of which any single one is sufficient for determining the distance of the rod from the instrument. I may here observe that the lever L with one arm, say ten times longer than the other, has evidently been brought into requisition by the inventor, with the important object in view of—so amplifying the very small arcs or heights, which the eye end of the telescope has to traverse to determine visual rays that afford readings on the rod differing only by from $\frac{4}{1000}$ to $\frac{10}{1000}$ of its distance from the instrument—as to render the use of an automatic device for the determination of the said small displacement of visual rays, practicable both as regards mechanical execution and facility of operation.

Now the three intervals $\overline{ab}$, $\overline{bc}$, and $\overline{cd}$ between consecutive pins, which are adopted for the tacheometer of the ordinary construction, bear to each other the ratios of the numbers 10, 8 and 4. That is to say: in the tacheometer of the common type the pins are inserted at such intervals in the side of the fork shaped pillar, that by raising or depressing the long lever arm through the distance $\overline{ab}$, the short arm will depress or raise the prismatic guide rod T and with it the telescope, through a vertical space equal to $\frac{1}{100}$ part of the radius r adopted for the unit of the scale of tangents or slopes, or which is the same thing, for the length of the perpendicular let fall from the centre of the transverse axis around which the telescope revolves, on to the vertical path described by the steel knife edge when sliding up or down along the rear of the guide rod, and hence such working of the handle of the long lever arm, will also cause a corresponding change in the rod reading equal to $\frac{1}{100}$ part of its distance R, or to $(0{\cdot}01)R$, from the same transverse axis.

Again, by moving the same long arm through $\overline{bc}$ the corresponding change which obtains in the rod reading is equal to: $(0{\cdot}008)R$, and finally by passing over $\overline{cd}$ with the lever, the rod reading will be altered by $0{\cdot}004R$.

In the ordinary "Tachéomêtre Sanguet" the four displacements of visual rays determined by the four pegs afford six corresponding rod intervals which are all different, and when arranged in the order of their importance, the values of these intervals are:

$$\overline{dc} = \tfrac{4}{1000}R,\ \overline{cb} = \tfrac{8}{1000}R,\ \overline{ba} = \tfrac{10}{1000}R,$$
$$\overline{bd} = \tfrac{12}{1000}R,\ \overline{ac} = \tfrac{18}{1000}R,\ \text{and}\ \overline{ad} = \tfrac{22}{1000}R.$$

The most generally useful of these six relations between the intervals intercepted on the rod and its distance from the instrument, is evidently the third, viz.: that afforded by a displacement $\overline{ab}$ of visual rays causing $\frac{1}{100}$ part of the distance R, or a height of $(0{\cdot}01)R$, to be intercepted on the rod.

With a view of controlling the readings and increasing the precision of the results, it is however advisable to combine two or three of the above six elementary ratios of rod interval to distance, whenever time will permit.

Thus if we combine:

1. $\overline{bc} = (0{\cdot}008)R$, and $\overline{bd} = (0{\cdot}012)R$, the following relations must obtain when all the readings are correctly taken, viz.:

$$\overline{bc} + \overline{bd} = (0{\cdot}020)R \text{ and } \overline{bd} - \overline{bc} = (0{\cdot}004)R = \frac{\overline{bc}}{2} = \frac{\overline{bd}}{3} = \frac{\overline{bc} + \overline{bd}}{5}.$$