$$\therefore \qquad H = s\,\frac{\sin\left\{h+(\frac{1}{2}-m)\sigma\right\}}{\cos\left\{h+(1-m)\sigma\right\}}. \qquad (65)$$

See Supp. to Manual of Dominion Land Surveys.

For the numerical value of m see p. 76.

In eq. (65) it is assumed that the distance s is equal to the chord AC'. If A and B are stations of a trigonometric survey and s is obtained by the solution of a triangle, then it is the distance AB reduced to sea level. The correction to s for elevation is

$$s\,\frac{H_1}{\rho},$$

H_1 being the height of A above sea level. Also the correction to reduce from the arc to the chord is

$$\frac{s'}{24}\left(\frac{s}{\rho}\right)^2,$$

so that the length of the chord AC' is

$$s\left(1+\frac{H_1}{\rho}\right)\left\{1-\frac{1}{24}\left(\frac{s}{\rho}\right)^2\right\},$$

the second correction only becoming appreciable for considerable distances.

Reciprocal zenith distances—

If the zenith distances z and z' be observed simultaneously at the two stations the effect of refraction is eliminated, if it can be assumed to affect the two zenith distances equally. Thus, returning to the above equation for H, we have

$$BAC' = 90° - z - r + \frac{\sigma}{2}$$

$$ABC' = 180° - z' - r$$

But we have also

$$A'AB = z + r = 180° - (z' + r) + \sigma$$

so that

$$r = \frac{180° - z - z' + \sigma}{2}$$

which therefore becomes known. Substituting this we have

$$BAC' = \frac{z' - z}{2}$$

$$ABC' = 90° - \frac{z' - z + \sigma}{2}$$

$\therefore$ substituting in the first above expression for H gives

$$H = s\,\frac{\sin\frac{1}{2}(z'-z)}{\cos\frac{1}{2}(z'-z+\sigma)} \qquad (66)$$

s having been corrected for elevation, and if necessary for curvature.