately calculated or computed, and should be proportionately adjusted to the total registered extent of the field. In no case

should the area of one or more subdivisions alone be computed and those of others obtained by deduction of these areas from the total registered area of the field.

(c) In no case should a 'G' line be measured between subdivision points. When no convenient line can be run between field trijunctions, bi-junctions may be used.

(d) If for any reason an arbitrary line has to be chosen for a 'G' line it should be between two field trijunctions, though not of the field under survey. If this is not possible one at least of the point should be a field trijunction or a known point in a line between two field trijunction points. The particulars of the points so chosen should be noted in the sketch.

(e) When a new number or subdivision is to be made out of a large block, necessary data for locating it in the block should invariably be given in the sketch of the new subdivisions, with another sketch, though on a smaller scale, of the whole block, with the new subdivision located in it without measurement.

(f) Ill-conditioned triangles or triangles without offsets for vertices or tie lines should never appear in any sketch.

3. Demarcation of subdivisions, should follow the existing limits of occupation on the ground. But cases may often arise in which a required area has to be subdivided from large fields, such as unregistered waste etc., for assignment or other purposes and there may be no limits of occupation on the ground for guidance. The following explanatory notes on a few cases of this kind will be of use in dealing with them:—(See Figure 130.)

*Case I*—When the extent to be subdivided has to adjoin a given portion of one of the sides of the field.

Let ABCDEF be a waste field of 22·10 acres in extent from which it is required to subdivide an area of 4 acres or 40 sq. chains having for one of its sides 8 chains of the line AB.

Let X and Y be two points on the line AB, the measurement between which is 8 chains. In this case, it will be convenient to lay out the subdivision as a rectangular one.

As the area of a rectangle is equal to the product of its length and breadth and as the length of the required subdivision is to be 8 chains, its breadth should be  $40/8$  chains=5 chains.

If, therefore, perpendiculars XM and YL each measuring 5 chains be erected on the line AB, the plot XYLM will be a subdivision of the required area.

*Case II.*—When the extent to be subdivided has to be located to border on portions of two adjoining sides.

Let it be required to form a subdivision of 1.50 acres having AN and AO for two of its sides with lengths 4 chains and 5 chains in AB and AF respectively.

Measure NO and find out the area of the triangle ANO either by multiplying half of NO with the offset measurement of A on NO, or by the application of the formula that the area of a triangle =  $\sqrt{s(s-a)(s-b)(s-c)}$  where  $s$  is half the sum of  $a$ ,  $b$  and  $c$ , the lengths of the sides of the triangle. In this case, the area of the triangle is 96 cents. If therefore a point P be selected on the other side of NO such that the area of the triangle PON = 150 cents - 96 cents, the figure ANPO will be the subdivision of the required extent.

To determine the position of the point P, its offset distance from the diagonal NO is required and this is arrived at by dividing the area of the triangle PON in square links (that is, the area of the subdivision to be formed—that of the triangle ANO) by half the length of NO, the base. Calculating from the data available in diagram this offset distance is found to be 195 links. If, however, an offset of 195 links be laid out from any convenient point on the line NO, on the side away from A, and it be denoted by the letter P, the figure ANPO will be the required subdivision.

*Case III.*—When the extent to be subdivided has to be located to border on the whole of one side and portions of two other sides of the field.

Let it be required to form a subdivision of 3 acres having the whole side BC and the portions BR and CS of the sides BA and CD as three of its sides.

Measure RS and RC and from RC offset the points B S. Then determine the area of the 2 triangles RBC and SCR forming the quadrilateral RBSC by either of the methods mentioned in the previous case.

Calculating from the data available in figure it will be found to be equal to 2.26 acres and this is short of the extent required to be subdivided by 3.00 acres - 2.26 acres = 74 cents. If, therefore, we determine a point T on the



other side of SR, such that the area of the triangle TSR will be 74 cents, the figure BCSTR will be a subdivision satisfying the conditions required. The offset distance of T from SR can easily be found by dividing the area in square links of the proposed triangle TSR by half the length in links of the base SR.

Thus 74 cents or 74,000 square links divided by  $1000/2$  or 500 links  $= 74000/500 = 148$  links. If, from any convenient point on the line SR, an offset of 148 links be laid out on the side away from BC, we get a figure BCSTR which satisfies the conditions required.

*Case IV.*—This case is similar to the foregoing one but differs from it only in respect of the extent of the subdivision to be formed, being less than that of the quadrilateral formed by joining the extremities of the portions of lines referred to.

Let FE be the lines and FV and EU the portions of lines specified and let the extent required to be subdivided be 4 acres.

Proceedings on the lines detailed in the foregoing case, we get the area of the quadrilateral FEUV to be 4.36 acres. This being 36 cents in excess of that required to be subdivided, we should take 36 cents away from the quadrilateral by forming a triangle on the line VU with its vertex on the side of FE, that is, with the vertex falling within the quadrilateral. The length of the offset to be laid out for forming such triangle in this case is 36,000 square links divided by one half of 1,400 links.  $36,000/700 = 51$  links.

If, therefore, we fix a point W within the quadrilateral such that its offset distance from VU is 51 links, then VWUEF will have an area of 4 acres satisfying the other conditions laid down.

4. If the field map measurements be defective or erroneous, the whole field should be surveyed in the triangles and offset method, offsetting all the new stones also with all the necessary precautions for independent check so that each field with all the subdivisions in them could be plotted.

## Chapter V.

### PREPARATION OF MEASUREMENT SKETCHES FOR FURTHER SUBDIVISIONS.

1 The field measurement sketches shall be of uniform size, 13 inches into 13 inches. The scale to be adopted for plotting it is as follows :—

		Scale.
Field up to 1 acre	...	1" = $\frac{1}{2}$ chain.
Fields from 1 acre to 5 acres	...	1" = 1 chain.
Fields from 5 to 20 acres		1" = 2 chains.
Fields over 20 acres		1" = 5 chains.

2. The survey fields should be plotted in the centre of the paper and to the correct north.

3. The survey field boundary lines should be inked 5 links broad on the scale of 40" to 1 mile, irrespective of the scale used in plotting the survey field.

4. The subdivision boundary lines should be inked much thinner than the survey field boundary.

5. The (sides) 'F' measurements of the survey field should always be entered just outside the field and adjoining the boundary line.

6. The 'G' lines as well as check lines should be inked in thin broken lines neatly. The measurements of these lines should be entered where the lines close and within brackets.

7. The 'G' measurements and offsets should be neatly entered in the right hand side of the paper within the marginal line.

8. Only adjoining survey numbers (without their subdivisions) should be shown.

9. Theodolite stones on or within the boundary of survey fields should be marked in the field measurement sketches by their appropriate symbols, and in their correct positions.

10. In survey fields which have already been sub-divided at the time of settlement, the new subdivisions shall be given subnumbers in continuation of the last subnumber of the fields, viz. if a survey field originally contained 10 subdivisions and 5 new subdivisions are made the new subdivisions should be numbered 11, 12, 13, 14, and 15.

If letters have been assigned to the subdivision at the time of settlement or later on, such letters shall be retained for those subdivisions but the new subdivision shall be numbered 1, 2, 3, 4 and so on.

11. If the areas computed from the present plotted sketches differ from the areas of survey numbers given in the Settlement Register, the old and new areas should be entered in the field measurement sketches in the top right hand corner within the marginal lines.

## Chapter VI.

### INSPECTION OF PORAMBOKES.

1. The inspection of Porambokes will vary in the different systems of survey that has been adopted in Travancore.

2. In the Taluks surveyed under the 'Tak' system the inspection of Porambokes is very easy. There are several checks to each stone and the distances being short ones there can be no difficulty in measuring them and refixing the missing stones in their proper position.

3. In the base line and offset system this process is more difficult. Here long base lines and traverse lines will have to be run for fixing correctly the poramboke boundaries.

4. In the triangles and offset system the refixing could be done with the measurements recorded for each survey field which are independent.

5. A poramboke should be inspected with the available records on the ground and with the help of the measurement the several stones on the poramboke boundary should be correctly refixed.

6. With the side measurement the points should be roughly fixed and their position should be verified with the measurements of the adjoining fields.

7. The traverse lines or the long base lines should then be measured and with the help of the chain line and offset

measurement recorded already the point already traced with the side measurement should then be fixed finally.

8. The missing stones should then be renewed.

9. For the encroachments clear and neat sketches should be prepared and the sketch should be drawn roughly to the scale.

10. The poramboke number should be shown in the sketch with the adjoining survey fields. The encroachment should be shown in hatched lines.

11. For every encroachment an A form statement giving particulars of the name of the encroacher, number of trees standing in it both taxable and non-taxable, period of occupation, etc. should be prepared.

12. The side measurements for the encroachments should be measured and noted.

13. Whether an encroachment is objectionable or non-objectionable should be clearly stated by the Inspecting officer.

14. The non-objectionable encroachments when transferred to assessed waste should be demarcated and surveyed as a subdivision of the full poramboke survey number or revenue number as the case may be.

15. A tracing of the poramboke number should be taken from the field measurement sketch and the encroachment should be plotted in it.

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# DIAGRAMS.

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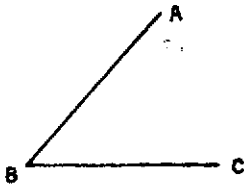


Fig. 1

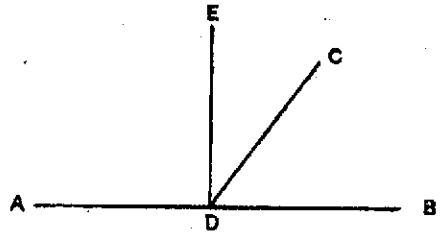


Fig. 6

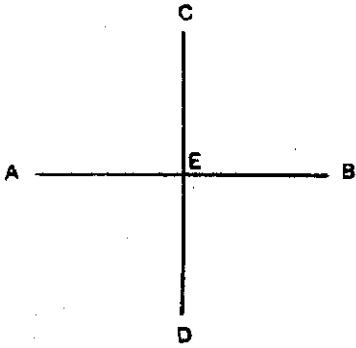


FIG. 2

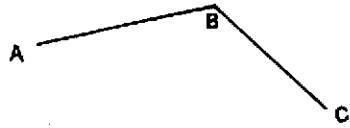


Fig. 7

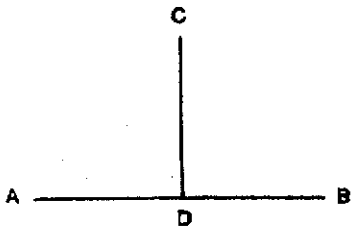


Fig. 3



Fig. 8

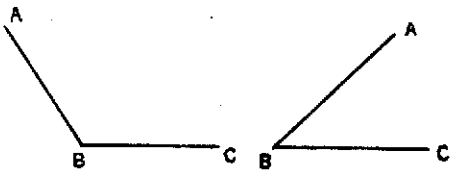


Fig. 4

Fig. 5

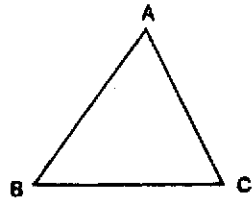


Fig. 9

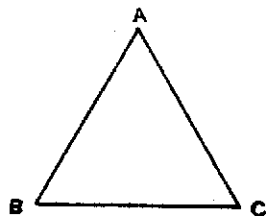


Fig. 10

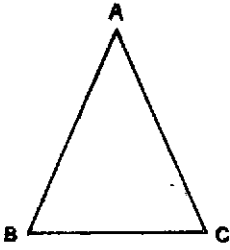


Fig. 11

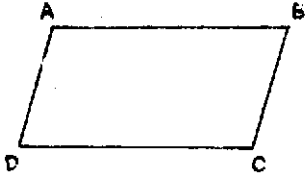


Fig. 16

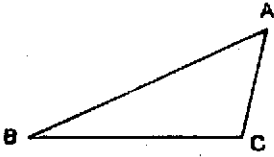


Fig. 12

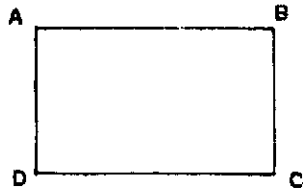


Fig. 17

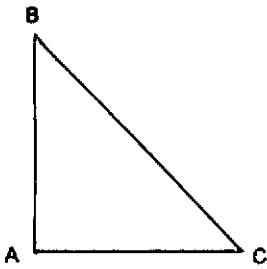


Fig. 13

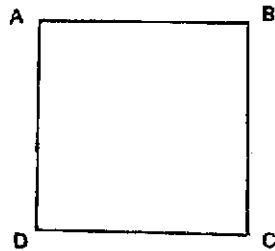


Fig. 18

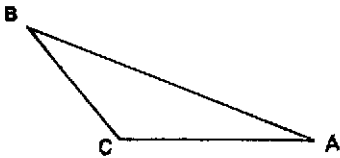


Fig. 14

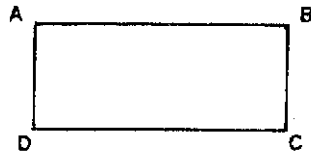


Fig. 19

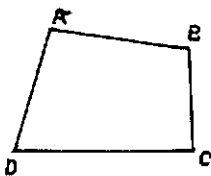


Fig. 15

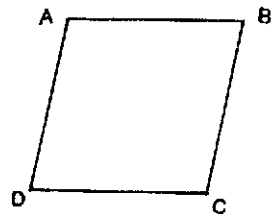


Fig. 20

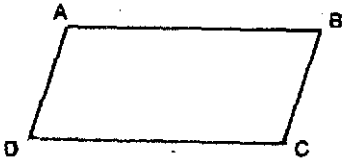


Fig. 21

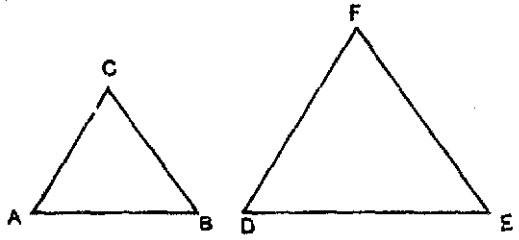


Fig. 26



Fig. 22

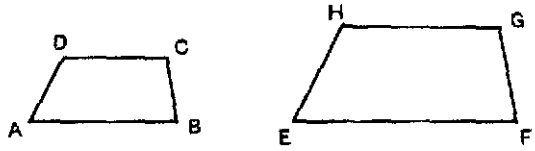


Fig. 27

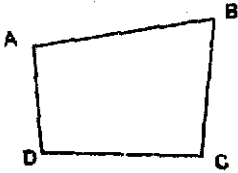


Fig. 23

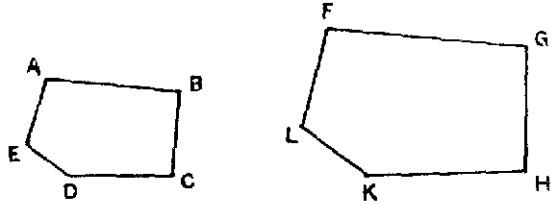


Fig. 28

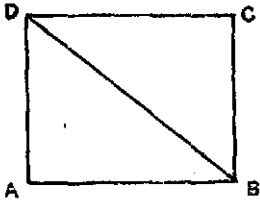


Fig. 24

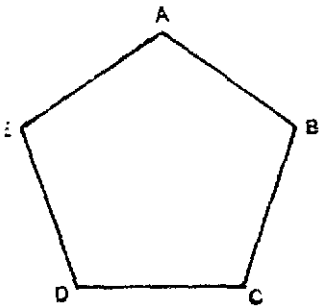


Fig. 25

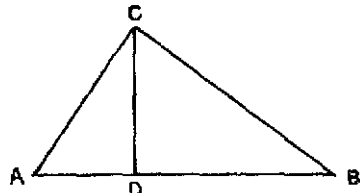


Fig. 29



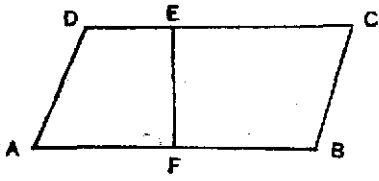


Fig. 30

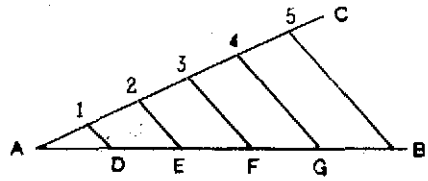


Fig. 35

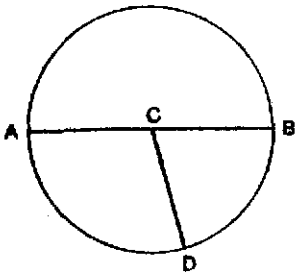


Fig. 31

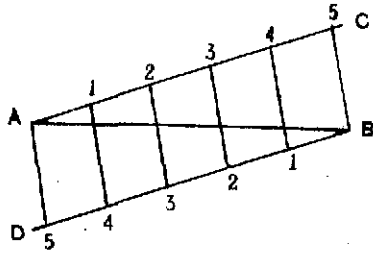
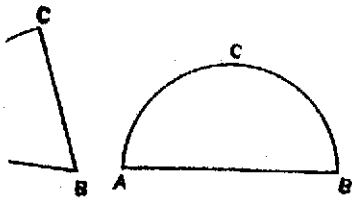


Fig. 36



32

Fig. 33

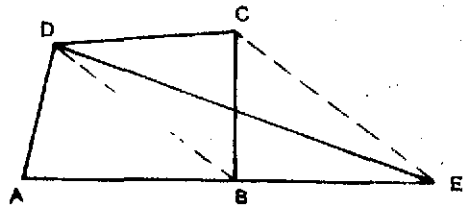


Fig. 37

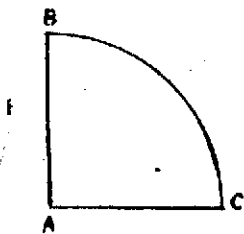


Fig. 34

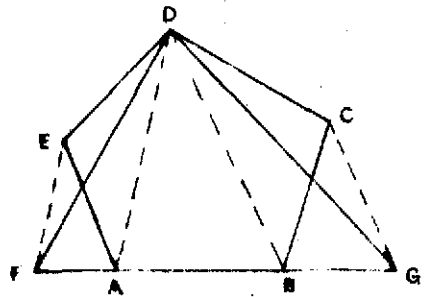


Fig. 38

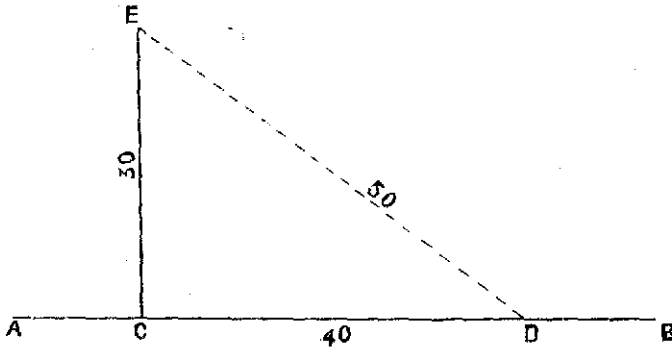


Fig. 39

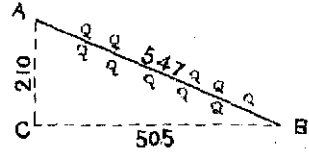


Fig. 42

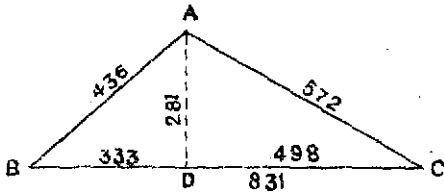


Fig. 40

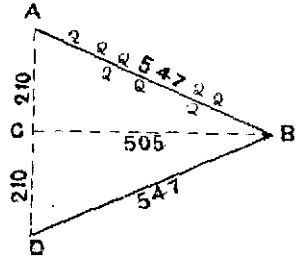


Fig. 43

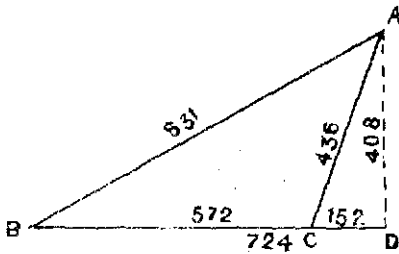


Fig. 41

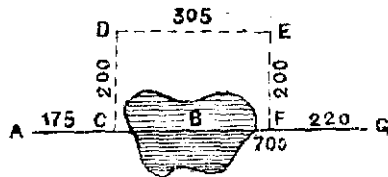


Fig. 44

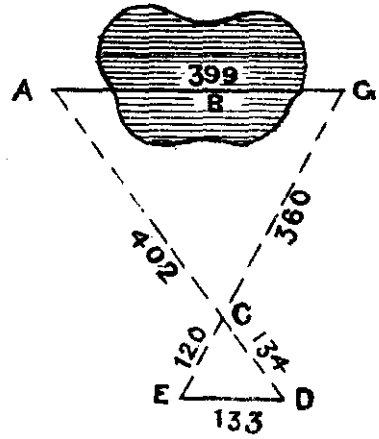
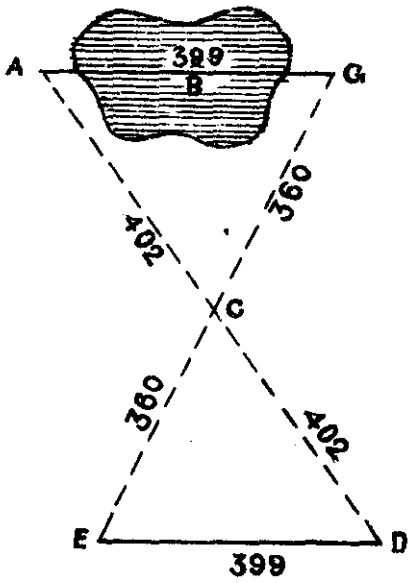


Fig. 45

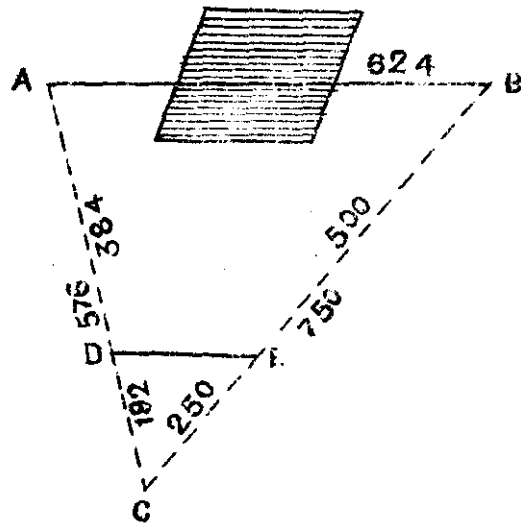
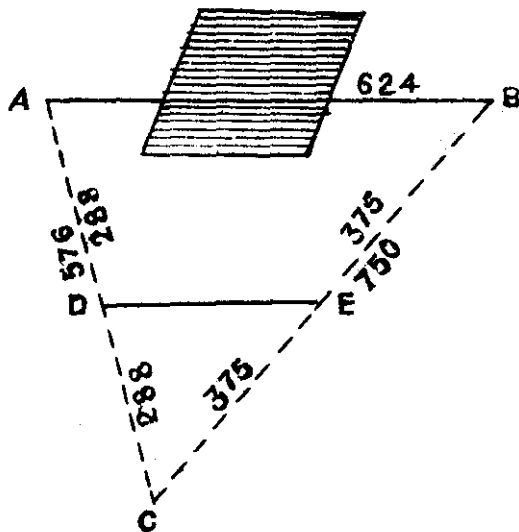


Fig. 46

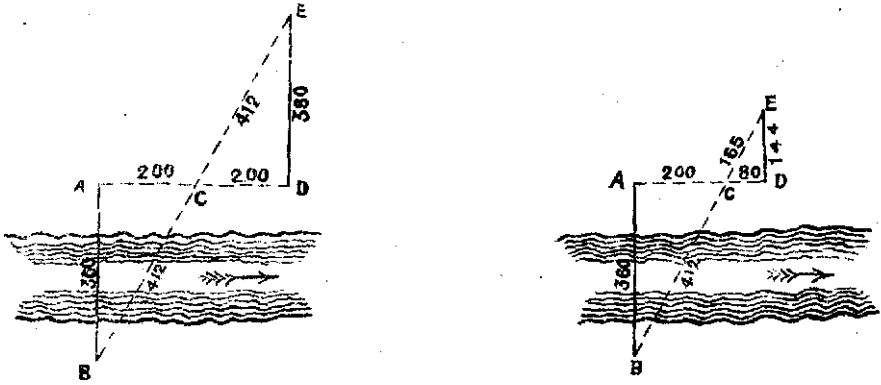


Fig. 47.

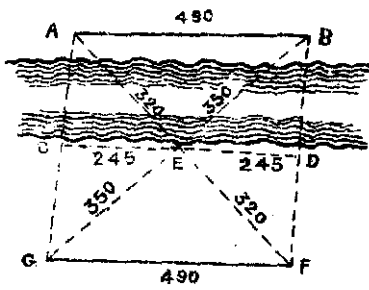


Fig. 48

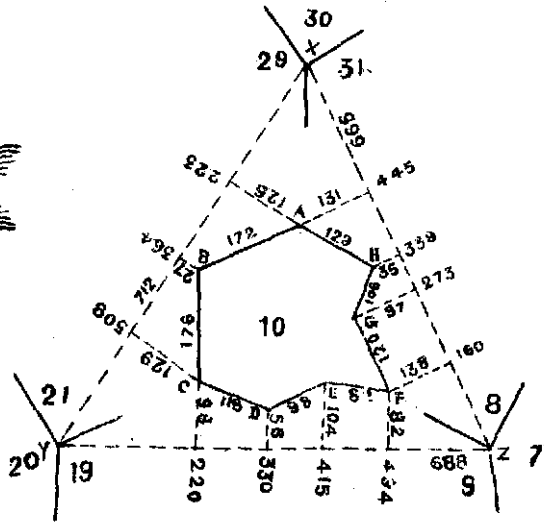


Fig. 49

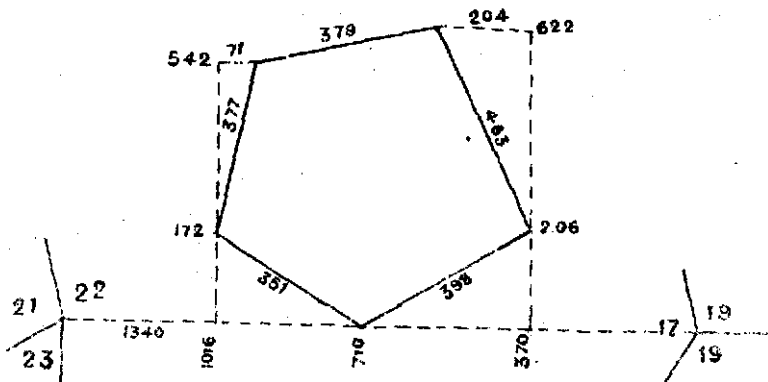


Fig. 50

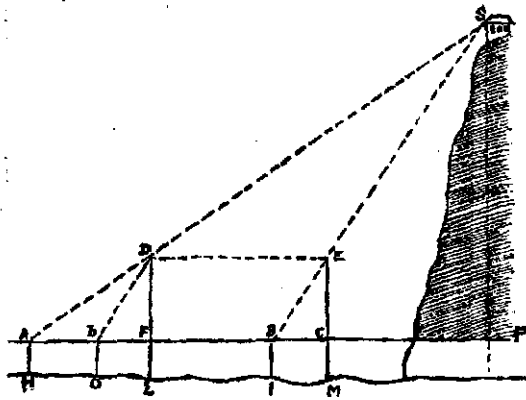


FIG. 50.A

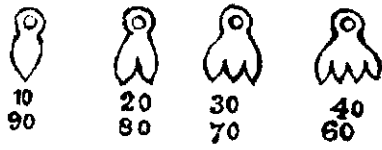
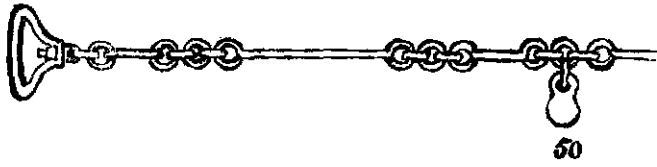


FIG. 51

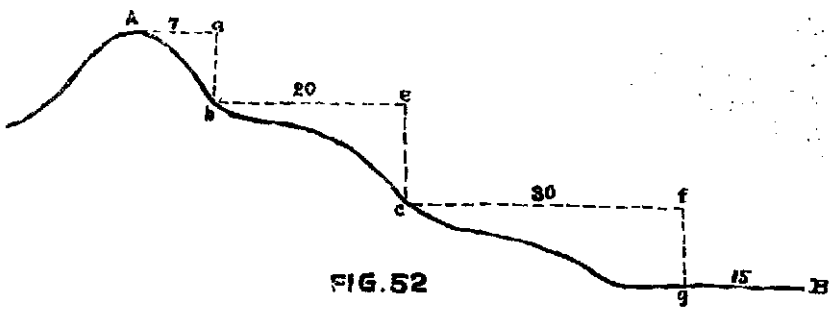


FIG. 52

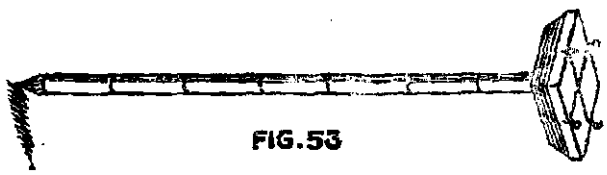


FIG. 53

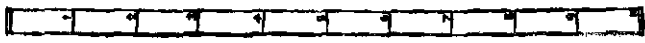
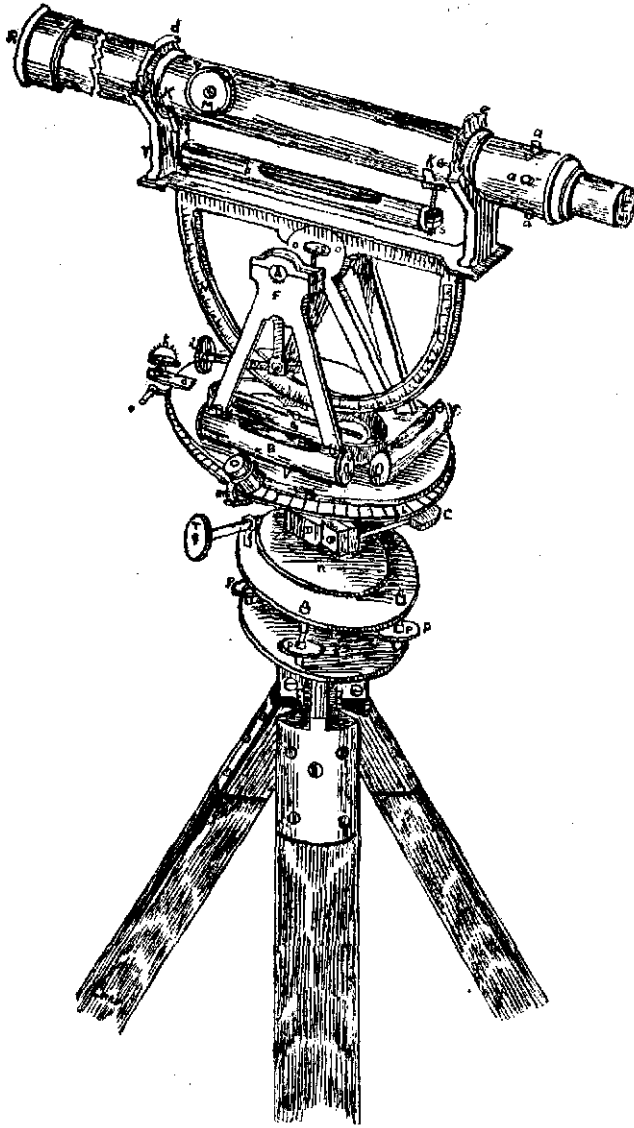


FIG. 54



*Theodolite*

FIG. 55

EVEREST'S DOUBLE ARC  
THEODOLITE

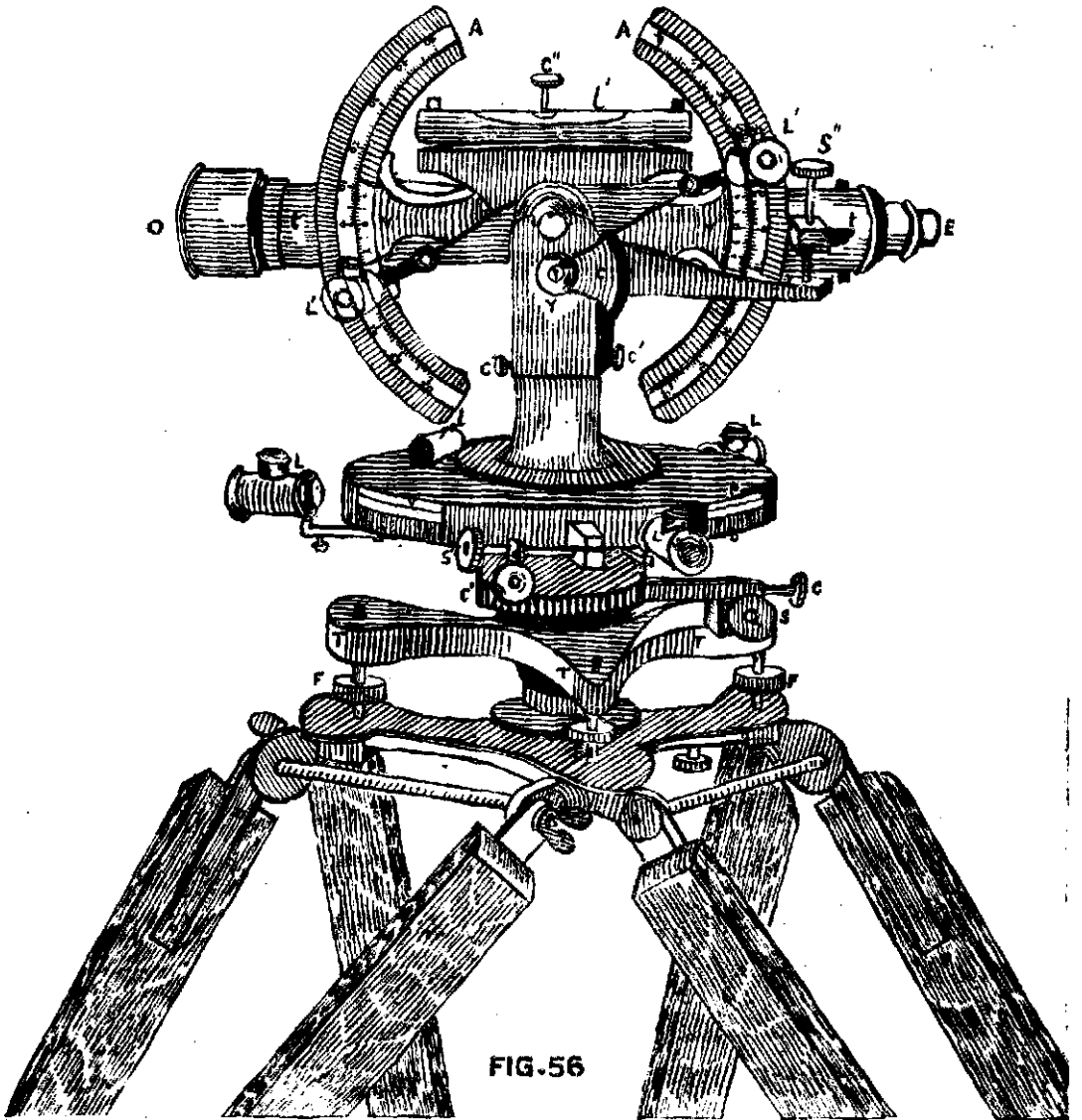
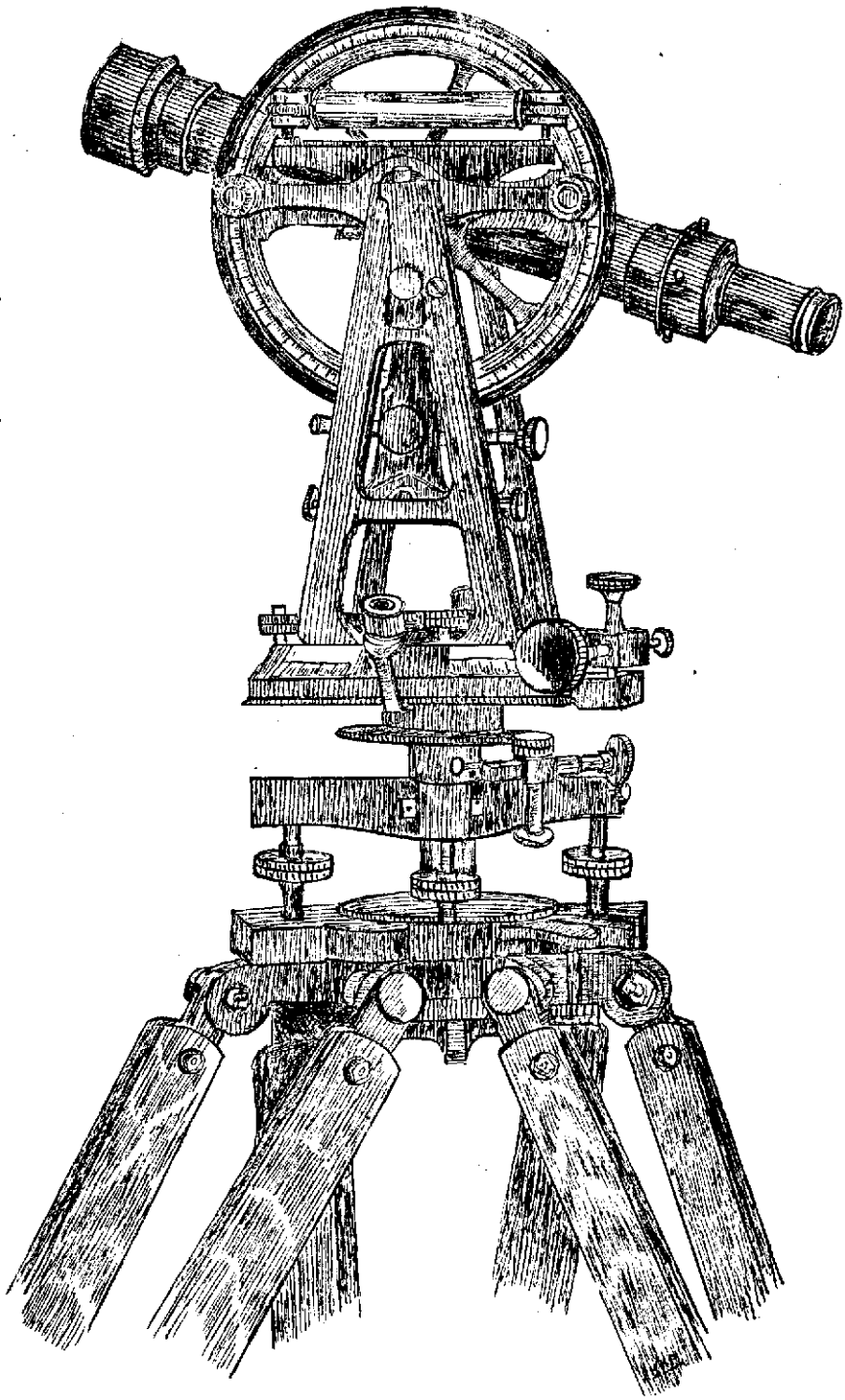


