260 ANDERSON on the North-American Boundary, from

density and figure of the earth, deflecting the plumb-line from a truly vertical direction, and the successive astronomical stations, although accurately determined to be in latitude 49° N., were found to be on different parallels of latitude, when connected by actual surveyed lines. Discrepancies of this kind were always found to occur, so that the parallel passing through one station would not, if traced with the proper allowance for curvature, be identieal with the parallel passing through the next station, and so on. It thus became necessary to decide whether the points determined astronomically to be in lat. 49° N. should be simply joined, or whether a mean line parallel to the Equator should be adopted. The opinion of the Astronomer Royal was taken on this point, which was to the effect that there should be no departure in the smallest degree from the points determined by the actual use of astronomical instruments. It was thereupon agreed between the British and United States Commissioners that the astronomical determinations of each station should be adopted, and the intervening boundary-marks between the stations should be set up on lines connecting the adjacent astronomical stations having the same curvature as the 49th parallel of latitude, but not necessarily parallel to the Equator. Thus the work of marking the actual boundary-line proceeded *pari passu* with the establishment of the astronomical stations. The method of determining the latitude which was agreed upon by the Joint Commission, was by observing the differences of the zenith distances of north and south stars with the zenith tenscope. The local time for the reduction of the zenith telescope observations was obtained by the use of the sextant, by the transits of zenith stars observed with the zenith telescope, or by transits observed with the portable transit. These instruments were mounted on massive tripod stands specially made by Mr. Simms for the Expedition. The stands were packed quite flat when they were taken to pieces, and were transported very easily.

The method of working generally practised by the astronomical parties was as follows:—On approaching the site selected for an astronomical station, usually at about 3 P.M., thou, be sometimes much later, the first step was to select, for the observatory tent, an elevated spot from which an uninterrupted sight-line could be obtained to a distance of about three-fourths of a mile, either due north or due south. The camp was then pitched at a short distance off, so that neither the north or south, nor the east or west lines from the observatory tent came within 100 yards of it.

The true time of the last astronomical stat. In having been brought forward on a pocket mean-time chronometer, or sometimes on an ordinary watch, the sidereal chronometer was started by it, allowance being made for the difference of longitude obtained from the reconnaissance sketches; and observations for time on the sun in the west were taken with a sextant for combination with equal altitudes the next morning. The zenith telescope was next mounted and adjusted, the direction of the meridian being obtained by observation of the transit, according to the time by account, of a circumpolar star as soon after sunset as practicable.

When darkness had set in, the latitude observations were commenced, a correction to the approximate time being soon obtained by taking transits of two zenith stars, and were continued throughout the night until dawn began to appear, the meridian being also altered if necessary during the course of the observations. The next morning equal altitudes were taken on the sextant corresponding to those obtained the previous evening, and the true chronometer error during the night being now known, the computers could set to work at once to reduce the latitude observations. A first value of the latitude of the zenith telescope was obtained before the afternoon, and a spot was selected the proper distance north or south of it, so as to be nearly on the 49th parallel, and, if possible, on the meridian of the instrument, from which