

are established, magnetic surveys are begun, etc., etc. The magnitude, frequency, and simultaneity in time over large areas, of the magnetic disturbances or storms become known for the first time. It is perceived that the earth's magnetism is in sympathetic touch with a variety of hitherto unsuspected forces, and that gravitation is not the only bond that binds us in friendly union with our sister planets and our parent Sun. To quote from one of the most active workers of that period, Sabine:

“We have hitherto known magnetism only as a telluric force of much less apparent simplicity than gravity, and greatly requiring a key to enable us to apprehend its laws, as well as its purposes in the general economy of nature. But if, as we appear to have reason to believe, we are to view the magnetism not only as a *telluric* but also as a *cosmical* force, the interest and importance of our inquiries regarding it must undoubtedly be viewed as greatly augmented.”

The total force,  $F$ ; of the earth's magnetism is equal to the product of the horizontal component,  $H$ , into the secant of the magnetic inclination,  $I$ .

#### THE ELEMENTS INVOLVED IN MAGNETIC SURVEYS.

*There are then three elements involved in a complete magnetic survey—the declination, the dip, and the intensity.* These three quantities completely define the direction and magnitude of the earth's magnetic force. The determination of one element alone, for example, declination, does not any more constitute a magnetic survey than the determination of a number of latitudes would constitute a geographical survey. A latitude survey might fulfil certain definite and practical purposes, just as a declination survey will suffice for the practical needs of the surveyor. The more complete the geographical survey in all its details, the more complete the magnetic survey in all its details, the more to be obtained of direct benefit from such surveys.

In view of the fact that there is every evidence that the era of detailed magnetic surveys has set in in this country, it will not be amiss to set forth fully the desirability, if not indeed the absolute necessity, of making the survey a complete one at the very start, that is to