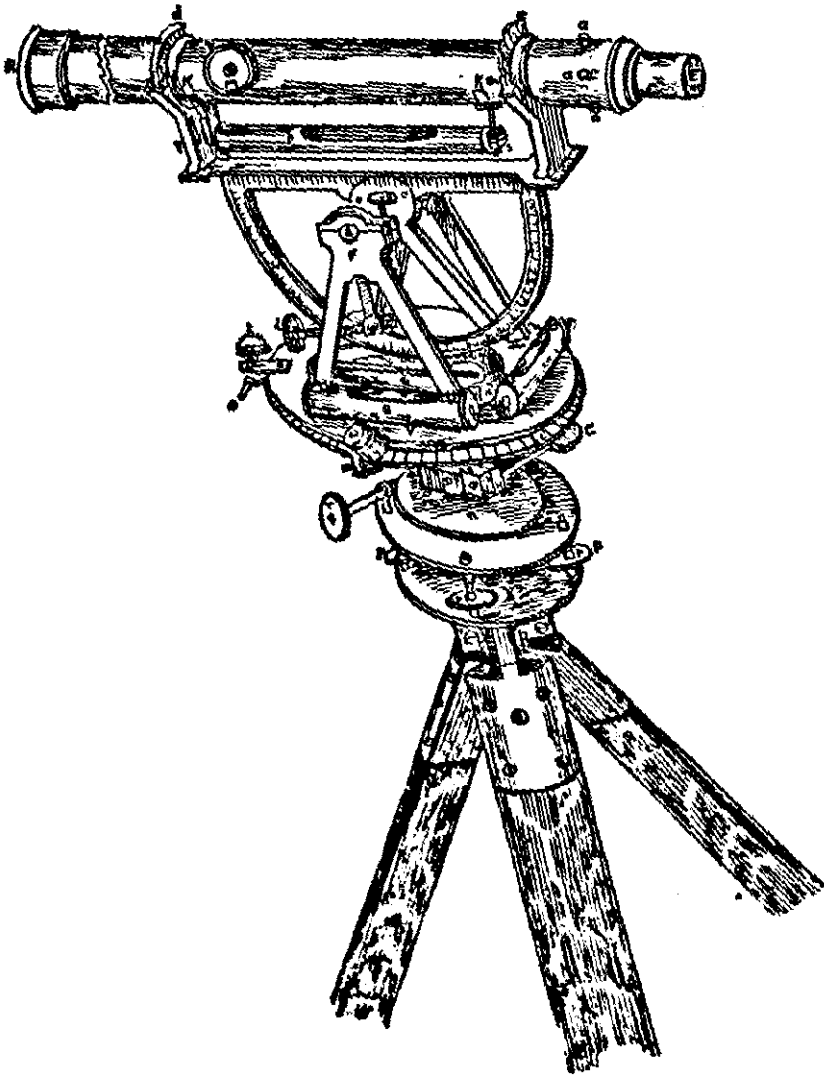
FIG. 56



*Transit Theodolite*

FIG. 57





**Theodolite**  
**FIG. 55**

EVEREST'S DOUBLE ARC  
THEODOLITE

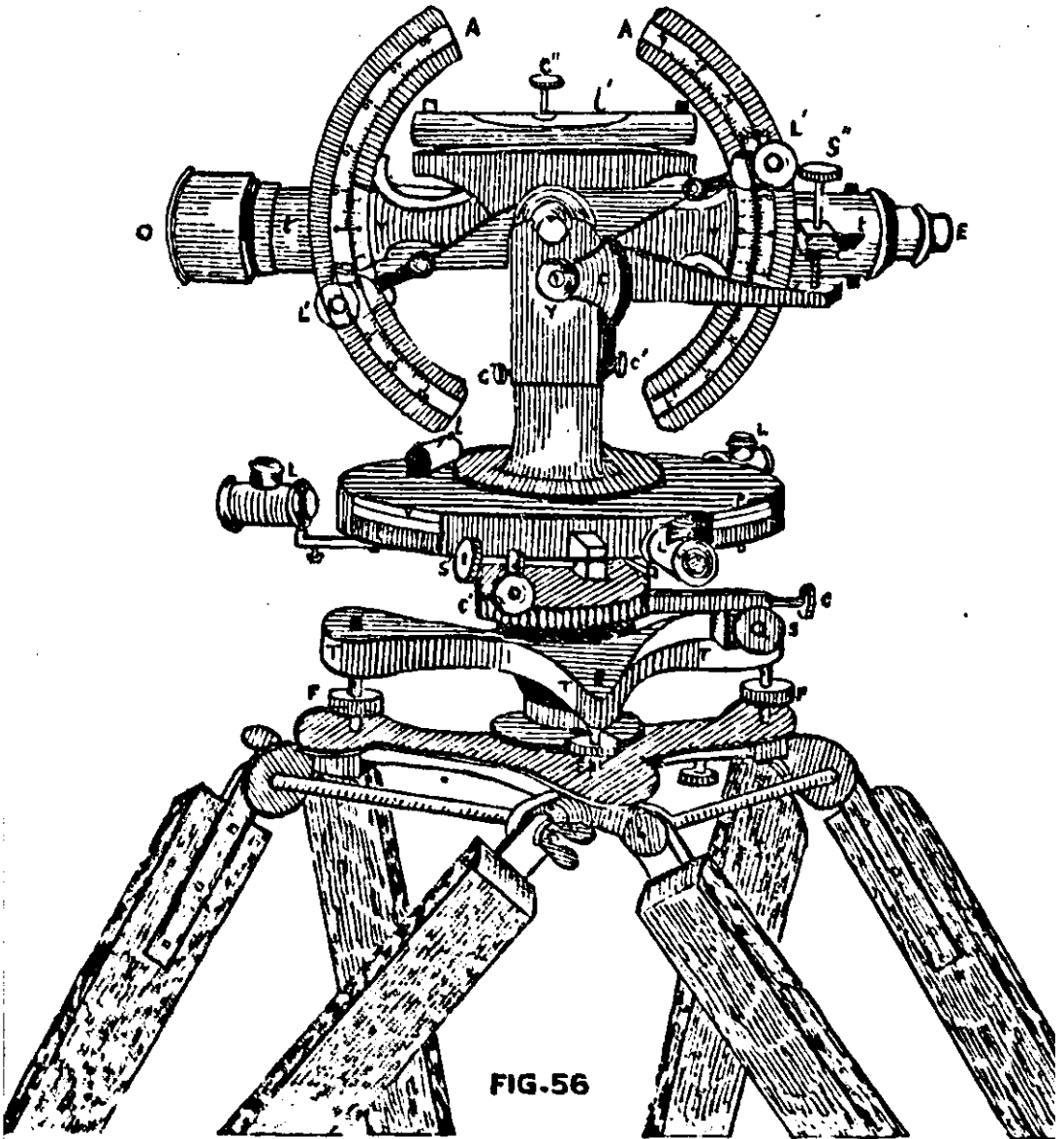
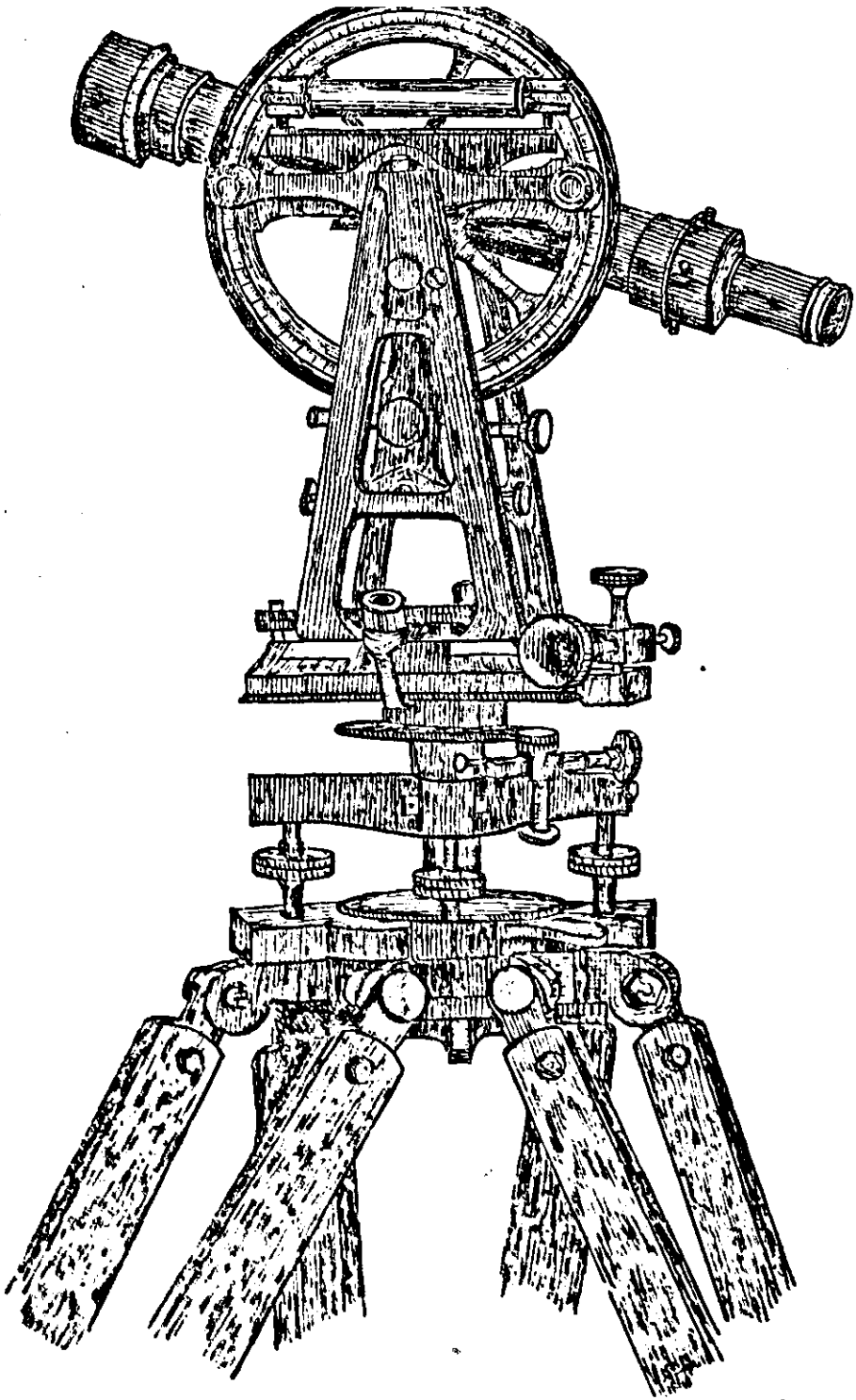


FIG.56

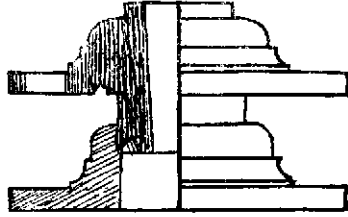


*Transit Theodolite*

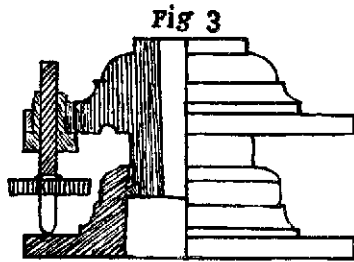
FIG. 57



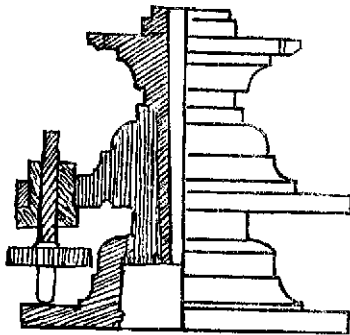
**FIG.58**



**FIG.59**



**FIG.60**



**FIG.61**

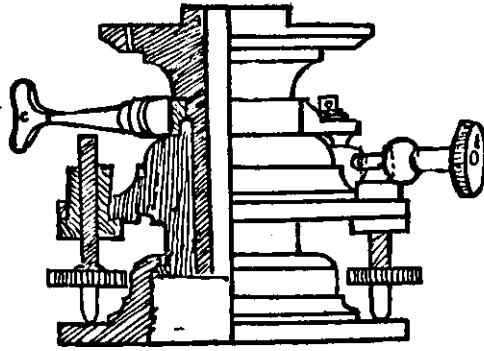


FIG. 62

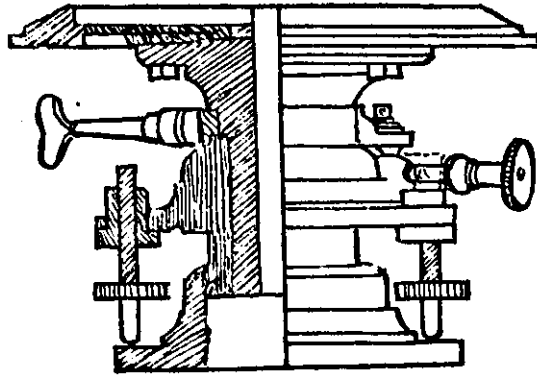


FIG. 63

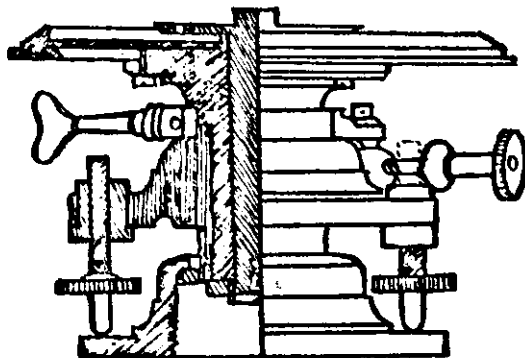


FIG. 64

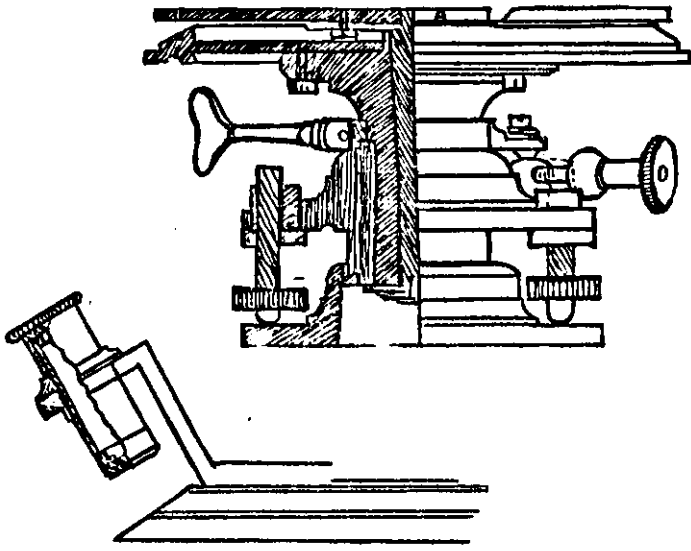


FIG. 65

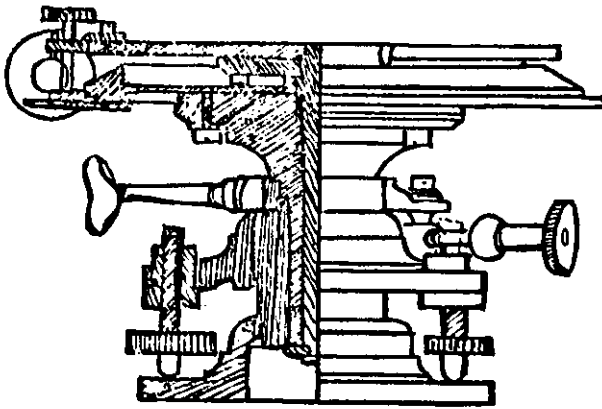


FIG. 66

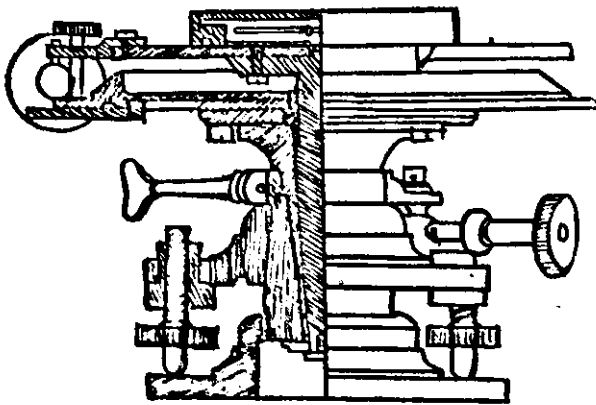


FIG. 67

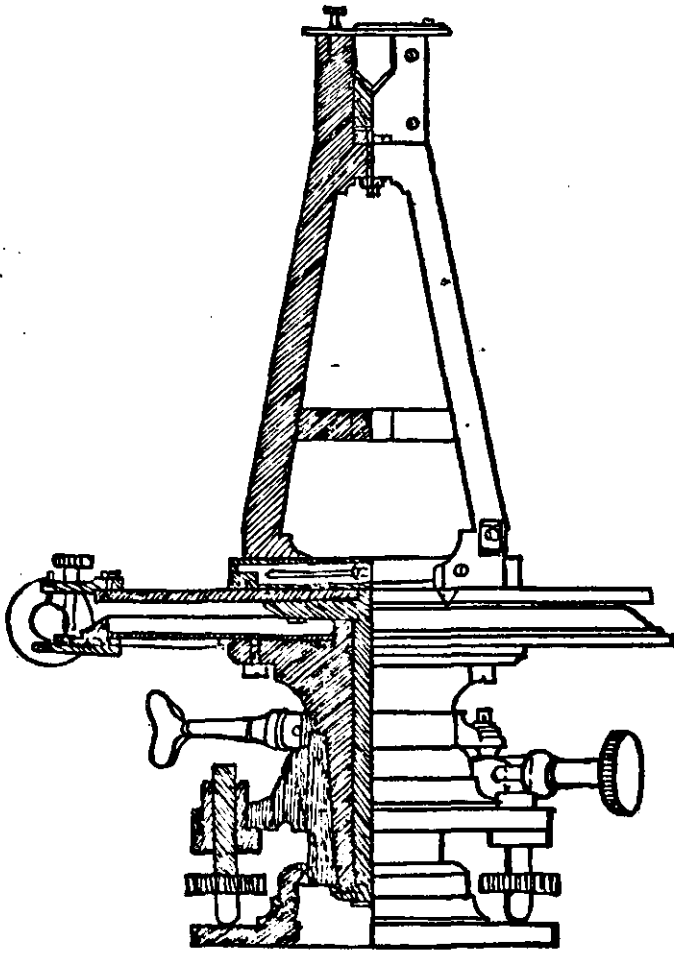


FIG. 68

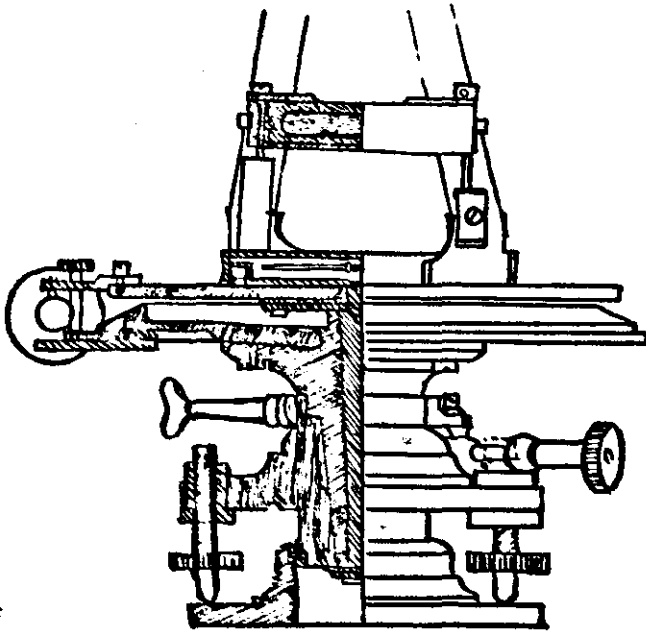
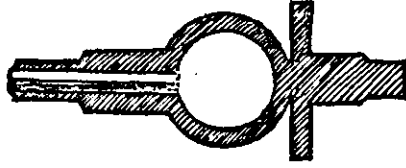
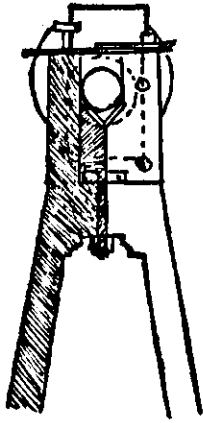
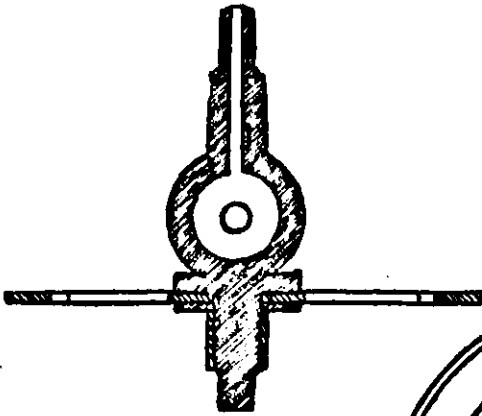


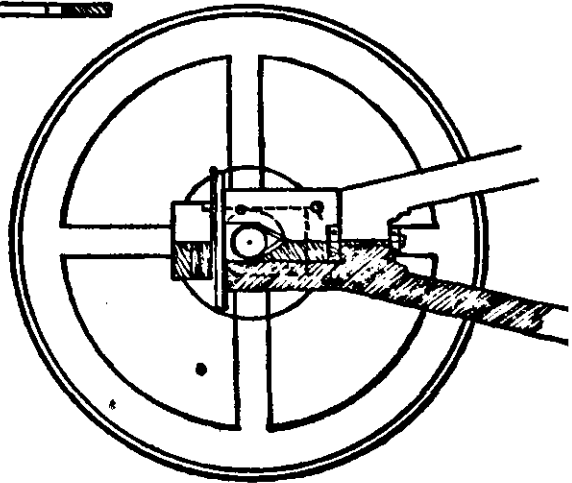
FIG. 69



**FIG. 70**  
**Fig. 13**



**FIG. 71**





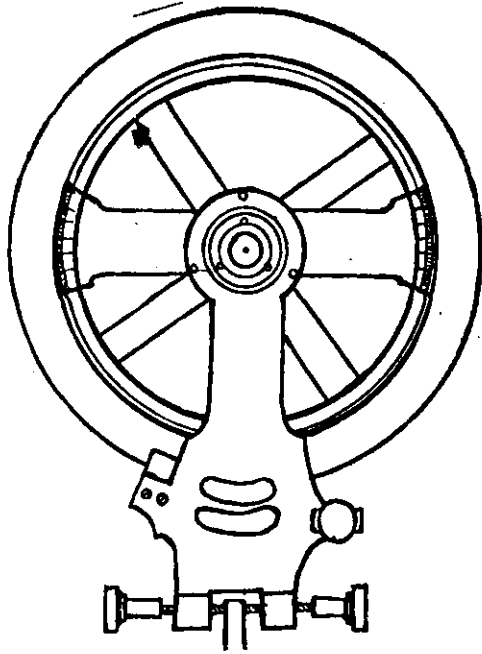


FIG. 72

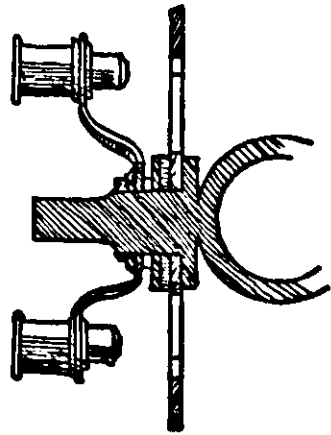
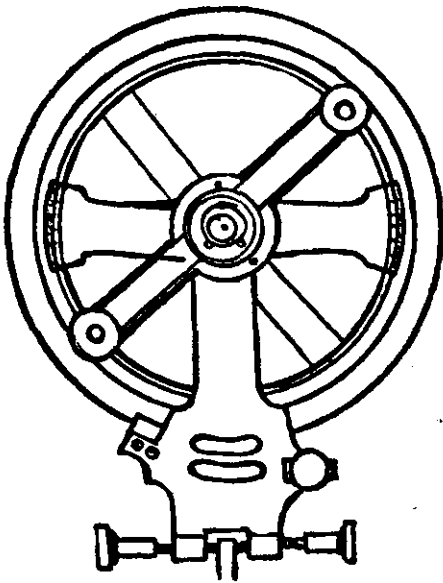


FIG. 73

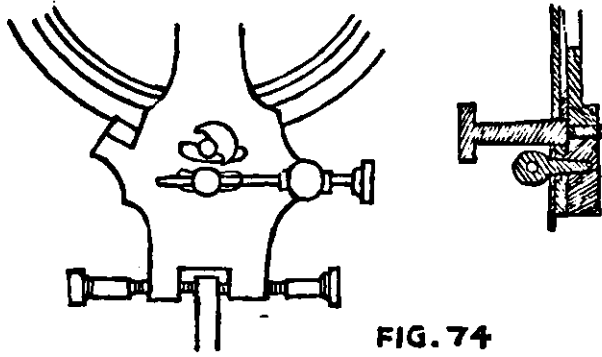


FIG. 74

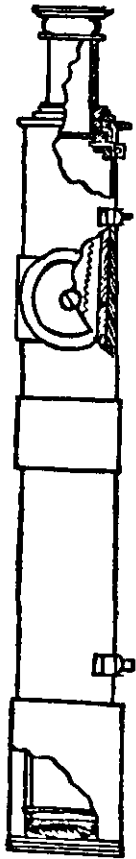


FIG. 75



FIG. 76

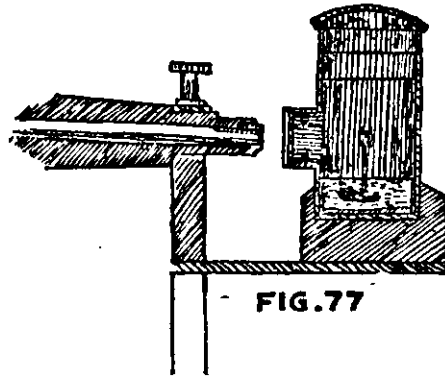


FIG. 77



FIG. 78

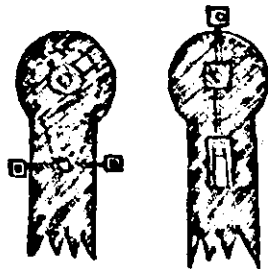
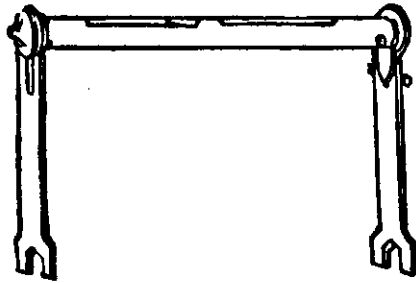


FIG. 79

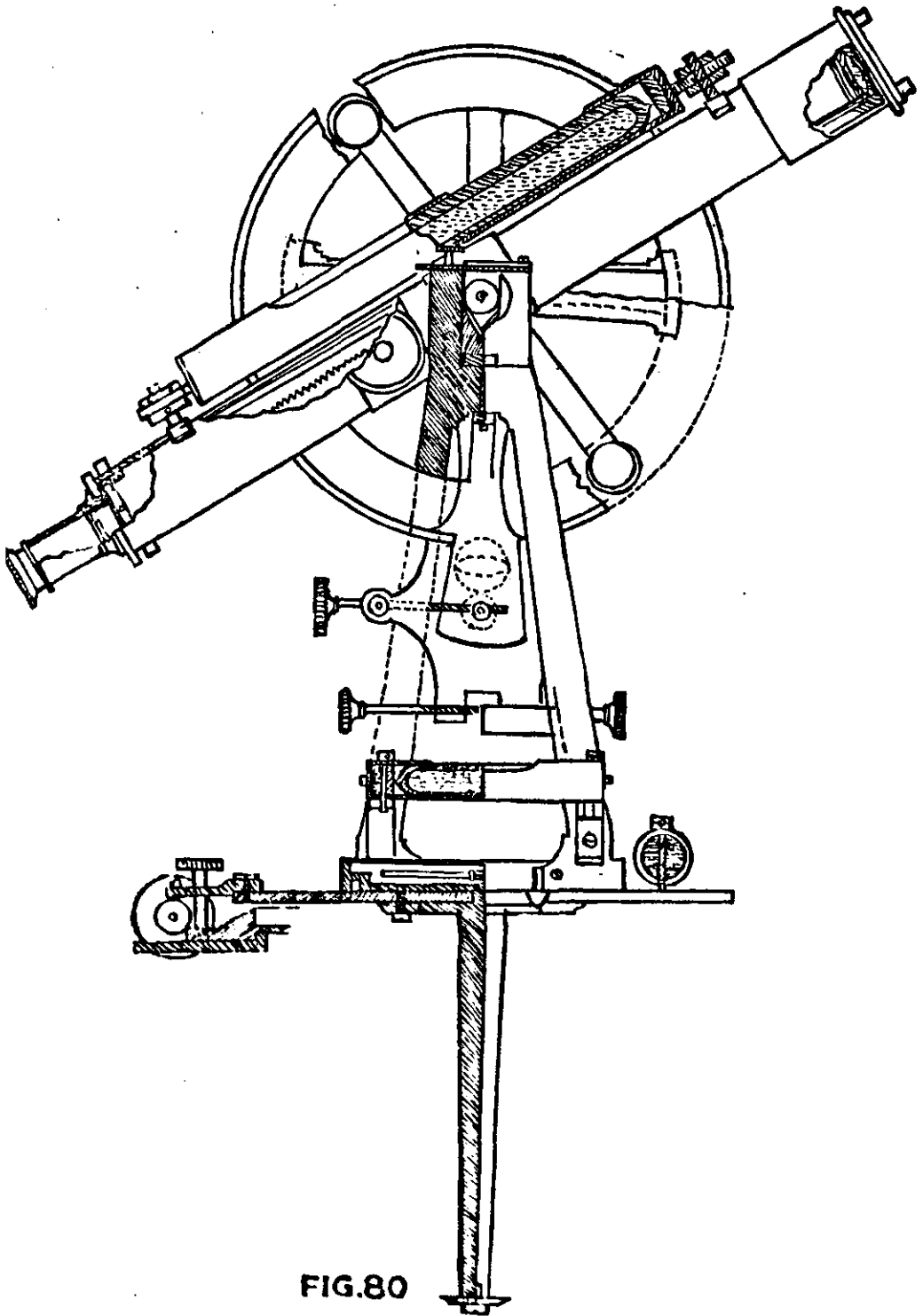


FIG.80

Fig. 23

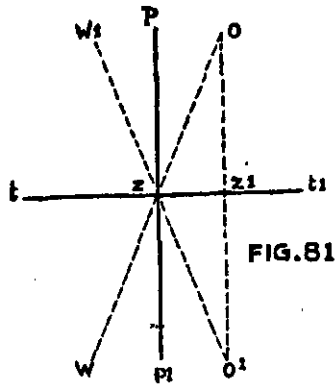


FIG. 81

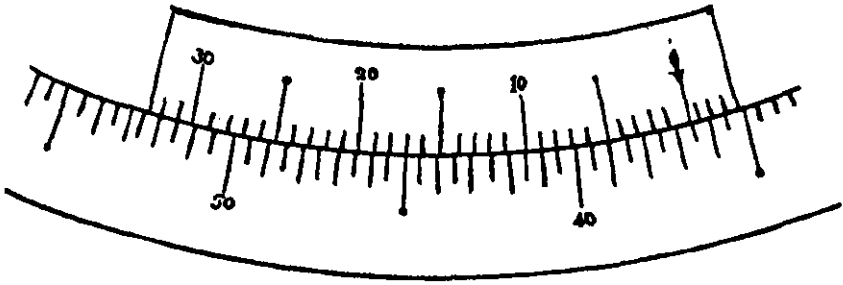


FIG. 82

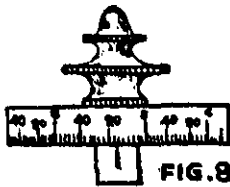


FIG. 83

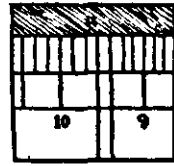


FIG. 84

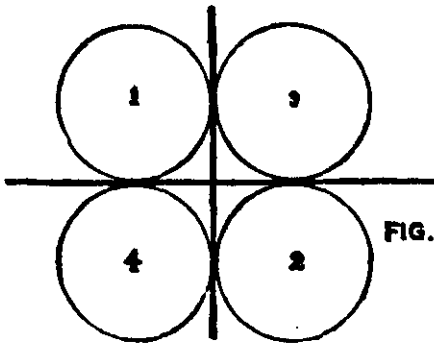


FIG. 85

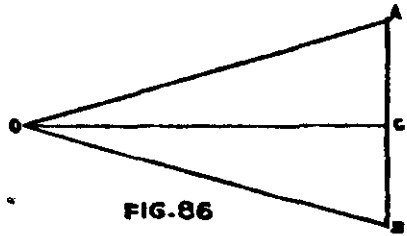
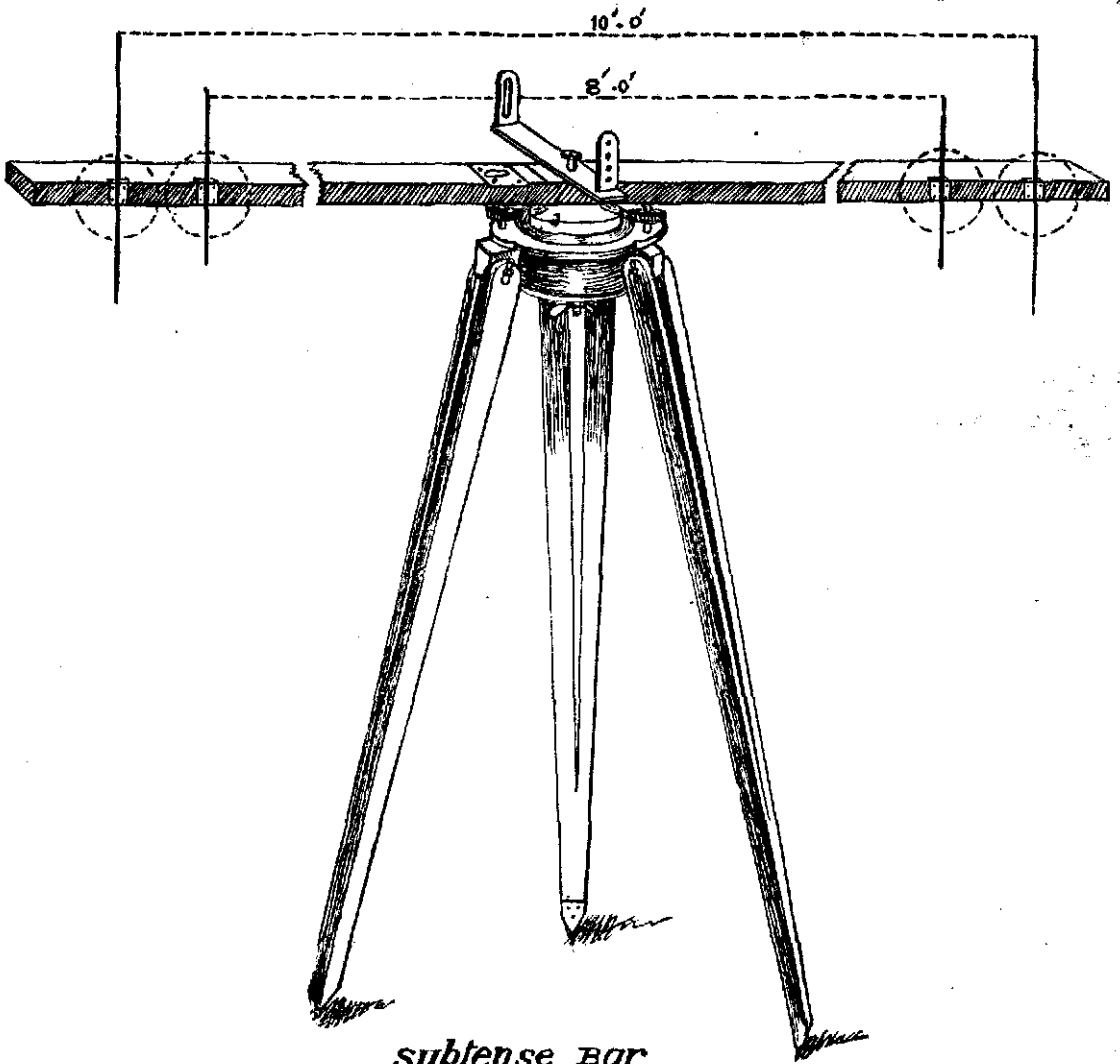


FIG. 86



*subtense Bar*  
FIG. 87

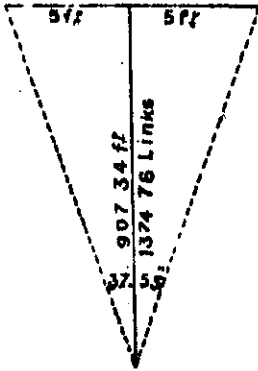


FIG. 88

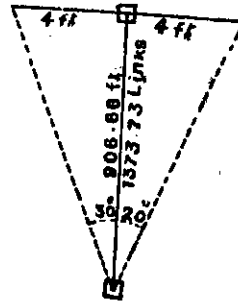


FIG. 89

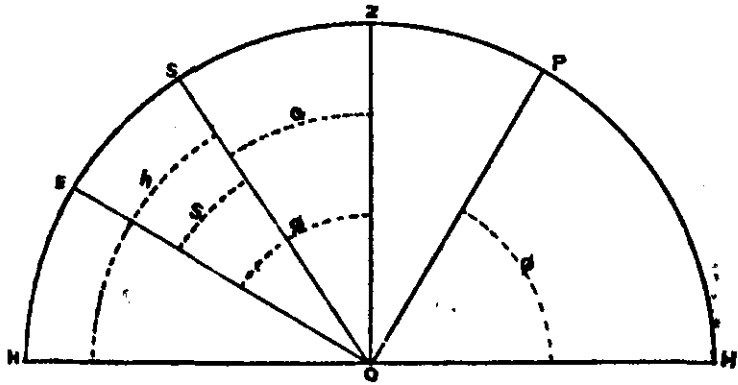
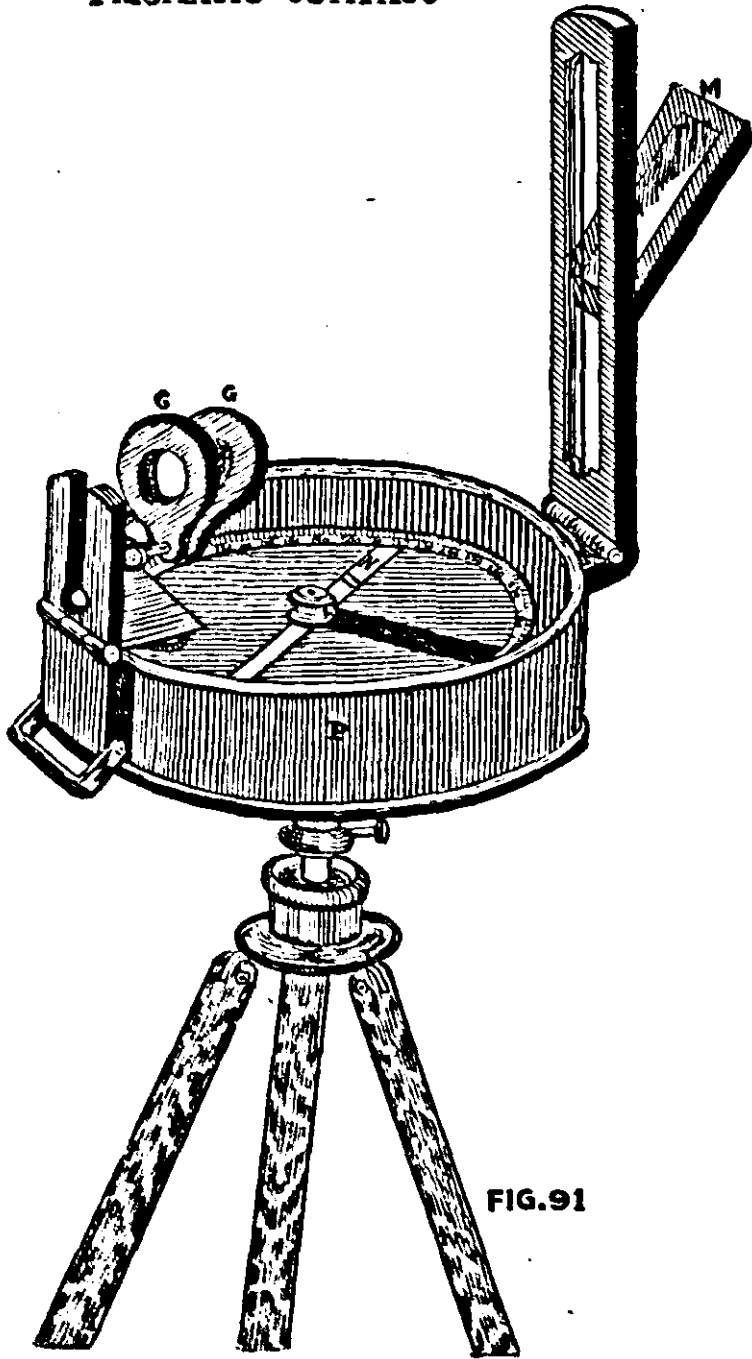


FIG. 90

**PRISMATIC COMPASS**



**FIG. 91**



PLANE TABLE

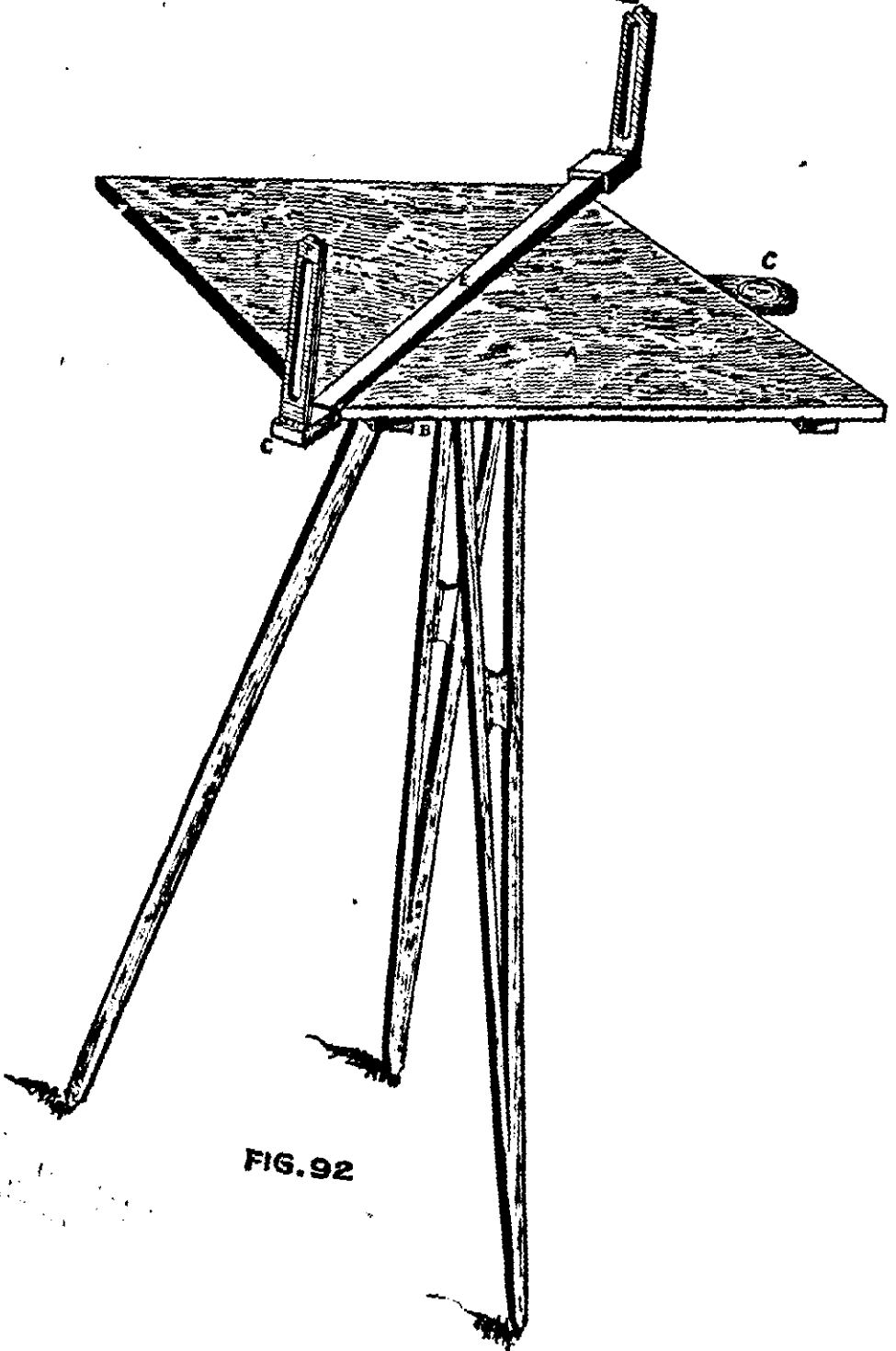


FIG. 92

**SIMPLE SCALE**



**FIG. 93**

### DIAGONAL SCALE



FIG. 94

### VERNIER SCALES

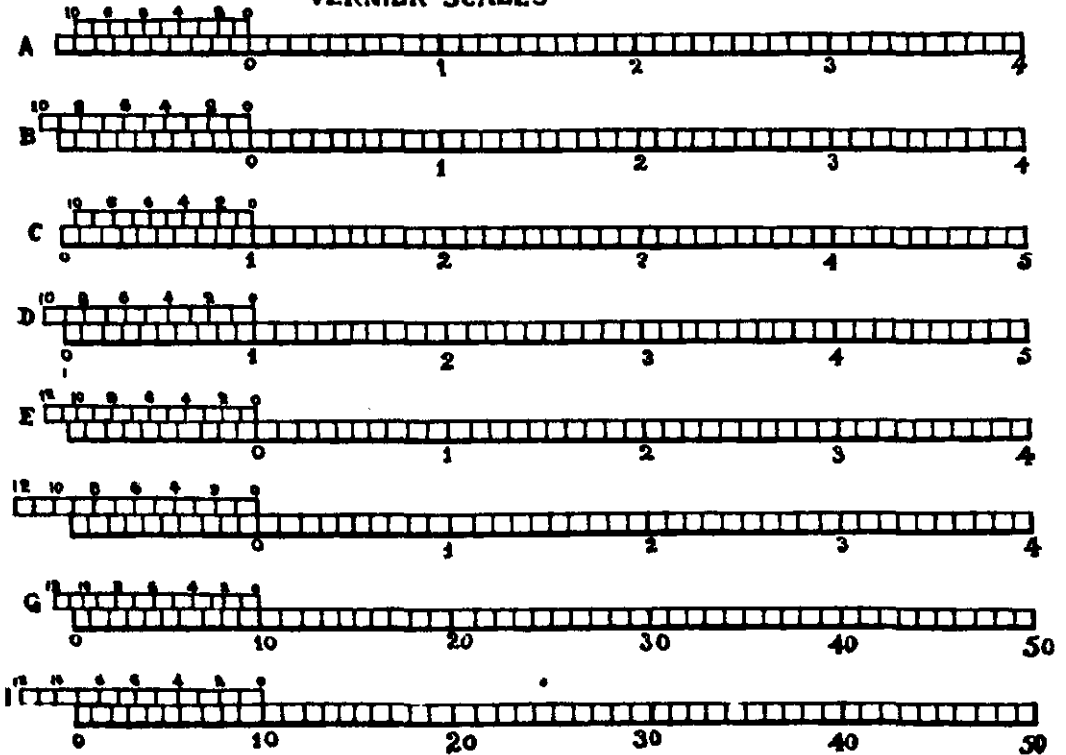


FIG. 95

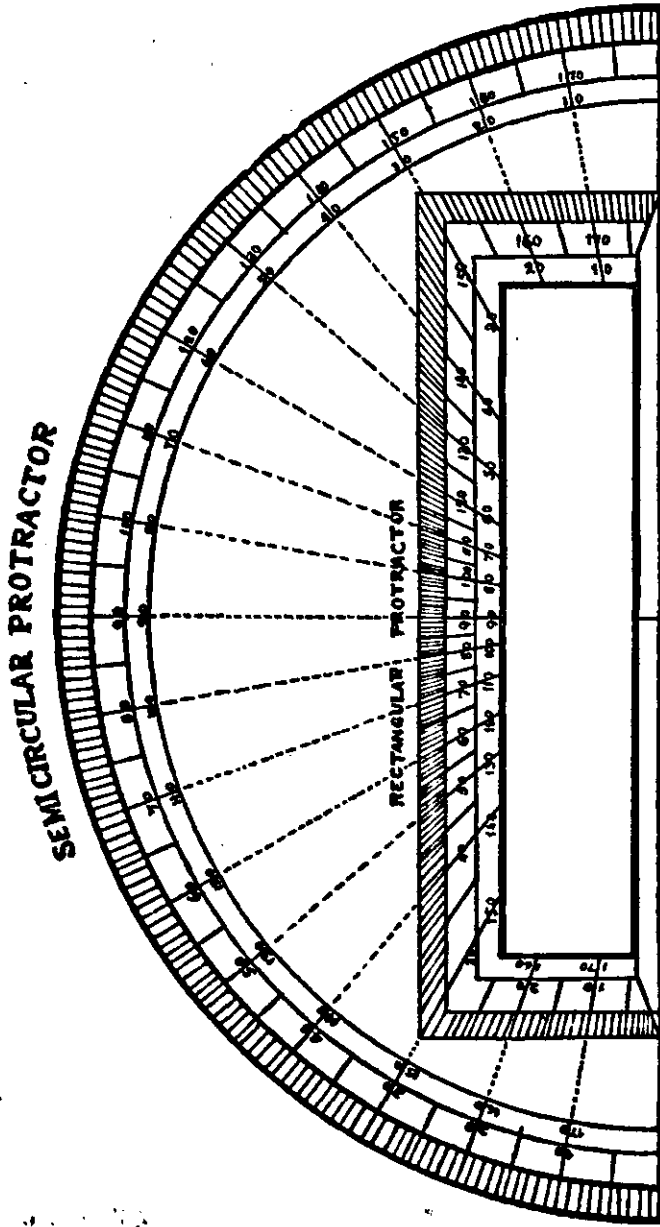
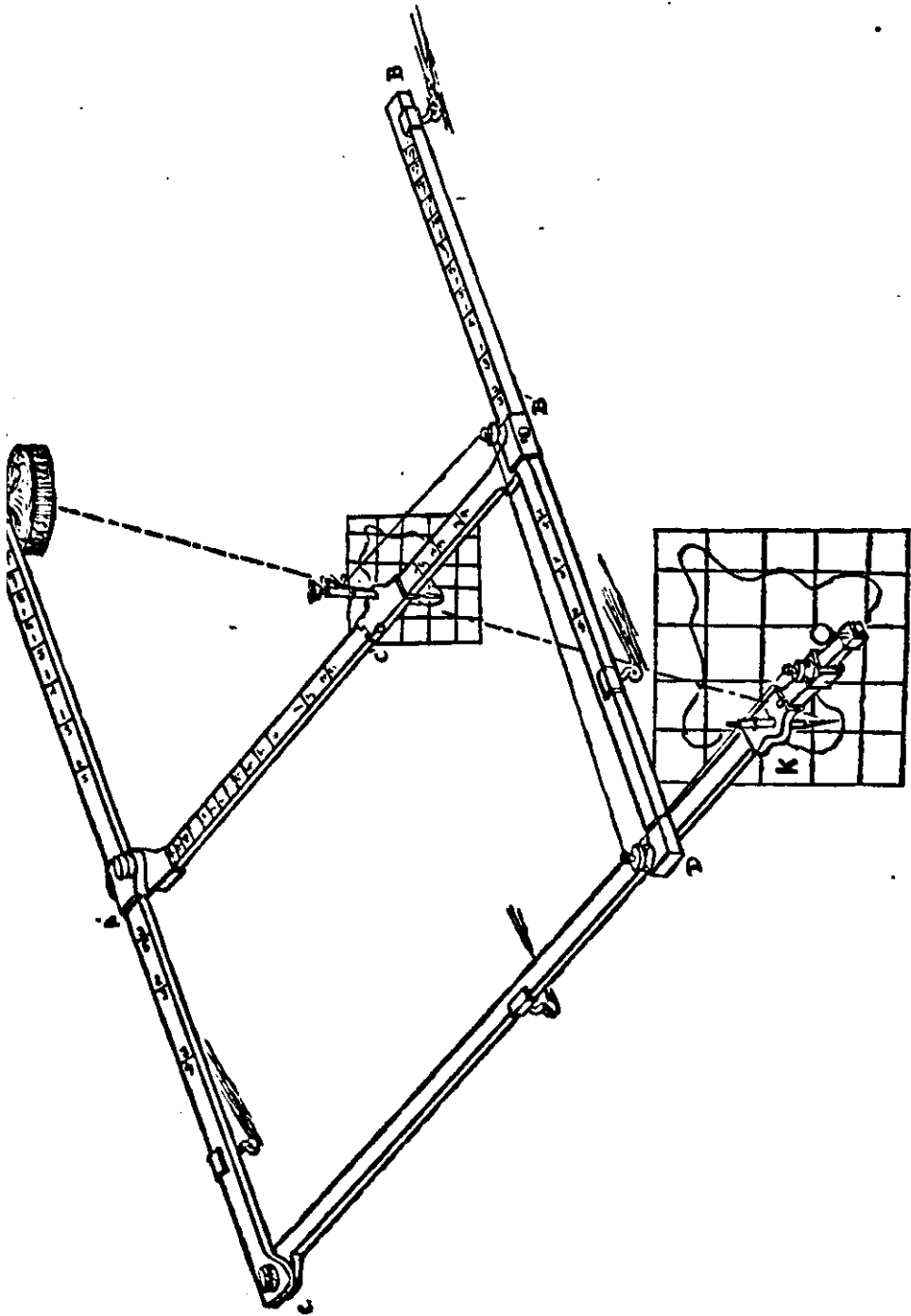


