

$$E_{115} = \sqrt{(0.25)^2 + 3(0.4)^2 + 4(0.225)^2} = \sqrt{0.0625 + 0.48 + 0.2025} = \sqrt{0.7450} = 0.863$$

Again, the corresponding errors on the distance are:

$$E_{R_1} = \frac{1.15 \times 100}{3} = 38.33 \text{ or } 0.0383 \text{ yard.}$$

$$E_{R_{115}} = 0.863 \times 100 = 86.3, \text{ or } 0.0345 \text{ yard.}$$

If instead of the intervals being determined with one pointing made while the lever is abutted against pin **b** or against **c**, two pointings are made, the error of the pointing which is used for two readings is doubled, and we have for the total error of the intervals:

$$E = \sqrt{E_p^2 + (2Ep)^2 + 3(Er)^2 + 4(Ec)^2}$$

Whence we deduce for the total error E_1 of the intervals measured with tachometer No. 1:

$$E_1 = \sqrt{(0.25)^2 + (0.50)^2 + 3(0.50)^2 + 4(0.357)^2} = \sqrt{0.0625 + 0.25 + 0.75 + 0.5098} = \sqrt{1.5723} = 1.253$$

and for the total error of those determined with tachometer No. 115:

$$E_{115} = \sqrt{(0.25)^2 + (0.50)^2 + 3(0.40)^2 + 4(0.225)^2} = \sqrt{0.0625 + 0.48 + 0.2025} = \sqrt{0.9950} = 0.997.$$

Once more the corresponding errors on the distance are:

$$E_{R_1} = \frac{1.253 \times 100}{3} = 41.8 \text{ or } 0.0418 \text{ yard, and}$$

$$E_{R_{115}} = \frac{0.997 \times 100}{2.5} = 39.88 \text{ or } 0.0399 \text{ yard.}$$

The inventor of the "Tachéomètre auto-réducteur" has himself given the following formulas, which, he states, indicate the error we are liable to make on any distance R with the two first combinations above mentioned of rod intervals determined with the ordinary instrument (No. 1), viz.:

1st. By using the relation $\frac{ab}{R} = 0.01$:

$$E_{R_1} = 0.04 + \frac{\text{Yard } R}{4000} \dots \dots \dots (A)$$

2nd. By using the relation $\frac{ab+ac+ad}{R} = 0.05$:

$$E_{R_{115}} = 0.02 + \frac{\text{Yard } R}{10000} \dots \dots \dots (B)$$

By substituting 100 yards for R in equations (A) and (B) we have:

With ratio $\frac{ab}{R} = 0.01$:

$$E_{R_1} = 0.062 \text{ yard.}$$

With ratio $\frac{ab+ac+ad}{R} = 0.05$:

$$E_{R_{115}} = 0.030 \text{ yard.}$$