

Now, with a micrometer screw of the pitch settled upon, the most convenient length to adopt for the unit of the vertical scale of tangents, that is to say: for the radius $r = 1$ of the smallest circle that can be described from a point on the axis of revolution of the telescope near its optical axis as a centre, so as to be tangent to the path followed by the knife edge, would evidently be 10 inches or $\frac{2}{3}$ of a foot—for, in such case each division of a micrometer head divided into 100 parts would indicate a vertical motion of the screw equal to $\frac{1}{100 \times 6.666}$ or $(0.000.010)r$. This dimension would be more than sufficient to satisfy all requirements in other respects, unfortunately, however, the increase of r from 16 centimeters=6.30 inches, its length in the Sanguet tachometer as now usually constructed in France, to 10 inches, would render the instrument altogether too bulky and heavy to be used for the ordinary run of field operations. Hence:

(c) The minimum distance between the axis of rotation of the telescope and the knife edge (or the line of tangents) had to be reduced to 8 inches = $\frac{2}{3}$ ft. and the number of divisions on the micrometer head increased from 100 to 125, each of which still represents $\frac{1}{100 \times 6.666}$ part of r or $(0.000.010)r$.

On account of the ordinary slow motion screw which is provided in tachometer No. 1 under the prismatic guide rod for adjusting the inclination of the telescope, etc., being replaced by a fine micrometer screw R in tachometer No. 115, (See Pl. I in pocket) the zero of the vertical or slope scale of this instrument—instead of being placed, as usual, near the centre of the flat vertical straight edge FH , and so as to correspond as nearly as practicable to a truly horizontal axis when the instrument is accurately levelled—was lowered to the foot of the said straight edge; the object being to eliminate all negative quantities from the field book, both as regards the vernier and micrometer readings, also to obviate the necessity of making such readings in contrary directions. On the vertical scale of tachometer No. 115, a perfectly level line of collimation corresponds therefore very nearly to reading 0.50 instead of 0.

A detached chambered double faced level, O , is used on the telescope, the bubble tubes of which are ground to a circle of such radius that a division of the circumference $\frac{1}{2}$ -inch in length will correspond to an angle of 5 seconds. This level has thus been rendered four times as sensitive as the single face level on the alidade bar, and about twice as sensitive as the double faced level used in the ordinary instrument. An air chamber is provided at one end to permit of regulating the length of the bubble according to the temperature of the atmosphere, etc., so as to keep it within convenient limits.

The diaphragm placed in the telescope for defining the position of the optical axis carries no cross wires or hairs. Instead, fine lines are engraved at right angles to each other, through the centre of the plane face of the outer or field lens of the Ramsden eye piece; the diaphragm serves to delimitate the pencil of rays disposed symmetrically around the line of sight which joins the intersection of the cross lines on the lens and the centre of the field of view afforded by the objective. Lines engraved on glass are preferable to w. s. or spider webs, as they are not affected by the humidity of the atmosphere, nor can they be broken, the eye piece has, however, to be adjusted to the proper length, according to the sight of the observer, to render the lines plainly visible to him.