FIG. 98



**FRENCH PANTAGRAPH**  
**FIG. 99**

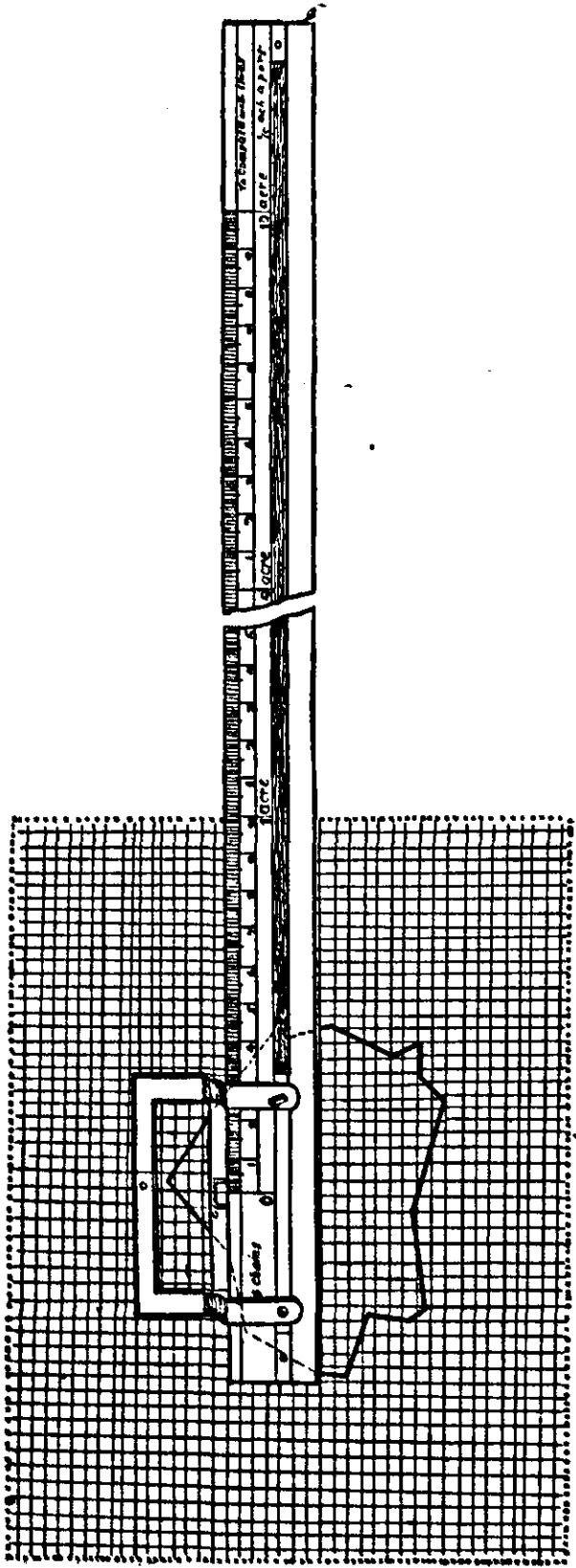


FIG.100

COMPUTING SCALE

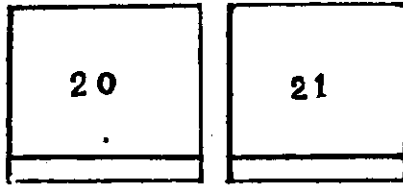


FIG. 101A

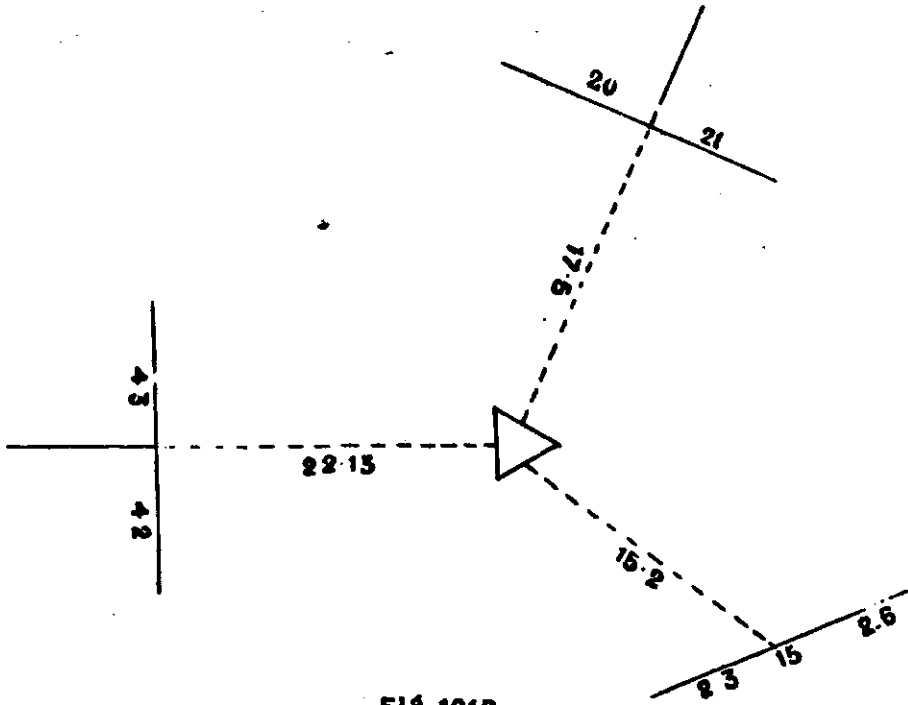


FIG. 101B

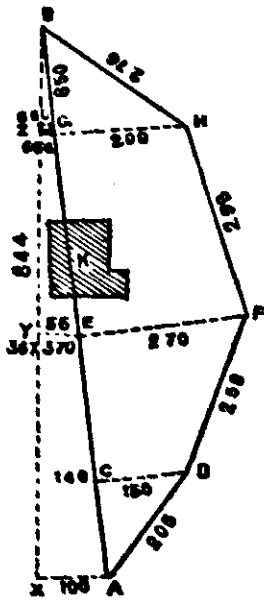


FIG. 102

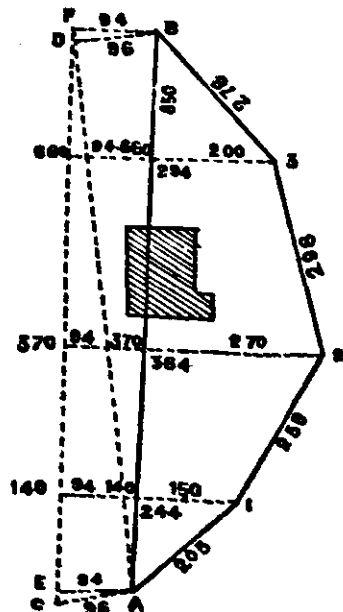


FIG. 103

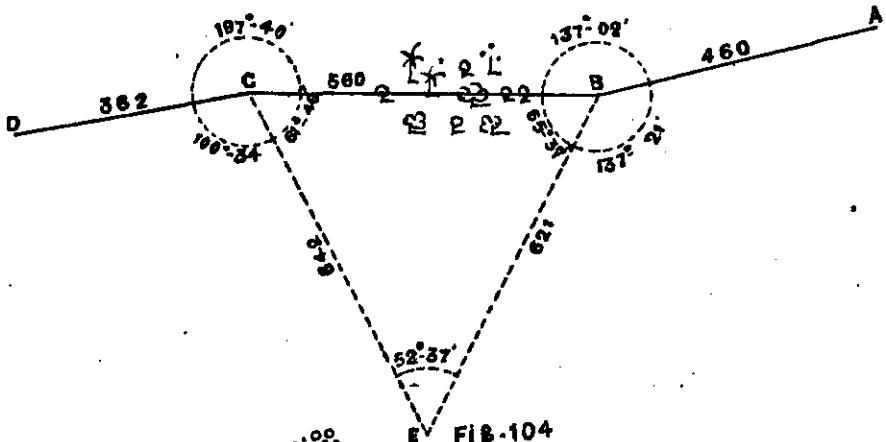


FIG. 104

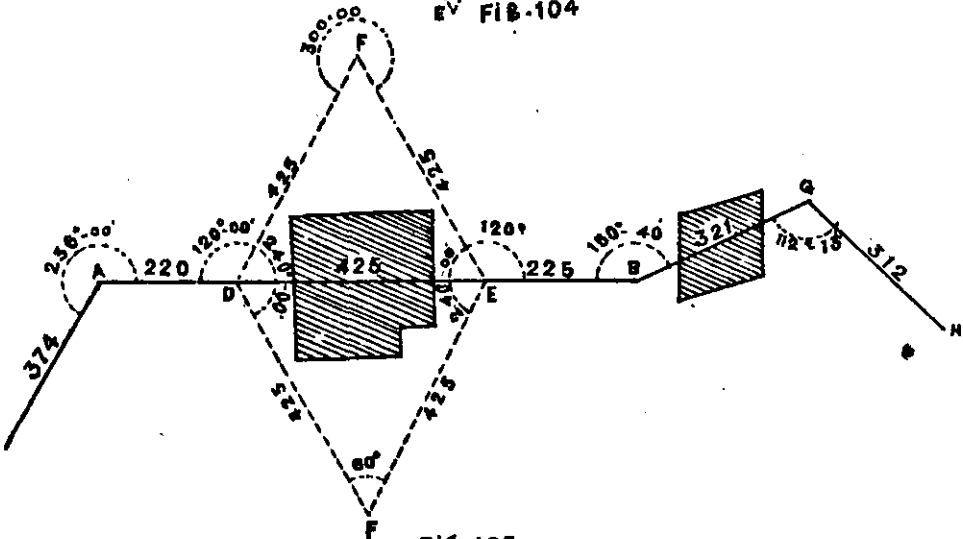


FIG. 105

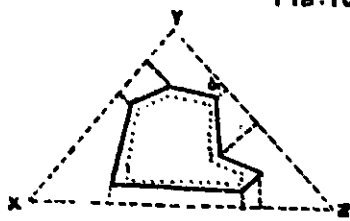


FIG. 106

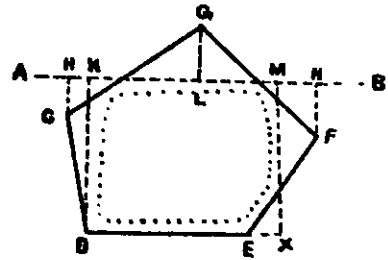


FIG. 107

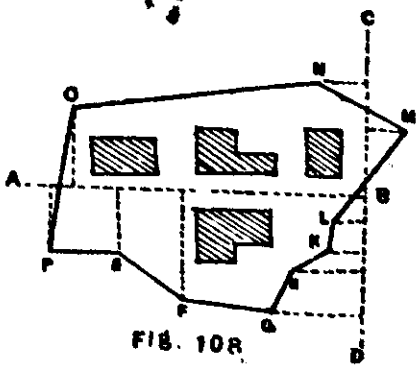


FIG. 108

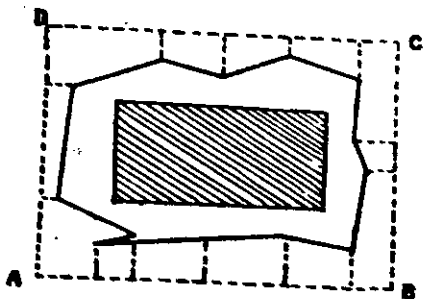


FIG. 109



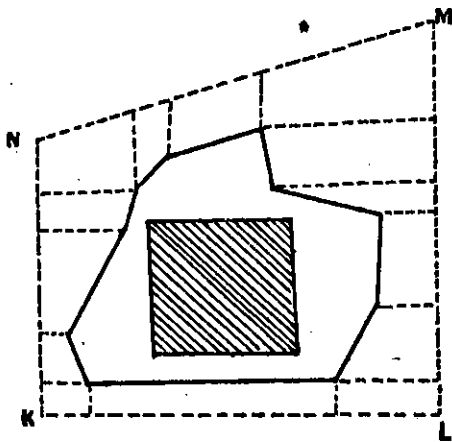


FIG. 110

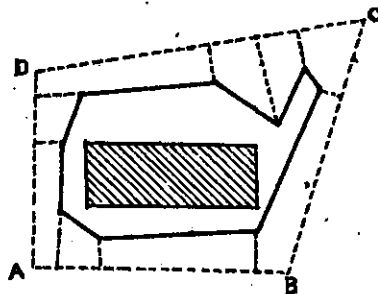


FIG. 111

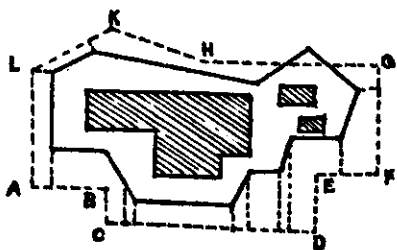


FIG. 112

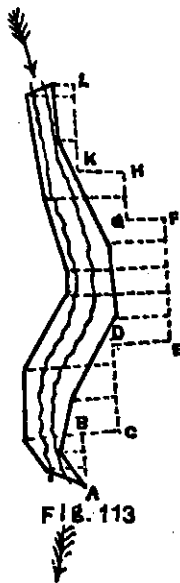


FIG. 113

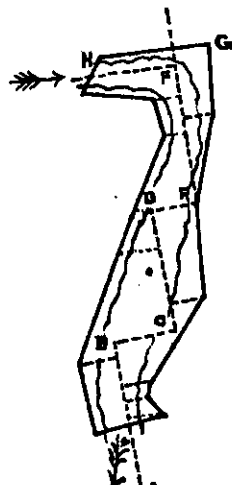
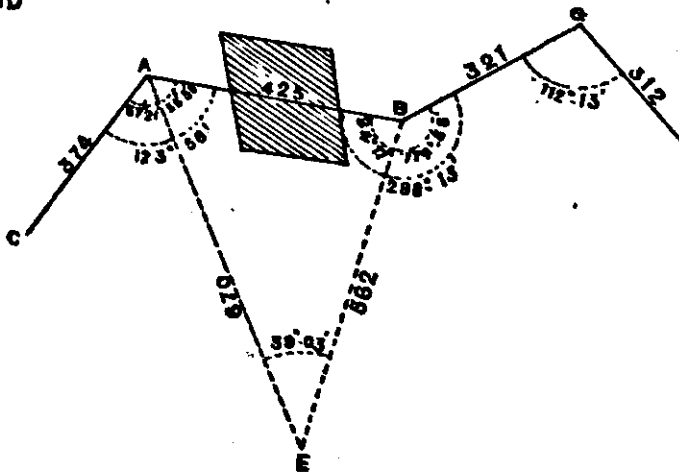
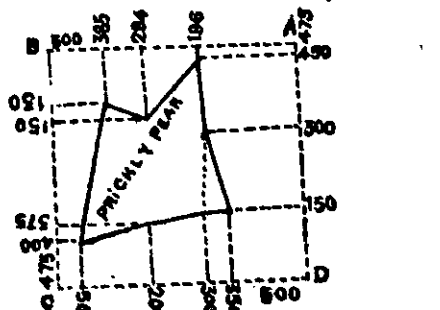


FIG. 114





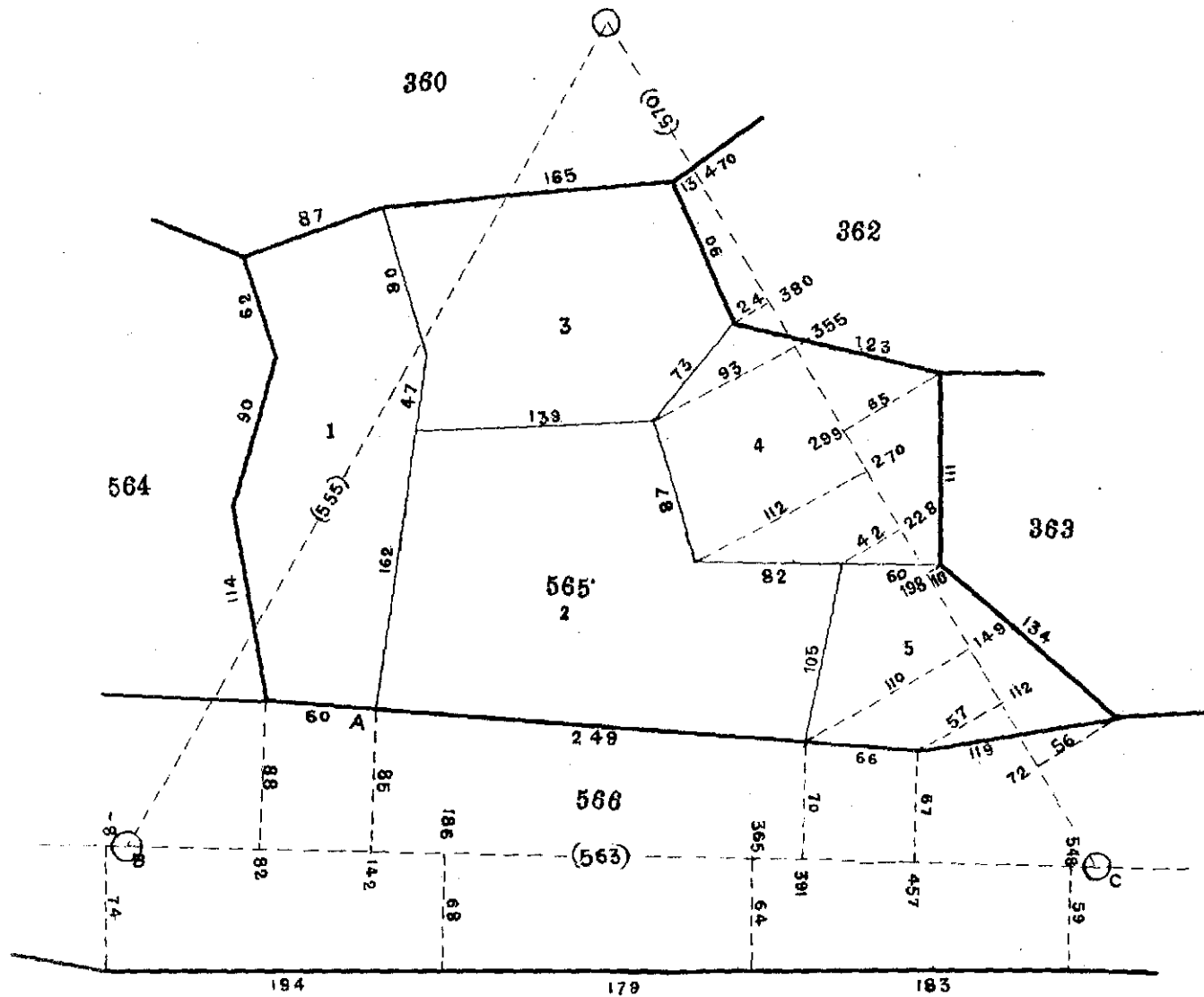


FIG. 119

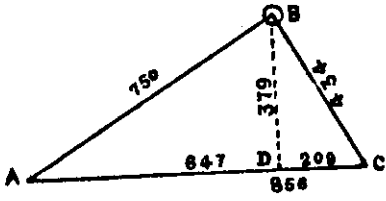


FIG. 120

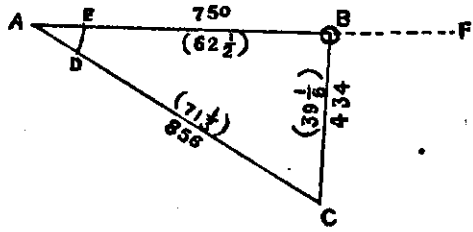


FIG. 121

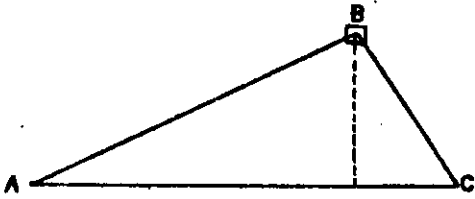


FIG. 122

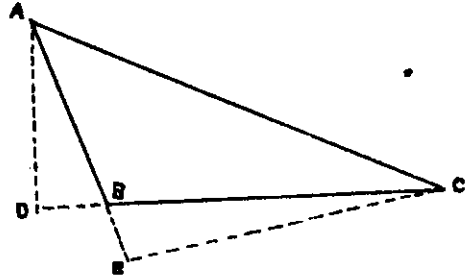


FIG. 123

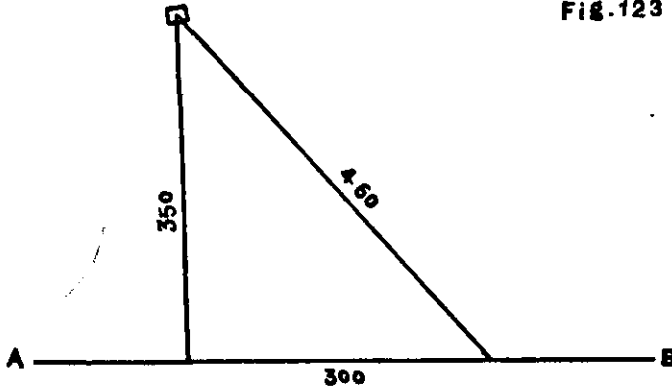


FIG. 124

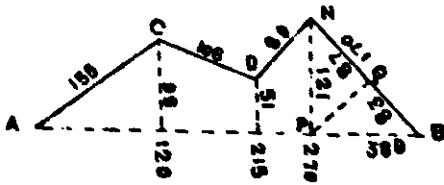


FIG. 125

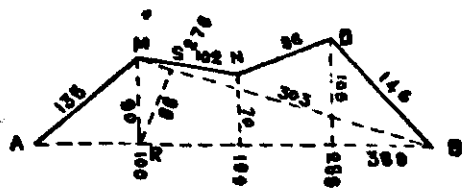


FIG. 126



## TOPOGRAPHICAL DETAILS.



Tiled Buildings.



Thatched Buildings.



Pagoda.



Mosque.



Church.



Fort.



Lamp Post.



Light House.



British Residency.



Important Palaces.



Zilla Court.



Munsiff's Court.



Taluk Cutcherry.



Magistrate's Court.



Proverthy Cutcherry.



Hospital.




Travellers' Bungalow.




Landing Place.


 Conservancy Office.

 Abkari Office.

 Post Office.

 Telegraph Office.

 Choultry.

 Chatram.

 Watching Station.

 Anchal Office.

 Anchal Box.

 Registrar's Office.

 Sanchayam Office.





**Chowkey.**



**Police Station.**



**College.**



**High School.**



**School.**



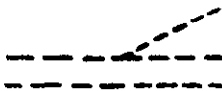
**Salt Bankshall.**



**Tobacco Bankshall.**



**Metalled Road and Mile Stone.**



**Gravelled Road and Foot Path.**



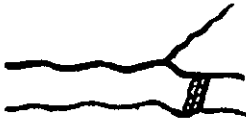
**Railway.**



**Monorail Truck Road.**



Telegraph line.



River, Stream Anicut.



Canal and Aqueduct.



Culvert and Bridge.



Ferry.



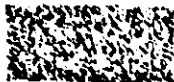
Sea Customs Office.



Tank, Sluice and Calingula.



Hills.



Sand.



Village Boundary Station.



**Khandom Station.**



**Minor Circuit Station,**



**G. T. S.**



**M. T. S. (Travancore Survey).**



**Square Well.**



**Salt Pan,**



**Round Well.**



**Burial Ground.**



**Swamp.**



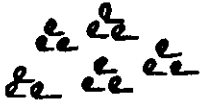
**Cocoanut Trees.**



**Arecanut Trees.**



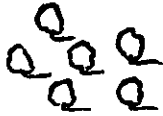
Palmyra Trees.



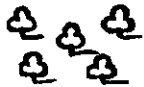
Scrub and Jungle.



Forest.



Mango Trees.



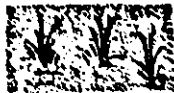
Tamarind Trees.



Date Palm Trees.



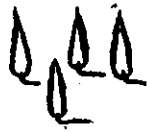
Bamboos.



Lemon Grass and Vayambu.



Hemp Cultivation.



Casuarina Cultivation.



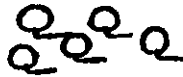
Gravelia Cultivation.



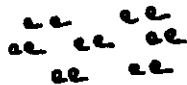
Blue Gum Do.



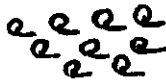
Red Gum Do.



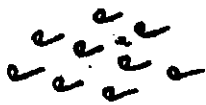
Rubber Cultivation.



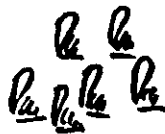
Cinchona Cultivation.



Coffee Cultivation.



Tea Cultivation.



Reeds.

## APPENDICES.

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- (1) Travancore Survey and Boundaries Regulation X of 1094.
  - (2) Rules under Survey and Boundaries Regulation X of 1094.
  - (3) Demarcation Rules issued in 1058 M. E., for the conduct of the Survey of the State.
  - (4) Resurvey Rules for Nedumangad Taluk, dated 9th March 1911.
  - (5) Puduval Survey Rules, dated 19th January 1921.
  - (6) Land Records Maintenance Rules dated 27th January 1922.
  - (7) Land Records Maintenance Rules dated 31st December 1926.
  - (8) Standing Orders regarding Land Records Maintenance.
  - (9) Circulars etc., for the guidance of the Revenue and Land Records Maintenance Staff.
-

## APPENDICES.

### No. 1—Regulation X of 1094.

A REGULATION TO CONSOLIDATE AND AMEND THE LAW RELATING TO SURVEY OF LANDS AND SETTLEMENT OF BOUNDARY DISPUTES, PASSED BY HIS HIGHNESS THE MAHA RAJA OF TRAVANCORE ON THE 24TH MAY 1919, CORRESPONDING TO THE 10TH EDAVAM 1094, UNDER SECTION 13 OF REGULATION V OF 1073.

Preamble Whereas it is expedient to consolidate and amend the law relating to survey of lands and settlement of boundary disputes ; It is hereby enacted as follows :—

#### CHAPTER I.

##### PRELIMINARY.

1. (1) This Regulation may be called “The Travancore Survey and Boundaries Regulation of 1094”.
- Title
- Local extent. (2) It extends to the whole of Travancore.
- Repeal. 2. Regulation III of 1058, as amended by Regulation II of 1060, is hereby repealed.
- Interpretation Clause. 3. In this Regulation unless there is something repugnant in the subject or context,—
- (i) “Edavaga” means a compact area recognised as such in the Government accounts, the whole or any portion of which area is exempt from payment of revenue to Government ;
- “Edavaga.”
- (ii) “Government land” means any land not forming an Edavaga or any portion thereof ;
- “Proprietor.” (iii) “proprietor” means a sole owner or the eldest or the principal of several joint owners of an Edavaga ;
- (iv) “registered holder” means and includes any person in whose name Government land is for the time being registered :
- “Registered holder.”

Provided that, when any person other than the registered holder is in lawful management of Government land otherwise than as agent or servant of the registered holder or as mortgagee or lessee, such person shall be deemed to be the registered holder in respect of such Government land ;

Where a Government land is registered in the names of two or more persons jointly, the registered holder shall, for the purposes of this Regulation, be the person who is recognised by the other joint holders as the manager of the land or who, in case of dispute, is recognised by the Division Peishkar as senior joint holder ;

" Survey." (v) " survey " includes resurvey and demarcation ;

(vi) " survey-mark " means any mark or thing heretofore or hereafter made, erected or placed for the purpose of indicating survey points or lines above, on or below,

" Survey-mark." the surface of any land by or by order of any person duly authorised under any enactment for the time being in force to make a survey of such land or to settle the boundaries thereof.

4. (1) Our Government may appoint any person either by name or by virtue of his office to be a Survey officer under this Regulation, and may dismiss, suspend or remove any person so appointed.

Government to appoint and remove Survey officers.

(2) Subject to the control of Our Government and of any superior officer or authority appointed in this behalf, every person so appointed shall exercise and perform the powers and duties of a Survey officer within such limits as Our Government may direct.

Government to prescribe local limits of Survey officers.

## CHAPTER II.

### THE SURVEY OF GOVERNMENT LANDS.

5. Our Government may by Notification, direct the survey of any Government land.

Government may direct survey of Government lands.

6. (1) When the survey of any Government land has been directed under Section 5, the Survey officer shall publish a Notification inviting every person claiming to be interested in such land as registered holder or otherwise, to attend either in person or by agent at a specified

Notification to be published by Survey officer.



place and time, and from time to time thereafter when called upon for the purpose of pointing out boundaries and supplying information in connection therewith.

(2) A Notification published under sub-section (1) shall be held to be valid notice to every person having any interest in the land about to be surveyed.

*Such Notification to be valid notice to persons interested.*

(3) Such Notification shall further require all registered holders of the land about to be surveyed—

*Terms of such Notification.*

(a) to clear, within a specified period, by cutting down or removing any trees, jungle, fences, standing crops or other material obstructions, the boundaries or other lines the clearance of which may be necessary for the purposes of the survey ;

(b) to provide labour at such times and for such periods as may from time to time be required by furnishing flag-holders and chain-men ; and

(c) to provide suitable survey-marks and otherwise to give such assistance in the survey as may be demanded under this Regulation or the rules made thereunder.

7. (1) If any person fails to comply with any requisition of a survey officer made under Clauses (a), (b) or (c) of sub-section (3) of Section 6, the Survey officer may employ hired labour for the purposes of the survey.

*Employment of hired labour on failure of registered holders to assist in the survey.*

(2) The Survey officer shall, in accordance with such rules as Our Government may prescribe, apportion the cost of such hired labour on the lands which have been surveyed, and charge the same to the registered holders thereof.

*Costs to be charged to registered holders of land surveyed.*

8. If the registered holder of any land, which has been or is about to be surveyed, fails to provide suitable survey-marks to the satisfaction of the Survey officer, such officer may himself provide or make such marks, and the cost of providing or making them shall be apportioned and charged as provided in sub-section (2) of Section 7.

*Provision of survey-marks.*

9. Notwithstanding anything contained in sub-section (3) of Section 6 and in sub-section (1) of Section 7, whenever it may appear to the Superintendent, Revenue Survey, to be desirable that the cost of all or any of the operations prescribed in Clauses (a), (b) and (c) of sub-section (3) of Section 6 should be defrayed in the first instance by Our Government, he may, with the previous sanction of Our Government, in lieu of the Notification prescribed in sub-section (3) of Section 6, issue a Notification that such cost will be defrayed in the first instance by Our Government and may thereupon proceed with the survey of the land and apportion and charge such cost in the manner prescribed by sub-section (2) of Section 7.

Cost of survey operations may be defrayed in the first instance by Government in certain cases

10. The cost of hired labour under sub-section (1) of Section 7 and of providing survey-marks under Section 8 shall be defrayed in the first instance by Our Government, but any sum charged under Section 7, 8 or 9 to the registered holder shall be recoverable from the land in the same manner as an arrear of land revenue.

Recovery of charges incurred by Survey officer.

11. (1) If, at the time of survey, a boundary is undisputed, the Survey officer may order that it shall be laid down as pointed out by the registered holder or his agent.

Procedure where boundary is undisputed.

(2) If the registered holder is not present, or if the boundary is disputed, the Survey officer shall order it to be laid down, as nearly as may be, in accordance with the Revenue records, or as ascertained from the Proverthicar and from such other evidence as the Survey officer may be able to procure.

Procedure where boundary is disputed.

(3) The order passed by the Survey officer in the case of any dispute under sub-section (2) shall be recorded in writing, and the purport thereof communicated forthwith to the parties to the dispute, a copy of the order being furnished to them on their application and at their cost.

Order in disputed cases to be in writing.

(4) When the survey of any village or other defined local area forming part of the land under survey has been completed in accordance with the orders passed under sub-sections (1), (2) and (3), the Survey officer shall notify the fact as soon as practicable thereafter.

Completion of demarcation to be notified.

12. (1) Notice of every order passed by the Survey officer under Section 11 shall be given to all registered holders the boundaries of whose holdings may be affected by the order, and an appeal from such order shall lie to the authority to whom the Survey officer is immediately subordinate : Provided that it be filed,—

(a) in the case of an order communicated under sub-section (3) of Section 11, within three months of the date of service of the order ;

(b) in the case of any other order, within three months of the date on which the Notification prescribed under sub-section (4), of Section 11 was published ; and

(c) where an appeal is filed, notice shall be given by the appellate authority, in the case of an appeal preferred under Clause (a) to the other parties to the dispute, and, in the case of an appeal preferred under Clause (b), to all registered holders, the boundaries of whose holdings may be affected by the proceedings in appeal.

(2) The decision of the appellate authority shall be recorded in writing, and, the purport thereof communicated forthwith to the parties concerned, a copy of the order being furnished to them on their application and at their cost.

Appellate decision to be in writing.

Such order or appellate decision final in certain cases

(3) The order of the Survey officer, or, in the event of an appeal being filed, the decision of the appellate authority shall be final, and there shall be no further appeal from such decision.

13. Any party to a boundary dispute before the Survey officer, and any party to an appeal preferred under Section 12 or to whom notice of such appeal is given, and any person claiming under any such party, deeming himself aggrieved by the order of the Survey officer or by the decision of the appellate authority, as the case may be, subject to the provisions of Parts II and III of the Limitation Regulation of 1062, institute, within the period of one year from the date of service of such order or decision or from the date on which the Notification prescribed under sub-section (4) of Section II was published, a suit to establish the right

Institution of a suit in Civil Court within one year to establish rights claimed in respect of the boundary of property surveyed.

which he claims in respect of the boundary of the property surveyed: Provided that, subject to the result of such suit, if any, such order or decision shall be conclusive as between the parties to the dispute or to the appeal, including those to whom notice of such appeal has been given; and those claiming under such parties or any of them.

*Explanation.*—Where parties litigate *bona fide* in respect of boundaries of property claimed in common for themselves and others, all persons interested in such boundary dispute shall, for the purpose of this Section, be deemed to claim under parties so litigating.

14. Subject to such rules as Our Government may prescribe in this behalf, every registered holder of Government land shall be bound to maintain, renew and repair the survey marks on or within the boundaries of his holding, and in default of his doing so within a prescribed period, the Survey officer or Peishkar may, at the cost of Our Government, maintain, renew and repair such survey marks and apportion the cost thereof; such cost may be recovered from the land as an arrear of land revenue: Provided that Our Government may from time to time exempt, by a Notification any local area from the operation of the former part of this Section and cancel such Notification.

Ryots responsible for the maintenance of survey-marks.

15. It shall be the duty of every Proverthicar and Pakuthi Accountant

Duties of Proverthicar and Pakuthi Accountant.

(a) to prevent the destruction, injury or alteration of any survey-mark on or within the limits of his jurisdiction; and

(b) when he becomes aware that any such mark has been destroyed, injured or altered, to report the fact to his immediate official superior or the nearest Survey officer having jurisdiction.

16. (1) Every order of a Survey officer or of a Division Peishkar imposing charges under Sections 7, 8, 9, and 14 shall be recorded in writing, and an account prepared in accordance therewith shall be communicated forthwith to the persons affected, a copy of the order being supplied to them on their application and at their cost.

Order imposing charges to be communicated to persons affected.

(2) An appeal against every such order shall lie to the authority to whom the officer passing it is immediately subordinate: Provided that it be filed within one month of the date of service of such order.

(3) The order of the Survey officer or of the Division Peishkar if an appeal is not preferred, or in the event of an appeal being filed, the decision of the appellate authority, shall be final.

Order of appellate decision final.

### CHAPTER III.

#### THE SURVEY OF EDAVAGAS.

17. Our Government may, by Notification direct the survey of any Edavaga or portion of an Edavaga—

Government may direct survey of an Edavaga in certain cases.

(a) on the application in writing of the proprietor of such Edavaga, accompanied by a written statement of his consent to defray the whole cost of the survey, or

(b) without such application, for reasons to be recorded prior to the issue of such Notification:

Provided that a survey commenced under clause (a) shall be stopped on the withdrawal by the proprietor of his application, unless Our Government see reason to direct the continuance of the survey in virtue of the power conferred on them by

Proviso.

Clause (b).

18. . Except as hereinafter provided in Sections 19 and 20, the conduct of such survey and the proceedings of a survey officer shall, as far as may be, regulated by the procedure laid down in Chapter II with regard to the survey of Government lands; and the provisions contained in that Chapter in regard to appeals from the orders of a Survey officer, the granting of copies thereof and the effect of such orders and of the decisions passed in appeal there from shall, as far as may be, apply to all orders passed by a Survey officer under this Chapter and to the decisions passed in appeal against such orders.

Procedure to be observed during survey.

19. All costs incurred by Our Government on account of a survey conducted under this Chapter shall be recoverable from the Edavaga, the whole or a part of which has been surveyed in the same manner as an arrear of land revenue:

Costs of survey recoverable from proprietor.

Provided that the cost of a survey directed under Clause (b) of Section 17 shall be borne by Our Government unless otherwise prescribed by any law for the time being in force.

20. (1) On the application of the proprietor of an Edavaga under survey, Our Government may direct the Survey officer to apportion among the lands which have been surveyed the whole or a specified portion of the cost of such survey: Provided that the cost so apportioned shall not exceed the amount which would be chargeable to such lands under Sections 7, 8 and 9 if they were Government lands.

Government may direct apportionment of costs among lands surveyed.

(2) Such apportionment among the lands shall be made in accordance with such rules as Our Government may prescribe, and shall be subject to appeal in the manner prescribed in Section 16.

Apportionment how made.

(3) The amount so apportioned shall be recoverable by the proprietor from the tenants concerned in the same manner as if it were an arrear of rent due by a tenant to his landlord

Cost so apportioned recoverable by proprietor from tenants.

21. (i) When an Edavaga or a portion of an Edavaga has been surveyed in pursuance of a Notification issued under Section 17, the Survey officer shall report the completion of the survey to the Division Peishkar and to the proprietor, and the following consequences shall thereupon ensue:—

Consequences ensuing on completion of survey of an Edavaga.

(ii) Subject to such rules as Our Government may prescribe in this behalf every tenant of the land surveyed shall be bound to maintain, renew and repair the survey-marks on or within the boundaries of his holding, and, in default of his doing so within a prescribed period, the Division Peishkar may, at the cost of Our Government, maintain, renew and repair such survey marks, and such cost shall be recoverable

Duty of tenants.

from the tenant in the same manner as an arrear of land revenue.

Duty of Proverthi-  
car and Pakuthi Ac-  
countant

(iii) It shall be the duty of the Proverthi-car and the Pakuthi Accountant of every Pakuthi, the whole or a part of which has been surveyed—

(a) to prevent the destruction, injury or alteration of any survey-mark on or within the limits of his Pakuthi; and

(b) when he becomes aware that any such mark has been destroyed, injured or altered, to report the fact to the proprietor of the Édavaga and to the Division Peishkar or to such officer subordinate to the Division Peishkar as the Division Peishkar may from time to time direct.

## CHAPTER IV. •

### THE SETTLEMENT OF BOUNDARY DISPUTES

ARISING OTHERWISE THAN IN THE COURSE OF A SURVEY.

22. The Division Peishkar may—

Division Peishkar  
may direct settlement  
of boundary dispute.

(a) of his own motion, or

(b) on the application of any of the disputants,  
direct that any dispute, arising otherwise than in the course of a survey, as to the boundaries of any land, shall be decided under the provisions of this Regulation.

23. (1) Unless Our Government appoint a Survey officer under Section 4 for the purpose of settling such dispute, the Division Peishkar shall thereupon.—

Officer by whom dis-  
pute may be settled.

(a) proceed to deal therewith himself, or

(b) refer it for disposal to any officer not below the rank of Deputy Tahsildar.

(2) Every officer to whom a dispute is referred for disposal as aforesaid shall be a Survey officer for the purpose of this Regulation.

24. (1) The Division Peishkar or Survey officer, as the case may be, shall, after giving due notice of the time and place at which his inquiry will be held, proceed to investigate the

Inquiry regarding  
dispute.

claims of the various parties and record the evidence of all persons examined by him.

(2) At the close of the investigation, he shall record in writing his decision and the reasons upon which it is based, and, after duly informing the parties of the same and intimating to them the date on which he intends to demarcate according to his decision, shall proceed to mark out the requisite boundaries conformably therewith.

