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responding to the lowest sliding target or target line observed on, viz:—at N feet above 0, and c is a constant having a value in the immediate vicinity of 0.5, such as 0.49925, the value assumed for the set of typical field operations submitted, which represents the precise scale reading when the optical axis is in a truly horizontal position.

3. The elevation of the zero point of the rod, viz.:  $E_0 = C - R \{ (n) - c \}$ , in which relation the symbols have the same meaning as above.

4. The radius R of the vertical circle passing through the optical axis and having its centre on the axis of revolution of the telescope and its circumference tangent to the rod directrix along which the scale divisions are laid off, or to this line produced.

$$R = 100 \ \overline{AB} = 200 \ \overline{BC} = 200 \ \overline{CD} = 100 \ \overline{BD} = 4 \left\{ \overline{BA} + \overline{BC} + \overline{BD} \right\} \times 10 =$$

$$= 2 \ (\overline{AB} + \overline{AU} + \overline{AD}) \times \left\{ 10 + 1 + 0 \cdot 1 + 0 \cdot 01 + \dots \right\} =$$

$$\frac{5 \cdot 7}{\overline{ba}} = \frac{4 \cdot 56}{\overline{bc}} = \frac{2 \cdot 28}{\overline{cd}} = \frac{12 \cdot 54}{\overline{ad}} = \frac{6 \cdot 84}{\overline{bd}} = \frac{17 \cdot 10}{\overline{ba} + \overline{bc} + \overline{bd}} = \frac{28 \cdot 50}{\overline{ab} + \overline{ac} + \overline{ad}}$$

In column 6, the readings of the three verniers, A, B C, which give the directions of the survey lines, are entered.

The actual direction of a line is indicated by vernier C in degrees, minutes and half minutes. Vernier A gives the correct number of degrees, less  $180^{\circ}$  plus  $\frac{2}{5}$  of the total number of minutes indicated by vernier C, and vernier B indicates the same number of degrees as vernier A plus  $15^{\circ}$  and the remaining  $\frac{2}{5}$  of the total number of minutes. So that: 1. The sum of the minutes read with A and B must always be equal to the minutes read with C. 2. The degrees read with B must be equal to the degrees indicated by C less  $180^{\circ}$  and to the degrees read with B less  $15^{\circ}$ . If these relations do not obtain, it is a sign that an error has been made; any one erroneous reading, taken with either of the verniers, can always be corrected by means of the other two readings.

Column 7 is reserved for notes relative to state of weather, description of points, water surfaces, &c.

In column 8 sketches are drawn showing the features of the country traversed, the lines run and levelled, &c. The computations of heights and distances, which have to be measured with the aid of micrometer scale intervals corresponding to known rod intervals, are also made in this column, as well as any other arithmetical operations that may be found necessary.

As already stated, the standard target positions marked on the rod are at: 0.3, 2.58, 7.14 and 12.84 feet above 0 and determine consecutive intervals of 2.28, 4.56 and 5.7 feet, which bear to each other the same ratios as the intervals ab, bc and cdbetween the pins a, b, c, d, of the ordinary tachcometer, pattern No. 1, viz., the ratios of the whole numbers, 4, 8 and 10. These intervals have been selected because they are found to be, on the whole, perhaps better adapted for making accurate distance measurements, independently of levelling than any other.