

12. Compute and tabulate for each pair of Latitude stars

$$a = (Z' - Z) z_0 \quad (15)$$

$$b = (t' - Tc') - (t - Tc) \quad (16)$$

$$c = (L^{\phi'} - L^{\phi}) - \frac{L_1}{Z_1} (Z^{\phi'} - Z^{\phi}) \quad (17)$$

13. The correction to latitude or $\Delta\phi = \frac{b - a}{c}$ (18)

and will be in seconds of arc.

RESULTS.

The writer had an opportunity to try this method in 1906, when engaged in making a survey of the harbour of Prince Rupert under instructions from W. J. Stewart, Esq., Chief Hydrographer, Department of Marine and Fisheries. Directions were given to observe for latitude at some suitable spot and tie on to the triangulation. The Dept. provided an eight-inch Troughton & Simms alt-azimuth with micrometer microscopes for both circles reading to ten seconds, and by estimation to say 2.5 seconds. The telescope was of about thirteen inches focal length, with an inch and three-quarter objective. The diaphragm had five vertical and three horizontal spider webs. One division of the latitude level (0.05 of an inch) was equal to 5 seconds. The level was not a chambered one, and was mounted as in the ordinary field transit, in Plaster of Paris. The striding level was similar to the latitude level. A sidereal watch was also provided.

There were, therefore, three methods available for latitude determination, namely, the usual method of transits of north and south stars across the meridian, Bessel's prime vertical, and Mr. Cooke's method, and the writer determined to try this last one.

The approximate latitude was obtained by a couple of north and south stars in the usual way. The observation covered a period of nine hours. The method of taking the time of transit was the crudest. The "tip" at the instant of transit was given to the recorder, who read the face of the watch by eye. In this way the errors of judgment of two men instead of one enter into the result. Transits were observed across the three horizontal wires, and the mean of the three taken as the observed time of transit T . Ten pairs of Time stars and fifteen pairs of Latitude stars were taken. The probable error of the mean of the Latitude pairs was $0''.34$.

Later, an effort was made to verify the accuracy of the result by Bessel's prime vertical method. But fine nights that season were few and far between, and on both nights the work of verifying was stopped by clouds.

A determination at Port Simpson, in 1895, by the U. S. Coast and Geodetic Survey, the result of 32 pairs of stars with one of their large zenith telescopes, and reduced through the triangulation of Chatham Sound, was $0''.26$ greater than the writer's value.