Decision and demarcation in accordance therewith.

(3) The date on which the demarcation is completed shall be entered on the record of the case and forth with communicated to the parties.

Completion of demarcation to be intimated to parties.

(4) The decision so arrived at shall be final unless reversed or modified by the decree of a civil court. Provided that, in the case of an order passed by an officer to whom the dispute was referred by the Division Peishkar under Clause (b) of sub-section (1) of Section 23, such decision shall be submitted to the Division Peishkar who after giving notice to the parties concerned and hearing them if they appear, shall either confirm it or pass such other orders as he may deem fit.

Decision when final.

25. The provisions of Section 13 shall apply *mutatis mutandis* in the case of any final decision passed under the preceding section.

Right of suit in regard to decisions under Section 24.

26. (1) In the case of any dispute settled under this chapter, the costs of survey shall in the first instance be defrayed by Our Government, and shall then be apportioned by the Division Peishkar or the Survey officer, in accordance with such rules as our Government may prescribe, among the parties to the dispute; and the amount so apportioned to each party shall be recoverable from his as an arrear of land revenue.

Recovery of cost of survey in case of dispute settled under this Chapter.

(2) Appeals against orders passed under sub-section (1) shall be governed by the provisions of Section 16.

27. The provisions of Chapters II or III, as the case may be, shall so far, as they relate to the maintenance, renewal and construction of survey-marks, apply to marks erected under this Chapter.

Applicability of Chapters II and III to survey-marks erected under Chapter.



CHAPTER V.

MISCELLANEOUS.

28. For the purpose of any survey, inquiry, or other proceeding under this Regulation the Survey Officer or the Division Peishkar or any of the subordinates of such officers shall have power to enter upon, examine and measure any land under survey.

Power to enter upon and examine lands.

29. Any Survey officer generally or specially authorised in that behalf, or the Division Peishkar, or any officer to whom an appeal is preferred under any of the provisions of this Regulation, may, for the purposes of any survey, inquiry or other proceeding under this Regulation, summon and enforce the attendance of any person for giving evidence and for the production of documents or for the purpose of rendering assistance in the survey of any land in which such person has an interest; and the procedure prescribed in the Code of Civil Procedure for summoning and enforcing the attendance of witnesses and for the recording of evidence shall be followed as far as it can be made applicable.

Power to summon witnesses and require production of documents.

30. (1) The Division Peishkar or Survey officer may, with the consent of all the parties concerned, refer to arbitration any dispute as to a boundary.

Reference to arbitration.

(2) The procedure laid down in Chapter XXXVI of the Code of Civil Procedure, Regulation II of 1065, shall thereupon apply as far as may be.

Procedure in such cases.

(3) The decision of the Division Peishkar or the Survey officer passed in accordance with such award shall be conclusive between the parties to such arbitration and those claiming under them.

31. (1) A proprietor of registered holder of any Edavaga or Government land under survey who incurs expenses under this Regulation in respect of such survey or from whom the expenses of such survey are recovered under this Regulation, shall, if he be not the owner thereof, acquire a charge on such Edavaga or Government land to the extent of the expenses so incurred or recovered from him, with interest thereon at the rate of nine

Proprietor or registered holder may recover expenses paid by him from the owner of the Edavaga or Government land and may acquire a charge upon the land to that extent.

per cent. per annum : Provided that, if he be a co-owner of such Edavaga or Government land, such charge shall extend only to so much of the amount of such expenses as is payable in respect of the shares of the other co-owners in such Edavaga or Government land.

(2) It shall be lawful for any person who is a mortgagee, lessee or tenant, or who is the owner or co-owner or in good faith believes himself to be the owner or co-owner of an Edavaga or Government land under survey, to pay the charges payable under this Regulation in respect of the survey of such Edavaga or Government land, though he be not the proprietor or registered holder thereof.

Mortgagee, lessee, tenant or owner or co-owner may pay charges payable by proprietor or registered holder.

(3) A mortgagee making such payment shall be entitled to add the same to the principal money due under the mortgage at the rate of interest payable on the principal, and where no such rate is fixed, at the rate of nine per cent. per annum. And a lessee or tenant making such payment shall be entitled to deduct the same with interest at the rate of nine per cent. per annum from the rent then due, or thereafter becoming due, in respect of such Edavaga or Government land.

Claim of mortgagee, tenant or lessee in such case.

(4) A co-owner or a person who, in good faith, believes himself to be owner or co-owner, making such payment, shall acquire a charge on such Edavaga or Government land for the amount so paid by him with interest thereon at the rate of nine per cent. per annum ; Provided that in the case of a co-owner such charge shall extend only to so much of the amount paid as is due in respect of the share of the other co-owners in such Edavaga or Government land.

Co-owner similarly to acquire a charge upon the land.

32. Our Government may make rules consistent with this Regulation :—

(a) prescribing for different localities the unit of survey, the sub-divisions thereof and the description of the survey-marks ; and for the maintenance, renewal and repair of such marks ;

(b) for the collection and record of any information in respect of any land which has been or is about to be surveyed ;

Government may make rules under this Regulation.

(c) prescribing and limiting the powers and duties of officers conducting proceedings under this Regulation and for regulating their procedure ;

(d) for the publication of all Notifications issued under this Regulation, and for the issue under this Regulation, and for the issue and service of all orders, communications and notices to be issued, communicated, given or served under this Regulation ;

(e) for the apportionment of all charges directed to be apportioned by this Regulation ;

(f) prescribing the fees payable for processes issued and copies granted under this Regulation and

(g) generally for carrying out the purposes of this Regulation ;

and all such rules shall be published in Our Government Gazette and shall thereupon have the force of law.

Immunity for acts done in good faith or purporting to be so done.

3). No suit or other legal proceedings shall lie against any person for any thing in good faith done or purporting to be done under this Regulation.

SIGN MANUAL.

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## NOTIFICATION.

Dis. No, 257 of 1921/Land Revenue.

Under Section 32 clause (a) of the Travancore Survey and Boundaries Regulation X of 1094, the following Rules regarding the description of the Survey marks, and the maintenance, renewal and repair of such marks, are passed with the sanction of His Highness the Maha Raja, in supersession of the Rules dated the 24th December 1914.

1. Survey marks shall ordinarily be of the following description and shall be set up at the points indicated :—

<i>Description.</i>	<i>Position.</i>
<p>(a) <i>Theodolite stones.</i> Stones of durable quality, roughly squared, of dimensions measuring 3' x 9" x 9" for village boundaries and khandam lines, and 2' x 6" x 6" for sub-khandams and Minor Circuits, with a plummet hole <math>\frac{3}{4}</math>" deep cut on the top and a shank mark 1" deep cut on one of the sides.</p>	<p>At the places which are marked on the village map or other records prepared at the time of Survey as Stations at which the Theodolite has been set up.</p>
<p>(b) <i>Field stones.</i> Stones of durable quality, roughly squared, of dimensions measuring 2' x 6" x 6", with a shank mark cut <math>\frac{1}{2}</math>" deep on one of the sides.</p>	<p>At the bends and trijunctions on the boundaries of the Survey field and Sub-divisions (including Revenue fields).</p>

*Exceptions.*

(1) Survey marks which have been duly planted under proper authority before the issue of these Rules shall be deemed to be of the prescribed description.

(2) In Punjapadam lands and backwaters, theodolite stones and field stones shall be of dimensions 5' x 9" x 9" and 4' x 6" x 6" respectively wherever they could be conveniently planted instead of 3' x 9" x 9" and 2' x 6" x 6" ordinarily prescribed.

When the water is, however, too deep even for stones of the above-mentioned size being planted, hard and stout bamboo posts with the shank mark painted in tar near the top, shall be planted firmly so that a length of at least 4 feet may be buried under the ground and 2 feet may be visible at high tide.

2. The following symbols shall also be cut on the Theodolite stones to facilitate identification:—

(a) On a Theodolite stone at the village trijunction, a triangle ( $\frac{1}{4}$  inch deep) enclosing the plummet hole.

(b) On a Theodolite stone at any other point on the village boundary, two lines ( $\frac{1}{4}$  inch deep) one on either side of the plummet hole, in the direction of the boundary line.

(c) On a Theodolite stone on the khandam line, a circle ( $\frac{1}{4}$  inch deep) enclosing the plummet hole.

3. Every owner or occupant of land which has been surveyed and is not at the disposal of Government shall be bound to maintain in good repair, and renew, if missing, all survey marks situated on or within the boundaries of his holding as indicated below:—

*Position of survey mark.*

*Party responsible.*

(a) When the stone is situated within the boundaries of an occupied registered field or sub-division.

The owner or occupant of that field or sub-division.

(b) When the stone is situated on the boundary between a paramboke field or sub-division and a registered field or sub-division.

The owner or occupant of the registered field or sub-division.

(c) When the stone is situated on the boundary between two or more registered survey fields or sub-divisions

The owner or occupant of the field or sub-division on whose northern or eastern boundary the stone is situated

4. A stone shall be deemed to require repair, when (a) it is out of the ground, or buried less than  $\frac{2}{3}$  of its length, or entirely covered by earth or overgrown by vegetation, or (b) it is out of its correct position.

5. Every owner or occupant shall be bound to renew or repair the stones referred in Rules 3 and 4 within 15 days of such stones being notified by the Pakuthy Accountant or other Officer appointed for the purpose to be in need of renewal or repair.

6. In the event of default on the part of the owner or occupant, the Pakuthy Accountant or other Officer appointed for the purpose shall execute the necessary repairs and renewals, and may clear, by cutting down or removing any trees,

jungle, fences or standing crops or other material obstruction the boundaries or other lines the clearance or which may be necessary for the purpose.

7. The cost of renewing a missing stone under Rule 6, shall comprise the following items:—

(1) The actual cost at the village depot, of a stone of the required size and description, which cost shall be fixed at a uniform rate for each Taluk according the terms of the agreement with the contractor,

(2) The actual cost of hired labour employed for conveying the stone from the village depot to the land and planting it, and

(3) A fixed charge for the time and labour of the Government maintenance staff, which charge shall be calculated at 14 chs. for each stone.

8. The cost of repairing a stone under Rule 6 shall comprise the following items:—

(1) The actual cost of hired labour, if any, employed for clearing jungle and planting the stone correctly, and

(2) a fixed charge of 14 chuckrams for the time and labour of the Government staff.

9. When action is taken under Rule 6, the cost of renewals and repairs calculated according to Rules 7 and 8 shall be recovered as an arrear of Land Revenue from the owners or occupants responsible for the maintenance of Survey marks as per para 3 above.

(By order)  
Huzur Cutcherry, } N. RAJARAM RAO,  
Trivandrum, 19th February 1921. } *Chief Secretary to Govt.*

## NOTIFICATION.

Dis. No. 257 of 1921/L. R.

With the sanction of His Highness the Maha Raja, the following Rules regarding the collection and record of information in respect of his lands surveyed or to be surveyed, are passed under section 32, clause (b) of the Travancore Survey and Boundaries Regulation X of 1094.

1. When the Survey Officer has published a notification under Section 6 (1) or Section 18 of the Regulation in respect of any land about to be surveyed, such Officer or any subordinate of such Officer, not below the grade of Field Surveyor, may, by written notice, call upon any person claiming to be interested in such land :—

(a) to attend either in person or by agent at a specified place and from time to time thereafter, in order to point out boundaries and supply information in connection therewith ;

(b) to produce before such Officer or subordinate for inspection and registry all grants, title deeds and other documents, relevant in his opinion, to the Survey.

2. The Survey Officer or the said subordinate of such Survey Officer may, by written notice, call upon the Village Officers to produce the Village records and also to attend during the survey, whenever necessary.

3. For every Village, Estate, or other defined local area, the following records shall be prepared by the Survey Officer before the completion of the survey of such Village, Estate or other defined local area is notified under Section 11 (4) or 21 (1) :—

(1) Field Register showing the number and area of each survey field and sub-division and, as far as ascertainable, the tenure and ownership of the same.

(2) Record of measurement or field measurement book plotted to scale and showing the measurements for each field and sub-division.

(3) Map plotted to scale showing all survey fields with important topographical details. The records shall be authoritative record of all orders passed in undisputed cases under Section 11 (1) and (2) of the Regulation.

(By order)

Huzur Cutcherry, } N. RAJARAM RAO,  
Trivandrum, 19th Februhry 1921. } Chief Secretary to Govt.

## NOTIFICATION.

Dis. No. 334 of 1922/Revenue.

Under sanction of His Highness the Maha Raja, it is hereby, notified that, in the Table under Rule 1 of Notification Dis. No. 257 of 21/Rev : dated the 19th February 1921, issued under section 32, clause (c) of the Travancore Survey and Boundaries Regulation X of 10£4, the following is substituted for the portion prescribing and limiting the powers and duties of Sub-Assistants of Survey and Head surveyors :—

Class of Officers empowered.	Section of Regulation under which powers are granted.	Brief description of the powers conferred.
	Section 6	Publication of Notification of commencement of Survey.
	Section 7 (1)	Employment of hired labour for the propose of survey.
	Section 7 (2)	Apportioning the cost of hired labour employed.
	Section 8.	Provision of suitable mark and apportioning the cost incurred
	Section 11 (1) & (2)	Ordering the demarcation of boundaries.
	Section 11 (3)	Enquiring into boundary disputes.
	Section 12 (1)	Giving notice to registry-holders of orders passed under Section 11.
	Section 16 (1)	Communication of the orders imposing demarcation and survey charges.
	Section 29.	Powers to summon witnesses and require production of documents

Huzur Cutcherry,  
Trivandrum, 11th  
March 1922.

By Order,  
(Sd) N. RAJARAM RAO,  
Chief Secretary to Govt



## NOTIFICATION.

Dis. No. 257 of 1921/Land Revenue.

With the sanction of His Highness the Maha Raja the following Rules are passed under Section 32 Clause (d) of the Travancore Survey and Boundaries Regulation X of 1094, for the publication of all Notifications issued under the Regulation, and for the issue and service of all orders, communications and notices to be issued communicated, given or served under the Regulation.

1. All Notifications, required under Sections 4 (1), 5, 5, 9, 11 (4), 14, 17 and 18 of the Regulation, shall be published in the Government Gazette.

2. The communications required under Sections, 11 (3), 12 (2), 16 (1), except in cases falling under Sections 14, 24 (2) and 24 (3), shall be issued in *writing*.

The Notices required by Section 12 (1), to be issued in respect of every order passed under Section 11 (1) and (2), shall be in the form of an extract from the land Register relating to the holding.

Every such communication or Notice, shall be accompanied by an acknowledgment form, which should be signed, by the party in token of the receipt of the communication or notice, and returned to the Officer who issued it.

3. All Notices issued, under Sections 12 (1), c. 24 (1) and 24 (4), shall be issued in duplicate the original for signature and return to the officer who issued it, and the duplicate for retention by the Party to whom the Notice was issued.

4. When the registered holder or other person on whom any of the Notices or communications referred to in Rules 2 and 3 is to be served is absent, service may be effected by delivering the Notice or communication to some adult male member of his family at his usual place of abode or to his authorised agent or by affixing it on some conspicuous part of his last known residence or on some conspicuous part of the land to which the Notice or communication relates. When service is effected by so affixing the notice the serving Officer shall note the method of service on the printed form of acknowledgment or duplicate, which is returned to the office issuing the Notice or communication

By order,

Huzur Cutcherry,  
Trivandrum, 19th  
February 1921

} N. RAJARAM RAO,  
Chief Secretary to Government,

## NOTIFICATION.\*

Dis. No. 257 of 1921/Land Revenue.

With the sanction of His Highness the Maha Raja, the following Rules are passed under Section 32 Clause (e) of the Travancore Survey and Boundaries Regulation X of 1094 for prescribing and limiting the powers and duties of officers conducting proceedings under the Regulation and for regulating their procedure.

Class of Officers empowered.	Section of the Regulation under which powers are gi. en.	Brief description of the powers conferred.
Superintendent, Travancore Survey and Assistant Superintendent, Travancore Survey.	All the powers under the Regulation.	
	Section 6	Publication of Notification of commencement of Survey.
	Section 7 (1)	Employment of hired labour for the purpose of Survey.
Sub-Assistant of Survey and Head Surveyors.	Section 8	Provision of suitable Survey marks
	Section 11 (1) and (2)	Ordering the demarcation of boundaries.
	Section 11 (3)	Enquiring into Boundaries disputes.
	Section 12 (1)	Giving notice to registry holders of orders passed under Section 11.
	Section 29	Powers to summon witnesses and require production of documents.

2. The proceedings of all Officers authorised to conduct proceedings under Section 29 of the Regulation shall be

\*Amended Notification Dis. No. 334 of 1922/Revenue, dated 11<sup>th</sup> March 1922.

summary, but shall be governed so far as may be practicable, by the following provisions in the Code of Civil Procedure :—

(a) As to the service of summonses, Sections, 68 to 71, 74 to 81, 82 to 86:

(b) As to summoning parties and witnesses and enforcing their attendance—Sections, 60, 62, 63, 65, 90, 95, 96, 99 to 104, 154 to 158, 160 to 173 ;

(c) As to the examination of parties and witnesses, Sections 174, 176, 178 to 183 ; 186 to 188 ; 368 to 370 ;

(d) As to the production of documents Section 66, 123 to 140, 159 ; Provided that

*First.* The power of imposing fine under Section 165 and 169 of the Code of Civil Procedure shall not be exercised by any Officer below the grade of the Assistant Superintendent of Survey.

*Second.* The amount of fine shall in no case exceed Rupees Fifty.

Huzur Cutcherry,  
Trivandrum,  
19th February 1921.

(By order)  
N. RAJARAM RAO,  
*Chief Secretary to Government.*

### NOTIFICATION.

Dis. No. 257 of 1921/L. R.

With the sanction of His Highness the Maha Raja the following Rules are passed under Section 32 Clause (e) of the Travancore Survey and Boundaries Regulation X of 1094, for the apportionment of charges incurred under Section 7 and 8 of the Regulation.

1. During the Survey, it shall be the duty of every registered holder of land, (1) to clear the northern and eastern boundaries of his land and the interior chain lines, (2) to plant the survey marks on the northern and eastern boundaries and (3) to clear, and to plant survey marks on the western and southern boundaries also, if they adjoin Porambake or Government Waste.

2. The cost that may be incurred by Government on account of his default in performing these duties, shall be recovered at the following rates :—

I. For clearing boundaries  
and interior lines

... The actual cost incurred  
for line-clearing.

II. For providing Survey ... Seven chackrams, per each marks Survey mark and Fourteen chackrams on account of the labour to plant it.

3. Flag-holders and chainmen will be engaged by Government and the cost thereof shall be recovered, at a fixed rate per Acre measured as may be determined from time to time by Government according to circumstances.

Huzur Cutcherry, } (By order)  
 Trivandrum, } N. RAJARAM RAO,  
 19th February 1921. } Chief Secretary to Government.

### NOTIFICATION.

Dis No. 257 of 1921/Land Revenue.

With the sanction of His Highness the Maha Raja the following Rules are passed under Section 32 Clause (f) of the Travancore Survey and Boundaries Regulation X of 1094 prescribing fees payable for processes issued and copies granted under the Regulation.

1. All communications and notice issued under the Regulation shall ordinarily be served by the Peons attached to the Officer in charge of the Survey Party or to his subordinates; and no fees shall be charged for such service.

2. The summonses issued to parties and witnesses shall also be served by the Peons mentioned above; but fees according to the subjoined scale shall be levied and credited to Government.

*Nature of process. Amount leviable by Survey Appellate Officer in exercise of jurisdiction.*  
*Original jurisdiction.*

	Rs.	Chs.	C.	Rs.	Chs.	C.
For each summons						
(a) to a single defendant, respondent or witness.	0	14	0	1	0	0
(b) to every additional defendant, respondent or witness, residing in the same kara or muri, if the process be applied for at the same time.	0	7	0	0	14	0

3. For getting copies of the orders passed under Sections 11, 12 and 16 of the Regulation, the applicant shall produce the paper required and also pay the following fees :—

(1) Chackrams (3) three for 100 words or fraction thereof, and

(2) in the case of sketches or diagrams, such fees as may be prescribed by the Officer granting copy, according to the nature of each sketch or diagram.

Huzur Cutcherry,  
Trivandrum }  
19th February 1921.

(By order),  
N. RAJARAM RAO,  
Chief Secretary to Government.

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Dis. No. 257 of 1921/Land Revenue.

NOTIFICATION.

With the sanction of His Highness the Malu Raja the following Rules are passed under Section 32 Clause (g) of the Travancore Survey and Boundaries Regulation X of 1094, regarding the Survey of all Settlement, Post-Settlement and current sub-divisions necessitated by Pokkuvaravu, Land Acquisition, Karampathippu, Puduval registry, etc.

1. All old sub-divisions, Settlement and Post-Settlement, shall be demarcated and surveyed,---at least whenever they are involved in current cases.

2. All new sub-division, shall be duly demarcated, surveyed and plotted, before they are sanctioned by the Tahsildars or other Officers authorised for the purpose.

3. In the survey of these sub-divisions, renewals and repairs of old survey marks will be governed by the Rules passed under Clause (a) of Section 32 ; planting of new survey marks, clearing of boundaries and interior lines and provision of flag-holders and chainmen will be governed by the Rules passed under Clause (e) of Section 32.

Huzur Cutcherry, }  
Trivandrum, }  
19th February 1921.

(By order),  
N. RAJARAM RAO,  
Chief Secretary to Government.

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Dis. No. 228/23/Revenue.

NOTIFICATION.

With the sanction of His Highness the Maha Raja, the following Rules are passed under Section 26 of the Travancore Survey and Boundaries Regulation, X of 1094, regarding the apportionment of the cost of survey in the matter of Settlement of boundary disputes arising otherwise than in the course of a survey.

1. The cost of survey will include the pay and allowance of the officer for the days he is engaged on the work and also the wages of the men employed by him for measuring, clearing jungle &c., in the survey numbers concerned and also in the adjoining survey numbers, if found necessary.

2. If the old boundary stones and marks are found to exist on the disputed boundary in their correct positions as per survey records, the complainant will bear the cost of survey wholly.

3. If all the boundary stones and marks on the disputed boundary are missing or found in wrong places the cost of survey will be borne by the party or parties whose duty it is to maintain the stones as per the Rules passed under the Travancore Survey and Boundaries Regulation, X of 1094.

4. If some of the stones alone are missing or require repair, and some are found in incorrect places, the cost of survey will be divided in the ratio of the number of stones found correct and the number found missing or out of place; and the amounts will be charged to the respective parties as per paragraphs 2 and 3 above.

5. The Survey Officer deputed to settle the dispute will meet the expenditure required for the work (in the shape of demarcation stones and labour charges) from the grant under "Survey Advance" to the Taluk in which the disputed properties are situated. For the sums received from the Tahsildar, the Survey Officer shall render account to the Tahsildar, and also hand over to that Officer Recovery statements in the prescribed form for the amounts to be recovered from the parties to the dispute.

Huzur Cutcherry,  
Trivandrum,  
24th February/3rd  
March 1923.

(By Order,  
R. KRISHNA PILLAI,  
Chief Secretary to Government.

## DEMARCATIION RULES.

Before proceeding to start work in a Taluk the Supervisor charged with the duty, should visit the Taluk and see to complete arrangements being made for the requisite supply of stones for boundary and field demarcation. He should meet the Tahsildar and the local Proverthicans and also the leading ryots and make them understand the nature of the work to be undertaken and the kind of co-operation expected from them.

Preliminary arrangement.

2. A general Notification under the signature of the Settlement Dewan Peishkar will be issued with an abstract of the Boundary Regulation which the Supervisor should see duly published in the Several Proverthics.

3. One or two Deputy Supervisors, with a staff of Demarcators, will then be deputed, whose duty it will be to go over each Proverti and prepare an eye-sketch shewing the boundaries of the Proverti, the position of the component Moories and their limits, the divisions into which the Proverti should be divided, and also the main roads, rivers, channels etc., which skirt or cross the boundary lines.

4. The Tahsildar or one of his Sampraties, and the local Proverthicar and accountant and also those of the adjacent Proverthics should accompany the inspecting officer with the olugu and other accounts and furnish the necessary information for identifying the boundary lines.

5. If the Proverti boundary is found to require adjustment in any place, owing to very irregular shape or for the sake of compactness or convenience, a special report should be made of the parts to be added or excluded.

6. Special reports will also be made of cases where the boundary runs over very mountainous or impracticable ground.

7. These reports must be invariably accompanied by illustrative sketches and must be promptly submitted, so that sanction for transfer of land or deviation from true boundaries may be obtained before demarcation commences.

8. On receipt of Government sanction, a revised sketch will be prepared shewing the amended boundaries.

9. If the Proverti be within 4 square miles in extent, it will form a village in itself. If more than 4 square miles,

it should be divided into two or more villages according to the size.

10. The villages should be so formed that each may have a fair proportion of the population and the cultivated area of the Proverti, as far as possible, and include entire Moories.

11. The Tahsildar and local Proverthicar should, as a rule, be consulted in the forming of villages, and a sketch should be drawn shewing the boundary lines of the villages and the position of the Moories, and at the foot of the sketch, the area of each village and the population and land revenue should be entered as approximately as possible.

12. The sketch should be forwarded to the Supervisor, who, after verification, will submit it with a report to the Central Office for orders.

#### BOUNDARY DEMARCATION.

13. On the sketch being approved, a notice will be published under signature of the Settlement Dewan Peishkar, or his Deputy in charge of party, informing the land-holders of the villages formed, and of the date when the demarcation of their properties will commence.

14. The demarcation of the village boundaries will then be proceeded with.

15. Where a free-hold tract belonging to a Jenmy or Chief such as what is termed Desom Olivu (ദേശം ഒരിവ) or Adhikaram Olivu, (അധികാരം ഒരിവ) lines contiguous to a village, the Jenmy or Chief should be communicated with before demarcating that boundary, so that the Jenmi or Chief may be able to depute his agent to represent his interests.

16. Any differences arising regarding the boundary between the village and the free-hold Desom or Adhikarom should be reported for orders, and adjusted under Government sanction, unless the Jenmy or Chief concerned agrees to the boundary in accordance with Government accounts.

17. All tracts recognised as Desa Olivu, or Adhikara Olivu, will be treated as separate villages or circuits, and demarcated in other respects as other properties.

18. Where the village boundary runs over very mountainous or difficult country, and its demarcation would,



therefore, entail great labour, and cost, the Supervisor, under orders of the Settlement Dewan Peishkar, may grant permission to mark a conventional line round such tract of country, but in the case of adjoining free-hold Desom etc., the true boundary will be invariably demarcated.

19. Granite stones will, in all cases, be used for making boundaries according to the size and description given in the Appendix.

20. When a flat rock is found conveniently situated, it should be utilised as a boundary station or offset, the Shank and the following symbols being used ○ Station ○ Offset.

21. The cost of station or offset stones planted in connection with private lands, will be charged to the villagers rateably on their land assessment.

22. All station stones must have a plummet hole drilled in the centre of the upper surface, about one inch deep and three-quarters of an inch in diameter.

23. The Shank on the side and the distinguishing mark on the upper surface should be cut not less than a quarter of an inch deep.

24. All stones must be roughly squared for one-third of their length from the top, but it does not matter how rough they are for the remaining portion of their length, as that will be imbedded in the ground.

25. As Demarcators are responsible that no stone is found on inspection to be loose, they must take special care that all are properly imbedded, the hole should be made very little larger than the stone, and a small quantity of earth being put in, it must be well tamped from the bottom.

26. No stone should be accepted that is more than one inch smaller than the size ordered.

27. When selecting site for stations, the Demarcator must see that each station is as far as possible from the one on each side of it, provided both are clearly visible from it, and that no bend on the boundary is more than three chains from the line between any two stations.

28. Every station stone must be on the exact boundary, and wherever possible, at the junction of three field-boundaries.

29. There must be sufficient level space round each station to receive the Theodolite and to enable the Surveyor to use it-

30. When in allowing this space the station stone has to be planted away from the boundary line, on a public road or pathway, the stone should be sunk one inch below the surface and an offset stone set up opposite ; the position of the stone being indicated in the sketch.

31. Wherever convenient, an offset stone should take the place of a field stone at the junction of three fields.

32. When the village boundary runs through waste, very few offsets will be required, but when there is cultivation on the boundary, every bend must be marked.

33. When bends on the boundary are very numerous, endeavours should be made to induce the ryots to straighten them, they will thus save themselves the cost of many stones; but unless alteration is actually made, all bends must be marked as laid down in section 32.

34. When demarcating along the banks of rivers and channels or the sides of roads, etc., care must be taken that the marks are erected at sufficient distance from the edge to prevent all possibility of their being destroyed. This caution applies specially to stations, which must invariably be in a safe position and on firm ground.

35. Station sites should, in the first instance, be marked by flags and offsets by pegs or holes. Orders will then be given for the stones to be brought, and as soon as they have been erected, the Demarcator will go over the lines again and see that the stones are probably imbedded in the right places.

36. No alteration is ever to be made in a line already demarcated in adjoining village, without the express permission of the Supervisor, who will see, in case he grants the permission, that the completed sketch is also altered.

37. When the boundry has been demarcated, the village will *Forming Divisions*, be divided into divisions by check traverse lines through the length of the village, from 20 to 40 chains apart.

38. The said lines must always follow the field boundaries commencing and closing on village boundary stations ; they should be marked in the manner most convenient for Survey by Theodolite, and the divisions should be as regular as possible. The rules for the selection of sites for stations etc., on village boundaries apply also to divisions.

39. Large tanks, hills, blocks or jungle and rivers passing through a village, will be marked as divisions of the village.

40. Arable waste lands situated in villages, and in the midst of cultivated lands, and such as likely to be fought after for cultivation, should be demarcated in fields of two acres if wet, and of four acres if dry.

Other outlying tracts not likely to be readily brought under the plough may be demarcated in blocks of 100 acres or so.

41. When permission has been granted under para 8 to deviate from the exact boundary, the approximate limits will be shown on sketches by dotted lines and the portion of the excluded tract belonging to each village will be numbered as one of its divisions.

42. The demarcated divisions will be numbered consecutively, commencing at the north-east or north-west corner.

43. A rough sketch of the village and its divisions and minor circuits will be prepared in pencil when the sites for the marks are selected, and inked in as soon as the stones are fixed. The area of each division will be entered under its number.

44. The sketch should be drawn on a scale just large enough to allow of each bend and stone being clearly shewn; it should also show the approximate position of the village sites and hamlets, chief roads' tanks, rivers and all old boundary marks if any. The sketch must be on good paper of regular shape and must be kept rolled and not folded.

45. On the upper part of the sketch will be entered the Taluk and proveri, number and name of the village, and area as per village accounts, also the North point.

46. The number of stones erected will be given on the sketch in the following tabular form.

	Stations.	Offsets.
Erected before on the side of village ...	20	102
Do. on ...	24	130
Now erected in ...	118	496
Total ...	162	728
On Division boundaries. ...	323	1,561

47. The numbers and name of exterior adjacent villages will be entered, and in the lower right hand corner of the Demarcator's and Deputy Surveyor's signature, with dates of commencement, completion and inspection.

48. A duplicate copy of the sketch must be prepared and sent to the Deputy Supervisor as soon as the last stone has been erected.

49. The Boundary Demarcators and the Deputy Supervisors must use their best endeavours to induce villagers to have all the necessary field-stones ready before field demarcation commences; the number in readiness will be regularly noted in the weekly reports of work.

50. They will also explain to the land holders all that will be required of them, and give them any information they may ask for regarding demarcation.

#### *Field Demarcation.*

51. When a village is laid out in divisions and the boundary marks are set up the village will be assigned for field demarcation to one or more Demarcators. If more than one be employed, they will be set to work in different divisions in the order in which they are numbered in the sketch.

52. The Demarcators will carry on their work under the direction of the Deputy Supervisors and Supervisors in the proportion of 4 of the former and 2 of the latter to every 32 Demarcators.

53. Each Demarcator will be furnished with a copy of the sketch showing village and division boundaries and printed form of the Field Register. For using the sketch and the Register the Demarcator will be guided by the detailed instructions laid down under appropriate headings.

54. As soon as the Demarcator arrives at the village, his first duty will be to send to the Supervisor a special report regarding the supply of stones ready, the presence of Proverti officials and land holders or any other circumstances likely to affect progress of work. Unless this report is sent excuses for delay made afterwards will not be accepted.

55. The Demarcator must always be accompanied by a Proverti accountant with Olugu and other accountants and by the owner of the properties he is demarcating. Wherever possible two or three intelligent and respectable ryots well acquainted with the locality should also be in attendance.

56. If owing to several Demarcators being at work in the same village or in the different villages of the Proverti, the number of accountants of the Proverti be insufficient to meet the requirements arrangements should be previously made with the Tahsildars to supplement them by others drawn from the neighbouring Proverties.

57. Where a division is mixed up of paddy lands and gardens, the Demarcator will, as a rule, deal with the properties of one description first—(wet or dry cultivation)—and then with those of the other.

58. The Demarcator must be careful that timely notice is invariably given to all persons whose attendance he may require; he should daily ascertain the names of the proprietors or occupants of the lands he has to demarcate next day and issue written notices to be served on them.

59. He should, as a rule, plant stones as he proceeds, but if he cannot easily do so, he will, in the first instance, mark out the field boundaries with pegs, making his Sketch and filling up his Register; the pegs should be replaced by stones without delay.

60. If possible all the stones in one division should be erected before the demarcation or the next one commences; in no case should more than two divisions assigned to one and the same Demarcator be allowed to remain incomplete at the same time.

61. Every piece of land that cannot be measured by chain in triangles, must, as a rule be demarcated as a minor circuit if less than about 50 acres, such circuit may be included in the same division with measurable fields; if more, it should be treated as a separate division in either case a separate field number will be assigned to it.

Village sites, freehold Desoms, large tracts of waste land, tanks etc., will be treated under this para.

62. When there is only one such piece of land of less than 10 acres within a division, or several small pieces aggregating less than 10 acres and the boundaries of such pieces are not very irregular, they need not be marked as minor circuits but can be left to be dealt with by the Surveyor.

63. All fields which have to be treated as circuits having been demarcated as such, the remaining fields in the village will be marked with ordinary field stones for chain measurement only.

64. In marking out fields existing boundaries must be adhered to and all bends marked except such as are within (10) \* links from a line between the marks on each side where the land is valuable or 20 links in dry land of little value.

65. When these small bends between two corners are not marked, care should be taken that the corner stones are so placed that an equal quantity of land is given and taken on both sides of the line.

66. When field boundaries are found to be very crooked, every endeavour should be made to induce land-holders to consent to their being rectified ; it must be explained that the saving in stones will be very great and that they can lose nothing, because just as much will be added to each field as is taken away from it.

67. If ryots agree to straighten their boundaries, they must demolish the old and set up the new banks at once ; unless they do this, the field boundaries will have to be marked as they exist ; in no case is any bend beyond the limits prescribed in section 64 to be ignored on the plea that the ryots will form the new banks after the marks have been put in.

68. A sketch showing every rectified boundary will be entered in the Village Agreement book.

69. The signatures of the land-holders interested will in each case be entered and the Supervisor when testing work will himself see all the straightened boundaries, and note whether the bends have been properly equalised and substantial bunds raised in accordance with the sketch.

70. When there are banks or hedges between adjacent fields, the centre of these will as a rule, be considered the boundary ; in some cases the whole of the hedge etc., may belong to the holder of one of the fields, it must then be included in that field.

71. When village roads, cart tracts or channels divide fields, they will, if more than about 15 feet wide, be demarcated as separate numbers when less, they will be included in either of the adjoining fields. The same rule applies when the road or channe runs through a field.

*Note* :—A width of 10 feet is allowed as the minimum for cusbah alone.

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\* 5 links substituted by Huzur letter No. S/150 dated the 25-11-83.

72. Care should be taken to leave sufficient width for village roads, also that public land set apart for burial grounds, market places, topes, village sites etc., is not encroached on. Where no proper title can be shown, the land in question must be marked out with the Poramboke.

73. Unprofitable land such as masses of rock, streams etc., which are included in a land-holder's property must, if he wishes, be included in his field by the Demarcator, but any such piece of land of greater extent than half an acre (or in the case of large fields more than one-fifth of the area of the field) may, at the ryot's request, be marked out and registered as a separate field; when this is not done the owner of the field will sign an entry in the Agreement book to the effect that the unprofitable land was included at his request.

74. When the patches of unculturable land in a Patta field are very small and much scattered, they need not be noted by the Demarcator, such cases will be considered by the Settlement Officer when classifying the fields.

75. In demarcating the boundaries of Government roads, channels, tanks or other public works in the charge of the D. P. W., the Demarcator will be guided by the boundary marks erected by the D. P. W. Where such marks do not exist, the walls or fences of adjacent private properties or the limits of present cultivation will be taken as the boundary line.

76. In doubtful cases notice must be sent through the Supervisor to the Overseer or other subordinate of D. P. W. in charge to attend and point out the boundaries. If there is any considerable difference between the line pointed out by the Public Works Officer and by the ryots, the matter must be reported for orders.

77. In cases of other channels, tanks etc., of public utility, the stones should be placed not nearer than 6 feet from the foot of the slope of the sides where they form detached bunds or embankments. Where a ryot objects to the allowing of this margin on the ground of long possession of the land, his adjacent land will be measured out with reference to the accounts and the boundary line demarcated accordingly.

78. Where public lanes or pathways are encroached upon and included in adjacent properties, their limits will be ascertained with reference to the accounts and demarcated as separate number or not as laid down in section 71.

79. In cases where the lanes have been planted and long enjoyed, or where the ryots concerned object to giving them up, they should be demarcated along with the properties in which they are included and should be indicated in the Sketch and Register by distinguishing letters.

80. Where small detached pieces of cultivation are found to exist, within the village site or in tank-beds or forest blocks, orders must be applied for the exact position, extent etc., being given.

81. The Supervising officer will, in such cases, use his discretion in directing that the fields be marked under the ordinary rules as minor circuits, or that they be omitted by the Demarcator, or that they be marked as fields only, for measurement by chain; his decision will depend upon the extent and value of the land, the comparative difficulty and cost of survey, the permanency of the cultivation and the probability of the surrounding lands being afterwards taken up.

82. In important cases where there is a great deal of this scattered cultivation, the orders of the Settlement Dewan Peishkar must be applied for.

83. All permanently established cultivation in tank or river beds should be marked out; fields that are regularly submerged should be included in the tank or river division; if the holders of land within the bed of a tank wish to give it up and sign a statement to that effect in the Agreement book, the land need not be marked out. Unregistered land in the water-spread of a tank is in no case to be demarcated in fields.

84. A Revenue field is a piece of land which bears a separate number or name in the present Revenue fields how to be dealt with. accounts whether assessed to or exempted from public revenue.

85. As a rule each Revenue field will form a Survey field. This rule should be strictly observed except as below :—

Exception I. Two or more contiguous fields owned by the same ryot may be clubbed into one Survey field, subject to the following conditions :—

1st. The Revenue fields so clubbed must be of the same description, wet or dry. ("Dry" includes gardens).



2nd. They must all be of the same tenure.

3rd. The Revenue fields so clubbed must not exceed in the aggregate 2 acres if wet land, and 4 acres if garden or dry.

4th. They must not differ perceptibly in quality of soil

5th. They must not be situated in strikingly higher and lower levels. For instance, there may be paddy lands on the slope of a hill and others in the flat of the valley some feet below ; such lands ought never to be mixed up in one Survey number.

6th. If wet lands, the included Revenue fields should all be either single crop or double crop lands.

7th. There must not be any difference in regard to the source of irrigation.

For example—a land under a rain-fed tank must not be clubbed with one under river-irrigation or a field under one tank or channel with that under another.

8th. They must all be in a compact block not severed by public roads, rivers or channels.

9th. If the lands to be dealt with be garden lands, planted and nonplanted properties differently assessable, the former with tree-rates and the latter with ground tax, must not be included in the same Survey number.

Exception II. Government gardens sites of Palace buildings, Public offices, Government Schools, Satrams, Travellers' Baugalows, Military Stations etc., will in each case be demarcated together, though the lands comprised may be of different numbers and even of different tenures.

So also the Revenue fields included in village sites ; free hold Desoms etc., which under para 61 will form minor circuits. (Rice lands by the side of backwaters which, by reason of their being under water do not admit separate demarcation will be likewise clubbed together, the outer bund put up being alone marked with stones. When the area of the fields so clubbed is large enough to form a minor circuit, the individual holdings comprising it will be entered in a separate register and distinguished by sub-numbers. In other cases the interstitial fields will be entered in the demarcation Register and distinguished by letter.)\*

\* Added as per ruling contained in Huzar letter No. S 137 dated 31-10-1883.

Exception III. Fields occupying the banks of rivers, channels, tanks etc., mentioned in paras 75 and 77 must be marked out with the Poramboke, being included with the said rivers, channels etc.

In every such case a remark will be entered in the Register noting the Revenue numbers, the name of the owner and the existence of taxable trees if any. The position of the property will be indicated in the sketch.

Exception IV. Where a Revenue number occupies a small area below 5 cents as a bund, cultivator's lodge etc., in the midst of paddy lands it will be clubbed with the adjacent property of the owner if he has any, or with that of another, whatever may be the tenure. In the former case, if the area is planted, it will have a distinguishing letter, with the particulars entered in the Register. In the latter case, the same rule will be followed, whether the land forms a plantation or not.

Exception V. Where an area of paddy cultivation containing more than 5 cents is situated in the midst of a garden, it will be included in the same Survey number, with that garden and be distinguished by a letter as in the preceding para.

Exception VI. There may be cases in which the site of a house or other building includes portions of two or more properties of different tenures. In such cases the included properties may be demarcated together, the area not built upon belonging to each tenure being ascertained and specified by a letter and particulars entered in the Register.

86. Except as above specified no fields of different tenures should be clubbed together in the same Survey number.

87. Sometimes it so happens that such fields in the occupation of a ryot lie mixed up together without any landmarks to identify them. It will be the duty of the Demarcator to separate and mark out each tenure with reference to the accounts. This rule to be followed is to ascertain, by actual measurement, the area in Parahs of the whole block and then to divide it proportionately according to the number of Parahs entered in the accounts for the several tenures.

Thus—suppose No. 7 Pandara Otti, and No. 8 Erayali, entered in the accounts as 1 and 3 Parahs respectively, are

found mixed up together. By actual measurement the whole area contains, say, 6 Parahs. Then  $\frac{1}{4}$  and  $\frac{3}{4}$  of this entire area will be marked out for Nos. 7 and 8 respectively.

88. No Revenue field, however large, will be sub-divided except in the following cases :—

**Exception I.** Where a Revenue field is partitioned among the different individuals, each holding his share as a distinct property, by right of inheritance sale or otherwise every such portion must be demarcated as a separate number.

Where the divisions lie undefined on the ground, the limits of each will be marked as the owners may point out by common consent.

Any portion of a field, held on mortgage or other revocable title, must not be separately demarcated, but will be included in the same Survey number with the portion retained by the owner, the fact of separate possession alone being entered in the Register.

Where the owners do not desire to have their shares separated consent to hold them jointly, they will be demarcated together, the names of the several joint owners being entered in the Register with particulars as to the proportion of the shares if this be known.

**Exception II.** Where paddy land forming an entire Revenue field is partly converted into a plantation, the part so converted will be separately demarcated if it is of measurable size and has taxable trees. Otherwise both parts will be demarcated together and distinguished by letters.

The same rule will apply to garden land partly converted into paddy cultivation.

89. Occupied lands not yet brought to account and assessed to Government revenue will be considered as puthuvals.

90. Such puthuval lands shall be demarcated according to existing occupancy subject to the rules laid down in para 85.

91. Puthuval plantations occupying the banks of rivers, channels etc., will be dealt with according to the rules contained in para 85, Exception III.

*Note.*—The trees only will be registered and not the ground on which they stand. Whether the trees are bearing or below bearing age will be mentioned in the remark column of the Register.

92. If any portions of such banks etc., being public property, be taken up or occupied in view to cultivation and the holders want such portions to be demarcated, demarcation will, as a rule, be refused and the lands restored to the banks.

93. Any cases of doubt or dispute will be specially reported for orders.

94. Special care is necessary in demarcating registered properties, encroachments bordering on waste lands, public roads, banks of Government lands, rivers etc., belonging to Government. The demarcator should see, by actual measurement and with reference to accounts whether any encroachments have been made.

95. Where evident encroachment exists and where the encroached part is within a width of 15 feet, and has an area above 1 and below 25 cents, it will be demarcated with the property to which it is added and will be marked by a letter.

