

which, through the co-operation of the three Governments in North America, an international geodetic work, of the highest value to this continent and to the world, may be carried out.

The size and shape of the earth may be found, either from two meridional arcs or two longitudinal arcs, or from a single oblique arc. The first method was exclusively employed during the last century, because it was possible to determine latitudes with far greater precision than longitudes; but, in recent times, the electric telegraph has so simplified the determination of longitudes, that the last two methods may now be applied with entire success.

All three are comparatively simple in their theory, although the problem, considered in detail, becomes an intricate and difficult one.

The process in each case is as follows:—For the first case, we have only to measure the length of two lines running north and south, and observe the latitudes of the extremities. From this data, the flattening is first found, and afterwards the absolute length of the axis. This method was that used up to the present time, and our knowledge of the figure of the earth, and of the constants of the spheroid, depends wholly on measurements of such arcs of the meridian.

The second case, that of determining the earth's figure by means of longitudinal arcs, is rapidly coming into use, on account of the application of electricity to the determination of longitudes. The fundamental idea, like the preceding one, is simple. We measure the distance between two points lying nearly, or exactly, east and west, determine their longitudes, and, also, their reciprocal directions. The latitudes need not be accurate when the observations are near the equator, and when the line is nearly east and west the azimuths do not need to be accurately known. A second arc gives similar relations, and by means of both we can determine the earth's compression and its absolute size.

A third way of getting at the constants of the spheroid is by an oblique arc, such as has just been completed in the United States, between the northern part of Maine and the southern part of Alabama. Here we have a case, where the directions between the extreme points are of much greater importance than in the last method. As usual, the latitude of the extreme points must be found, and with this data, and the reciprocal azimuths, the flattening of the earth may be deduced. The simple addition of the length of the line joining the two points, enables us also to find the size of the earth, and thus completely determine the figure. It is evident that the method is not applicable, when the line is nearly north and south, or east and west, or when the work lies near the equator. The most favorable conditions are when the arc is quite oblique to the meridian, and above middle latitudes.

Two discussions of the form and size of the earth are in use in geodesy, and both depend entirely on the results obtained of