

hundred feet from the peep sight and exactly in range with it and the plumb-line; carefully measure this distance.

Take from the table XVI the azimuth of Polaris corresponding to the latitude of the station and year of observation; find the natural tangent of said azimuth and multiply it by the distance from the peep sight to the rod; the product will express the distance to be laid off from the rod *exactly at right angles* to the direction already determined (to the *west* for eastern elongation or to the *east* for western elongation) to a point which with the peep sight will define the direction of the *true meridian* with a fair degree of accuracy.

III.—TO DETERMINE THE TRUE MERIDIAN BY OBSERVING THE TRANSITS OF POLARIS AND ANOTHER STAR ACROSS THE SAME VERTICAL PLANE.

This simple method for tracing out on the ground a true north and south line, one demanding only a very slender instrumental outfit, was given in Lalande's *Astronomy*, published more than a century ago. It was used by Andrew Ellicott in 1785 in his boundary survey work of Pennsylvania and was again brought to notice in the present century by Dr. Charles Davies. It consists in watching for the time when Polaris and a given bright star come to the same vertical, and then after a short lapse of time, given in a table, Polaris will be found exactly on the meridian, and hence can be referred to the horizon and to any meridian mark placed there.

The verticality may be ascertained by a plumb-line or by the vertical thread of a transit instrument; the method demands neither a graduated circle, nor a chronometer, nor any *exact* knowledge of the local time, an ordinary watch being sufficient to measure the short tabular interval.

Early in the present century the star Alioth (ϵ Ursae Majoris) was favorably situated for the use of the method; however in 1850 the interval between times of verticality and of culmination already amounted to 17 minutes, which interval in 1893 had grown to 28.5m. for lower culmination and to 29.5m. for upper culmination, hence this star is no longer suitable. Zeta (ζ) Ursae Majoris or Delta (δ) Cassiopeiae should now be substituted for it, both these stars being