96. Where the encroached land is above this width and size, it will be separately demarcated.

97. Any area measuring one cent or below need not be noticed at all.

98. If, in any case, it is found necessary or proper, in the interests of Government, or of the public, that the encroached land should be restored, and if the ryot concerned consents to give it up, the restoration should be effected before demarcation. Otherwise the matter should be specially reported for orders.

99. Care is likewise necessary in demarcating lands which were once private properties, but now unoccupied and lying waste, having reverted to Government by relinquishment or other causes.

100. If it is found, with reference to the accounts and by actual measurement, that any such land has been encroached upon by an adjacent land-owner, restoration should be effected before demarcation.

101. If the adjacent land-owner concerned objects to the restoration, the demarcation may be made according to present possession. But in the register, the revenue number of the property to which the encroached part is added must be coupled with the number of the property encroached

upon and particulars entered in the remark column for identification of the part.

102. Corresponding remarks will be entered opposite the encroached property to account loss occasioned by the encroachment.

#### *Boundary Disputes.*

103. The disputes likely to arise in the course of demarcation may be generally in respect of two neighbouring revenue fields having no distinct boundaries between them, or of a single field sub-divided where the sub-divisions are not defined on the ground.

104. In the former case the village accounts will guide the determining of the boundary line. In the latter case the express terms on which the sub-division is made will help the adjustment of the dispute.

105. The demarcator should see that every endeavour is made to bring about an amicable settlement, and with tact on his part, this can generally be done.

106. Cases so adjusted will be entered in the Agreement book then and there and the signature of the parties taken.

107. When contending parties fail to come to any agreement, the Supervisor must be informed and he or his deputy will, after due enquiry on the spot, submit a report in the prescribed form to the officer empowered to decide such cases.

108. It may sometimes happen that a party may dispute the correctness of an existing boundary and require it to be re-adjusted, but it shall be the duty of the demarcator to respect present possession and to decline to enter into any investigation of rights.

109. Possession, where it is clear, should be maintained, and one party should not be allowed to disturb the undisputed possession of another. Advantage, in fact, should not be allowed to be taken of the demarcation to get up new disputes, and all attempts of this nature must be discountenanced.

#### *Sketches.*

110. When the field demarcator receives a copy of the sketch of village and division boundaries alluded to in para 53, he will copy each division on a large scale on a separate paper and enter in it the boundaries of the fields he demarcates.

111. Fields must be consecutively numbered throughout a village, the divisions being taken up in the order in which they have been numbered by the boundary demarcator. It will be found convenient to assign to each field a divisional number (in pencil) in the first instance, and to fill in general village number when all the fields have been demarcated.

112. Sketches must be neatly drawn on a scale sufficiently large to admit of every bend being clearly shown; where fields are of moderate size, (3 or 4 acres each) a square inch should represent about an acre, the lines will be inked as soon as the stones have been erected and not before; every demarcation mark will be represented in the manner ordered.

113. At the head of the sketch, the name of the taluk, number and name of the village, number and area of the division and number of field stones will be entered, the number and names of adjoining villages of the numbers of adjacent divisions and fields must also be given.

114. The Demarcator must sign each sketch in the lower corner and enter date of commencement and completion of the division; nothing else should be entered on the sketch.

115. When roads or channels or other public property have not been separately marked, their position will be shewn on the sketch.

#### *Field Register.*

116. Registers must be filled in along with the sketches.

117. Column 1 of the Register will be left blank and filled after the whole village has been demarcated.

118. In column 2 the division numbers corresponding to these sketches will be entered as each field is demarcated. They will be written first in pencil.

119. In column 3 the name of the field should also be entered against each Revenue number, there being no separate column for names.

Where a field has no Ayacut number, the Puthuval number if it is registered property, will be entered; otherwise no number will be entered in the column.

The Registry for Puthuval properties may not be available to the Demarcator on the spot. But he can easily ascertain from the village accountant and the owner whether the

property is registered and tax-paying or not and according to the information he may obtain, he will note in the Remark Column "registered" or "not registered".

In cases of doubt he will enter the words "to be ascertained".

As the demarcation of each division is completed, if not before, the numbers as per Puthuval Registry should all be filled in with the Assistance of village accountants.

All the old Ayacut (Paimash) numbers must be accounted for in the Register and entered opposite the Survey numbers in which they are included; and where portions of an old number are included in several Survey fields the approximate area of each such portion should be entered opposite its proper Survey number.

120. Under the head "tenure" in Column 4, only the tenures as per Column 4. Government Olugu accounts should be entered; as "Pandara Pattam" "Otty", "Adima", "Anubhogom", "Kudijennum", "Nilampalam", and similar tenures of Jennum properties under Devaswom, Brahma-swom etc.

Suppose, certain land is entered in the account as "Athyramatom-Otty"; this means a tenure, and should be entered in Column 4. "Athyramatom" should not be taken as the actual owner and entered in Column 7 as Register-holder.

Sometimes a certain tenure as given in the accounts may have been subsequently converted into some other tenure. If this conversion be known the altered tenure should be entered and not the one in the Ayacut. The fact of conversion and the Ayacut tenure will be noted in the Remarks.

121. The description of wet, dry or garden in respect of any property should have sole reference to its present condition.

A property originally wet, but now turned into garden, will be entered as garden land and vice versa, a note being made in the Remark Column as to the fact of the change.

122. The head "cultivated" (Column 6) will include (1) all registered Column 6. Properties tax paying and tax free, (2) all non-registered properties (Puthuvals) liable to Government tax.

*Note.*—There may be registered properties lying uncultivated for a long period owing to their being cut up by

new roads, breaches, on other causes; but the tax may still be levied. Such lands must be entered as "cultivated" with particulars in the Remark Column describing the present condition.

Non-registered property (Puthuval land) may have no cultivation of any kind properly so called, but may be occupied by houses or enclosed or appropriated as building sites. Such lands will fall under this heading "cultivated."

"Culturable" and "unculturable" will embrace all unoccupied Government wastes. "Nirthal" or relinquished lands and also wastes and jungle belonging to Devaswom or Brahmaswom or other Jenmies.

Lands that are capable of being cultivated will be entered as "culturable". Forests, rocky and stony tracts, sandy wastes as those on the sea coast, lands encroached upon by backwaters, rivers etc., will fall under the head "unculturable".

In regard to "Nirthal" lands and others once under cultivation, the length of time they have been lying waste will be stated in the Remark Column if the fact be ascertainable. Otherwise a general remark "lying waste from time immemorial" will suffice.

123. In filling Column 7 the current Tandaper or rent-roll should be relied on more than the old Ayacut as the property may have changed hands since. The Proverti accountant ought to be able to say who the Thandaper-holder is in respect of each property. Perhaps the present occupant, if he be not the Thandaper-holder himself may be able to furnish the information and Thandaper accounts which should always be with the Proverti Pillai, may be referred to for verification.

Attention should always be directed to transfers of registry finally decided under the Pokkuvaravu Rules, and the entry should be made in accordance with such transfers. A statement of these transfers should be previously prepared and be with the accountant ready for guidance and reference

It is only as the last resort that the Ayacut name should be used, that is, failing all information as to the present proprietor.

For Puthuvals not yet brought to account no name will of course be entered in Column 7.



124. The occupant of a property may be the Tandaper-holder himself or one who has succeeded to his full right by inheritance, purchase, gift etc., or he may be a mortgagee or Otti-holder.

But a mere Pathivarakaran or Pauttakaran can never be entered as occupant.

When the occupant is other than the individual whose name is entered in Column 7, particulars will be given in the Remark Column as to the nature of the occupancy.

125. Column 9 will be filled by entering the number of Parahs for paddy lands and dimensions for gardens as per accounts, and the corresponding figures in acreage.

In converting Parahs into acreage the calculation should be made with reference to the number of square rods ( a rod being 10 English feet) fixed as the prevailing equivalent for a Parah in each locality.

When the Parah unit is found to vary, 10 cents will be taken to be equal to a Parah.

The Demarcator will note at the foot of the Register the equivalent he has taken for the Parah in making his calculation.

In regard to registered Puthuvals the Olugu accounts of which are not forthcoming, non-registered Puthuvals and waste lands of ordinary size, the acreage will be ascertained by actual measurement with the rod.

In the case of large areas of waste land a rough estimate of the extent should be made by measuring any two of the adjacent sides.

126. In preparing these Registers the greatest care is necessary; the required information will be obtained from the Proverti accountant and the entries made in the field; in any doubtful cases, pains should be taken to verify the accountant's statements.

127. At the foot of each division the number of fields in it and their area will be given and at the end of the Register a statistical table in the form ordered will be filled in.

128. When part of a river, range of hills or forest has been excluded from the demarcated boundary, the fact should be noted opposite the division number assigned to such tract and the approximate area of the excluded portion added to the Village area.

129. The Demarcator will initial every page of the field Register and the last page will bear his signature and that of his Deputy Supervisor, and Proverti Officials.

130. In preparing Sketches and field Register, special attention should be paid to the general rule regarding crasures; as entries are all first made in pencil, there should be very few corrections, and when absolutely necessary they should be so made that the original entries remain distinctly visible. In every case the initials of the persons signing the Sketch or Register must be attached.

*Supply of Stones.*

131. Depots will be opened at one or two centres conveniently situated in respect of all the village of the Proverti from which stones will be supplied both for Government purposes and to such ryots as may be desirous of purchasing them at the contract rates for the demarcation of their own properties.

132. A Proverti Subordinate will be in charge of the Depots whose duty it will be to examine the stones as they are delivered by contractors and pass such as are of the size and description according to samples.

133. The stones wanted for Government purposes shall be supplied on indents given by the Demarcator according to prescribed Form and the charges of conveying them to the places indicated in the indents will be defrayed by the Proverticar from public funds deposited with him under Government orders.

134. The stones for Government purposes will include village and division boundary station stones and offsets which have to be planted where no private properties exist and field stones for marking Government gardens and other properties of the class mentioned in para 85, Exception II.

135. When stones have to be supplied from Government stores the cost of which is chargeable to private individuals under section 5 of Regulation III of 1058 separate indents will be necessary.

136. Indents for stones must be sent in duplicate.

137. The person in charge of the Depot will enter the number supplied in both copies of the indent and return one

to the Demarcator who will then sign the receipt form at the foot and forward the indent to the Central Office with his weekly Report.

138. Where any charges for cooly labour have to be incurred for planting the stones, the Demarcator shall send a requisition to the Proverticar who will meet the same or otherwise arrange for the planting of the stones.

139. In case any charges are incurred for cooly labour the Proverticar shall send a bill under his signature to the Demarcator who will countersign and forward it to the Office through the Supervisor.

140. A duplicate copy of the Bill shall be kept on the Proverti records.

141. At the end of each month, the Proverticar shall send all the indents received by the Depot official and Bill for cooly charges incurred during the month through the Taluk Cutcherry to the settlement Office with a statement of the number of stones in hand.

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**Nedumangad Resurvey Rules.**

Original rules passed in G. O. No. 2453/L. R.,  
dated 9th March 1911.

Amendments made in G. O. No. 10084/L. R. & F.  
dated 18th September 1913.

Sections amended. 3, 12, 14, 15, 20, 23 and 26.

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RULES FOR THE RESURVEY OF THE NEDUMANGAD TALUK.

Before the Resurvey is started, the Dewan Peishkar, Trivandrum, will, in consultation of the Survey Superintendent, determine whether any sub-divisions should be made of the existing *Pakuthies* and obtain Government sanction for the Sub-divisions that may be found necessary.

(2) The Dewan Peishkar will ascertain from the Superintendent of survey the probable date of the commencement of the Resurvey in each village; and in good time before the starting of operations in a village, he will by notification in the Government Gazette and beat of drum require the pattadars of the village to clear the boundaries of their fields, put all the existing stones in proper repair and get new stones ready in the place of the missing ones.

(3) The Dewan Peishkar will also arrange for statement in the accompanying form, of all sub-divisions of survey numbers that have been made, and of all *Puduvals* that have been registered, since the Settlement, with their dates of registry, (olugu or application) being prepared by the village staff and furnished to the Survey Superintendent.

(4) For the Puduvals, all available, "divide" sketches and *Olugus* should be collected and handed over to the Survey Party Officer before he starts work in a *Pakuthy*.

(5) During the Resurvey, one of the Accountants of the village where operations are going on, will be detailed on special duty with the Survey Party for giving any information or assistance that may be required. An Accountant on Rs. 12 will be provided in the Resurvey Staff for the purpose. The Tahsildar may appoint an acting Accountant in the place of the permanent man on special duty.

(6) When work is about to be started in a *Pakuthy*, the Superintendent of Survey will notify the fact in the Government Gazette.

*Traverse Survey and Plotting.*

(7) All old traverse stations for which there are traverse records will be examined on the ground. Missing Station Stones will be replanted and necessary repairs done to those requiring repair, in accordance with the original survey measurements, where-ever possible,

(8) Where the positions of missing theodolite stones fall in the bed of a river, in the middle of a road, or in other inconvenient situations, the new stones should be fixed in convenient places, and a fresh survey made for the new stones, connecting them with the nearest available old theodolite stones.

(9) Additional traverse survey will be required in the following cases :—

a. The limits of occupied lands in waste survey numbers for subdividing them into blocks of about 100 acres.

b. The boundaries of Forest Reserves situated within or adjoining a village boundary, and

c. The boundaries of fields over-grown with jungle and un-suited for traingulation with chain.

(10) Traverses will be set up for all lines newly surveyed with the Theodolite; and with the old and new traverse sheets, a skeleton village map will be plotted on scale 16"=1 mile.

#### *Field Demarcation.*

(11) Field stones which are now found on the ground and which correctly mark the boundaries of fields should be used in the Resurvey, unless they are far below the prescribed dimensions. Where the necessary marks are not found on the existing stones, the marks should be cut on them.

(12) Where the old marks have disappeared or do not correctly mark the present boundary of a field or sub-division, new stones should be planted according to the existing limits of enjoyment and in doing so, care should be taken to see that the Resurvey field boundary follows substantially that of the original survey field boundary and that the extent does not exceed (5) five cents. The exception to this rule will be in the case of village boundaries where missing marks should be replaced in accordance with the original survey measurements.

(13) In demarcating the boundary between *Patta* field and Government Waste, care should be taken to ascertain whether there has been any encroachment. If there is none, or the encroachment found is less than 10 links in width or 5 cents in area, the demarcation may follow the present limits of enjoyment. Encroachments of greater extent should be marked out as sub-divisions of the waste number, for registry as *Pudawal* in the name of the occupant,

(14) In the case of boundaries between *Patta* lands and *Porambokes*, the demarcation stones will be planted strictly according to the original measurements. All encroachments detected will be shown in a tracing from the field measurement plan in hatched lines with the measurements required.

(15) Where the survey marks defining the boundary between two adjoining survey fields have been obliterated by reason of the two fields or portions of them being now in the enjoyment of one and the same individual, the missing stones need not be replaced if the fields are of the same description of soil and tenure. Where the survey fields are of different descriptions of soil and tenure, new stones should be planted according to original survey measurements, if available and sufficient for the purpose. If no sufficient measurements are available, the common boundary should be laid down with reference to the original survey village map.

(16) Additional demarcation will be required in the following cases :—

- (a) *Puduwals* registered and subdivisions formed *after* the original survey, by the Settlement and Revenue Departments,
- (b) new roads, channels &c., that have come into existence after the original survey, and
- (c) subdivisions of waste survey numbers (likely to be taken up in the near future) into about 5 Acre blocks.

(17) In the case of subdivisions for field channels and lanes, the subdivision stones will be planted only if they are at least 10 links in width. But the measurements of *all* subdivisions (even though less than 10 links in width) should be taken for plotting them correctly in the Field Measurement Book.

(18) In demarcating *Puduwals*, if a registry-holder has not occupied the whole registered area, and there be unregistered lands adjoining, the exact extent will be demarcated for him by including the requisite unoccupied area also.

- (19) If more than the registered area has been occupied:
- (a) the exact registered area will be cut out for the registered sub division, and
  - (b) if the excess has been occupied from unregistered land, the excess will be separately demarcated in the name of the occupant for registry as *Pudwal*.

(20) The boundary between registered *Puduvai* lands will be demarcated according to present limits of enjoyments, irrespective of the extent involved.

(21) When land has been registered in one portion of a waste number but the land occupied by the registry-holder is in another place, which, however, has not been registered in the name of any other person, the land actually occupied may be demarcated as the sub-division and registered.

(22) If the sum total of the various registries in a waste survey number be found to be in excess of the area of the waste number, the later registries will be ignored and cancelled.

(23) Waste survey numbers or portions of them that remain still unregistered (but which are likely to be taken up in the near future) will be cut up and demarcated into blocks of about (5) five acres in extent, to facilitate future registry.

(24) In demarcating registered *Puduvais*, pathways of available width will be formed where-ever possible so that there may be excess to each *Puduvai* independently.

(25) In demarcating unregistered and unoccupied *Puduvais*, pathways, 30 links wide, should be reserved, where-ever necessary.

#### *Field Survey.*

(26) In the original survey, each revenue field, as it then existed, was divided into a series of triangles by "Tak" lines and measured as a separate survey field. Those fields, as well as the *Puduvais* since registered, will now be grouped to form bigger survey fields, subject to the following conditions:—

1. The aggregate area of the grouped fields should not be more than two acres in wet land and four acres in dry land.

2. The total number of fields grouped, inclusive of subdivisions, should not be more than ten.

3. Settlement subdivisions of the same description of soil and tenure and also the later subdivisions, namely, registered *Puduvais*, need not be separately demarcated and surveyed, provided they are in the enjoyment of one and the same person.

4. Wet lands and Purayidams should not be clubbed together to form survey fields.



(27) In the case of roads, canals &c., which have come into existence since the original survey, survey fields will be formed in lengths up to 10 chains according to convenience.

(28) In the Resurvey, new numbers will be given to the new survey fields formed by grouping ; and for identification, the old numbers will be entered in the Land Register against the new numbers in the front column, in the same way as the *Olugu* lekkoms were noted therein during the original survey.

(29) *The measurement of no survey field should begin until all the stones on its boundaries and the subdivision stones within it have been planted.*

(30) Each survey field should be divided into triangles by chaining lines from junction to junction of three or more survey fields, and offsets taken from the chain lines to all bends on the field and subdivision boundaries. Where it is not possible to chain lines from trijunction to trijunction, the triangles should be so formed that not only each survey field can be plotted independently, but also a continuous series of triangles may be built up for the whole village so as to facilitate the plotting of the village map.

(31) Fields which are, by their jungly nature or extensive area, unsuited for chain triangulation, will be surveyed with the Theodolite or Circumferenter.

(32) The positions of important topographical details such as village sites, public buildings, channels, cart-tract &c., should be fixed by measurement in the Minor Circuit of survey field in which they are situated, though they are not surveyed as subdivisions ; and they should be correctly plotted according to measurements in the plotted Field Measurement book. The details and their measurements may however, be left in pencil in the Field Measurement Book.

#### *Field Measurement Book.*

(33) As each field is measured, its plan will be plotted in a field measurement book, the measurements of the field being entered neatly and legibly in the plan. The Field measurement book must be prepared in duplicate, one copy being for the Survey Department and the other for the Land Revenue Department.

(34) The scale on which the fields should be plotted will depend on their area, thus.

up to 5 acres, Scale 1 Inch = 1 chain.

From 5 to 20 acres, Scale 1 Inch = 2 chains.

Over 20 acres, Scale 1 Inch = 5 chains.

(35) The area of each survey field and its subdivisions will be taken up by the field surveyor with the area square from the plotted plan in the Field Measurement Book, and entered in pencil on the plan.

#### LAND REGISTER.

(36) As each field is measured, particulars regarding the field will be entered in the Land Register. The present area taken by the surveyor from the field plan will be entered in pencil in the Land Register also.

#### VILLAGE MAP.

(37) The skeleton village map plotted from the traverse sheets will be filled in by plotting the fields from the Field Measurement Books.

(38) Subdivisions of survey fields (*i. e.* the individual numbers of the newly formed grouped field) need not be shown in the village map.

(39) The areas of survey fields and of subdivisions will be retaken in the office with the area square from the Field Measurement Book and compared with the areas given by the surveyor. Any material difference found should be verified by re-computation. The areas computed in the office should be preferred to those taken in the field.

(40) The area of each survey field will be taken from the village map with the computing scale and compared with the areas in the Field Measurement Book. The difference, if any, should be investigated by re-computation and examination of the plotting. The area taken from the Field Measurement Book should be preferred to those obtained from the village map.

(41) The old shapes and areas of the Government Wastes and of *Porambokes* will be compared with their present shapes and areas, to ascertain whether the instructions regarding the treatment of encroachments in Rules 13 and 14 have been properly carried out. Any discrepancies or omissions found will be sent out for examination in the field, and all the records corrected after final adjustment of the differences.

(42) The traverse area of the village (after correction for offsets on the boundary) will be compared with the total of the field areas. The difference should not exceed one per cent.

(43) The final areas obtained in the above manner will be entered in the Field Measurement Book, the Land Register and the Area List.

(44) The topographical details measured will then be plotted on the village map, the names printed, and the map completed for printing.

#### GENERAL.

(45) Complaints regarding the demarcation and survey of any land should be made in writing, and within 15 days after the completion of the survey of the land, to the officer in charge of the Survey Party, who will after enquiry and investigation, pass decision, and communicate the same to the parties.

(46) As soon as the complaints and appeals, if any, are disposed of, the corrections required according to the decisions will be made on the ground and in all the records concerned. The records will then be closed finally and the village map printed.

(47) The following records will be supplied to the Land Revenue Department.

1. Village map.
2. Area List.
3. Land Register.
4. Field Measurement Book.
5. Statements of encroachment on *Perambokes* and Waste lands.

(True copy)

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Statement of Subdivisions of Survey Numbers,  
made since the Settlement in No. Pakuthy,  
Nedumangad Taluk.

Survey Number.	Sub-division No. or letter.	Area.		No. and name of Pattadar.	Patta No. and name of present holder.	Remarks.
		Acres.	Cents.			

Statement of *Puduwals* registered and applied for, since the Settlement in  
No. Pakuthy, Nedumangad Taluk.

Survey Number.	Sub-division No. or letter.	Date of registry, Olugu or application.	Area.		Patta No. and name of registry holder.	Patta No. and name of present holder.	Name and address of applicoant if registry is incomplete.	Remarks.
			Acres.	Cents.				

*Explanation for the Amendments made in the Rules.*

(3) In rule No. 21 it is ordered that if the sum total of the various registries in a waste survey number be found to be in excess of the area of the waste number, the later registries will be ignored and cancelled. To do this, it is found quite necessary to ascertain the dates of the several registries. A new column has therefore been inserted in the "Statement of sub-divisions of survey numbers made since the Settlement". A specimen form is herewith enclosed.

(12) The rule, as it is, fixes no limit as the amount of alteration that can be made, of the original survey field boundary and it is found quite necessary to fix a limit as is done in the case of patta field and Government waste. In the existing rules the procedure to be adopted in laying out the original village boundary, has not been laid down and hence it is added as this is the rule to which it should be attached.

(14) As Field Measurement sketches form part of permanent records, it is not advisable to show the encroachments detected, in them. Tracings of survey fields will be prepared and the encroachment shown in them which will be forwarded, along with the other records, to the Taluk.

(15) The rule, as it is, increases considerably the field work and mapping, as such portions have to be demarcated separately measured and mapped. It is also found by practical working of the rule that it is not necessary to refix the original marks in their correct positions, if the fields are of the same description of soil and tenure. In the Land Register necessary entries will be made giving particulars of portions of whole original survey fields included in the survey field.

(20) At the time of settlement and subsequent to that period, puduvals have been registered. These are what are called Divide sketches. They have not been permanently demarcated and there are no correct measurements. It is not therefore possible to treat them in the same way as the patta fields for which measurements exist.

(23) This is modified to be in accordance with rule 16 (c) and to prevent the whole sale cutting up of unregistered waste areas which are unculturable.

(26) 3. Even with regard to Land Records Maintenance work, the Government have in their letter No. 2084/L. R. and F. dated 15th February 1912 sanctioned the clubbing of settlement sub-divisions and Puduval registries provided they are of the same tenure and are in the enjoyment of one and the same individual. The same procedure, may, with advantage, be followed in the Resurvey also. This will minimise field work and mapping.

(4) In the original rule this was omitted, and it is now found necessary that the same should be inserted.

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### NOTIFICATION.

87/1

Dis. No. ——— of 1921.

Land Revenue.

Under sanction of His Highness the Maha Raja, the following Rules, dated the 19th January 1921, are issued for the guidance of the Officers and staff engaged in the conduct of Puduval Survey under G. O. No. L. R. 12133/1110 of 1920, dated the 30th December 1920.

(By order)

Huzur Cutcherry, ) N. RAJABAM RAO,  
Trivandrum, 19th January 1921. ) *Chief Secretary to Govern-  
ment.*

Rules for the guidance of the officers and staff in conducting Puduval Survey operations, dated the 19th January 1921.

#### *Preliminaries.*

The Officer in Charge of the Survey Party shall communicate to the Tahsildar the probable date of commencement of Survey in each Pakuthy in good time before the starting of operations in the Pakuthy.

2. The Tahsildar shall arrange for statements in the accompanying form, of all puduvals registered and sub-divisions sanctioned since the Settlement, being prepared for each Survey Number to be dealt with by the Survey Department, and for the statements being furnished to the Party Officer before the date fixed for the starting of operations in each Pakuthy.

3. The Tahsildar shall also forward to the Party Officer all the "divide" sketches and plotted sub-division sketches and group or key sketches relating to the Survey Numbers mentioned above, before the date fixed for the starting of operations in each Pakuthy.

4. The Party Officer shall report the probable date of commencement of survey in each Pakuthy, to the Superintendent of Survey, who shall publish the same in the Government Gazette, by a notification as per Section 6 of Regulation X of 1094.

5. When work is about to be started in each Survey Number, the Party Officer shall publish the fact in the Taluk Office Proverthy Cutcherry, and in the land itself.

#### *Demarcation and Survey.*

6. The limits of the Ayakut and other fields that adjoin the Survey Number will be verified with reference to the original survey measurements; and the common boundary between the Survey Number and the adjoining survey fields will be correctly refixed.

7. The outer boundary of the Survey Number will be surveyed with Theodolite, if it has not been so surveyed during the original survey.

8. Additional traverse lines will also be surveyed.

(a) for subdividing the minor circuit into blocks of about 200 acres (for facility in plotting),

(b) along the boundaries of the Reserved Forests, and

(c) for surveying (1) registered divide Numbers of large extent (2) fields overgrown with jungle, and (3) rocky areas, (all these being unsuited for Chain Survey).

9. The holdings registered already by the Settlement of Revenue Departments, will be first demarcated and surveyed. The sketches and the particulars available in the statements received from the Revenue Department should be consulted in locating the registries and determining their boundaries, although they cannot be *strictly* followed in many cases. The points mentioned in the succeeding paras 10 to 23 should also be kept in view in demarcating the registered holdings.



10. Demarcation stones already found on the ground may be accepted and utilised in the present survey, if they are of the prescribed dimensions and description, and also correctly mark the boundaries of fields. If not, they shall be removed and demarcation renewed correctly.

No stone, old or new, shall be accepted if it is not of the prescribed size and description.

11. The boundary between one registered puduval and another shall be demarcated according to the present limits of enjoyment.

12. When the land has been registered in one portion of a Survey Number, but the land occupied by the registry holder is situated elsewhere within that Survey Number, the land actually occupied may be demarcated as the registered subdivision.

13. When a registry-holder has not occupied any place in the Minor Circuit, the land indicated as his divide number by the Olugu or 'divide' sketch may be demarcated for him, provided that that portion of land has not been occupied by any other registry holder. If it has been occupied by any other registry-holder, the registered extent will be demarcated in some place where unregistered land is available.

14. When the area in the occupation of a registry-holder exceeds the registered area by 6 cents or more the excess area will be cut off as a sub-division for future registry in the name of the occupant if it adjoins unregistered land.

15. When the area in the occupation of a registry-holder is less than the registered area by 6 cents or more the deficit shall be made up as far as possible, if there is unregistered land adjoining it, by treating the latter or a portion of it as part of the registered divide number.

16. If permanent improvements have been made in unregistered land, the extent occupied will be demarcated for registry in the name of the occupant.

17. Adjacent 'divide' Numbers which are of the same tenure and 'tharam' and in the ownership of the same person need not be separately demarcated, but may be clubbed as one field.

18. If in the unregistered portions of minor circuit, there are any blocks over 10 acres in extent, such of them will be cut up and demarcated into blocks of about 10 acres in extent according to the configurations of the ground in order to facilitate future registry.

19. Rocks and rocky portions, which are unfit for cultivation, need not, however, be cut up into 10-Acre blocks, whatever their extent may be.

20. If the Survey Number contains any lands for the registry of which Government sanction or the approval of other Departments is necessary, the Party officer will report such cases promptly for orders as to whether those lands should be cut up into 10-Acre blocks or not.

21. Railways, cart-tracks, foot-paths and channels, which are now seen in the Minor Circuits, will be demarcated as such in the present survey.

22. In demarcating unregistered puduvals and waste lands, new pathways (30 links wide) shall be demarcated wherever necessary, so that there may be access to each puduval and Government lands. They shall also be laid out in as easy gradients as may be possible in the locality.

23. Similar pathways will be laid out in the demarcating registered puduvals also, wherever possible, and to the available width.

24. The lands will be surveyed in the "Triangles and Offsets" system.

25. For this purpose, the registered 'divide' Numbers and the newly formed sub-divisions may be grouped to form survey fields, subject to the following conditions. :—

(1) Wet lands and purayidams should not be put into one survey field.

(2) The total area of the grouped fields should not exceed 2 acres in wet land and 5 acres in purayidam.

(3) The sub-divisions in the survey field (newly formed) should not exceed five.

26. The measurement of no survey field shall be begun until all the stones on its boundaries and the sub-division stones within it have been planted.

#### *Preparation of records.*

27. As each field is measured, its plan will be plotted to scale, and the measurements will be entered neatly and legibly in the plan.

28. The scale in which the fields should be plotted will depend on their area, as shown below :—

- Fields up to 5 Acres ... Scale 1" = 1 Chain.
- „ above 5 up to 20 acres. „ 1" = 2 Chains.
- „ over 20 acres ... „ 1" = 5 Chains.

29. The 'divide' numbers given to the registered puduvals by the Settlement and Revenue Departments, shall be retained for them ; and new sub-numbers in continuation of the last 'divide' number as per statement received will be assigned to the unregistered lands newly demarcated.

30. The area of each Survey Number and its sub-divisions will be taken by the Surveyor with the area square from the plotted plan and entered in pencil on the plan.

31. As each field is measured, particulars regarding the field shall be entered by the Surveyor in the Land Register. The areas computed by the Surveyor from the field plan will be entered by him in pencil in the Land Register also.

32. While the unoccupied lands are demarcated and surveyed, lists of Royal and other trees standing on each sub-division shall be prepared in the subjoined forms. The names of the trees to be counted and measured are given in the statement attached to these Rules.

(a) List of *Royal trees* in Survey Number.....  
 .....of.....Pakuthy.

1 Name of Tree.	2 No. of Trees	3 Girth in inches	4 Height in feet (Approximate)	5 Remarks.

(b) List of Reserved and Unreserved trees in Survey Number ... .. of ... .. Pakuthi

(Group... .. of the Schedule for valuation of tree growth.)

Name of Tree	Number of trees	Girth in Inches	Height in Feet (Approximate)	Cubic contents in C. Feet.	Rate per Cubic Feet.	Value.	Remarks.
1	2	3	4	5	6	7	8

NOTE. The Surveyors need fill up only cols. 1 to 4 in the field. The other columns and the number of the group in the heading will be filled up in the Office.

33. Traverses will be set up for all lines newly surveyed with the Theodolite; and a skeleton map of the minor circuit will be plotted from the traverses, on scale 16" to a mile. The skeleton map will be filled in by plotting the fields from the field measurement plans.

34. The areas of the survey fields and sub-divisions will be computed in the office both from the map and from the field measurement plans. The areas taken from the latter will be compared with those of the Surveyors first and then with the areas taken from the map; and the differences, if any, will be investigated and adjusted, after sending the records to the field also wherever found necessary.

35. The outer boundary of the Minor Circuit shall also be scrutinised; and explanations for differences seen, if any will be called for, if not already submitted with the records.

36. After the survey, plotting, and areas have been finally checked, the final areas will be entered in the field measurement plan, Land Register and Area List.

37. The Topographical details will then be entered in the map of the Minor Circuit and the map completed.

38. As soon as the records of a Minor Circuit are thus completed, the fact will be notified by the Superintendent of Survey in the Government Gazette as per section 11 (4) of Regulation X of 1094. Copy of the notification will also be published in the Taluk and Pakuthi Cutcheries.

39. The Party Officer shall then give notice to the registry holders as per section 12 (1) of the Travancore Survey and Boundaries Regulation, in the case of all registered pudaivals. The notice shall be in the form of extract from the Land Register relating to the registered pudaival.

40. Disputes about boundary, which arise during the demarcation and survey, will be enquired into and disposed of by the Party Officer.

41. The appeals that may be preferred against the Party Officer's decision or after the receipt of notice under section 12 (1) of Regulation X of 1094, will be disposed of by the Superintendent of Survey ; and the corrections that may be ordered in the appeal decisions will be made on the ground and in the records concerned.

42. The records will then be finally closed ; and the following records will be supplied to the Tahsildar for each Minor Circuit.

- (1) Map on Scale 16"—1 Mile.
  - (2) Copy of Field Measurement book.
  - (3) Land Register.
  - (4) Area List.
  - (5) List of Royal trees in the unoccupied lands, and
  - (6) Valuation Lists of reserved and unreserved trees in the unoccupied lands.)
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**LIST OF TREES TO BE COUNTED AND VALUED IN ASSIGNING  
PUDUVAL LANDS. (*Vide Rule 32 b.*)**

No.	Name of tree.
1	Aujili
2	Kongu
3	Venga
4	Edankorna (Pathiri)
5	Thembaru
6	White cedar (Agil)
7	Irul (Kadamaram)
8	Venteak
9	Punnappa
10	Cherupunna
11	Red cedar
12	Vaka
13	Karinthakara
14	Karivaga
15	Myia
16	Manjakadambu
17	Karimaruthu
18	Poovan
19	Multuvengai
20	Maruthi
21	Unuam
22	Vekkali
23	Venkotta
24	Kadukka
25	Nangu
26	Pyne
27	Puvarasu
28	Ohokkala
29	Mavu
30	Puli
31	Illuppei
32	Pasakottai
33	Theeli
34	Morala
35	Kolapala
36	Mattipal
37	Kanjiram
38	Puthankolli
39	Karanjili
40	Vellaini
41	Malaveppu
42	Shenburantbi
43	Pohpathiri
44	Karuva
45	Ilapungu
46	Konna
47	Nedunar
48	Gnaval
49	Karinjaral
50	Ohavarai
51	Karivelam
52	Parambo
53	Kadapala
54	Ningal (Niroli)
55	Kurangan
56	Vadapla (Kar-Ayivi)
57	Nannai (Thirippu)
58	Incha
59	Vemaram
60	Shorea talura (Botanical name)
61	Ilavu
62	Oheni
63	Malayuram
64	Bamboos
65	Firewood

Dis. No. 115 of 1922/Revenue.

IN VIRTUE OF THE POWERS VESTED UNDER SECTIONS 14 AND 32 OF THE TRAVANCORE SURVEY AND BOUNDARIES REGULATION, X OF 1094, AND IN EXERCISE OF THE GENERAL POWERS VESTED IN THEM, THE GOVERNMENT OF HIS HIGHNESS THE MAHA RAJA ARE PLEASED TO MAKE THE FOLLOWING RULES FOR THE MAINTENANCE OF LAND RECORDS, IN SUPERSESSION OF THE RULES, DATED THE 24TH DECEMBER 1914.

## PART I.

### SURVEY MARKS.

1. Survey marks shall ordinarily consist of two classes :—

- (1) Theodolite stones.
- (2) Field stones.

2. (1) Theodolite stones are the marks placed at stations where the Theodolite is set up, whether on the Village boundary or on that of the Khandoms, Minor Circuits, etc. Their positions are marked on the Village map and measurement sketches.

(2) Field stones are the marks placed at the bends and trijunctions on the boundaries of survey fields and subdivisions ; and include boundary, Khandom and other offset stones. Their positions are marked on the Village map and measurement sketches.

3. The above two classes of stones shall be of the following descriptions and dimensions :—

(1) Theodolite stones—of durable quality, roughly squared, of dimensions measuring 3' x 9" x 9" for Village boundaries, 2'—6" x 8" x 8" for Khandom lines and 2' x 6" x 6" for sub-Khandoms and minor circuits with a plummet hole  $\frac{3}{4}$ " deep cut on the top and a shank mark  $\frac{1}{4}$ " deep cut on one of the sides.

(2) Field stones—of durable quality, roughly squared, of dimensions measuring 2' x 6" x 6" with a shank mark cut  $\frac{1}{4}$ " deep on one of the sides.

*Exception 1.*—Survey marks which have been duly planted under proper authority before the issue of these rules, if they are not below 2'—6" x 6" x 6" in the case of theodolite stones and 1'—8" x 4" x 4" in the case of field stones, shall be



deemed to be of the prescribed dimensions or description and need not be re-placed on that account ; but when a stone is missing, the new stone to be put in its place shall invariably be of the prescribed size and description.

*Exception 2.*—In *Punjabdom* lands and backwaters, theodolite stones shall be 8" square and 5 to 8 feet long according to the needs of the locality and field stones shall be of dimensions varying from 4' x 6" x 6" to 8' x 8" x 8" according to the needs of the locality. When the water is however too deep even for stones of the above mentioned size being planted, hard and stout cocoanut stems with the shank mark painted in tar near the top shall be planted firmly, so that a length at least of 4 feet may be buried under the ground, and 2 feet may be visible at high tide.

(3) The following symbols shall also be cut on the theodolite stones to facilitate identification :—

(a) On a theodolite stone at the Village trijunction, a triangle ( $\frac{1}{4}$  inch deep) enclosing the plummet hole.

(b) On a theodolite stone at any other point on the Village boundary, two lines ( $\frac{1}{4}$  in. deep) one on either side of the plummet hole, in the direction of the boundary line.

(c) On a theodolite stone on the khandom line, a circle ( $\frac{1}{4}$  inch deep) enclosing the plummet hole.

4. The responsibility to maintain the survey marks in good repair, and renew them, if missing, shall rest on the persons as indicated below :—

<i>Position of Survey mark.</i>	<i>Person responsible.</i>
(a) When the mark is situated within the boundaries of a registered field or sub-division.	The registered-holder of that field or sub-division.
(b) When the mark is situated on the boundary between a <i>poramboke</i> field or sub-division and a registered field or sub-division.	Do.
(c) When the mark is situated on the boundary between two or more registered survey fields or sub-divisions.	The registered-holder of the field or sub-division on whose northern or eastern boundary the mark is situate.

5. (1) In every case where survey marks have to be repaired or renewed by registered-holders, the Accountant or Assistant Tahsildar or other officer appointed for the purpose shall give notice to the registered-holder concerned in Form I A hereto annexed, calling upon him to repair or renew the same within seven days of the service of the notice on him either (a) personally or (b) by affixture at his ordinary residence or place of business and in the Pakuthi Cutcherry.

(2) On failure or refusal of the registered-holder to comply with the requisition, the necessary work shall be done by the Accountant or Assistant Tahsildar or other officer appointed for the purpose, and the cost thereof shall be recovered as an arrear of land revenue as provided in Section 10 of Regulation X of 1094.

6. A stone Register shall be maintained by the Accountant in the following form for all the stones on the boundaries of *poramboke* lands :—

Survey No. and its Sub-division No. or letter.	Serial No. of the stones in the field.	Whether theodolite (A) or field (B) stones.	Survey No. of the field or subdivision, the registered-holders of which are responsible for the maintenance of the stone.	Year 109		M. E.
				Accountant's date of inspection and result.	If renewed or repaired by registered holder, date of verification by Accountant.	Initials of the inspecting officers in token of renewal or repair executed by them or in verification of Accountant's entry in column 6.
1	2	3	4	5	6	7

*Note.*—Each stone should have a separate line in the Register.

7. (1) The Accountant shall first prepare from the Settlement Register a list of all *porambokes* in the Pakuthi. He shall then correctly refix the boundaries of the *porambokes* with reference to the original survey records and shall renew all the missing stones. He shall then measure each *poramboke* in such a way as to admit of its independent plotting and prepare a field measurement sketch on a sufficiently large

scale. In this plotted sketch, not only the theodolite stations within or on the boundary of the *poramboke* number, but also those lying close to the *poramboke* number although they may be entirely within the adjoining fields, should be marked and indicated by the proper symbols.

(2) All theodolite and field stones marked on the sketch shall be numbered consecutively in the plotted sketch in one series irrespective of the class of stones. The counting of the stones shall be made from right to left (counter clockwise) beginning from the south-east corner of the field.

8. Columns 1 to 4 of the Stone Register shall be filled up from the Village map and the plotted sketches. Care must be exercised in filling up column 4, *viz.*, the fields the registered-holders of which are responsible for the maintenance of stones. If the stones to be repaired or renewed lie within *porambokes* or on the boundary between two *poramboke* fields, the word 'Government' shall be noted in column 4.

9. The Accountant must inspect every theodolite and field stones planted on the *Poramboke* side, at least once in a year. If the Accountant finds a stone in its proper position, he shall merely enter the date of inspection in column 5 of the Register. In other cases, he shall add to this entry the words "missing", "out of ground", "buried", or "overgrown" as the case may be. If the stones are renewed or repaired by the registered holders, the Accountant shall note the fact in column 6 of the Register, with the date of his verification and initials.

If the missing stone cannot be replaced owing to its position now falling in a river bed, road, channel or railway, the Accountant shall note the fact in the Register. The stone shall then be abandoned after inspection by the Assistant Tahsildar.

10. The Assistant Tahsildar shall, during his visit to the Pakuthi, inspect as many stones as practicable whether previously inspected by the Accountant or not. When the result agrees with the Accountant's entry, if any, he shall merely enter his initials in the same column of the Register. Where it differs, he shall score out the Accountant's entry, and make his own. Where there is no entry of inspection by the Accountant, he shall note the result of his inspection in column 5 in the manner prescribed in the preceding rule.

11. On the first of every month, the Accountant shall prepare from the Stone Register an extract showing (a) the number of theodolite and other stones verified, missing or out of repair and (b) the number of stones repaired or renewed by the ryots or by himself during the previous month, and send this extract with his signature to the Assistant Tahsildar.

12. The Assistant Tahsildar shall check the Stone Register with the extract during the visit in the Pakuthi.

13. If any theodolite stones are entered in the Register as missing or out of repair, the Assistant Tahsildar shall refix them with reference to the original traverse records.

14. To provide an easy accessible stock from which renewals may be effected, the Assistant Superintendent of Survey shall arrange to store in each Pakuthi, in the custody of the Proverthicar, a few theodolite and a number of field stones of the proper sizes and descriptions. The number of stones to be stored shall be regulated by the Assistant Superintendent of Survey from time to time according to necessity.

A Stock Register showing the number of stones received and sold or issued on indents shall be kept by the Proverthicar in Form No. 2 appended.

The Tahsildar, the Assistant Tahsildar and the Assistant Superintendent of Survey shall, during their inspections check the Stock Register with the number of stones in the depot and also see if the register is properly maintained and if the necessary chellans are forthcoming.

15. The Assistant Tahsildar shall issue a pass list to the contractor, in Form No. 9 appended after carefully measuring and testing the quality of each stone and give the original pass list to the contractor and send the duplicate direct to the Assistant Superintendent of Survey.

16. The contractor shall submit his bills, in Forms Nos. 10 and 11 appended attaching the pass lists granted by the Assistant Tahsildar as vouchers.

17. The Assistant Superintendent of Survey shall carefully scrutinise the bills so submitted and pass them for payment.

18. The prices of stones at the Pakuthi depot shall be fixed and notified by the Assistant Superintendent of Survey according to the terms of the agreement made with the

stone contractor. It shall include the cost and other charges at the quarry plus the transmission charges to the depot. The total cost of stones including transmission and other charges shall first be debited to "Survey Advance—Land Records Survey." All sales to the ryots shall be for cash, and the sums so realised shall be remitted into the Taluk Treasury with a chellan to the credit of the abovesaid account head.

19. The Accountant or the Assistant Tahsildar shall obtain the required number of stones on indent from the depot. The indent shall be in triplicate in Form No. 3 appended. The original will be kept by the Accountant or the Assistant Tahsildar as his office copy. The duplicate copy will accompany the bill sent to the Assistant Superintendent of Survey by the Assistant Tahsildar for the stones renewed by him and the Accountants. The triplicate is to accompany the monthly stone account of the depot submitted by the Proverthicar to the Assistant Superintendent of Survey.

