The accuracy of the method is dependent upon the sensitiveness of the latitude level, the uniformity of rate of the chronometer or watch, and the personal equation of the observer, or, if the observer does not take the time himself, of the recorder also. On account of some stars crossing the horizontal wire very obliquely, this personal equation may be somewhat large.

Observing List.

Let ϕ_o = the observer's assumed latitude, always positive.

$\Delta\phi$ = the required correction to the assumed latitude.

a = the star's right ascension.

δ = the star's declination, positive when north.

t = the star's hour angle, negative when east.

θ, θ' = the sidereal time of transit across the co-latitude circle, east and west respectively.

A = the star's azimuth (counting from the north) at transit across the co-latitude circle.

T, T' = the observed time of transit over the horizontal wire reduced to sidereal time, east and west respectively.

Tc, Tc' = the observed time of transit in sidereal time, corrected for level, watch rate, and diurnal aberration.

$\Delta Tc, \Delta Tc'$ = the corresponding watch error.

d = the value of one division of the level in seconds of arc.

R = the correction to watch for rate.

Then
$$\theta = a + t \tag{1}$$
$$\cos t = \tan \phi_o \cdot \tan (45° - \tfrac{1}{2}\delta) \tag{2}$$
$$\cot \frac{A}{2} = \sin \phi_o \cdot \tan t \tag{3}$$

The first step is to prepare an observing list. Decide between what hours the observation is to take place. Two series of stars are required for the observation.

(a) The time stars, or "Prime Vertical" stars as Mr. Cooke calls them, and these must cross the co-latitude circle within about 20° N. or S. of the prime vertical, i.e., their azimuth must lie between 70° and 110°, or 250° and 290°.

(b) The latitude stars, and the hour angle of these must not be greater than two and one-half hours, or their polar distance must be between, say, 180°-2ϕ_o and 170°-2ϕ_o.

The Time Stars.—Starting with the two extreme values of A from (3) we find t must lie between two certain values. And from (2) we get values of δ for each of these two extreme values. From (1) we can now find the extremes of right ascension permissible for the two extremes of declination, both for east and for west stars.