

netic and astronomical methods were anxiously sought, in order to determine, on land and at sea, those points which are intersected by the ideal line of demarkation. The imperfect condition of science, and of all the instruments used at sea in 1493 to measure space and time, were unequal to afford a practical solution to so difficult a problem. Under these circumstances, Pope Alexander VI. actually rendered, without knowing it, an essential service to nautical astronomy and the physical science of terrestrial magnetism by his presumption in dividing half the globe between two powerful states. From that time forth the maritime powers were continually beset by a host of impracticable proposals. Sebastian Cabot, as we learn from his friend, Richard Eden, boasted on his death-bed of having had a "divine revelation made to him of an infallible method of finding geographical longitude." This revelation consisted in a firm conviction that magnetic declination changed regularly and rapidly with the meridian. The cosmographer Alonso de Santa Cruz, one of the instructors of Charles V., undertook, although certainly from very imperfect observations, to draw up the first general *variation chart** in the year 1530, and, therefore, one hundred and fifty years before Halley.

The advance or *movement* of the magnetic lines, the knowledge of which has generally been ascribed to Gassendi, was not even conjectured by William Gilbert, although Acosta, "from the instruction of Portuguese navigators," had at a much earlier period assumed that there were four lines without declination over the earth's surface.† No sooner was the

* In corroboration of this statement regarding Sebastian Cabot on his death-bed, see the well-written and critically-historical work by Biddle, entitled *A Memoir of Sebastian Cabot* (p. 222). "We do not know with certainty," says Biddle, "either the year of the death or the burying-place of the great navigator who gave to Great Britain almost an entire continent, and without whom (as without Sir Walter Raleigh) the English language would perhaps not have been spoken by many millions who now inhabit America." On the materials according to which the variation chart of Alonso de Santa Cruz was compiled, as well as on the variation compass, whose construction allowed altitudes of the sun to be taken at the same time, see Navarrete, *Noticia biografica del cosmografo Alonso de Santa Cruz*, p. 3-8. The first variation compass was constructed before 1525, by an ingenious apothecary of Seville, Felipe Guillen. The endeavors to learn more exactly the direction of the curves of magnetic declination were so earnest, that in 1585 Juan Jayme sailed with Francisco Gali from Manilla to Acapulco merely for the purpose of trying in the Pacific a declination instrument which he had invented. See my *Essai Politique sur la Nouvelle Espagne*, t. iv., p. 110.

† Acosta, *Hist. Natural de las Indias*, lib. i., cap. 17. These four