20. The Accountant shall prepare bills (in duplicate as per Form Nos. 4 and 5 appended), one for the stones repaired and renewed by him in Government properties, and the other for those renewed and repaired in the properties of defaulting registered-holders, and submit them to the Assistant Tahsildar with the necessary vouchers for the charges incurred in carrying out the work. The Assistant Tahsildar shall verify the accuracy of the bills and submit them to the Assistant Superintendent of Survey. Similarly, the Assistant Tahsildar shall prepare bills for the renewals and repairs done by him and send them to the Assistant Superintendent of Survey.

21. The Assistant Superintendent of Survey shall cause these bills to be checked and draw the amount in bills headed "Survey Advance—Land Records Survey". He shall also send statements of the expenditure chargeable to Government in Form No. 4 and also statements in Form No. 5 for the sums recoverable from registered-holders, to the Account Officer. The latter officer shall arrange for the Survey Advance standing against the Assistant Superintendent of Survey being adjusted by debiting the former to contingent expenditure for "Land Records Survey" and transferring the latter to "Survey Advance—Tahsildars".

22. Should the Proverthikar be unable to collect, within three days, the sums shown in column 15 of Form No. 5, he shall post the full entry relating to each outstanding in a separate statement (Form No. 7 appended) for each pattadar. The statement shall be in duplicate, and one copy of it shall be served on the pattadar and the other sent to the Taluk Cutcherry with an endorsement as to what has been done. The Tahsildar shall then issue demands and take such coercive steps as may be necessary for the recovery of the amount due.

23. An annual return shall be submitted by the Tahsildar to the Division Peishkar, in Form No. 8 A appended, of the total number of stones on the side of *poramboke* in each Pakuthi, the number inspected during the year, the number missing or requiring repair and the number repaired or renewed. A duplicate copy of the same return shall also be forwarded by him to the Superintendent of Survey through the Assistant Superintendent. The Division Peishkar and the Superintendent of Survey shall append a consolidated statement, in the same form, for the whole Division or State, as the case may be, to the Annual Administration Reports forwarded by them to the Land Revenue and Income-tax Commissioner. They should also specifically state, in their reports, how far the maintenance of survey marks was properly attended to during the year.

24. In the re-surveyed taluk of Nedumangad, all the stones on the sides of *porambokes* should be inspected once in every year and all the stones fixed on the boundaries of survey fields once in every three years. The theodolite stations should also be verified along with the field stone once in three years. The stones fixed on the boundaries of subdivisions, except those on the sides of *poramboke* subdivisions, need not be verified.

## PART II.

DEMARCATION AND SURVEY OF PUDUVAL SUB-DIVISIONS, AND OF SUB-DIVISIONS, NECESSITATED BY POKKUVARAVU, LAND ACQUISITION, KARAMPATHIPPU, etc.

(i) *Puduvai Sub-Divisions.*

25. For the Minor Circuits in which, according to the accounts, lands are available for registry, the Proverthicar should prepare a key map showing all the sub-divisions registered at the time of Settlement and later on up to date. Then the land available for registry according to the accounts should be inspected with the help of this key map, and if it is found that the land has not been registered in anybody's name, the Proverthicar shall demarcate the land and survey it in such a way that it can be plotted independently.

If, however, the lands available lie together, they may be clubbed together to form survey fields, treating each holding as a separate sub-division, and plotted together. In doing so, the holdings so clubbed should not be over-five sub-divisions.

26. In the case of backwaters, a key-map showing all the sub-divisions registered at the time of Settlement and later on up to date should be prepared. With this key-map, the Accountant should proceed to the ground, refix the backwater boundary according to the original measurements, and then demarcate and survey all the holdings according to the extent registered for them. The excess area should be dealt with in accordance with the revised Puduvai Rules dated the 31st March 1921.

27. In minor circuits where waste areas have been split up into small blocks by the Survey Department, sub-divisions may become necessary. In such cases, the portions applied for should be demarcated as sub-divisions of the blocks and plotted in a tracing made from the field measurement sketch prepared by the Survey Department.

28. Should the demarcation and survey of a registered holding within a minor circuit disclose any excess in area over the registered extent, such excess shall, as far as possible, be utilised for providing the necessary pathways to the other holdings. If the provision of a pathway is unnecessary, the whole of the excess shall be brought under registry.

29. In cases where, for the purpose of sale or registry waste survey fields of large extent are split up into small blocks or where new formation of land or unsurveyed areas are demarcated and surveyed, the new fields so created shall be given serial numbers in continuation of the last survey number of the Pakuthi to which they are attached.

30. In survey fields which have already been sub-divided at the time of Settlement, the new sub-divisions shall be given sub-numbers in continuation of the last sub-number of the fields, viz., if a survey field originally contained 15 sub-divisions and 5 new sub-divisions are made, the new sub-divisions should be numbered 16, 17, 18, 19 and 20.

If letters have been assigned to the sub-divisions at the time of the Settlement or later on such letters shall be retained for these sub-divisions, but the new sub-divisions shall be numbered 1, 2, 3 and so on.

31. In cases where a portion of a *poramboke* field is transferred to assessed waste for registry, it shall be demarcated and surveyed as a sub division of the whole *poramboke* field and plotted within the survey number with all the previous sub-divisions, if any, in it.

(ii) *Fokkuvaravu, Land Acquisition, and Karam-pathippu Sub-Divisions.*

32. All old sub-divisions, Settlement and post-settlement shall be demarcated and surveyed by the Accountant, at least whenever they are involved in current cases, according to the rules and with reference to the records of each case. He shall also certify in the plotted sketches that all the stones have been planted.

33. In the taluks that have been surveyed in the 'Tak' system and in the re-surveyed taluk of Nedumangad, the whole survey field with all the sub-divisions in it shall be surveyed and plotted.

34. In the other taluks, it is enough if plotted sketches are prepared for each revenue field with all the sub-divisions in it. The revenue field shall be surveyed in such a way as to admit of its dependent plotting. If the revenue field is however, very large (over 5 acres,) each sub-division may be surveyed separately or the sub-divisions may be grouped for survey according to convenience.



35. *Porambokes* which have been treated as full revenue numbers or survey fields should be demarcated strictly in accordance with the measurements recorded in the original survey.

‘If, however, such *porambokes* have become broader and consequently the original boundaries now fall within the *porambokes*, the *porambokes* should be demarcated and measured as per the existing limits.

*Porambokes* which are Settlement sub-divisions should be demarcated and measured according to the extent recorded for them. The whole revenue field or survey field with all the sub-divisions in it should be measured in such a way as to admit of independent plotting.

(iii) *General.*

36. (1) Seven days before commencing the survey of *puduval* and other sub-divisions, the Accountant shall issue notice, in Form I B appended, to the registered-holders concerned calling upon them to produce survey marks of the prescribed description and dimensions, to clear the boundaries and to render necessary help for the demarcation and survey of the lands.

(2) On failure of the registered-holder to comply with the requisition, the necessary work shall be done by the Accountant or Assistant Tahsildar or other officer appointed for the purpose, and the cost thereof shall be recovered as an arrear of land revenue as provided in section 10 of Regulation X of 1094.

(3) As regard the sale of stones from the Pakuthi depot, the preparation of recovery statements as per Form No. 6 appended and the recovery of cost, the same procedure as described in Rules 18 to 22 of Part I shall be followed.

37. An annual return shall be submitted by the Tahsildar to the Division Peishkar in Form No. 8 B appended, of the total number of *puduval* and other sub-divisions that had to be surveyed at the beginning of the year, the number sanctioned during the year, the number surveyed during the year, &c. The Division Peishkar shall, in his Annual Administration Report forwarded to the Land Revenue and Income-tax Commissioner, note specially whether adequate progress has been made in the survey of *puduval* and other sub-divisions during the year and attach thereto a statement

for the whole division in the aforesaid Form. The Land Revenue and Income-tax Commissioner shall, with his Annual Report forward to Government a consolidated statement for the whole State in the same Form.

(iv) *Field Measurement Sketches.*

38. The Field Measurement sketches shall be of uniform size viz., 13" x 13". The scale to be adopted for plotting is as follows :—

*Scale.*

Fields up to 5 acres	1"=1 chain.
Fields from 5 to 20 acres	1"= 2 chains.
Fields over 20 acres	1"=5 chains.

*Exception.*—Small fields which are less than one acre, and in which measurements could not be clearly noted, should be plotted on a scale of 2 inches to one chain.

The sketches shall be neatly inked, and the areas shall be computed by the Accountants and noted in the sketches. He should take care to compare his areas with those noted in the Settlement Register and in the *Puduval Pokkuwaravu*, and other cases. The sketches thus finished shall then be sent to the Assistant Tahsildar.

39. The Assistant Tahsildar shall scrutinise the sketches and after rectifying discrepancies, if any be found, and examining the fields on the ground, dispose of the Pokkuwaravu cases in accordance with the instructions contained in the Revised Rules issued by Government for the disposal of Pokkuwaravu cases, dated the 6th March 1921.

40. The Assistant Tahsildar shall submit the sketches to the Survey Office where they will be checked by the Computer-Draftsmen. The sketches will then be returned to the Tahsildar for record in the Pakuthi Cutcherry.

## PART III.

DUTIES OF THE SEVERAL OFFICERS IN CONNECTION WITH  
LAND RECORDS MAINTENANCE.(i) *Duties of Accountant.*

41. (1) The duties of the Accountant are (a) the inspection of *porambokes* and detection of encroachments, and the survey, demarcation and plotting of *poramboke* survey numbers and sub-divisions, (b) the demarcation, survey and plotting of settlement and post-settlement sub-divisions of all survey numbers or revenue fields in which current sub-divisions have to be surveyed, and (c) the demarcation and survey of current sub-divisions.

(2) He shall inspect all the *porambokes* once a year and attend to the repair and renewal of all the field stones on their sides. When an encroachment is observed, he shall prepare a sketch of the *poramboke* number showing the measurements, area and nature of the encroachment and the name and address of the person responsible for the encroachment, and submit the sketch to the Assistant Tahsildar.

(3) In surveying *puduval* and other sub-divisions, he shall first identify all the old survey marks in the survey or revenue fields with reference to the old measurements and execute the necessary repairs or renewals. He shall then plant the stones required for the new sub-divisions, and on completion of the stone-planting, take the side measurements of the sub-divisions and the necessary offsets to the bends on the sides of the new sub-divisions.

(4) The Accountant shall then plot the field with the new sub-divisions in it, to the proper scale, ink the sketch neatly, compare the areas of the sub-divisions and enter the same in the sketch and submit the sketch through the Proverthicar to the Assistant Tahsildar.

(5) Before the 5th of every month, the Accountant shall submit two returns to the Assistant Tahsildar, one showing the survey marks verified, renewed and repaired during the previous month and the other showing the survey numbers in which sub-division were effected during the previous month, the sub-divisions surveyed, the number of old stones attended to and of new stones put in for the sub-divisions. If no work was done, a *nil* statement shall be submitted.

(6) Every Accountant shall be thoroughly qualified in survey work. If any be found inefficient, he shall be sent to the Survey School for re-training, such leave as he is eligible for under the Service Regulations being granted to him for the purpose. On production of a certificate of having become qualified, he shall be re-admitted for work in the Pakuthi.

The maximum period allowed for such re-training in the Survey School shall be six months, *i. e.*, two courses of the school. If the Accountant fails to pass in the two chances thus given to him, he shall be discharged from his post.

(ii) *Duties of Proverthicar.*

42. (1) The Proverthicar shall maintain a Stock Register of demarcation stones as prescribed in Rule 14 of Part I, and sell the stones for ready cash to the ryots. The money realised by the sale of stones should be remitted into the treasury from time to time, under "Survey Advance-Land Records Survey."

(2) The Proverthicar shall issue stones to the Accountants and the Assistant Tahsildars on idents given by them.

(3) The Proverthicar shall submit at the beginning of each month an extract from the stock Register to the Assistant Tahsildar who will submit it to the Assistant Superintendent of Survey.

(4) Every Proverthicar shall be thoroughly qualified in Survey work. If any be found inefficient, he shall be sent to the Survey School for re-training, such leave as he is eligible for under the Service Regulations being granted to him for the purpose. On production of a certificate of having become qualified he shall be re-admitted for work in the Pakuthi.

The maximum period allowed for such re-training in the Survey School shall be six months *i. e.*, two courses of the school. If the Proverthicar fails to pass in the two chances thus given to him, he shall be discharged from his post.

(iii) *Duties of Assistant Tahsildar.*

43. The Assietant Tahsildar shall be in charge of the Land Records work in the Taluk and he shall be responsible for the proper conduct of the same.

44. The Assistant Tahsildar shall be out on inspection duty for at least 20 days in a month. He shall, during his visits to the Pakuthies, see that the demarcation, survey and plotting of the *porambokes* are attended to by the Accountants in accordance with the instructions issued.

He should also check on the ground (1) the encroachments reported, (2) 20 per cent of the *poramboke* numbers measured and plotted by the Accountants, (3) 20 per cent of the *pokkuwaravu* sub-divisions, and (4) 20 per cent of the field stones repaired, removed and newly planted in the Pakuthi.

45. He shall also check the plotting of the fair plotted sketches prepared by the Accountants and the areas noted in them and then submit the sketches to the Assistant Superintendent of Survey.

46. He shall, by constant inspection of field work and examination of records, bring to the notice of the Tahsildar and the Assistant Superintendent of Survey any laxity on the part of the Pukuthi officials.

47. He shall check the bills that are submitted by the Accountants on account of the repair or renewal of the survey marks carried out at Government cost. He shall also see that the stones obtained on indent are utilised without delay and that bills are submitted promptly.

48. He shall renew and repair the theodolite stations requiring attention.

49. Before the 5th and 20th of every month, he shall submit a fortnightly Diary in Form No. 12 appended.

50. He shall report to the Tahsildar the inefficient Pakuthi officials who require retraining in Survey.

51. He shall pass the theodolite and field stones delivered by the stone contractor and see if they are of the prescribed size and dimensions and hand them over to the Proverthicar for custody. He shall also grant pass lists to the contractor as per Form No. 9 appended.

He shall also check the Stock Register of stones maintained by the Proverthicar and see that the sunns realised by the sale of stones are remitted into the treasury promptly.

52. The Assistant Tahsildar shall see that the plotted measurement sketches for the *porambokes* are prepared in triplicate.

(iv) *Duties of Tahsildar.*

53. The Tahsildar will generally see if the Land Records work of his taluk is making good progress, and give the necessary help and advice to his Assistant Tahsildar in carrying out the work.

(v) *Duties of the Assistant Superintendent of Survey.*

54. The Assistant Superintendent of Survey will be in charge of Land Records work. He shall during his tours examine the work in the several taluks and see if the Assistant Tahsildars and the Pakuthi officials are doing their work properly and if the rules issued by Government are properly carried out. He shall bring to the notice of Government and the Division Peishkars any laxity on the part of the officers.

Huzar Catcherry,  
Trivandrum, 27th  
January 1922.

(By order)  
} S. PARAMESWARA IYER,  
Secretary to Government.

## FORM NO. I A.

## NOTICE.

1. It is hereby notified that the survey marks noted in the attached lists are missing or out of repair as specified therein.

2. Those interested in the fields specified in column 4 of the lists should execute the necessary renewals or repairs within 7 days of the service of this notice. In default of their doing so, the Accountant, Assistant Tahsildar or other officer appointed for the purpose will take the necessary action, and the charges incurred will be recovered as arrears of land revenue from the land specified in column 4 of the lists.

3. Persons wishing to learn further particulars should apply to the Accountant, who will give all reasonable assistance in the matter.

Station.	Accountant, Assistant Tahsildar or other Officer appointed for the purpose.
Date.	

## FORM NO. I B.

## NOTICE.

1. It is hereby notified that the *Puduvals* and sub-divisions noted below will be taken up for demarcations and survey immediately.

2. Those interested in these lands should produce Survey marks of the prescribed size within 7 days of the service of this notice and render necessary help to the Accountant by clearing jungle, providing and planting stones &c., during the survey. In default of their doing so, the Accountant, Assistant Tahsildar, or other officer appointed for the purpose will do the needful and the charges incurred will be recovered as arrears of land revenue from the person responsible.

3. Persons wishing to learn further particulars should apply to the accountant who will give all reasonable assistance in the matter.

Station.	Accountant, Assistant Tahsildar, or other Officer appointed for the purpose.
Date.	





FORM NO. 3.

Indent for Survey marks

Indent for Survey marks.

Indent for Survey marks.

ORIGINAL.

DUPLICATE.

TRIPLICATE.

*To be retained by the Indenting Officer.*

*To accompany the bill of charges incurred for renewals and repairs of stones, submitted by the Assistant Tahsildar to the Assistant Superintendent of Survey.*

*To accompany the Depot account submitted by the Proverthikar to the Assistant Superintendent of Survey.*

Indent No.

Indent No.

Indent No.

Date.

Date.

Date.

Stone Depot.

Stone Depot.

Stone Depot.

No. and Name of Village.

No. and Name of Village.

No. and Name of Village.

Theodolite stones.

Theodolite stones.

Theodolite stones.

Field stones.

Field stones.

Field stones.

Accountant or Assistant Tahsildar.

Accountant or Assistant Tahsildar.

Accountant or Assistant Tahsildar.

**FORM No. 4.**

Bill of charges incurred for stones planted etc in Government lands in.....Pakuthy .....Taluk During.....109 .

Survey No. of the land.	Description or nature of the land.	Particulars of stones planted.				Particulars of extra cost incurred for carriage and planting.				Line clearing charges.			Total amount.	Remarks.
		Size.	No.	Rate per stone.	Amount.	Particulars.	Rate per stone.	Amount.	Length cleared in chains.	Rate per stone.	Amount.			
				Rs. ch c.	Rs. ch c.		Rs. ch c.	Rs. ch c.		Rs. ch c.	Rs. ch c.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	

(N. B. This statement should be submitted in duplicate.)

Camp.

Date.

Accountant or  
Assistant Tahsildar.

XXXX

FORM

Registered Holder's

Bill of charges incurred for planting stones etc., recoverable from registered holders

Name of Pattadar from whom to be recovered.	Survey No. of the land.	Particulars of stones planted.				Particulars of extra cost incurred for carriage & planting.		
		Size.	Number.	Rate per Stone.	Amount.	Parti- culars.	Rate per stone.	Amount.
				Rs. ch. c.	Rs. ch. c.		Rs. ch. c.	Rs. ch. c.
1	2	3	4	5	6	7	8	9

(N. B. This statement should be submitted in duplicate)

Accountant,

No. 5.

BIII.

in.....No.....Pakuthy.....Taluk during.....109 .

Line clearing charges.			Amount to be recovered from the Pattadar.			Particulars of recovery.		Remarks.
Length cleared in chains.	Rate per chain.		To be credited to survey advance (Total of cons 6, 9 & 12.)	To be credited to Government as miscellaneous receipts viz. Fixed charge at 14 Obs. per stone for the time & labour of the Government staff.	Total of cols. 13 & 14.	Date of recovery	Amount re-covered.	
	Rs. ch. c.	Rs. ch. c.					Rs. ch. c.	Rs. ch. c.
10	11	12	13	14	15	16	17	18

Assistant Tahsildar.





**FORM No. 7.**

Statement of sums to be recovered under Section 10 of the Survey and Boundaries Regulation  
 X of 1094, on account of lands registered in the name of.....  
 .....Pattadar No.....of .....Pakuthy.

Survey No. and Serial No. and class of stones.	Cost of stone			Cost of hired labour.			Line clearing charges.			Renewal or repairing charges at 14 chs. per stone.			Total charges to be recovered.			Remarks.
	Rs.	ch.	c.	Rs.	ch.	c.	Rs.	ch.	c.	Rs.	ch.	c.	Rs.	ch.	c.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

(Certificate regarding mode of service of statement on Pattadar.)

Village

Date.

Proverthicar.

**FORM No. 8 A.**

Annual return of Survey marks on the boundaries of Porambokes, renewed and repaired during the year 109 .....M. E. in.....Taluk.

No. and Name of Village.	Description of stones.	Total number of marks in the Village.	No. of stones inspected.		Among the stone inspected, Number.		No. of stones renewed.		No. of stones repaired.		No. of stones remaining.		Remarks.
			By the Accountants.	By the Inspecting Officers.	Missing	Requiring repair.	By registered holders.	By the Accountants.	By the Inspecting Officers.	By theregistered holders.	By the Accountants	By the Inspecting Officers.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Station.

Date

Assistant Tahsildar.

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**FORM NO. 8 B.**

Annual return of pudaival and other sub-divisions demarcated and surveyed during  
109....., in.....Taluk during 109.....

No. and name of Village.	No. of pudaival and other sub-divisions remaining to be surveyed at the beginning of the year.	No. of pudaival and other sub-divisions sanctioned during the year.	No. of pudaival and other sub-divisions surveyed and plotted during the year		No. of new stones put in for the pudaival and other sub-divisions		No. of old stones.				Remarks
			Of the old sub-divisions as per col. No. 2.	Of the new sub-divisions as per col. No. 3.	Theodolite stones.	Field stones.	Renewed.		Repaired.		
							Theodolite stones.	Field stones.	Theodolite stones.	Field stones.	
1	2	3	4	5	6	7	7	7	7	7	8

100

Station.  
Date.

Assistant Tahsildar.

ORIGINAL.  
STONE PASS LIST NO.

Taluk.

Name of Depot.

Name of contractor.

Date on which passed.	Number of stones passed.				Remarks.
	Theodolite stations. 5' x 9" x 9".	Theodolite stations. 3' x 9" x 9".	Field stations. 4' x 6" x 6".	Field stations. 2' x 6" x 6".	
1	2	3	4	5	6

*N. B.*—The entries in columns 2 to 5 should be in words as well as in figures.

*Assistant Thasildar.*

**DUPLICATE.**  
**STONE PASS LIST NO.**  
 (Not payable at the Treasury.)

**Taluk.**

**Name of Depot.**

**Name of Contractor.**

Date on which passed.	Number of stones passed.				Remarks.
	Theodolite Stations 5' x 9" x 9"	Theodolite stations. 3' x 5" x 9"	Field stations. 4' x 6" x 6"	Field stations. 2' x 6" x 6"	
1	2	3	4	5	6

*N. B.*—The entries in columns 2 to 5 should be in words as well as in figures.

*Assistant Tahsildar.*

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*FORM NO. 9.*

ORIGINAL.

STONES PASS LIST No.

Taluk.

Name of Depot.

Name of Contractor.

Date on which stones were passed.

I hereby acknowledge to have received  
the stones mentioned within.

ഇതുകൊണ്ടു വിവരിച്ചിട്ടുള്ള കല്ലുകൾ ഞാൻ  
ഏറ്റെടുക്കുന്നു.

Date.

തീയതി.

Proverthicar.

പാർശ്വകാർ.

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*FORM NO. 9.*

DUPLICATE.

STONE PASS LIST No.

(Not payable at the treasury.)

Taluk.

Name of Depot.

Name of Contractor.

Date on which stones were passed.

Date of despatch of Pass List to the Head  
Quarter Office.

Date of receipt of Pass List in the Head  
Quarter Office.

Number and date of Contractor's bill in  
which the cost of stones was drawn.

I hereby acknowledge to have received  
the stones mentioned within.

അതുകൊണ്ടു വിവരിച്ചിരിക്കുന്ന കല്ലുകൾ ഞാൻ  
എടുത്തിട്ടുണ്ട്.

Date.

തീയതി.

Proverthicar.

പറയുന്നവർ.

FORM No. 10.

CONTRACTOR'S BILL FOR THE COST OF SURVEY MARKS.

No. ....

To  
The

Treasury Officer,

To \_\_\_\_\_ Contractor for the supply of Survey marks.

for \_\_\_\_\_ Taluk, \_\_\_\_\_ Division.

Cost of stones supplied.	No. of the Pass Lists	No. of stones.	Rate per stone.			Cost.		
			Rs.	ch.	c.	Rs.	ch.	c.
Theodolite stations 5'x9" x 9"								
Do. 3'x9" x 9"								
Field stations 4x6" x 6"								
Do. 2'x6" x 6"								
Total.....								

Rupces (in words) \_\_\_\_\_

Date \_\_\_\_\_

Contractor \_\_\_\_\_

Passed for rupees (in words) \_\_\_\_\_

Camp \_\_\_\_\_

Date \_\_\_\_\_

*Assistant Superintendent of Survey.*

All entries are to be made in the office of the Assistant Superintendent of Survey.

Amount of credit available.		Rs.	Ch.	C.
(1)	Budget grant for M. E.			
(2)	Add additional grant sanctioned in G. O. No. .... dated .....			
	Total .....			
	Deduct			
	Amount of Survey Officer's bills drawn up to date, and			
	Amount of Contractor's bills including this bill			
	Balance available.			

FORM No. 11.

CONTRACTOR'S BILL FOR THE CARRIAGE OF DEMARCATION STONES.

No. \_\_\_\_\_  
 To \_\_\_\_\_  
 The Treasury Officer,  
 \_\_\_\_\_  
 To \_\_\_\_\_ Contractor, for carriage of survey  
 marks to \_\_\_\_\_ Taluk, \_\_\_\_\_ Division.

	Rs.	ch.	e.
Cost of carriage of survey marks as per particulars			

Rupees (in words) \_\_\_\_\_

Date \_\_\_\_\_

Contractor.

The distance entered in this bill are correct.

Date \_\_\_\_\_

Assistant Tahsildar,  
Taluk.

Passed for rupees (in words) \_\_\_\_\_

Camp. \_\_\_\_\_

Date \_\_\_\_\_

Assistant Superintendent of Survey.

These entries are to be made in the Office of the Assistant Superintendent of Survey.

	Amount of credit available	Rs.	ch.	e.
	Budget grant for M. E.			
	Add additional grant sanctioned in G. O.			
No. _____				
Dated _____				
	Total.			
	Deduct			
	Amount of Survey Officers' bills drawn up to date, and			
	Amount of contractor's bills including this bill.			
	Balance available.			

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**BILL FOR THE CARRIAGE OF STONES.**

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BILL FOR THE

Name of quarry.	Village to which stones were carried.	Distance, in miles from the quarry to the Village Depot.	Requisition for stones.		Particulars of		
			No.	Date.	By head-load or by cart or by boat.	Description of the	
						Theodolite	
						4' x 9" x 9'	Rete per stone.
		Bs.	ch.	c			
1	2	3	4	5	6	7	



FORM NO. 12.

Diary of Assistant Tahsildar,.....of  
 .....Taluk, for the.....term of.....109.....

Date.	Village in which encamped.	Village inspected.	Remarks. (Explanation for doing no field inspection.)
1	2	3	4

N. B. All the days in the term should be shown in this page.

Date.

Assistant Tahsildar.

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**FIELD INSPECTION.**

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FIELD

Date.	Name of the Village inspected.	Name of the Accountant whose work was inspected.	Survey of Porambokes.				Field stones inspected out of those repaired and renewed by the Accountant.		
			Survey fields re-measured for fixing correctly the boundaries of porambokes.	Number of chains measured.	Poramboke No. re-surveyed for independent plotting.	Number of chains measured.	Survey Number.	Repaired Number.	Renewed Number.
1	2	3	4	5	6				

n. B. Only the dates on which field inspection was done

INSPECTION.

Theodolite stations refixed by the Assistant Tahsildar	Pokkuvaravn and Puduval sub divisions inspected.			Quality of the work examined. good, fair, indifferent or bad.	Condition of		Field measurement sketches.		Remarks.
	Survey No.	Sub-divisions.	Chains measured.		Instruments examined.	Records examined	Survey Nos. for which plotting was examined	Discrepancies observed.	
7	8			9	10	11	12	13	14

need be entered in this page.

*Assistant Tahsildar.*

Remarks of the Assistant Superintendent.

Name.....

For.....term\_of.....110

ABSTRACT.

Period.	No of Villages inspected.	No. of days spent on field inspection.	No. of days spent at Head Quarters.	No. of days spent on leave or holidays.	Remarks.
During the term					
Up to the term since the beginning of the year.	•				
Total	•				

N. B. — No entries need be made in the places marked'

Dis. No. 1951 of 1926/Revenue.

IN VIRTUE OF THE POWERS VESTED UNDER SECTIONS 14 AND 32 OF THE TRAVANCORE SURVEY AND BOUNDARIES REGULATION, X OF 1094, AND IN EXERCISE OF THE GENERAL POWERS VESTED IN THEM, THE GOVERNMENT OF HER HIGHNESS THE MAHA RANI REGENT ARE PLEASED TO MAKE THE FOLLOWING RULES FOR THE MAINTENANCE OF LAND RECORDS, IN SUPERSESSION OF THE RULES DATED 27TH

JANUARY 1922.

PART I.

SURVEY MARKS.

1. Survey marks shall consist of two classes :—

(i) Theodolite marks.

(ii) Field marks.

2. (i) Theodolite marks are the marks placed at the stations where the Theodolite is set up, whether on the village boundary or on that of the *Khandoms*, Minor Circuits, etc. Their positions are marked on the village map and measurement sketches.

(ii) Field marks are the marks placed at the bends and tri-junctions on the boundaries of survey fields and subdivisions ; and include village boundary, *khandom* and other offset stones. Their positions are shown in the measurement sketches.

3. The above two classes of marks shall ordinarily be granite stones of the following descriptions and dimensions :—

(i) Theodolite stones—of durable quality, roughly squared, of dimensions measuring 3' x 9" x 9" for village boundaries, 2'—6" x 8" x 8" for *khandom* lines and 2' x 6" x 6" for sub-*khandoms* and minor circuits with a plummet hole, 3/4" deep, cut on the top and a shank mark, 1/4" deep, cut on one of the sides.

(ii) Field stones—of durable quality, roughly squared, of dimensions measuring 2' x 6" x 6" with a shank mark, 1/2" deep, cut on one of the side.

*Exception 1.*—Survey marks which have been duly planted under proper authority before the issue of these Rules, if they are not below 2'—6" x 6" x 6" in the case of



theodolite stones and 1' - 8" x 4" x 4" in the case of field stones, shall be deemed to be of the prescribed dimensions or description, and need not be replaced on that account; but when a stone is missing, the new stone to be put in its place shall invariably be of the prescribed size and description, provided that the old stones already in stock are used up first, even if they are undersized.

*Exception 2.*—In Punjabdom lands and backwaters, theodolite stones shall be 8" square and 5 to 8 ft. long according to the needs of the locality; and field stones shall be of dimensions varying from 4' x 6" x 6" to 8' x 8" x 8", according to the needs of the locality.

(iii) The following symbols shall also be cut on the Theodolite stones to facilitate identification :—

(a) On a theodolite stone at the village tri-junction, a triangle ( $\frac{1}{4}$ " deep) enclosing the plummet hole.

(b) On a theodolite stone at any other point on the village boundary, two lines ( $\frac{1}{4}$ " deep), one on either side of the plummet hole, in the direction of the boundary line.

(c) On a theodolite stone on the *khandom* line, a circle ( $\frac{1}{4}$ " deep) enclosing the plummet hole.

4. When stones cannot be planted owing to the position of the survey mark falling on a rock, the survey mark shall be cut on the rock. Squares with 9 inch side 8 inch side, or 6 inch side shall be chiselled, instead of stones of that size, and the shank mark shall be cut adjoining the square. For Theodolite stations, the plummet hole and the symbols mentioned in Rule 3 (iii) shall also be cut inside the square according to the class of survey mark.

5. When the water in the *punjabdom* lands and backwaters is too deep even for stones of the size mentioned in Rule 3, Exception 2 being planted, hard and stout cocoanut stems with the shank mark painted in tar near the top shall be planted firmly, so that a length of at least 4 feet may be buried under the ground and a length of 2 feet may be visible above high-water level.

6. (i) Every registered-holder of land which has been surveyed (and is not at the disposal of Government) shall be bound to maintain in good repair, and renew, if missing, all survey marks situated on or within the boundaries of his holding, as indicated below :—

*Position of Survey mark.*

*Party responsible.*

(a) When the survey mark is situated within the boundaries of a registered field or sub-division.

The registered-holder of that field or sub-division.

(b) When the survey mark is situated on the boundary between a poramboke field or sub-division and a registered field or sub-division.

The registered-holder of the registered field or sub-division.

(c) When the survey mark is situated on the boundary between two or more registered survey fields or sub-divisions.

The registered-holder of the field or sub-division on whose northern or eastern boundary, the survey mark is situated

(ii) When the survey mark is situated within a poramboke or on the boundary between two porambokes, it shall be maintained at the cost of Government.

7. A stone shall be deemed to require repair when,

(a) it is out of the ground, or buried less than  $\frac{2}{3}$  of its length, or entirely covered by  $\frac{1}{2}$  earth or overgrown by vegetation, or

(b) it is out of its correct position.

*Explanation.*—In these rules, wherever theodolite or field stones are referred to, the rule shall apply, so far as may be, to the other kinds of survey marks also, *viz.*, rock-marks and cocoanut stems, mentioned in Rules 4 and 5 *supra*.

8. (i) In every case where survey marks have to be repaired or renewed by registered-holders, the Accountant shall give notice (in duplicate) to the registered-holder concerned, in Form No. I hereto annexed, calling upon him to repair or renew the same within 15 days of the service of the notice on him, as per the procedure prescribed in the Civil Procedure Code relating to service of summons or by affixture on some conspicuous place on the land in question.

*NOTE.*—Whenever notice is served by affixture, the attestation of the occupant of the land, if any, available, and other respectable *thadasthars* shall be taken.

(ii) On failure or refusal of the registered-holder to comply with the requisition, the necessary work shall be done by the Accountant or any of the officers appointed for the purpose, and the cost thereof shall be recovered from the

registered holders responsible for the maintenance of the stones, as per Rule 6 above, as an arrear of land revenue, as provided for in Section 10 of the Travancore Survey and Boundaries Regulation, X of 1094.

9. The cost of renewing a missing stone under Rule 8 shall comprise the following items :—

(i) The actual cost, at the village depot, of a stone of the required size and description, as notified by the Tahsildar.

(ii) The actual cost of hired labour employed for conveying the stone from the village depot to the land and planting it, and

(iii) A fixed charge for the time and labour of the Government Maintenance Staff, which charge shall be calculated at 14 chs. for each stone.

10. The cost of repairing a stone under Rule 8 shall comprise the following items :—

(i) The actual cost of hired labour, if any, employed for clearing jungle and planting the stone correctly, and

(ii) A fixed charge of 14 chs. for each stone for the time and labour of the Government Maintenance Staff.

11. (i) The stones on the boundaries of each poramboke shall be numbered in the plotted sketch of the poramboke number, if available, or in its absence, in a sketch roughly drawn to scale. In this sketch, not only the Theodolite stations within or on the boundary of the poramboke number, but also those lying close to the poramboke number, although they may be entirely within the adjoining fields, shall be marked and indicated by the proper symbols.

(ii) All theodolite and field stones marked on the sketch shall be numbered consecutively in the sketch in one series, irrespective of the class of stones. The counting of the stones shall be made from right to left (counter-clockwise) beginning from the south-east corner of the field.

12. A Stone Register shall be maintained by the Accountant in Form No. II appended, for all the stones on the boundaries of poramboke lands.

13. Column 4, *viz.*, the fields, the registered-holders of which are responsible for the maintenance of stones, should be filled in carefully as per Rule 6 above.

14. The Accountant shall inspect every theodolite and field stone planted on the poramboke side at least once in a year. If the Accountant finds a stone in its proper position,

he shall merely enter the date of inspection in column 5 of the Register. In other cases, he shall add to this entry, the words 'missing,' 'out of ground,' 'buried,' or 'over-grown,' as the case may be. If the stones are renewed or repaired by the registered holders, the Accountant shall note the fact in column 6 of the Register, with the date of his verification and initials.

15. If the missing stone cannot be replaced owing to its position now falling in a river-bed, road, lane, channel, railway or the like, the Accountant shall note the fact in the Register and need not plant the stone.

16. The Revenue Supervisor shall, during his visit to the pakuthi, inspect as many stones as practicable, whether previously inspected by the Accountant or not. When the result agrees with the Accountant's entry, if any, he shall merely enter his initials in the same column of the register. Where it differs, he shall score out the Accountant's entry and make his own. Where there is no entry of inspection by the Accountant, he shall note the result of his inspection in column 5 in the manner prescribed in Rule 14.

17. On the first day of every month, the Accountant shall prepare from the Stone Register an extract showing (a) the number of theodolite and other stones verified, missing or out of repair and (b) the number of stones repaired or renewed by the registered holders or by himself during the previous month, and send this extract with his signature to the Revenue Supervisor.

18. The Revenue Supervisor shall check the Stone Register with the extract during his visit to the Pakuthi.

19. If any theodolite stones are entered in the Register as missing or out of repair, the Revenue Supervisor shall refer them with reference to the original traverse records.

20. To provide an easily accessible stock from which renewals may be effected, the Tahsildar shall arrange to store in each Pakuthi, in the custody of the Proverthicar, a few theodolite stones and a number of field stones of the proper size and description. The number of stones to be stocked shall be regulated by the Tahsildar from time to time according to necessity.

21. A Stock Register showing the number of stones received, and sold or issued on indents shall be kept by the Proverthicar in Form No. III appended.

The Tahsildar and the Revenue Supervisor shall, during their inspections, see if the Stock Register is properly maintained, work out the balance of stock as per the register on the date of inspection, and verify if the balance of stock agrees with the number of stones in the Depot and also if the necessary chellans and indents are forthcoming. They shall also record in the Stock Register the result of their inspections.

22. The Tahsildar shall issue a Pass List, in duplicate in Form No. IV appended, after carefully counting, measuring, and testing the quality of, each stone either by himself or by the Revenue Supervisor, give the original to the contractor and send the duplicate to the Proverthicar direct, who shall, after verifying the number of stones, enter the same in the Stock Register, Form No. III, and return the duplicate to the Tahsildar.

23. The contractor shall submit his bills to the Tahsildar, in Form No. V appended, attaching to Pass Lists granted by the Tahsildar as vouchers. The Tahsildar shall carefully scrutinise the bills so submitted before passing them for payment-

24. The price of stones at the Pakuthy Depot shall be fixed by the Tahsildar and notified in the Government Gazette according to the terms of the Agreement made with the stone contractor. Notice about the price of the stones shall also be published in the Pakuthi Cutcherry by the Tahsildar.

25. The total cost of stones shall be debited by the Tahsildar to "Survey Advance—Tahsildar,..... Taluk."

26. (a) All the old stones shall be disposed of first at their original value whether it is higher or lower than the present market value.

(b) All sales to the ryots shall be for cash and the sums so realised shall be remitted into the Treasury by the Proverthicar with the next remittance, with chellans in triplicate to the credit of the abovesaid account-head.

27. The Accountant or the Revenue Supervisor shall obtain the required number of stones on indent from the Pakuthi Depot, the Accountant's indent being invariably countersigned by the Revenue Supervisor,

28. The indent shall be in quadruplicate, in Form No. VI appended. The original will be kept by the Accountant or Revenue Supervisor as his office copy. The duplicate will accompany the bill sent to the Tahsildar by the Revenue Supervisor for the stones renewed by him and the Accountants. The triplicate will accompany the monthly stone account of the Depot submitted by the Proverthicar to the Tahsildar. The quadruplicate will be retained by the Proverthicar as authority for his issues.

29. The Accountant shall prepare bills (in duplicate) as per Forms Nos. VII and VIII appended, one for the stones planted, repaired and renewed by him in porambokes and unregistered lands, and the other for those renewed and repaired in the properties of defaulting registered-holders, and submit them to the Revenue Supervisor with the necessary vouchers for the charges and also with clear sketches showing the positions wherein stones were planted at Government cost. In these sketches, the letters "G. S." shall be noted in red ink against the stones planted at Government cost.

30. The Revenue Supervisor shall verify the accuracy of the bills and pass them. He shall then issue notices (in duplicate) in Form No. IX appended, under Section 16 (1) of the Travancore Survey and Boundaries Regulation, to the parties affected by the bills. Similarly, the Revenue Supervisor shall prepare bills for the renewals and repairs done by himself and issue notices (in duplicate), in the above form, under Section 16 (1) of the Travancore Survey and Boundaries Regulation, to the parties affected by the bills. He shall then send his own bills and those of the Accountants to the Tahsildar for further action with the duplicate copies of notices in Form No. IX served in the proper manner.

31. The Tahsildar shall cause these bills to be checked in his office. He shall also enquire into appeals, if any, preferred under Section 16 (2) of the Travancore Survey and Boundaries Regulation. After the appeal time expires or after the appeals are disposed of, the Tahsildar shall draw the transport and planting and line-clearing charges passed by him the bills relating to private properties (Form No. VIII) from the Treasury in bills headed, "Survey Advance—Tahsildar ... .. Taluk."

The statements of all the pakuthies in a month shall be bound or permanently stitched with an index for the same attached at the top in the Form No. VIII (A) appended.

32. The Tahsildar shall charge the total amount in the bills of charges incurred for stones planted in porambokes and unregistered lands, as per Form No. VII, to the contingencies of his office under 'demarcation of Government lands.' He shall at the same time credit the value of the stones included in the bill (Form No. VII) to "Survey Advance—Tahsildar."

33. The Tahsildar shall, after posting the fixed charges as per column 14 of the bill in the appropriate revenue registers of the taluk, send one copy of the bill in Form No. VIII for the sums recoverable from registered-holders to the Proverthicar for recovery of the amounts, together with notices in Form No. IX (A) appended. The Proverthicar shall post the amounts to be recovered in a register, to be maintained by him, in Form No. X appended and the amount under fixed charges in Village Account No. 8 and shall have the notices served forthwith on the registered-holders concerned.

At the end of each month, the Proverthicar shall take this register with the chellan receipts for the amounts recovered and remitted into the Treasury to the Taluk Office where all the recoveries will be marked by the taluk subordinate entrusted with the work in columns 16 to 18 of the original copy of the statement in Form No. VIII kept in the Taluk Office and initialled by the Head Clerk.

34. Should the Proverthicar be unable to collect within seven days from the date of service of the notice, in Form No. IX (A) on the registered holders the sums shown in column 15 of Form No. VIII, he shall prepare a list of the defaulters showing the sums due from each and submit it to the Tahsildar.

35. The Tahsildar shall then issue demands and take such coercive steps as may be necessary for the recovery of the amounts due.

36. (a) The Tahsildar or the Revenue Supervisor, if so ordered, shall check whether the Proverthicar is taking prompt action for the recovery of the sums recoverable from registered-holders according to the bills in Form No. VIII, whether the recoveries have been remitted into the Treasury promptly and whether chellans for such remittances are forthcoming.

(b) The Tahsildar shall maintain in his office a register showing the amounts drawn under Survey Advance, the recoveries made under Survey Advance, etc., and shall also

submit monthly Demand, Collection and Balance statements to the Dewan Peishkar as detailed in Appendix I of these Rules.

37. An Annual return shall be submitted by the Tahsildar to the Division Peishkar, in Form No. XI appended, of the total number of stones on the sides of porambokes in each Pakuthi, the number inspected during the year, the number missing or requiring repair and the number repaired or renewed.

38. The Division Peishkar shall append a consolidated statement, in the same Form for the whole Division, to the Annual Administration Report forwarded by him to the Land Revenue and Income Tax Commissioner. He shall also specially state in his report how far the maintenance of survey marks was properly attended to during the year.

39. In the resurveyed taluk of Nedumangad, the stones on the sides of porambokes shall be inspected once in every year, and the stones fixed on the boundary of survey fields once in every three years. The theodolite stations shall also be verified along with the field stones once in three years. The stones fixed on the boundaries of sub-divisions, except those on the sides of poramboke sub-divisions, need not be verified.

## PART II.

### VERIFICATION AND SURVEY OF PORAMBOKES, (FULL SURVEY NUMBERS OR SUB-DIVISIONS) WHICH HAVE BEEN DEMARCATED AND SURVEYED AT OR AFTER THE TIME OF THE ORIGINAL SURVEY.

1. The boundaries of the porambokes (full survey numbers or sub-divisions), which have been demarcated and surveyed at or after the time of the original survey, shall be verified with reference to the measurements recorded for them and, if necessary, also to the measurements of the adjoining registered holdings.

2. All the missing stones on the boundaries of the porambokes shall be renewed and those requiring repair shall be repaired, as provided for in Part I of these Rules.

3. If, in the course of the verification of the porambokes, any of the previous survey measurements, either of the poramboke or of the adjacent lands, are found to be wrong



and to require correction, the matter shall be reported by the Accountant to the Revenue Supervisor with clear and illustrative sketch of the fields in which corrections have to be made. The Revenue Supervisor shall examine the measurements on the ground and offer his remarks on the corrections required. The sketch together with the report containing the remarks of the Revenue Supervisor shall then be sent by the Tahsildar, after verification if necessary, to the Superintendent of Survey, for orders. On receipt of orders from the Superintendent of Survey, the poramboke shall be surveyed and plotted as per instructions received in the matter. A register of the corrections shall also be maintained noting all final orders received from the Superintendent of Survey.

