2. The combination of $\overline{ac} = (0{\cdot}018)R$ with $\overline{ad} = (0{\cdot}022)R$, gives:

$$\overline{ac} + \overline{ad} = (0{\cdot}040)R \text{ and } \overline{ad} - \overline{ac} = (0{\cdot}004)R = \frac{\overline{ac} + \overline{ad}}{10}.$$

3. If we combine the three ratios: $\overline{ab} = (0{\cdot}010)R$, $\overline{ac} = (0{\cdot}018)R$ and $\overline{ad} = (0{\cdot}022)R$, the relations which afford us a means of checking in the office the operations performed on the ground are:

$$\overline{ab} + \overline{ac} + \overline{ad} = (0{\cdot}05)R \text{ and } \frac{\overline{ab} + \overline{ac} + \overline{ad}}{5} = \overline{ab}.$$

The last combination affords the greatest degree of precision attainable with a minimum number of pointings, it should always be used when great accuracy is desired. When an obstacle between the rod and the observer prevents making one or the other of the three readings without changing the position of the clamp P on the guide rod, it is usual to omit such reading altogether.

When the visible part of the rod is too short to permit of reading on it heights equal to: $(0{\cdot}018)R$ and $(0{\cdot}022)R$, the interval corresponding to $(0{\cdot}01)R$ is first read, after which having left the lever arm butted against the pin b, the clamp is moved up or down and the cross wire again made to bisect the zero mark by working the slow motion or micrometer screw R, that is to say: a new pointing is made which will enable us to read off the rod intervals corresponding to $\overline{bc} = (0{\cdot}008)R$ and $\overline{bd} = (0{\cdot}012)R$.

We have, in such case, the following relations to control the rod observations, viz.:

$$\overline{ab} + \overline{bc} + \overline{bd} = (0{\cdot}030)R \text{ and } \frac{\overline{ab} + \overline{bc} + \overline{bd}}{3} = \overline{ab}.$$

Now for determining the horizontal projection R of the radius vector of a point on the ground of which the position is to be established, that is to say: the distance from the rod to the transverse axis of the instrument reduced to the horizon, we have the relations:

$$R = 100\,\overline{ab} = \frac{100\,\overline{ac}}{1{\cdot}8} = \frac{100\,\overline{ad}}{2{\cdot}2} = \frac{100\,\overline{bc}}{0{\cdot}8} = 100\,\overline{bc} + \frac{100\,\overline{bc}}{4} = \frac{100\,\overline{bd}}{1{\cdot}2} = \frac{100\,\overline{cd}}{0{\cdot}4}$$

and by combination, 56 additional means of arriving at the value of this radius, such as:

$$\frac{100\,(\overline{ab} + \overline{ac} + \overline{ad})}{5} = \frac{100\,(\overline{ab} + \overline{ad})}{4} = \frac{100\,(\overline{ac} + \overline{cd})}{3} = \frac{100\,(\overline{ad} + \overline{bc})}{3}.$$

As it might be a matter of some interest to engineers to know for what particular reason the displacements of the visual rays were arranged for, so as to cause consecutive intervals to be intercepted on the rod, bearing to each other the ratios of the numbers 10, 8 and 4, when 10 and its submultiples 5 and 2, or some other simple numbers might apparently have proved equally well, if not better suited for the purpose intended, I may state that the ratios $\frac{10}{100}$, $\frac{8}{100}$ and $\frac{4}{100}$ were selected because, while they permit of combinations sufficiently simple being made, to render the finding out of mistakes in the office and the correction of the same a comparatively easy task, yet they necessitate, when passing from one reading of the series