

of that force acting, the *vertical* component having been counteracted by adding an additional weight to the south arm of the needle, generally a bit of brass wire. The changes that are taking place in the *true* direction of the earth's magnetic force and in the *magnitude* of the force constitute the real facts to be studied.

It is an interesting problem to inquire: How does the north end of the freely suspended magnetic needle move with the lapse of time, if we behold the motion from the point of suspension of the needle? Does it move clockwise or anti-clockwise. Would needles similarly suspended in all parts of the earth move in the same direction? What is the nature of the curve described in space by the north end? These are some of the fascinating questions we can ask ourselves under the new point of view.

It has been found by the writer that over the greater portion of the earth the north end of a freely suspended magnetic needle during the past two or three centuries has been moving in a *clockwise* direction. In the Pacific Ocean and along the western coast of our country we have evidences of small irregularities in the general law of motion as announced above. Some of the stations in this region exhibit small *anti-clockwise* motions. No station has thus far been found where the reversed motion has prevailed for any such length of time as has been the case with the direct motion.

Fig. No. 5 exhibits the curves resulting in the manner described above for London and for Baltimore.

I have given at such length the main facts at present known to us with regard to the variations of the earth's magnetism, believing that a fuller exposition than can be obtained from text-books would not be unwelcome to the surveyor or to those desiring to make themselves more intimately acquainted with the subject of terrestrial magnetism. The questions that I have endeavored to answer have been such as I have been asked almost daily throughout the progress of the magnetic survey by all classes of men, notably surveyors, lawyers and teachers.

We are now prepared to present all the data at present known, with