4. Fifteen days before the commencement of the survey of porambokes for independent plotting, the Accountant shall (in addition to and along with the notice in Form No. 1 appended), issue a notice (in duplicate) in Form No. XII appended, asking the holders of the adjoining registered lands to render help in the demarcation and survey of the common boundary between their registered lands and the porambokes.

On failure of the registered-holder to comply with the requisition, the necessary work shall be done by the Accountant; and the cost incurred therefor shall be recovered as an arrear of land revenue, as provided for in Section 10 of the Travancore Survey and Boundaries Regulation, X of 1094.

5. The poramboke shall be measured for independent plotting in the 'triangles and offsets' system, and plotted sketches shall also be prepared for them.

Against those survey points in which no stones have been planted as per Rule 15 of Part I of these Rules, the word 'peg' shall be entered in the plotted sketch.

6. Backwaters, rivers, broad and deep canals etc., need not be measured in 'triangles', as it will not be possible to do so. Traverse skeleton plots of the poramboke numbers shall be obtained from the Survey Office.

In the above-mentioned porambokes, there might often be several holdings registered after the previous survey. Such holdings shall be demarcated and surveyed now, with reference to present possession and the olugu and other revenue records, and then plotted in the skeleton map.

7. In the case of porambokes, such as roads, canals etc., which have been widened by acquiring lands on both sides or on one side alone, two sets of plotted records shall be prepared as indicated below :—

*Firstly*, a plotted sketch for the revenue or survey field, as the case may be, from which portions have been acquired, so as to show the poramboke and other sub-divisions in it.

For this purpose, the previous survey boundaries of the survey or revenue number, wherefrom portions have been acquired, shall be verified and fixed by running the necessary old chain lines ; and the missing stones, if any, shall be renewed. If the positions of the previous survey marks fall within the road, stones shall not be planted for those marks. The remaining portion of the survey number or revenue field shall be measured for independent plotting ; and offsets shall be taken to the survey marks pegged out within the road from the adjoining side of the remaining portion of the field. The plotted sketch thus prepared will be the sub-division sketch of the survey or revenue number from which land has been acquired.

*Secondly*, a sketch of the poramboke to show its revised boundaries (including the portions acquired).

The original boundaries of the poramboke shall be ignored and the porambokes shall be surveyed to its present width, i. e., including the portions acquired. Demarcation stones shall be planted on the new boundary of the poramboke and the necessary 'G' lines run for plotting the poramboke independently.

8. (a) If, during the verification or survey and demarcation of the boundaries of the porambokes, any portion of the adjoining registered field is found lying unoccupied by the registered-holder, but is in the possession of the Public Works Department which maintains the poramboke road, river, etc., or lies indistinguishably amalgamated with the poramboke, the Accountant shall prepare a sketch of such unoccupied bit of the adjoining registered land and submit it through the Revenue Supervisor to the Tahsildar for investigation and orders. The Tahsildar shall investigate whether there are any records to show that such bit has been acquired by Government or has been relinquished by the registered-holder, though the assessment for the portion has not been remitted and the bit has not been formerly included in the Poramboke Register.

(b) If such records are found out, the Tahsildar shall take the further action required to reduce the assessment and to record the bit as poramboke, after giving due notice to the parties concerned, and shall also issue orders to the Accountant to demarcate and survey the bit of land as a poramboke sub-division of the survey number concerned.

(c) If no such records are forthcoming, the Tahsildar shall issue notice to the registered-holder and enquire of the party whether the land has been acquired by Government previously, and if it has not been, whether he is willing to give up the bit of land to Government free of cost for use as poramboke.

(d) If the party admits previous acquisition by Government or gives a statement to the effect that he is willing to give up the land now free of cost, the Tahsildar shall take steps to reduce the assessment and to declare the bit as poramboke, and issue orders to the Accountant to demarcate and survey the bit as a poramboke sub-division of the survey number concerned.

(e) If the party denies previous acquisition by Government and deposes that he is not willing to give up the bit of land free of cost, the Tahsildar shall, if the poramboke is maintained by the P. W. D., intimate the circumstance of the case to the Division Officer concerned, with sketch, and ask him to take steps to acquire the bit of land if it is absolutely required for use as poramboke; and in the case of porambokes not maintained by the P. W. D., the Tahsildar shall, if he thinks that the same is indispensably required for use as poramboke, report the matter to Dewan Peishkar for taking steps for the acquisition of the bit of land.

9. For the encroachments detected, the Accountant shall prepare reports, in Form No. XIII appended, and submit them to the Revenue Supervisor, who shall after inspection on the ground send them on to the Tahsildar with his remarks.

The sketches in the reports shall be neatly drawn and shall contain the measurements taken. A sufficient number of check lines shall be measured for ascertaining the extent of the encroachment.

10. For marking the encroachments detected in backwaters, rivers, canals, roads etc., a copy of the 16" map or of the key-map of the poramboke number shall be used: and the encroachments shall be shown in it in hatched lines with

their side measurements. The encroachments relating to a particular poramboke number shall be numbered consecutively. Separate sketches and other necessary records shall also be prepared for the encroachments as mentioned in Rule 9, and in these separate sketches, the serial numbers given for the encroachments in the group sketch shall be noted.

11. The Revenue Supervisor shall inspect 20 per cent of the poramboke numbers measured and plotted by the Accountants and also all the encroachments detected by the Accountants; and shall then send the records to the Tahsildar after duly initialling and dating the sketches in token of his having inspected and checked them.

12. Complaints about the demarcation of the boundaries received during the course of the survey work under Section 11 (2) of the Survey and Boundaries Regulation will be of two kinds:—

(i) those in which the contention is only that the boundaries have not been correctly fixed as per the previous survey measurements, and

(ii) those in which the contention is that any land now treated as poramboke forms part of registered lands as per the *olugu* accounts or as per the old Settlement Demarcation Rules.

13. Complaints under Rule 12 (i) shall be presented to the Revenue Supervisor who will post them in a register to be maintained by him, whereas those under Rule 12 (ii) shall be presented to the Tahsildar of the taluk who shall have the same posted in a register to be maintained in the Taluk Office.

14. In regard to the complaints under Rule 12 (i), the Revenue Supervisor shall conduct the necessary enquiry as contemplated in Section 11 (2) of the Travancore Survey and Boundaries Regulation, X of 1094, and pass his decision in writing, giving full reasons, and shall immediately communicate the same to the parties in writing as required by Section 11 (3) of the above Regulation, stating in it that, if the party is satisfied with the decision, he may prefer an appeal to the Tahsildar of the Taluk (to whom an appeal shall lie against the decision of the Revenue Supervisor) in which the land is situated, within three months from the date of service of that order.

The Revenue Supervisor shall also make a report to the Tahsildar with the necessary sketches and records.

15. On receipt of the appeals contemplated in Rule 14, they shall be posted in a register to be maintained in the Taluk Office and the Tahsildar shall make a regular enquiry and decide on the question in dispute and pass an order under the Travancore Survey and Boundaries Regulation, X of 1094, as to where the survey mark or marks ought to be planted. The decision of the Tahsildar shall be forthwith communicated to the parties in writing.

16. In regard to the complaints under Rule 12 (ii), the Tahsildar shall conduct the necessary enquiry and pass orders in writing under Section 11 (2) of the Survey and Boundaries Regulation, X of 1094, and shall immediately communicate the same to the parties in writing as required by Section 11 (3) of the above Regulation, stating therein that, if the party is not satisfied with the decision, he may prefer an appeal to the Dewan Peishkar of the Division within three months from the date of service of that order. The procedure laid down under Rule 15 shall be followed also in regard to the appeals received by the Peishkar under this Rule.

17. Revenue Supervisor shall forward to the Tahsildar, at the beginning of every month, the plotted Field Measurement Sketches and other records, if any, prepared in the previous month. The Tahsildar shall then send the plotted Field Measurement Sketches to the Survey Office for checking.

18. On receipt back of the plotted Field Measurement Sketches from the Survey Office, after check, the Tahsildar shall notify monthly, in the Government Gazette, the poramboke numbers in respect of which demarcation, survey and preparation of plotted sketches have been completed, as required by Section 11 (4) of the Travancore Survey and Boundaries Regulation, X of 1094.

19. The Tahsildar shall, along with the publication of the abovesaid notification in the Gazette, issue notice, under Section 12 (1) of the Travancore Survey and Boundaries Regulation, X of 1094, in Form No. XIV appended, to all registered holders affected by the survey, pointing out that appeals from orders passed under Section 11 of the Survey and Boundaries Regulation in cases where the registered holder or holders concerned were not present at the time of survey and those in which the boundary was not disputed at the time of survey (that is except in regard to those complaints under Section 11 of the Regulation for

which provision has been made in Rules 14 to 16 *supra*) may be made to the Tahsildar of the taluk if the case falls under Rule 12 (i) and to the Dewan Peishkar of the Division if it falls under Rule 12 (ii), within three months from the date of the notification published in the Government Gazette as per Rule 18.

In cases where there are encroachments, the registered holder shall be furnished with full particulars of the encroachment in respect of which action under the Land Conservancy Regulation may have to be taken against him.

20. Appeals preferred on receipt of notice under Section 12 (i) of the Travancore Survey and Boundaries Regulation, X of 1094, shall be posted in a register to be maintained in the Taluk and Division Offices, and decided by the Tahsildar or Dewan Peishkar, as the case may be, according as the cases relate to Rule 12 (i) or 12 (ii), and the decision communicated to the parties in writing by the respective officers. Such decision shall be final.

21. After the time allowed for preferring appeals is over, or after the appeal is disposed of if one has been preferred, the Tahsildar shall arrange for the demarcation and survey being revised, wherever necessary, in accordance with the final decision.

NOTE:—Where no appeal has been preferred, the decision of the Revenue Supervisor or the Tahsildar, as the case may be, shall be final.

22. If it is decided that the land reported as encroachment forms part of the adjoining registered holding according to *olugu* measurements or the old Settlement Demarcation Rules, the land shall be demarcated and measured as a subdivision of the poramboke survey number or revenue field; and the Tahsildar shall take the necessary further action for fixing the assessment on the land and for issuing patta for it.

23. (i) If the encroachment is decided to be unobjectionable and is ordered to be transferred to assessed waste and to be registered, then also the encroachment shall be demarcated and surveyed as a sub-division of the poramboke survey or revenue field.

(ii) If however the encroachment is considered objectionable, necessary action shall be taken by the Tahsildar under the Land Conservancy Regulation.

24. The Tahsildar shall, in deciding appeals regarding the demarcation of boundaries under the Travancore Survey and Boundaries Regulation, X of 1094 take the advice of the higher officers of the Survey Department, if it is found necessary.

### PART III.

#### SURVEY OF SUB-DIVISIONS NOT DEMARCATED AND SURVEYED AT THE TIME OF THE ORIGINAL SURVEY OR SUBSEQUENTLY.

##### (A) *Settlement sub-divisions which are porambokes.*

1. The poramboke sub-division alone (without the other sub-divisions in the survey number or revenue field) shall be first surveyed according to the existing shape seen on the ground.

When the poramboke sub-division is shown in the 'divide' sketch in one portion of the survey number or revenue number, but lies in a different portion within that survey number or revenue number, then also demarcation shall be made according to the existing position of the poramboke. A remark shall be made in the new sketch prepared that the survey has been done according to the lay of the ground, and the Tahsildar, or under his orders the Revenue Supervisor, shall verify the same and the old 'divide' sketch shall be cancelled by the Land Revenue Commissioner.

2. (a) If the area now calculated is the same as the settlement area though its present width is more or less than the width recorded in the 'divide' sketch, or

(b) If the area now calculated is more than the area recorded in the Settlement Register and if the present width is not greater than the width recorded in the 'divide' sketch,

then, in these two cases, the demarcation shall be confirmed according to the existing state of the ground.

3. If the present area and width are both less than the settlement area and the 'divide' sketch measurements, then the whole survey or revenue field with the poramboke and all the other sub-divisions in it shall also be surveyed according to existing limits. If the area of the next adjoining sub-divisions shows any excess, that excess shall be added to the poramboke and treated as encroachment as far as there is deficit in the recorded width of the poramboke.

4. If both the present area and measurements are greater then also the whole survey or revenue field with the poramboke and all the other sub divisions in it shall be surveyed according to existing limits. If the next adjoining sub divisions exhibit any deficit in area, the deficit may be made good from the area available in the poramboke over and above the recorded width of the poramboke as given in the 'divide' sketch.

5. When the whole of a poramboke sub-division of any survey number or revenue field is now seen on the ground to be lying in the adjoining survey or revenue number, the poramboke sub division shall be demarcated within the survey number or revenue number as per the Settlement Register, so as to cover the settlement area, and by the side of the existing poramboke. The whole area of the poramboke sub-division shall be treated as an occupation in respect of which an investigation will have to be made, and a report shall be submitted in Form No. XIII.

For the poramboke actually seen on the ground in the adjoining survey number, report shall be submitted with a sketch to the Tahsildar.

6. When any portion of a poramboke sub-division of any survey number or revenue number lies in the adjoining survey number or revenue number, demarcation shall be made and action shall be taken as described in Rules 3 and 4 above; and a report, with sketch, shall be submitted to the Tahsildar in respect of the portion lying in the adjoining survey number or revenue number, as described in Rule 5.

7. The discrepancies reported as per Rules 5 and 6 shall be investigated and disposed of by the Tahsildar as detailed in Rule 8 of Part II of these Rules.

*(B) Lanes, kals &c. which are now found in registered lands but which have not been sub-divided as such by the Settlement Department.*

8. When lanes, kals, &c., are found in registered lands but have not been brought as yet into the revenue records, the Accountant shall report the same with sketch to the Tahsildar.

9. The Tahsildar shall find out whether such lanes, kals, &c., are mentioned in the old *olugu* accounts of the adjoining registered holdings.



10. If the *kals*, lanes, etc., are mentioned in the old *olugis* accounts, the Tahsildar shall issue notices to the parties concerned, and after hearing them, take the necessary steps for sub-dividing the porambokes, reducing the assessment on the area of the lanes, *kals*, etc., and declaring the same as porambokes.

11. If no *olugis* are found, then also notices shall be given to the parties concerned, and further action shall be taken as detailed in Rule 8 of Part II of these Rules.

(C) *Pathways, canals, etc., within large Minor Circuits and backwaters.*

12. In Minor Circuits, there are roads and pathways which have not been demarcated and declared as porambokes, because the adjacent registered holdings have not been demarcated and surveyed. In the backwaters also, the P. W. D. have peg marked the waterway to be reserved for navigation, and these waterways also have not been surveyed.

The Proverthicar shall prepare key-maps for such Minor Circuits and backwaters, showing the existing roadways and waterways as also the registered lands therein and shall submit them to the Tahsildar.

13. The Tahsildar shall, in the case of the pathways, inspect the locality and determine which of them require to be demarcated for reservation as poramboke and the widths to be demarcated. He shall then send the key-maps with his remarks thereon to the Revenue Supervisor for demarcation and survey.

14. The Accountant shall demarcate and survey the pathways as ordered by the Tahsildar and the waterways as demarcated by the P. W. D. The Accountant shall form them into survey fields having a length of ten chains more or less, according to convenience, and each survey field shall be measured for independent plotting. The junctions of the adjoining registered lands, if ascertainable, shall be demarcated and shown in the Field Measurement Sketch.

15. If the length of the pathway falling within the Minor Circuit is more than 40 chains, the Revenue Supervisor shall run a traverse line with theodolite along the pathway and take offsets to all the bends and junctions. It is not necessary that he should connect this traverse with any old theodolite station. It is enough if he starts the work from an old field stone on the outer boundary of the Minor Circuit and closes it on another old field stone.

16. The Accountant shall insert the new survey done by him for the pathways and waterways in the key-map furnished by the Proverthicar.

17. The Revenue Supervisor shall inspect the work, and then submit the records to the Tahsildar.

18. The Tahsildar shall, after the complaints, if any, are disposed of and after the time for appeal is over, submit proposals to the Dewan Peishkar for getting the pathways declared as porambokes and notified in the Gazette.

(D) *Sub-divisions necessitated on account of Puduval registry.*

19. For the Minor Circuits in which, according to the accounts, lands are available for registry, the Proverthicar shall prepare a key-map showing all the sub-divisions registered at the time of Settlement and subsequently up-to-date. Then the land available for registry according to the accounts or the land applied for shall be inspected with the help of the key-map, and if it is found that the land has not been registered in anybody's name, the Accountant shall demarcate the land as per enjoyment if it is occupied, or cut it up into five acre blocks more or less if it is unoccupied.

The occupied lands and also small bits of unoccupied lands may be clubbed together to form survey fields, and surveyed accordingly, provided that the sub-divisions so clubbed are not over five in number and the total area of the sub-divisions clubbed is not more than five acres.

20. In the case of backwaters also, a key-map showing all the sub-divisions registered at the time of Settlement and subsequently up-to-date shall be prepared by the Proverthicar. With this key-map, the Accountant shall proceed to the ground, refix the backwater boundary according to the original measurements, and then demarcate and survey all the holdings according to the extent registered for them.

21. In Minor Circuits where the waste areas have been split up into small blocks by the Survey Department, sub-divisions may become necessary. In such cases, the portions applied for shall be demarcated as sub-divisions of the blocks, and plotted in a tracing made from the Field Measurement Sketch prepared by the Survey Department.

22. Should the demarcation and survey of a registered *puduval* within a Minor Circuit disclose any excess in area over the registered extent, such excess shall, as far as possible, be utilised for providing the necessary pathways to the

other holdings. If the provision of a pathway is unnecessary, the whole of the excess area shall be brought under registry.

23. In survey fields which have already been sub-divided at the time of Settlement, the new sub-divisions shall be given sub-numbers in continuation of the last sub-number of the fields. For instance, if a survey field originally contained 15 sub-divisions and 5 new sub-divisions are made, the new sub-divisions shall be numbered 16, 17, 18, 19 and 20.

If letters have been assigned to the sub-divisions at the time of Settlement, or subsequently such letters shall be retained for these sub-divisions; but the new sub-divisions shall be numbered 1, 2, 3 and so on.

24. In cases where a portion of a poramboke field is transferred to assessed waste for registry, it shall be demarcated and surveyed as a sub-division of the poramboke field and plotted within the survey number with all the previous sub-divisions, if any, in it.

(E) *Sub-divisions necessitated on account of Karampathippu.*

25. As soon as the decisions in the *Karampathippu* cases become final (after the lapse of the appeal period or after the appeals are disposed of), such of these cases as involve further sub-division work shall be handed over to the Revenue Supervisor for demarcation and survey of the sub-divisions.

26. In the taluks that have been surveyed under the 'tak' system the whole survey field, with all the previous sub-divisions in it, shall be surveyed and plotted.

In the other taluks, it is enough if plotted sketches are prepared for each revenue field with all the previous sub-divisions in it. The revenue field shall be surveyed in such a way as to admit of its independent plotting.

If the revenue field is, however, very large (over 5 acres), the new sub-divisions alone need be surveyed, and they may be surveyed separately or may be grouped for survey according to convenience.

In the resurveyed taluk of Neduvangad, it is enough if additional measurements required for plotting the new sub-divisions are taken, and if with these measurements the new sub-division is plotted in a copy of the existing Field Measurement Sketch.

27. The outer boundary of the survey or revenue number shall be demarcated strictly in accordance with the original measurements, ignoring the present limits of enjoyment ; and the missing stones shall be renewed and repaired as provided for in Part I of these Rules. Sub-division boundaries which have been previously demarcated and surveyed shall also be dealt with in the same manner.

28. Sub-division boundaries which have to be newly demarcated shall be demarcated in accordance with the Government records and the documents of title wherever such records and documents clearly indicate the measurements, extent and shape of the sub-divisions to be made and in the absence of that in accordance with the limits of enjoyment as seen on the ground or as appearing from other evidence to be taken by the survey officers.

(F) *Sub-divisions necessitated on account of Land Acquisition.*

29. As soon as the award has been made in a Land Acquisition case and the land acquired is taken possession of on behalf of Government, the case shall, if it involves the demarcation and survey of new sub-divisions, be handed over to the Revenue Supervisor for demarcation and survey.

30. In respect of old Land Acquisition cases, the Tahsildar shall obtain from the Division Peishkar or other Land Acquisition Officer the cases disposed of since the Settlement.

The Tahsildar shall then make a pakuthi-war list showing the survey numbers, areas, and other particulars regarding the lands acquired and also copies of the sketches in the files. These lists shall be handed over to the Revenue Supervisor for the survey of the sub-divisions involved in them.

31. The Revenue Supervisor shall ordinarily be guided by the rough sketch in the Land Acquisition File.

32. Where the area now in the possession of the Government is less than the area acquired, the Revenue Supervisor shall investigate, with reference to the acquisition sketch, where the deficit area lies, and shall treat the same as encroachment, and report the same to the Tahsildar with the necessary records for disposal.

33. Where there is excess area or where the area in the possession of the Government is in a survey number other than that from which the land was acquired, the Revenue

Supervisor shall report the difference with sketches to the Tahsildar ; and the Tahsildar shall deal with the same on the lines explained in Rule 8 of Part II of these Rules.

34. The demarcation and survey of the sub-divisions shall be carried out as detailed in Rules 27 and 28 above.

*General.*

35. Fifteen days before the commencement of survey of sub-divisions, the Accountant shall issue a notice, in duplicate, in Form No. XV appended, to each of the registered-holders concerned, calling upon them to produce survey marks of the prescribed description and dimensions, to clear the boundaries and to render necessary help for the demarcation and survey of the lands.

On failure of the registered-holder to comply with the requisition, the necessary work shall be done by the Accountant or any of the officers appointed for the purpose, and the cost incurred therefor shall be recovered as an arrear of land revenue as provided for in Section 10 of the Travancore Survey and Boundaries Regulation, X of 1094.

36. If during the survey of the sub-divisions, any errors are found in the side measurements or chain-line measurements of the survey number or revenue field, the Accountant shall report the same with a clear sketch for orders as explained in Rule 3 of Part II of these Rules.

37. As regards the sale of stone from the Pakuthi Depot the preparation of bills for charges incurred in planting stones as per Forms Nos. VII and VIII appended, and the recovery of the amounts, the same procedure as prescribed in Rules 24 to 35 of Part I of these Rules shall be followed.

38. The Revenue Supervisor shall forward to the Tahsildar, on or before the 10th of every month, the plotted field measurement sketches and other records prepared in the previous month.

39. All the field measurement sketches shall be sent to the Survey Office for checking. The sketches shall be checked and returned to the Tahsildar, who shall adopt, in the case of puduvals, the areas furnished by the Survey Department for the issue of patta.

40. On receipt back of the plotted field measurement sketches from the Survey Office, after check in accordance with Rule 39 *supra*, the Tahsildar shall notify monthly in the Government Gazette the sub-divisions in respect of which

demarcation, survey and preparation of plotted sketches have been completed, as required by Section 11 (4) of the Travancore Survey and Boundaries Regulation, X of 1094.

41. The Tahsildar shall also issue along with the notification referred to in Rule 40 individual notices in Form No. XIV appended for poramboke sub-divisions and No. XVI appended for other sub-divisions under Section 12 (1) of the Travancore Survey and Boundaries Regulation, X of 1094, to all registered-holders affected by the survey.

42. Complaints received against the demarcation and survey of sub-divisions shall be disposed of by the Revenue Supervisor as provided for in Rules 12 to 14 of Part II of these Rules.

43. Appeals against the decisions of the Revenue Supervisor as per Rule 42 shall lie to the Tahsildar of the Taluk in which the land in dispute is situated, provided they are preferred within three months from the date of service of the Revenue Supervisor's order on the party and they shall be disposed of as provided for in Rules 15 and 24 of Part II of these Rules. Similarly the appeals preferred after the issue of notices under Section 12 (1) of the Travancore Survey and Boundaries Regulation, X of 1094, shall also be disposed of by the Tahsildar as per Rule 20 of the same Part. The final decision shall be incorporated in the records as provided for in Rule 21 of the same Part.

44. An Annual Return shall be submitted by the Tahsildar to the Division Peishkar, in Form No. XVII appended, of the total number of poramboke, puduval and other sub-divisions that had to be surveyed at the beginning of the year, the number surveyed during the year, etc. The Division Peishkar shall, in his Annual Administration Report forwarded to the Land Revenue and Income Tax Commissioner, mention specially whether adequate progress has been made in the survey of poramboke, puduval and other sub-divisions during the year and attach thereto a statement for the whole Division in the aforesaid form. The Land Revenue and Income Tax Commissioner shall with his Annual Report forward to Government a consolidated statement for the whole State in the same form.

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PART IV.

DUTIES OF THE SEVERAL OFFICERS IN CONNECTION WITH  
LAND RECORDS MAINTENANCE.

(1) *Duties of the Accountant.*

1. The duties of the Accountant are:—

(a) the inspection of porambokes and detection of encroachments, and the demarcation, survey and plotting of poramboke survey numbers and sub-divisions,

(b) the demarcation, survey and plotting of new sub-divisions, and

(c) the demarcation, survey and plotting of Settlement and other previous sub-divisions of all survey numbers or revenue fields in which current sub-divisions have to be surveyed.

2. The Accountant shall maintain a Diary in form No. XVIII appended. At the end of each month, he shall take a copy of his Diary for the month and submit the same personally to the Revenue Supervisor, along with the records prepared by him during the month, for necessary check.

3. Every Accountant shall be thoroughly qualified in survey work. If any be found inefficient, he shall be sent to the Survey School at Trivandrum or Kottayam for re-training, such leave as he is eligible for under the Service Regulations being granted to him for the purpose. On production of a certificate of having become qualified, he shall be re-admitted for work in the Pakuthi.

The maximum period allowed for such re-training in the Survey School shall be six months, *i. e.*, two courses of the school. If the Accountant fails to pass in the two chances thus given to him, he shall be discharged from his post.

(2) *Duties of the Proverthicar.*

4. The Proverthicar shall maintain a Stock Register of demarcation stones as prescribed in Rule 21 of Part I of these Rules, and sell the stones for ready cash to the land-holders. The money realised by the sale of stones should be remitted into the Treasury, with the next remittance, under, "Survey Advance,— Tahsildar.....Taluk".

5. The Proverthicar shall issue stones to the Accountants and the Revenue Supervisor on indents given by them.

6. The Proverthicar shall submit at the beginning of each month an extract from the Stock Register together with the triplicate copies of the indents to the Tahsildar.

7. The Proverthicar shall recover promptly the sums recoverable from registered-holders on account of the renewal of survey marks etc., done for them at Government cost owing to their default.

8. Every Proverthicar shall be thoroughly qualified in survey work. If any be found inefficient, he shall be sent to the Survey School at Trivandrum or Kottayam for re-training, such leave as he is eligible for under the Service Regulations being granted to him for the purpose. On production of a certificate of having become qualified, he shall be re-admitted for work in the Pakuthi.

The maximum period allowed for such re-training in the Survey School shall be six months, *i. e.*, two courses of the school. If the Proverthicar fails to pass in the two chances thus given to him, he shall be discharged from his post.

### (3) *Duties of the Revenue Supervisor.*

9. The revenue Supervisor shall be in immediate charge of the Land Records work in the Taluk and he shall be responsible for the proper conduct of the same. He shall be immediately subordinate to the Tahsildar.

10. The Revenue Supervisor shall be out on inspection duty for at least 18 days in a month. He shall, during his visits to the Pakuthies, see that the demarcation, survey and plotting of the porambokes and sub-divisions are done by the Accountants in accordance with the rules and instructions issued.

11. He shall also check on the ground,  
 (a) the encroachments reported,  
 (b) twenty per cent. of the poramboke numbers measured and plotted by the Accountants,  
 (c) twenty per cent. of the sub-divisions, and  
 (d) twenty per cent. of the field stones repaired, renewed and newly planted in the Pakuthi.

12. He shall also check the plotting of the fair plotted sketches prepared by the Accountants and the areas noted in them and then submit the sketches to the Tahsildar.

13. He shall, by constant inspection of field work and examination of records, bring to the notice of the Tahsildar



any laxity on the part of the Survey Accountants and Pakuthi officials.

14. He shall check the bills that are submitted by the Accountants on account of the renewal of survey marks etc. carried out at Government cost, and be responsible for their correctness. He shall also see that the stones obtained on indent are utilised without delay and that bills are submitted promptly.

15. He shall renew and repair the theodolite stations requiring attention.

16. Before the fifth and twentieth of every month, he shall submit a fortnightly Diary in Form No. XIX appended.

17. He shall report to the Tahsildar the inefficient Survey Accountants and Pakuthi officials who require re-training in survey.

18. He shall meet the Superintendent and Assistant Superintendent of Survey during their inspections of the Taluk and accompany them to the field during their inspections for receiving technical instructions.

*(4) Duties of the Tahsildar.*

19. The Tahsildar shall be responsible for the proper conduct of Land Records Maintenance work in his Taluk.

20. He shall, during his inspections, check some of the encroachments detected in porambokes by re-measurement and satisfy himself if the work has been done correctly.

He shall also check some of the sub-divisions demarcated and measured by the Accountants.

21. He shall maintain, in the Taluk Office, a register for the new sketches prepared and shall, after the sketches are finally passed, arrange for copies to be prepared, if it has not already been done. The originals of such sketches shall be recorded in the Taluk office and the copies shall be preserved in the Pakuthi Cutcherry.

22. He shall also check the work of the Revenue Supervisor and see that he does proper work.

23. The Tahsildar shall keep up his own knowledge of survey by close and constant attention to that branch of work.

24. Before the tenth of every month, the Tahsildar shall submit to the Dewan Peishkar his own Land Records Maintenance Diary, in Form No. XX appended, and also the diaries of the Revenue Supervisor with his remarks.

If the Revenue Supervisor has not turned out sufficient quantity of work or has not done adequate touring work, he will recommend to the Dewan Peishkar the punishment to be meted out to the Revenue Supervisor in the shape of stopping his permanent travelling allowance, or otherwise.

*(5) Duties of the Dewan Peishkar.*

25. The Dewan Peishkar shall see that the Tahsildars and Revenue Supervisors and the subordinate staff discharge Land Records Maintenance work properly.

He shall also, whenever possible, check on the ground the Land Records Maintenance work of the staff.

26. The Dewan Peishkar shall review the work of the Tahsildars and the Revenue Supervisors once a quarter and send a copy of such review to the Land Revenue and Income Tax Commissioner.

*(6) Duties of the Superintendent and Assistant Superintendent of Survey.*

27. The Superintendent of Survey or under his direction his Assistant shall during his tours examine the Land Records Maintenance work and see if the Rules are properly worked. They may also check the knowledge in survey of the Accountants, Provertbikars and Revenue Supervisors. Their notes of inspections of Land Records Maintenance work shall be forwarded to the Land Revenue and Income Tax Commissioner for information and necessary action.

*(7) General.*

28. The higher officers of the Survey and Revenue Departments will, if during their checking of the Land Records Maintenance work they find that the stones are not properly fixed in their correct positions, or that there is encroachment on poramboke or any other irregularity, bring it to the notice of the Revenue Supervisor through the Tahsildar and direct him to take the necessary action.

(By order)

Huzur Cutcherry,  
Trivandrum, 31st December 1926.

K. GEORGE,  
*Chief Secretary to Government.*

FORM No. 1.

(Vide Rule 8 of Part I of the Rules.)

NOTICE.

No.

To

.....

... .. Pakuthi, ..... Taluk.

1. You are hereby informed that the survey marks noted in the subjoined statement are missing or out of repair, as specified against them, and it is seen that you are the registered-holder of the survey fields noted in column 4 of the statement as per the Thandaper Account.

2. These survey marks should be repaired or renewed, as the case may be, within 15 days of the service of this notice. In default of your doing so, the work will be done at Government cost, and the charges incurred will be recovered from you as an arrear of land revenue.

3. For further particulars, please apply to the undersigned who will give all reasonable assistance in the matter.

Station.

Date.

Accountant.

*Statement.*

Taluk.....		Pakuthi.....		
Survey No. and its sub-division No. or letter.	Serial No. of the stones in the field.	Whether Theodolite (A) or field (B) stones.	Survey No. of the field or sub-division the registered-holders of which are responsible for the maintenance of the stones	Remarks.
1	2	3	4	5

CERTIFICATE OF THE ACCOUNTANT OR OTHER OFFICER.

The repairs or renewals mentioned above have been executed by the party.

Date.

Designation.

FORM No. II.

(Vide Rule 12 of Part I of the Rules.)

Register of Survey Marks on the boundaries of Poramboke lands in.....Pakuthi,.....Taluk.  
 (Note.— Each stone should have a separate line in the Register.)

1	Survey No. and its sub-division No. or letter	
2	Serial number of the stones in the field.	
3	Whether Theodolite (A) or field (B) stones.	
4	Survey No. of the field or sub-division, the registered-holders of which are responsible for the maintenance of the stone.	
5a	Name of inspecting Accountant	Year.....M. E.
5b	Date of inspection and result.	
6	If renewed or repaired by registered-holder, date of verification by Accountant.	
7	Date of renewal or repair at Government cost and initials of the Accountant or other Officer who executes the work.	
5a	Name of inspecting Accountant.	Year.....M. E.
5b	Date of inspection and result.	
6	If renewed or repaired by registered-holder, date of verification by Accountant.	
7	Date of renewal or repair at Government cost and initials of the Accountant or other officer who executes the work.	
5a	Name of inspecting Accountant.	Year.....M. E.
5b	Date of inspection and result.	
6	If renewed or repaired by registered-holder, date of verification by Accountant.	
7	Date of renewal or repair at Government cost and initials of the Accountant or other officer who executes the work.	

FORM No. III.

(Vide Rule 21 of Part I of the Rules.)

(STOCK REGISTER OF DEMARCATION STONES.)

(This Register should be maintained in separate parts, each part being for one size of stone.)

Part.....stone. Size .....

Date.	From whom received.	No. of stones.	Rate fixed per stone.			Total Cost.			No. and date of pass list authorising receipt.	Date.	To whom issued.	Whether sold for cash or issued on Indent; if the latter, the No. & date of Indent.	Rate per stone.			Total cost.			In the case of cash sale, the No. & date of Chellan with which the money was remitted into the Treasury.	Remarks.
			Rs.	chs.	c.	Rs.	chs.	c.					Rs.	chs.	c.	Rs.	chs.	c.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14							

LXXXX

**FORM No. IV.**  
**(VIDE RULE 22 OF PART I OF THE RULES).**  
**Stone Pass List.**

**Original-**

No. \_\_\_\_\_  
 Taluk. \_\_\_\_\_ Pakuthi.  
 Where delivered.  
 Name of contractor.

Date on which stones were passed.	Number of stones passed. <i>(Enter the number in words as well as in figures.)</i>						Remarks.
	Theodolite stones.			Field stones.			
	Size.	Size	Size.	Size.	Size.	Size.	
1	2	3	4	5	6	7	8

I hereby acknowledge to have received the stones mentioned above.  
 Date. \_\_\_\_\_ Proverthicar.

**FORM No. IV.**  
**(VIDE RULE 22 OF PART I OF THE RULES).**  
**Stone Pass List.**

**Duplicate-**

No. \_\_\_\_\_  
 Taluk. \_\_\_\_\_ Pakuthi.  
 Where delivered.  
 Name of contractor.

Date on which stones were passed.	Number of stones passed. <i>(Enter the number in words as well as in figures.)</i>						Remarks.
	Theodolite stones.			Field stones.			
	Size.	Size.	Size.	Size.	Size.	Size.	
1	2	3	4	5	6	7	8

Tahsildar.

I hereby acknowledge to have received the stones mentioned above.  
 Date. \_\_\_\_\_ Proverthicar.

(Reverse.)

FORM No. IV.

STONE PASS LIST.

(Original)

Taluk.

Name of Pakuthi.

Name of contractor.

Date on which stones were passed.

Date of despatch of pass list to the Tahsildar.

Date of receipt of the pass list by the Tahsildar.

No. and date of contractor's bill in which the cost of stones was billed for.

FORM No. IV.

STONE PASS LIST.

(Duplicate).

Taluk.

Name of Pakuthi.

Name of contractor.

Date on which stones were passed.

Date of despatch of pass list to the Tahsildar.

Date of receipt of the pass list by the Tahsildar.

No. and date of contractor's bill in which the cost of stones was billed for.

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FORM No. V.

(VIDE RULE 23 OF PART I OF THE RULES).

Contractor's bill for the cost of survey marks.

No.

The Tahsildar.....Taluk

Dr.

To ..... Contractor for the supply of  
survey marks for.....Taluk.

Particulars of stones supplied.	No. and date of the pass list attached.	No. of stones.	Rate per stone.			Cost.			Remarks.
			Rs.	Ch.	C.	Rs.	Ch.	C.	
Theodolite stones	Size								
Field stones									
Total cost									

Total amount (in words) Rupees

Date

Contractor.

(The entries below are to be made in the Tahsildar's office).

Amount of credit available for.....Taluk under survey advance.

Rs. Chs. C.

(1) Budget grant under survey advance for.....M. E.

(2) Add additional grant sanctioned in.....

Total

Deduct amount of contractor's and other bills already drawn.

Balance available

Passed for Rupees (in words)

Camp

Date

Tahsildar.



FORM No. VI.

(VIDE RULE 28 OF PART I OF THE RULES).

ORIGINAL.

(To be retained by the Indenting Officer).

Indent for survey marks on Stone

Depot of.....Pakuthi

Indent No.

Date

Village in which the stones are to be used

Size No.

Theodolite stones

Field stones

Accountant

Countersigned

Revenue Supervisor

Issued the above mentioned stones on..... Proverthicar

FORM No. VI.

(VIDE RULE 28 OF PART I OF THE RULES).

DUPLICATE.

(To accompany the bill of charges incurred for renewals and repairs of stones submitted to the Tahsildar).

Indent for survey marks on Stone

Depot of.....Pakuthi

Indent No.

Date

Village in which the stones are to be used

Size No.

Theodolite stones

Field stones

Accountant

Countersigned

Revenue Supervisor

Issued the above mentioned stones on..... Proverthicar

FORM No. VI.

(VIDE RULE 28 OF PART I OF THE RULES).

TRIPLICATE.

(To accompany the Depot Account submitted by the Proverthicar to the Tahsildar).

Indent for survey marks on Stone

Depot of.....Pakuthi.

Indent No.

Date

Village in which the stones are to be used

Size No.

Theodolite stones

Field stones

Accountant

Countersigned

Revenue Supervisor

Received the above mentioned stones on..... Accountant

FORM No. VI. .

(VIDE RULE 28 OF PART I OF THE RULES).

QUADRUPLICATE.

(To be kept by the Proverthicar as voucher).

Indent for survey marks on

Stone Depot of....Pakuthi.

Indent No.

Date

Village in which the stones are to be used

Size No.

Theodolite stones

Field stones

Accountant

Countersigned

Revenue Supervisor

Received the above mentioned stones on..... Accountant

**FORM No. VII.**

**(VIDE RULE 29 OF PART I OF THE RULES)**

**Bill of charges incurred for stones planted &c., in Porambokes and unregistered lands in.....Pakuthi,  
.....Taluk, during the month of.....110 M. E.**

Survey No. of the land.	Description or nature of the land.	Particulars of stones planted.				Particulars of cost incurred for carriage and planting.			Line clearing charges.			Total Amount.	Remarks.
		Size.	Number.	Rate per stone.	Amount.	Particulars.	Rate per stone.	Amount.	Length cleared in chains.	Rate per chain.	Amount.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
				Rs. shs. c.	Rs. chs. c.		Rs. chs. c.	Rs. chs. c.		Rs. chs. c.	Rs. chs. c.	Rs. chs. c.	

Camp,  
Date,

Accountant.  
Revenue Supervisor.

FORM No. VIII.

(VIDE RULE 29 OF PART I OF THE RULES).

Bill of charges incurred for planting stones etc. in private properties recoverable from registered holders in No....Pakuthi.....Taluk, during 110 M. E.

Name of registered-holder as per Thandaper account from whom to be recovered.		Survey Number of the land.		Particulars of stones planted.			Particulars of cost incurred for carriage and planting.			Line clearing charges.			Amount to be recovered from the registered-holder.			Particulars of recovery.		
		Size.	Num-ber.	Rate per stone.	Amount.	Particulars.	Rate per stone.	Amount.	Length cleared in chains.	Rate per chain.	Amount.	To be credited to survey advance. Tahsildar (Total of columns 6, 9 & 12).	To be credited to Government as miscellaneous receipts viz., fixed charges at 14 chs. per stone in the case of renewals and repairs of old stones alone.	Total amount of Cols. 13 and 14.	Date of recovery.	Amount recovered.	No. and date of chellan in which the amount was remitted into the Treasury.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
				Rs.chs.c.	Rs.chs.c.	Rs.chs.c.	Rs.chs.c.			Rs.chs.c.	Rs.chs.c.	Rs. chs. c.	Rs. chs. c.	Rs. chs. c.		Rs. chs. c.		

Camp,  
Date.

Accountant.  
Revenue Supervisor.

**FORM No. VIII A.**  
**(Vide Rule 31 of Part I of the Rules).**

*Index of Recovery Statements sent to Proverthurs for recovery of amount during..... M. E.*  
*Note:—There should be sufficient number of columns for months as is necessary to make the entries till the end of the year.*

Serial No. Pakuthi		Amount to be recovered.											
		Recoveries in succeeding months.											
		Month.			Month.			Month.			Month.		
		Recoveries.	Balance.	Recoveries.	Balance.	Recoveries.	Balance.	Recoveries.	Balance.	Recoveries.	Balance.		
Rs. chs. c.	Under Survey Advance— Tahsildar.	Under survey advance— Tahsildar.			Survey Advance—Tahsildar.			Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.		
Rs. chs. c.	Under Fixed Charges.	Under fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		
Rs. chs. c.	Total.	No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.		
Rs. chs. c.		Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.		
Rs. chs. c.		Fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		
Rs. chs. c.		Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.		
Rs. chs. c.		Fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		
Rs. chs. c.		No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.		
Rs. chs. c.		Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.		
Rs. chs. c.		Fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		
Rs. chs. c.		Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.			Under Survey Advance— Tahsildar.		
Rs. chs. c.		Fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		
Rs. chs. c.		No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.			No. and date of chellan receipt.		
Rs. chs. c.		Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.			Survey Advance—Tahsildar.		
Rs. chs. c.		Fixed charges.			Fixed charges.			Fixed charges.			Fixed charges.		



FORM No. IX (A).

(VIDE RULE 33 OF PART I OF THE RULES).

NOTICE.

No.

To

.....

..... Pakuthi,..... Taluk.

You are hereby informed that the sum of Rs. .... Chs. .... C....imposed upon you as charges for the renewals and repairs of survey marks in survey No. .... of Pakuthi Taluk, by the Revenue Supervisor and intimated to you by him in Notice No.....dated..... has been confirmed, as no appeal has been received as fixed at Rs.....Chs...C...as a result of the specified in that notice onquiry made of the appeal preferred by.....

You are to pay this sum of Rs..... Chs ... C..... to the Proverthicar of.....Pakuthi, within seven days from the date of service of this notice, failing which coercive steps will be taken against you according to law.

Date.

Tahsildar,  
.....Taluk.

FORM No. X.

(VIDE RULE 33 OF PART I OF THE RULES).

Register of Recovery of "Survey Advances" and "fixed charges" on account of stones planted in private properties in..... .. Pakuthi.

Serial Number.	Authority for recovery.		Particulars of the stones planted.			Particulars of the amount to be recovered.					Details of recovery.								
						Cost of stones.	Carriage and planting charges.	Line clearing charges.	Fixed charges.	Total.	Date of recovery.	Amount recovered.	Date of remittance into the Treasury and Chellan number.	Remarks.					
	Number.	Date.	Survey number of the land.	Description of the stones.	Number of stones.										Rs. sh. o.	Rs. ch. o.	Rs. sh. o.	Rs. ch. o.	Rs. ch. o.





FORM No. XII.

(VIDE RULE 4 OF PART II OF THE RULES).

NOTICE.

No.

To

.....

..... Pakuthi,..... Taluk.

1. You are hereby informed that the poramboke numbers, ..... adjoining survey numbers.....in..... Pakuthi, ... .. Taluk, which are included in your Thandaper Account, will be taken up for survey fifteen days after the service of this notice.

2. You are required to attend during survey and to render help by clearing jungle, whenever necessary. In default of your doing so, the work will be done at Government cost and the charges incurred will be recovered from you as arrear of land revenue.

3. For further particulars, please apply to the undersigned, who will give all reasonable assistance in the matter.

Station.

Date.

Accountant.

*Certificate of the Accountant or other Officer.*

The line clearing work was done by the party.

Date.

Signature.

Designation.



Taluk Office.  
Register No.

FORM NO. XIII.

(VIDE RULE 9 OF PART II OF THE RULES).

Report on encroachment on Poramboke land, found in  
unregistered

No. \_\_\_\_\_ Pakuthi \_\_\_\_\_ Taluk.

1. Survey No. of the poramboke land, \_\_\_\_\_ and its  
unregistered  
area \_\_\_\_\_ acres \_\_\_\_\_ cents.
2. Description of the land,  
whether assessed, un-  
assessed, or poramboke ;  
if poramboke, its nature.
3. Area encroached \_\_\_\_\_ acres \_\_\_\_\_ cents.
4. Name of occupant, and  
address.
5. How occupied ; with the  
age of the occupation.
6. Sketch of the occupation.

[ Here enter Sketch. ]

[Reverse of Form No. XIII.]

7. Prohibitory assessment, if any, previously imposed.

Date.

Signature of the Accountant.

- 
8. Revenue Supervisor's opinion or remarks.
9. Purport of Revenue Supervisor's decision, in case he has disposed of an original land complaint under Rule 14 of Part II.
10. Whether any appeal was preferred and if so, purport of appeal decision passed by the Tahsildar under the Travancore Survey and Boundaries Regulation, under Rule 15 of Part II.
11. Purport of Tahsildar's decision, in case he has disposed of a complaint under Rule 16 of Part II.
12. Whether any appeal was preferred and if so, purport of appeal decision passed by the Dewan Peishkar under the Travancore Survey and Boundaries Regulation under Rule 16 of Part II.
13. Date of service of notice to party under Section 12 (1) of the Travancore Survey and Boundaries Regulation, under Rule 19 of Part II.
14. Purport of appeal decision, if any under Rule 20 of Part II.  
 (a) by the Tahsildar.  
 (b) by the Dewan Peishkar.

## FORM NO. XIV.

(VIDE RULE 19 OF PART II, AND RULE 41 OF PART III  
OF THE RULES.)

## NOTICE.

No.

To

\_\_\_\_\_ Pakuthi, \_\_\_\_\_ Taluk.

1. You are hereby informed that the porambokes, *viz.* survey numbers \_\_\_\_\_ adjoining survey numbers \_\_\_\_\_ in \_\_\_\_\_ Pakuthi, \_\_\_\_\_ Taluk, for which you are seen to be the registered-holder, have been demarcated and surveyed, and the fact has been published in the Government Gazette dated \_\_\_\_\_

2. You are also informed that the encroachment shown in the subjoined sketch has been taken against you.

3. Complaints against the present demarcation of the boundaries of your abovesaid lands, if any, should be preferred within three months from the date of publication (*i. e.*, \_\_\_\_\_) of the abovesaid notification to the undersigned if it be one that the boundaries have not been correctly fixed as per previous survey measurements, or to the Dewan Peishkar of the Division if it be one that the land now treated as poramboke forms part of registered land as per the *Mugu* accounts or as per the old settlement Demarcation Rules.

4. Copies of measurement or other records required may be had from the Taluk Cutcherry on payment of the prescribed fees.

Date.

Tahsildar.

*Sketch of the encroachments.*

[Here enter Sketch.]

FORM NO. XV.

(VIDE RULE 35 OF PART III OF THE RULES).

NOTICE.

No. \_\_\_\_\_  
To \_\_\_\_\_

\_\_\_\_\_ Pakuthi, \_\_\_\_\_ Taluk.

1. You are hereby informed that the sub-divisions noted below will be taken up for demarcation and survey fifteen days after the service of this notice, and it is seen that you are the registered-holder of these sub-divisions.

2. You are required to produce survey marks of the prescribed size and description and render necessary help by clearing jungle, planting stones, etc., during the survey. In default of your doing so, the work will be done at Government cost and the charges incurred will be recovered from you as an arrear of land revenue.

3. For further particulars, please apply to the undersigned, who will give all reasonable assistance in the matter.

Station.

Accountant.

Date.

Taluk.

Pakuthi.

Sub-divisions.

...

...

...

...

...

...

*Certificate of the Accountant or other Officer.*

The planting of stones and other works have been done by the party,

Date.

Signature,  
Designation.

FORM NO. XVI.

(VIDE RULE 41 OF PART III OF THE RULES).

NOTICE.

No. \_\_\_\_\_  
To \_\_\_\_\_

\_\_\_\_\_ Pakuthi, \_\_\_\_\_ Taluk.

1. You are hereby informed, that the sub-divisions \_\_\_\_\_ of survey numbers \_\_\_\_\_ in \_\_\_\_\_ Pakuthi, \_\_\_\_\_ Taluk, which are registered in your name, have been demarcated and surveyed, and the fact has been published in the Government Gazette dated \_\_\_\_\_

2. Complaints against the present demarcation of the boundaries of your abovesaid lands, if any, should be preferred to the undersigned within three months from the date of publication (i. e., \_\_\_\_\_) of the abovesaid notification.

3. Copies of measurement or other records required may be had from the Taluk Cutcherry on payment of the prescribed fees.

Date.

Tahsildar.

FORM No. XVII.

(VIDE RULE 44 OF PART III OF THE RULES.)

Annual Return of poramboke, puduval and other sub-divisions demarcated and surveyed during 110...M. E., in.....Taluk.

Number and name of village.	No. of poramboke, puduval, and other sub-divisions remaining to be surveyed at the beginning of the year.	No. of poramboke, puduval and other sub-divisions sanctioned during the year.	No. of poramboke, puduval and other sub-divisions surveyed and plotted during the year.		No. of stones put in for the poramboke, puduval and other sub-divisions.		No. of old stones.				Remarks.	
			Of the old sub-divisions as per Col. No. 2.	Of the new sub-divisions as per Col. No. 3.	Theodolite stones.	Field stones.	Renewed.		Repaired.			
							Theodolite stone.	Field stones.	Theodolite stones.	Field stones.		
1	2	3	4	5	6		7				8	

cliv

Station.  
Date.

Revenue Supervisor.

Tabsildar.

FORM No. XVIII.

(VEDE RULE 2 OF PART IV OF THE RULES).

Diary of Survey Accountant.....of.....peakuthi, for the month of.....TIC...M. E.

Date.		Verification of Poramboke boundaries.		Demarcation and Survey of Poramboke.		Encroachments detected.		Demarcation and Survey of Sub-divisions.	
Survey or Revenue No. of the Poramboke.		Survey or Revenue No. of the adjoining lands measured.		Survey or Revenue No.		Survey or Revenue No.		Survey or Revenue No.	
Total No. of chains measured.		Full area of Survey or Revenue No.		Area.		Area.		File No. of the Taluk.	
Chains, measured.		Chains measured.		Chains measured.		Chains measured.		Number of the Survey or Revenue numbers subdivided.	
Survey or Revenue No.		Survey or Revenue No.		Survey or Revenue No.		Survey or Revenue No.		No. of sub-divisions contained in the Survey or Revenue No.	
Full area of Survey or Revenue No.		Area.		Area.		Area.		Area of the full Survey or Revenue field measured for plotting.	
Chains, measured.		Chains measured.		Chains measured.		Chains measured.		Number of sub-divisions surveyed.	
Survey or Revenue No.		Survey or Revenue No.		Survey or Revenue No.		Survey or Revenue No.		No. of chains measured.	
Full number of Poramboke.		Back waters, rivers, roads, etc.		Back waters, rivers, roads, etc.		Back waters, rivers, roads, etc.		No. of stones planted by ryots.	
Number of stones found missing.		No. of stones renewed.		Number.		Area.		No. of stones planted at Government cost.	
Number.		Area.		Nature of the sub-division.		Nature of the sub-division.		Remarks.	
Area.		Nature of the sub-division.		File No. of the Taluk.		File No. of the Taluk.			
Nature of the sub-division.		File No. of the Taluk.		Number of the Survey or Revenue numbers subdivided.		Number of the Survey or Revenue numbers subdivided.			
File No. of the Taluk.		Number of the Survey or Revenue numbers subdivided.		No. of sub-divisions contained in the Survey or Revenue No.		No. of sub-divisions contained in the Survey or Revenue No.			
Number of the Survey or Revenue numbers subdivided.		No. of sub-divisions contained in the Survey or Revenue No.		Area of the full Survey or Revenue field measured for plotting.		Area of the full Survey or Revenue field measured for plotting.			
No. of sub-divisions contained in the Survey or Revenue No.		Area of the full Survey or Revenue field measured for plotting.		Number of sub-divisions surveyed.		Number of sub-divisions surveyed.			
Area of the full Survey or Revenue field measured for plotting.		Number of sub-divisions surveyed.		No. of chains measured.		No. of chains measured.			
Number of sub-divisions surveyed.		No. of chains measured.		No. of stones planted by ryots.		No. of stones planted by ryots.			
No. of chains measured.		No. of stones planted by ryots.		No. of stones planted at Government cost.		No. of stones planted at Government cost.			
No. of stones planted by ryots.		No. of stones planted at Government cost.		Remarks.		Remarks.			
No. of stones planted at Government cost.		Remarks.							

Station.  
Date.

Accountant.



FORM No. XIX.  
(VIDE RULE 16 OF PART IV OF THE RULES.)  
(1st page.)

Diary of Revenue Supervisor.....of.....  
Taluk, for the <sup>first</sup>/<sub>second</sub> fortnight of.....110.....

(All the days in the fortnight should be shown in this page.)

Date.	Village in which encamped.	Nature of work performed.	Details of the work done, in the case of work other than field inspection.	Remarks.
1	2	3	4	5

Camp.  
Date,

Revenue Supervisor.

(2nd page.)

DETAILS OF FIELD INSPECTION.  
(Only the dates on which field inspection was done need be entered in this page.)

Date.	Name of village in which work was inspected.	Name of Accountant whose work was inspected.	Survey of poramboles.			
			Survey fields re-measured for fixing correctly the boundaries of poramboles.	No. of chains measured.	Poramboke number re-surveyed for independent plotting.	No. of chains measured.
1	2	3	4			

(3 Page.)

Field stones inspected out of those renewed and repaired.			Theodolite stations re-fixed by the Revenue Supervisor.	Inspection of sub-divisions surveyed.			Land complaints enquired into.	Quality of the work examined good, fair, indifferent or bad.	Remarks.
Survey Number.	Renewed No.	Repaired No.		Survey Number.	Sub-division No.	No. of chains measured.			
5	6	7	8	9	10				

Revenue Supervisor.

(4th page.)

DIARY OF REVENUE SUPERVISOR.

Remarks of the Tahsildar.

Mr.....  
Of.....Taluk.

For <sup>first</sup>/<sub>second</sub> fortnight of.....110....

Orders of the Dewan Peishkar.

Abstract.

Period.	No. of days spent on field inspection.	No. of days spent at head quarters.	No. of days spent on leave, or holidays.	Remarks.
During the fortnight				
Up to the fortnight since the beginning of the year.				
Total ...				

FORM NO. XX.

(VIDE RULE 24 OF PART IV OF THE RULES).

(1st page),

L. R. M. Diary of Tahsildar, Mr.....Of.....  
Taluk, for the month of.....110.....M. E.

Date.	Village in which encamped.	Nature of work performed.	Details of the work done in the case of work other than field inspection.	Remarks.
1	2	3	4	5

Camp.  
Date.

Tahsildar.

(2nd page)

DETAILS OF FIELD INSPECTION.

(Only the dates on which field inspection was done need be entered in this page).

Date.	Name of Village in which work was inspected.	Survey of porambokes			Survey Number.	Renewed Number.	Repaired Number.
		Survey fields remeasured for fixing correctly the boundaries of porambokes.	No. of chains measured.	Poramboke numbers resurveyed for independent plotting.			
1	2	3	4	5			

Field stones inspected, out of those renewed and repaired.

(3rd page).

Inspection of the Theodolite stones refixed by the Revenue Supervisor.	Inspection of subdivisions surveyed.			Land complaints enquired into.	Quality of the work examined; good, fair, indifferent or bad.	If the work inspected is the over-check of the work of the Revenue Supervisor, brief remarks about the Revenue Supervisor's work.	Remarks.
	Survey Number.	Sub-division Number.	No. of chains measured.				
6	7	8	9	10	11		

Tahsildar.

(4th page)

DIARY OF TAFSILDAR.

Mr..... of.....

For <sup>first</sup> ~~second~~ fortnight.....of...110..

Orders of the Dewan Peishkar.

ABSTRACT.

Period.	No. of days spent on field inspection.	No. of days spent on record inspection.	Remarks.
Up to the fortnight since the beginning of the year.  Total			

## Appendix I.

1. A register shall be maintained in the Taluk Office in Form A appended. A total should be struck at the end of each month and should be agreed each month with the Treasury figures under debits and credits, "Survey Advance Tahsildar". These figures should also be agreed with the Account Office figures transmitted for the purpose, as soon as the accounts of a month are closed. There should be a certificate of agreement in the register in respect of the figures of each month.

2. Before the tenth of each month a Demand, Collection and Balance statement shall be prepared in Form B appended in respect of the stones planted in registered holdings, and forwarded to the Dewan Peishkar by the Tahsildar. The recoveries under "Survey Advance,—Tahsildar," and "fixed charges", (on account of the time and labour of the Government Maintenance staff) shall represent the sum total of the recoveries noted in the Index [Form No. VIII (A)] attached to the Recovery Statement in Form No. VIII maintained in the Taluk Office together with the receipts on account of cash sales. This statement shall be verified by the Sub-Treasury Officer before submission to the Dewan Peishkar. In arriving at the Balance, the figures under cash sales shall be ignored. A new sub-head under 'Land Revenue-Miscellaneous' will be opened in each Treasury and Sub-Treasury under "Fixed charges-L. R. M. Scheme"—to watch the recoveries under "Fixed charges" and to verify the same. The Dewan Peishkar will have the returns received from the Tahsildars verified by the Divisional Treasury Officers.

3. In respect of stones planted in Government porambokes and unregistered lands, a Demand, Collection and Balance statement shall be prepared, in Form C appended, and verified by the Treasury Officer. This statement shall also be submitted to Dewan Peishkar by the Tahsildar before the tenth of each month.

4. The Tahsildar shall also submit, before the tenth of each month, a statement in Form D appended, showing the stock of stones in the Pakuthi Depots. Value of stock at the beginning of the month and purchased during the month shall agree with the debits under "Survey Advance,—Tahsildar," in the Treasury Officer's books. Issues during the month shall agree with the month's issue lists received from

the Proverthicars as per Rule 28. Cash sales shall agree with the corresponding column in the D. C. B. statement in Form B.

5. The Dewan Peishkar shall review the various D. C. B. Returns and send copy of his review to the Land Revenue and Income Tax Commissioner and the Account Officer. The Land Revenue and Income Tax Commissioner shall, in turn, review the same sending copy of his review to the Government and the Account Officer.

6. As soon as the accounts of a month are closed the Account Officer shall send a statement to the Tahsildar showing the opening balance, debits and credits during the month under "Survey Advance—Tahsildar" and it shall be the duty of the Tahsildar to see that his figures and the Account Officer's figures tally each month.

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## FORM A.

(VIDE RULE 1 OF APPENDIX 1 TO THE RULES.)

Register showing the amounts drawn under Survey Advance and the recoveries and adjustments made on account of planting of demarcation stones.

Amount drawn under Survey Advance.										Amount adjusted under Survey Advance.												
Date of Drawal of the amount.	Cost of stones.			Cost of carriage and planting and line clearing charges.			Document on the strength of which the amounts are drawn.	Total amount drawn.		Value of stones sold for cash.		Value of stones planted in Government lands charged to contingencies.		Recoveries made from registered holders for stones planted in registered lands.					Document on the strength of which the amount was adjusted.	Total amount adjusted.	Remarks.	
Size- No. of stones.	Amount.	No. and date of abstract bill.	Carriage and planting.	Line clearing.	Total.	No. and date of the abstract bill.	No. of stones.	Cost.	No. of stones.	Cost.	No. of stones.	Cost.	No. of stones.	Cost of stones.	Carriage and planting.	Line clearing charges.	Total.	Date of adjustment.	No. and date of abstract bill.	Total.	Remarks.	
Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.		Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	Rs. ch. c.	

**FORM B.**

**(VIDE RULE 2 OF APPENDIX 1 TO THE RULES.)**

**Statement showing the Demand, Collection and Balance of amount spent in respect of stones planted in registered holdings for.....M. E.**

Serial No.	Name of Pakuthi.	Demand.			Collection.		Balance.	Remarks.
		Amounts recoverable as per Form No. VIII sent to the Proverthiars up to the end of the previous month.	Amount recoverable as per Form No. VIII sent to the Proverthiars during the month.	Total amount to be recovered.	Amount recovered and credited to Survey Advance during the month.	No. and date of chellan for the credit made.	Amount to be recovered as per Form No. VIII sent to Proverthiars at the end of the month.	Here enter the Serial No. of statements in Form VIII included in column 4.
1	2	3	4	5	6	7	8	9



### FORM C.

(VIDE RULE 3 OF APPENDIX 1 TO THE RULES.)

Statement showing the Demand, Collection and Balance of amount spent in respect of stones planted in Government porambokes and unregistered lands during..... M. E.

Serial No.	Name of Pakuthi.	Demand.			Collection.		Balance.	Remarks.
		Amount transferable as per Form No VII passed up to the end of the previous month.	Amount transferable as per Form No, VII passed during the month.	Total amount to be transferred.	Amount transferred to contingencies during the month.	No. and date of contingent bill in which adjustment is made,	Amount to be transferred as per Form No. VII passed at the end of the month.	Here enter the Serial No. of bills in Form No. VII included in column 4.
1	2	3	4	5	6	7	8	9

**FORM D.**

**(VIDE RULE 4 OF APPENDIX I TO THE RULES.)**

Statement showing the stock, issue and balance of demarcation siones in Pakuthi  
Depots for.....M. E.

Serial No.	Pakuthi.	Stock at the beginning of the month.			Purchases during the month.			Issued on Indents			Cash sales.			Balance.			Remarks.
		Number.	Description.	Value.	Number.	Description.	Value.	Number.	Description.	Value.	Number.	Description.	Value.	Number.	Description.	Value.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Rs. oh. c.			Rs. oh. c.			Rs. ch. c.			Rs. ch. c.			Rs. ch. c.	

AKP

R. Dis. 714 of 27/Rev.

**RULES UNDER SECTION 32, CLAUSE (e) OF THE TRAVANCORE SURVEY AND BOUNDARIES REGULATION.**

In supersession of Notification Dis. No. 257 of 1921/L. R. dated the 19th February 1921 and with the sanction of Her Highness the Maha Rani Regent, the following revised rules are passed under Section 32, Clause (e) of the Travancore Survey and Boundaries Regulation, X of 1094 for the apportionment of charges incurred under Sections 7 and 8 of the Regulation.

1. During survey it shall be the duty of every registered holder of land (1) to clear the northern and eastern boundaries of his land and the interior chain and offset lines, (2) to plant the survey marks on the northern and eastern boundaries, (3) to provide flag holders and chainmen to measure the northern and eastern boundaries of the land and the interior chain and offset lines and (4) to do all the above mentioned items of work on the western and southern boundaries also, if they adjoin a poramboke or Government waste.

2. The cost that may be incurred by Government on account of the registered holder's default in performing these duties shall be recovered at the following rates :—

(i) For clearing boundaries and interior lines. The actual cost incurred for line clearing.

(ii) For providing survey marks. (a) When the stones stocked in the Pakuthi depots are used, the price of the stones as fixed under sanction; when stones are specially cut, the actual cost incurred; and (b) The actual cost incurred for carrying and planting the stones.

(ii) For providing flag-holders and chainmen. Fourteen Chuckrams per acre or fraction thereof measured.

Huzar Cutcherry,  
Trivandrum, 10th June 1927. } (By order)  
K. GEORGE,  
Chief Secretary to Government.

Dis. No. 462/27/Revenue.

Rules for pointing out the boundaries of registered holdings already demarcated and surveyed as per the applications of registered holders.

With the sanction of Her Highness the Maha Rani Regent the following Rules are passed under Section 32 (g) of the Travancore Survey and Boundaries Regulation, X of 1094, regarding the procedure to be adopted in the case of applications from private parties for pointing out the boundaries of their registered holdings already demarcated and surveyed with a view to ensure the proper maintenance, renewal and repairs of the survey marks required under Section 14 of the said Regulation.

1. Applications for pointing out the boundaries of registered lands *already demarcated and surveyed*, shall be made to the Tahsildar of the Taluk in which the land concerned is situated.

2. Every application shall be signed by the applicant and presented by the applicant in person or by duly authorised agent and it shall contain full and accurate information on the following points :—

(1) The pakuthi in which the land concerned is situated.

(2) Survey number with revenue or sub division number of the land.

(3) Extent of the land concerned.

(4) The name of the pattadar.

(5) The name in full and the residence of the applicant.

(6) The applicant's right or interest in the land in item (2).

3. The Tahsildar shall enter the application in a register to be kept in the Taluk for such applications in Form 1 annexed.

4. The applicant shall bear the cost of the work to be done.

5. The fees to be levied will depend on the area of the survey number containing the lands in the case of taluks surveyed under the "Tuk" system and the resurveyed taluk of Nedumangad, and on the area of the revenue numbers containing the lands in the case of the other taluks.

The fees will be calculated at the following rates :—

(a) If the area of the survey number or revenue number is one acre or less Re. 1 Chs. 14.

(b) If the area of the survey number or revenue number is more than one acre Re. 1 Chs. 14 for the first acre and Re. 1 for every additional acre or fraction thereof.

In cases where the above rates of fees are not suitable owing to the heavy work involved, the Tahsildar may fix higher fees according to the condition of the case, in consultation with the Dewan Peishkar of the Division or the Commissioner, Devicolam.

6. The Tahsildar shall, after determining the fees to be levied, issue notice to the applicant in Form 2 annexed, informing him of the amount to be deposited and forward the application to the Revenue Supervisor (Revenue Inspector in the taluks of Devicolam and Peermade) who shall themselves attend to the work.

7. If the applicant fails to deposit the fee mentioned above within seven days as prescribed in the notice, the application shall be rejected.

8. The fee, if deposited, shall be credited to Government under the Budget Head—I-B 3 "other items".

9. The officer attending to the work shall issue notice in Form 3 annexed, to the applicant as well as to the pattadars of the adjoining lands, fixing the date of commencement of the work, at least seven days in advance.

10. If the applicant, after making the deposit, fails to produce the necessary survey marks or coolies for the line clearance, in spite of the notice issued, the application shall be returned by the officer to the Tahsildar and it shall then be struck off the register. The applicant shall also forfeit the amount deposited by him.

Complaints on the question whether there has been default or not will be enquired into and disposed of by the Tahsildar and his decision thereon shall be final.

11. The boundaries shall be refixed according to the existing measurement records, and the necessary renewals and repairs of survey marks executed. The applicant and the adjoining landholders shall be asked to attest the refixing sketch of the land in token of the work having been attended to by the officer responsible therefor. But the refusal of any of the parties to attest the sketch shall, in no way, interfere with the closing of the records and completion of the work.



(b) If the area of the survey number or revenue number is more than one acre Re. 1 Chs. 14 for the first acre and Re. 1 for every additional acre or fraction thereof.

In cases where the above rates of fees are not suitable owing to the heavy work involved, the Tahsildar may fix higher fees according to the condition of the case, in consultation with the Dewan Peishkar of the Division or the Commissioner, Devicolam.

6. The Tahsildar shall, after determining the fees to be levied, issue notice to the applicant in Form 2 annexed, informing him of the amount to be deposited and forward the application to the Revenue Supervisor (Revenue Inspector in the taluks of Devicolam and Peermade) who shall themselves attend to the work.

7. If the applicant fails to deposit the fee mentioned above within seven days as prescribed in the notice, the application shall be rejected.

8. The fee, if deposited, shall be credited to Government under the Budget Head—I-B 3 "other items".

9. The officer attending to the work shall issue notice in Form 3 annexed, to the applicant as well as to the pattadars of the adjoining lands, fixing the date of commencement of the work, at least seven days in advance.

10. If the applicant, after making the deposit, fails to produce the necessary survey marks or coolies for the line clearance, in spite of the notice issued, the application shall be returned by the officer to the Tahsildar and it shall then be struck off the register. The applicant shall also forfeit the amount deposited by him.

Complaints on the question whether there has been default or not will be enquired into and disposed of by the Tahsildar and his decision thereon shall be final.

11. The boundaries shall be refixed according to the existing measurement records, and the necessary renewals and repairs of survey marks executed. The applicant and the adjoining landholders shall be asked to attest the refixing sketch of the land in token of the work having been attended to by the officer responsible therefor. But the refusal of any of the parties to attest the sketch shall, in no way, interfere with the closing of the records and completion of the work.





FORM II.

No.

NOTICE.

To

.....  
.....Pakuthi,  
.....Taluk.

1. With reference to your application dated.....for pointing out the boundaries of Survey No.....in .....Pakuthi,..... Taluk, you are hereby informed that you should remit into the treasury the fee of Rs... ..due according to the Rules, and produce the Chalan receipt within 7 days from the date of service of this notice.

2. In the event of your not remitting the fee and producing the Chalan within the time specified above, your application will be rejected.

Date ... .. Tahsildar,  
.....Taluk.

FORM III.

No.

NOTICE.

To

.....  
.....Pakuthi,  
.....Taluk.

1. You are hereby informed that the boundaries of (Survey No... ..(and sub-divisions .....therein) in..... .....Pakuthy ... ..Taluk, will be refixed according to existing measurements as per your application dated as per the application dated of the registered holder of survey No. . . . . on.....or soon thereafter.

2. You are required to attend during the work, renew and repair the survey marks wherever necessary, and to render necessary assistance for the work by clearing jungle wherever required on or within the boundaries of your registered holding.

3. In default of your doing so your application will be struck off the necessary work will be done the Register and the amount deposited will be forfeited to Government at Government cost and the charges incurred will be recovered from you as an arrear of Land Revenue.

4. For further particulars, please apply to the under-  
signed, who will give all reasonable assistance in the matter.

Date,.....  
Revenue Supervisor,  
Revenue Inspector,  
.....Taluk.

FORM IV.

No.

NOTICE.

To

.....  
.....Pakuthi,  
.....Taluk.

1. You are hereby informed that the boundaries of  
Survey No. .... (and sub-divisions ..... therein)  
in ..... Pakuthi ..... Taluk have been refixed  
in connection with the application dated ... .. made  
by you \_\_\_\_\_  
its registered holder.

2. Complaints against the present refixing of the bound-  
aries of your land, if any, should be preferred to the Dewan  
Peishkar of the Division or the Commissioner, Devicolum  
within three months from the date of service of this notice.

3. Copy of the refixing sketch now prepared is herewith  
supplied may be had  
from the Taluk Office on payment of the prescribed fees.

Date

Tahsildar,  
Taluk.

D. Dis. No. 774/27/Revenue.

RULES FOR THE DEMARCATION AND SURVEY OF SUB-  
DIVISIONS OF HOLDINGS ON THE APPLICATION  
OF PARTIES UNDER SECTION 32, CLAUSE (g)  
OF THE TRAVANCORE SURVEY AND  
BOUNDARIES REGULATION.

In supersession of Notification Dis. No. 799 of 21/Rev.,  
dated the 31st August 1921, and with the sanction of Her  
Highness the Maha Rani Regent, the following rules are  
passed under Section 32, Clause (g), of the Travancore Sur-  
vey and Boundaries Regulation, X of 1094, for the demar-  
cation and survey of sub-divisions on the applications of  
parties.

1. When the registered holder of a settlement or post settlement or current Pokkuvaravu sub division *which has not yet been demarcated* and surveyed applies for the demarcation and survey of his land, it shall be done *at his cost*. Such applications shall be made to the Tahsildar of the Taluk in which the land is situate.

2. The full survey or revenue number containing the sub-division shall be demarcated and surveyed now so as to show all the sub-divisions therein and the applicant shall pay fees for the whole area of the survey or revenue number.

3. If the survey number or revenue number is, however, very large (over five acres) the area held by the previous registered holder at the time when the land was conveyed to the applicant shall be demarcated and surveyed so as to show the applicant's land and also later sub-divisions, if any, and fees shall be paid only for the area above mentioned.

4. Fees shall be levied at the following rates :—

(a) When the area to be surveyed is one acre or less, Re. 1 and Chs. 14.

(b) When the area to be surveyed is more than one acre, Re. 1 Chs. 14 for the first acre and Re. 1 for every additional acre or fraction thereof.

5. The Tahsildar shall, after determining the fees to be levied, issue notice to the applicant in form No. I annexed informing him of the amount to be deposited.

6. If the applicant fails to deposit the fee mentioned above within seven days as prescribed in the notice, the application shall be rejected immediately.

7. The Tahsildar shall, if the amount is deposited, enter the application in the register to be kept in the Taluk Office for such applications in Form No. IV and then forward the application to the Revenue Supervisor for demarcation and survey of the lands. The Revenue Supervisor shall issue notice in Form No. II annexed, to the applicant and also to the registered holders of the sub-divisions within the survey number or revenue number concerned and also of the adjoining survey numbers or revenue numbers, who may be affected by the sub-division survey to be taken up.

8. The fee shall be remitted into the treasury under the head I B (3) and it will not be refunded under any circumstances.

9. The outer boundary of the survey or revenue number shall be demarcated strictly in accordance with the original

measurements ignoring the present limits of enjoyment ; and the missing stones shall be renewed and repaired as provided for in the Part I of the Revised Land Records Maintenance Rules. Sub-division boundaries which have been previously demarcated and surveyed shall also be dealt with in the same manner.

10. Sub-division boundaries which have to be newly demarcated shall be demarcated in accordance with the Government records and document of title whenever such records and documents clearly indicate the measurements, extent and shape of the sub-division to be made and in the absence of that, in accordance with the limits of enjoyment as seen on the ground or as appearing from other evidence to be taken by the Survey Officers.

The clearing of the boundary and interior lines and the providing of new survey marks and flag-holders and chain-man will be carried out according to the rules passed under Section 32 Clause (e) of the Travancore Survey and Boundaries Regulation.

11. The field work, plotting and area-computation of the sub-division survey shall be checked by the Revenue Supervisor. He shall then return the application to the Tahsildar along with the plotted sketch and other records of the file.

12. Complaints received during the course of the demarcation and survey shall be enquired into and disposed of by the Tahsildar.

13. After the application and records are received from the Revenue Supervisor or the Tahsildar shall send the plotted field measurement sketches to the Survey office for checking. On receipt back of the sketches from the Survey officer after check the Tahsildar shall issue notice in Form No. III annexed to all parties affected by the survey about the completion of the sub-division survey.

14. Appeals against the orders of the Tahsildar shall lie to the Dewan Peishkar or the Commissioner, Devicolam, to whom the Tahsildar is immediately subordinate.

15. After the sub-division sketch becomes final according to the Regulation, the party on whose application and at whose cost the sub-division has been demarcated and surveyed, shall be supplied with a copy of the sub-division sketch free of cost.

16. The final sketch shall be sent to the Proverthicar for taking copy and shall be got back and recorded in the Taluk Office along with the measurement records of the Pakuthi.

17. The duties of the Revenue Supervisor mentioned above shall be performed by the Revenue Inspectors in the Devicolam and Peermade Taluks.

Huzur Cutcherry,  
Trivandrum, 10th  
June 1927.

By order,  
K. GEORGE,  
Chief Secretary to Government.

FORM No. I.

NOTICE.

No.

To

.....  
..... Pakuthi,  
..... Taluk.

1. With reference to your application dated .....  
..... for the demarcation and survey of sub-division No.  
..... of Survey No ... in ..... Pakuthy .....  
Taluk, you are hereby informed that you should remit into  
the treasury the fee of Rs ..... due according to the  
rules, and produce the chalan receipt within 7 days from the  
date of service of this notice.

2. In the event of your not remitting the fee and pro-  
ducing the chalan within the time specified above, your appli-  
cation will be rejected.

Tahsildar.

Date .....

..... Taluk.

FORM No. II.

NOTICE.

No.

To

.....  
..... Pakuthy ..... Taluk.

1. You are hereby informed that the sub-divisions .....  
..... of Survey numbers ... in .....  
Pakuthy, ... Taluk, will be taken up for demarcation  
and survey as per your application dated .....  
as per the application dated .. of

..... OR .....  
the registered holder of survey Nos... ..  
..... or soon thereafter.

2. You are required to attend during the survey, renew and repair the survey marks wherever necessary, and to render necessary assistance for the survey by providing new stones or marks and clearing jungles wherever necessary on the boundaries of your registered holding and also by providing flag-holders and chainmen.

3. In default of your doing so, the necessary work will be done at Government cost, and the charges incurred will be recovered from you as an arrear of land revenue.

4. For further particulars, please apply to Accountant .....who will give all reasonable assistance in the matter.

Revenue Supervisor.

Date.....

FORM No. III.

NOTICE.

No.

To

.....  
.....Pakuthi..... Taluk.

1. You are hereby informed that sub-division.....  
... of Survey No.....of.....Pakuthi.....  
..... Taluk, of which you are the registered holder, has been demarcated and surveyed in connection with the application dated..... made by you  
the registered holder of sub-  
..... and the particulars of the division ..... present survey are given overleaf.

2. Complaints against the present demarcation of the boundaries of your land, if any should be preferred to the Dewan Peishkar or the Commissioner, Devicolar, within three months from the date of the service of this notice.

3. Copy of the sub-division sketch and Land Register now prepared is herewith supplied  
may be had from the Taluk Cutcherry on payment  
of the prescribed fees.

Tahsildar.

Date .....

..... Taluk.



STANDING ORDER No. 1

*Subject:* Inspection of poramboke survey and subdivisions on account of Puduval, Pokkavaravu, Karampathippu etc. by the Assistant Tahsildars and the entries to be made by them in the Field Measurement sketches.

1. The Assistant Tahsildars should mark off in red ink, the measurements checked by them in the field.

2. If in the new measurements (side measurements, offsets, etc.) taken for the survey of porambokes and other subdivisions, differences are found, the measurements now found should be noted.

3. When the measurements taken by the Assistant Tahsildars are found to differ from those recorded by the village officers, such measurements should be scored through and the Assistant Tahsildar's measurements noted in good red ink with their initials.

4. In the bottom left-hand corner of the Field Measurement sketch and within the margin lines, the Assistant Tahsildars should make the following entry, *viz.*,

Checked.....lines.....chains.  
and affix thereto their initials and date.

5. Where only the plotting and areas of the sketches are examined, the Assistant Tahsildars should affix their initials and date in the bottom right-hand corner of the sketches just outside the margin line.

Survey Office, } (Sd.) M. RAGHAVA AIYANGAR,  
Camp: Kottayam, } *Asst. Supt. Trav. Survey.*  
17-7-21/2-12-1096. }

Land Records Office,  
Trivandrum, 14-12-23/29-4-1099.

STANDING ORDER No. 2.

It has been brought to the notice of the undersigned that the Assistant Tahsildars do not note the width of roads and channels in the sketches attached to the A form statements; the sites of which are recommended for registry by



them and that as such much difficulty is experienced by the Tahsildars and the P. W. D. officers in their joint inspection and disposing of them quickly.

The Assistant Tahsildars are therefore directed to note the width of roads and channels in the sketches of the encroachment cases (A form statements), the sites of which are recommended for registry, to prepare C form statements (as per Puduval rules) filling up columns 1 to 7 thereof and to forward them to the Tahsildars along with A form statements.

(Sd.) M. RAGHAVA AIYANGAR,  
*Supt: Land Records.*

To

All the Assistant Tahsildars.

Land Records Office,

Camp: Always, 2-5-99/17-12-1923.

STANDING ORDER No. 3.

It is noticed that in certain taluks inordinate delay is occasioned in the matter of submitting recovery statements on account of stones planted by the Accountants and Surveyors for audit and payment. As this practice leads to considerable delay in passing previous accounts for payment and the disposing of papers relating back to a long period of time, thus affecting the orderly routine of work, the Assistant Tahsildar should submit the recovery statements before the 10th of every month for the stones planted during the previous month promptly in future. The Accountants and Surveyors should be ordered to submit the statements there and there.

Any statement involving further delay will not be attended to by the undersigned.

(Sd.) M. RAGHAVA AIYANGAR,  
*Supt: Land Records.*

To

All the Assistant Tahsildars.

Land Records Office,  
Trivandrum, 3-3-1099/20-10-1923.

STANDING ORDER No. 4.

It is observed that the indents for the stones planted by the Accountants are omitted to be enclosed occasionally along with the individual recovery statements that are submitted for audit and payment. This tends to unnecessary correspondence and much difficulty is experienced in regard to the checking of the annual inspection statements and to the recovery of the value of stones from the Accountant responsible if he had not accounted for the stones received by him on indents. To avoid difficulties the following instructions are issued for the guidance of Assistant Tahsildars and Surveyors.

1. The indents for the stones received should be appended along with the individual recovery statements that are submitted to this office.

2. If all the stones received on indents have not been used, the stones actually used and planted should be noted on the reverse side of the indents themselves and the balance struck off by the Accountants in red ink.

3. The indents thus submitted should be numbered serially by the Assistant Tahsildar on the top of the indents in the right hand side and these may be referred to against the names of the Accountant in the consolidated statement.

The above instructions should be adhered to in future by the Assistant Tahsildars and Surveyors.

(Sd.) M. RAGHAVA AIYANGAR,  
Superintendent Land Records.

To

All the Assistant Tahsildars.

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Land Records Office,  
Trivandrum, 9-1-1924/25-5-1099.

STANDING ORDER No. 5.

Several petitions are being received in this office direct and from the Tahsildars protesting against the recovery of

the cost of demarcation stones planted at Government cost either on the ground that the stones for which the value is claimed have not been planted or that they were planted by the petitioners themselves. The matter has been seriously noticed by Government also. The Assistant Tahsildars are therefore requested to exercise better scrutiny in the matter of checking the stones planted at Government cost and not to give room to such complaints in future. Recovery statements will be passed hereafter, only after the same is fully certified to by the Assistant Tahsildars that the checking of the items claimed has been made by them.

(Sd.) M. RAGHAVA AIYANGAR,  
Superintendent, Land Records.

To

All the Assistant Tahsildars.

Land Records Office,  
Trivandrum, 18-6-1100.

#### STANDING ORDER No. 6.

The demarcation and survey of railway [porambokes, the following instructions should be followed.

1. The entire survey field with all the sub-divisions including railway porambokes should be surveyed as in the case of other porambokes.

2. A and B class lands may be surveyed together but lands relinquished may be surveyed as separate sub-division as they could be registered. Poramboke numbers or letters as the case may be, should be given as per the rules for the lands relinquished. A remark also should be made in sketches for giving new numbers as stated above.

3. The demarcation of the railway sub-divisions is to be done as per the existing state of ground provided the width noted in the railway maps is not diminished. Whenever doubt arises a report with neat sketch should be submitted for orders.

4. Stones need be planted only on the outer boundary of the railway lands. Stones falling within railway lands

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need not be planted either by the ryots or at Government cost and he is referred to the circular order on the subject, i. e., in the case of road porambokes.

(Sd.) M. RAGHAVA AIYANGAR,  
Superintendent, Land Records.

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Land Records Office,  
Trivandrum, 18-2-1925/7-7-1100.

**STANDING ORDER No. 7.**

It is observed that the Assistant Tahsildars are not submitting the original plotted sketches of porambokes to this office for checking as per instructions contained in this office No. 5198 dated 10-4-1924/25-8-1099 which lays down clearly that the records prepared in a month should be submitted to this office for checking at the beginning of the fourth month, succeeding to that in which originals were prepared after preparation of the duplicates and triplicates. But the records even of the pakuthies in which demarcation and survey have been completed by the end of 1099 are still pending with them. This is not at all satisfactory. Their attention is once more drawn to the circular referred to above and they are requested to see that the records pending submission on the date of receipt of this Circular are submitted at once. Any delay on their part in submitting the records, will be seriously taken notice of.

(Sd.) V. T. THOMAS,  
For Superintendent, Land Records.

To  
All the Assistant Tahsildars.

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LAND RECORDS MAINTENANCE CIRCULAR NO. 1.

*Subject*:—Preparation of Field Measurement sketches.

1. The survey field should be plotted in the centre of the F. M. printed form and in the correct direction. In the absence of printed forms, cartridge paper or other durable paper, of uniform size *viz.*, 13" × 13" may be used.

2. The scale to be adopted for plotting is as follows:—

*Scale.*

Fields up to 5 acres.	1" equal to 1 chain.
Fields from 5 acres to 20 acres.	1" Do. 2 chains.
Fields over 20 acres.	1" Do. 5 chains.

*Exception*:—Small or narrow fields should be plotted on a scale of 2" to 1 chain if it is necessary for the sake of clearness.

3. The survey field boundary lines should be inked five links broad on the scale of 40 inches to 1 mile irrespective of the scale used in plotting the survey field.

4. The Sub-division boundary lines should be inked much thinner than the survey field boundaries.

5. The (side) F measurements should always be entered just outside the field and adjoining the boundary line.

6. The G. lines as well as Check lines should be inked in thin broken lines neatly. The measurements of these lines should be entered near the ends where the lines close and within brackets.

7. The G. measurements and offsets should be neatly entered in the right hand side of the paper within the marginal line.

8. The adjoining survey numbers and sub-divisions should be shown.

9. Theodolite stones on or within the boundaries of survey fields should be marked in the F. M. sketches by their appropriate symbols, and in their correct positions.

10. The name of the Taluk, the No. and name of the Pakuthy, the No. of the Khandom, and scale of the plotting should be neatly entered in ink, in the heading of the Field Measurement Sketch.

*Land Revenue and Income-tax  
Commissioner.*

(Issued to the Dewan Peishkars with Commissioner's letter D. Dis. 2296/27 dated 1st September 1927.)

LAND RECORDS MAINTENANCE CIRCULAR No. 2.

*Subject:*—Correction of the previous survey measurements (*vide* Rule 3 of Part II of the L. R. M. Rules).

1. The previous survey measurements will be deemed to be wrong, if the difference between them and the present measurements exceeds the following limits:—

Lines of 5 chains and under.      3 links.

Do. above 5 chains & up to 10 chains.      1 link  
per chain.

Do. above 10 chains.      10 links.

2. Only in the case of differences, which are *errors* as classified above, the report prescribed in Rule 3 of Part II of the L. R. M. Rules need be prepared and submitted to the Survey Superintendent.

S. C. H. ROBINSON,  
*Land Revenue Commissioner,*  
16-2-28.

Circular approved by Government and the issue of the same sanctioned by Government in their letter D. Dis. No. 210 of 28/Rev. dated 9th February 1928.

LAND RECORDS MAINTENANCE CIRCULAR No. 3.

*Subject:* -Checking of the plotted F. M. sketches and areas by the Revenue Supervisors and the certificates to be entered by them in the Field Measurement sketches.

It is reported that several Revenue Supervisors do not properly check the plotting and areas in the Field Measurement sketches before the sketches are sent to the Survey Office for final check, as required in para 12 of Part IV of the Revised L. R. M. Rules and in para 11 of the Rules passed by Government (in D. Dis. No. 774/27/Rev. dated 10-6-1927) for the demarcation and survey of sub-divisions on the application of parties. This work should not be neglected by them. They should certify at the bottom right hand corner of each sketch just outside the marginal lines "Plotting and areas checked by me" with full signature and date.

Station—Trivandrum,  
Date—8-8-'28.

} S. C. H. ROBINSON,  
} Land Revenue & Income Tax  
} Commissioner.

## LAND RECORDS MAINTENANCE CIRCULAR No. 4.

*Subject*—Comparison of the new Field Measurement sketches with the previous measurement records.

The Revenue Supervisors should compare carefully the measurements in the new Field Measurement sketches now prepared by the Accountants with the previous measurements of the survey Nos. or sub divisions. If the measurements agree, the Revenue Supervisor should certify accordingly in the Field Measurement sketches.

If there are any differences between the measurements, the Revenue Supervisors should verify whether correction reports relating to them have been submitted to and approved by the Survey Superintendent. The approved correction reports should be sent to the Survey Office along with the plotted sketches concerned for verification.

Certificates in the following form should be made by the Revenue Supervisors in the Field Measurement sketches at the bottom right hand corner of each sketch, just outside the marginal lines—"Demarcated as per previous survey measurements" or "Demarcated as per previous survey measurements and correction report attached herewith", with signature and date.

Station. Trivandrum,  
Date. 8-8-'28.

S. C. H. ROBINSON.  
Land Revenue & Income Tax Com-  
missioner.

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~~CHECKED~~  
~~APR 27 1964~~