COMPASS DEVIATION OF A SHIP STRUCK BY LIGHTNING

(Extracted from "The Monthly Record" appearing in *The Geographical Journal*, London, March 1935).

Captain F. CLEGG, Master of the S.S. *Boma* of the Elder Dempster Line, reported as follows: On November 13, 1934, in Lat. 41°00'59" N., Long. 10°00'09" W., during a hard squall, the ship was enveloped in a vivid flash of lightning with what sounded like the burst of a high explosive shell overhead. The steering compass oscillated over an arc of about 180°, finally settling down 28° off the compass course, while no alteration had occurred in the standard compass. On November 17, off Grand Canary, the ship was swung and the deviations obtained on both compasses, the standard compass being quite unaffected, but the steering compass considerably disturbed on all points. The steering compass was then compensated with some difficulty and reduced to a small residual deviation. 3° E. on an easterly course was the greatest error showing, and this remained constant during the voyage to Freetown. It was found after the storm that half the fore-truck had been broken off and two valves in the MARCONI set had been destroyed, but otherwise no damage appears to have been done to the ship. The letter with complete details of the deviations and subsequent compensation was submitted to the Hydrographic Department of the Admiralty, and the Director of the Compass Department reports to the Hydrographer that it is unusual that the maximum effect of the change in deviation should be developed on the east. He recalls that H.M.S. *Veteran* was struck by lightning in October 1926 and a deviation of 80° appeared at the steering compass, the standard being unaffected. The error of the compass gradually decreased in the next two years, and the ship then resumed her original magnetism.

REVOLVING HELIOTROPE

(Extract from *Zapiski po Gidrographii*, Leningrad, 1934, No. 1, p. 110)

The Geodesist of the 1st Section of the Hydrographic Department of the U.S.S.R., R. P. MAKSIMOV, suggests improving the visibility of marks in surveying by fixing on the marks automatic heliotropes of conical shape actuated by the wind, which will not only make them revolve but also change the inclination of their axes.

Heliotropes of this kind, of the simplest construction, have been used with success in the triangulation of Kazakstan.

The Americans use heliotropes of more complicated construction consisting of an assembly of truncated pyramids with differently inclined faces, mounted on ball bearings and fitted with cup weather-vanes.

CHECKING A DIVIDED CIRCLE BY TWO METHODS AND EXPLANATION OF THE CONTRADICTIONS FOUND

The following is a translation of an analysis by M. M. AMBARD, in the *Revue d'Optique*, Paris, April 1935, p. 163, of an article by F. MUHLIG in the *Zeitschrift für Instrumentenkunde*, Vol. 53 (1933), entitled *Untersuchung eines Teilkreises nach zwei Methoden und Aufklärung der dabei aufgetretenen Widersprüche*.

Work done during these last few years on the checking of divided circles has shown the necessity of examining the circles on the instruments themselves and in the position in which they are used. The author quotes the case of a geodetic instrument which, in measurements of azimuth, gave systematic errors attributable to periodic errors of graduation. The divided circle, removed from the instrument, was examined on a testing apparatus, and the corrections thus determined were applied to the azimuth readings. Instead of obtaining improved results, it was found that the latter became worse. It was concluded that unknown causes of error must be at work in the testing apparatus, and that the circle would have to be examined on the actual apparatus on which it was to be used. The examining process consisted in measuring a fixed angle, determined by a direct sight at a mark and a sight at an image of the mark reflected in a mirror rigidly attached to the telescope and covering half the object-glass. The mirror could be replaced by a constant-deviation prism. The mark, which consisted of a small orifice lighted by an electric lamp, was placed at a distance of 40 m. The position of the eye was determined by a peep-hole. A comparison of the errors thus determined with those obtained on the testing apparatus reveals considerable systematic differences. In discussing the methods of fixing the circle on the instrument and on the testing apparatus, the author has shown the action of the different constraints imposed on the circle in the two cases. They lead to different deformations of the circle, and consequently to different systematic errors in the graduation. The author concludes from this that the errors must be determined on the circle when actually in position on the instrument.

TWO FUNDAMENTAL GEOGRAPHICAL INVENTIONS.

(Extract from the *Geographical Review*, New York, July 1935, page 511)

The invention of a map projection universally used by geographers and sailors has made the name of Gerhard MERCATOR known to every educated person. To MERCATOR'S teacher, GEMMA FRISIUS (1508-1555), belongs the credit for two inventions of far more fundamental value - yet, by the irony of fate, few but specialists in the history of geography are familiar with GEMMA'S name.

When a young man of only twenty-one, GEMMA, who later became a professor of medicine at Louvain, published a book entitled *De principiis astronomiae* (1530). In a short chapter in this work the epoch-making suggestion is made that clocks or watches, when carried from one place to another and not allowed to run down, may be used for the determination of longitudes. "The invention of the fusée, about 1525, improved portable timepieces to such an extent that they became capable of a more or less uniform 'continuus motus' during 24 hours — even of a 'perpetuus motus', if wound up in time". GEMMA'S other great invention was that of the method of triangulation as a basis for topographical surveying. To a second edition of Peter APIAN'S *Cosmographicus liber* edited by GEMMA and published in 1533 he appended a *Libellus de locorum describendorum ratione*, in which this method is explained and exemplified. "The horizontal use of an astrolabe for the determination of azimuths of celestial bodies was centuries old; GEMMA was the first to realize that by determining the bearings of terrestrial landmarks, and by repeating the observations at several stations, a network could be drawn on paper which would give, by the intersections of corresponding pointings, a map of the country surveyed".

The geographical importance of GEMMA'S work was made clear in a brief article by Dr. E.G.R. TAYLOR in 1927 ("The Earliest Account of Triangulation", *Scottish Geogr. Mag.* Vol. 43, 1927, pp. 341-345). The quotations in the preceding paragraph are from a recent and more comprehensive study by Dr. A. POGO ("Gemma Frisius, His Method of Determining Differences of Longitude by Transporting Timepieces (1530), and His Treatise on Triangulation (1533)", *Isis*, Vol. 22, 1934-1935, pp. 469-506). Scholars are indebted to Dr. POGO for a discussion of biographical and bibliographical problems concerning GEMMA'S work, a detailed analysis of the *Libellus*, and a complete facsimile reproduction of the full text of the *Libellus* from a copy in the Library of Congress.

A MARINHARIA DOS DESCOBRIMENTOS

(THE ART OF NAVIGATION DURING THE AGE OF DISCOVERIES)

by

CAPTAIN A. FONTOURA DA COSTA, PROFESSOR AT THE NAVAL COLLEGE AT LISBON.

Captain FONTOURA DA COSTA has kindly presented a copy of this monumental work to the Library of the INTERNATIONAL HYDROGRAPHIC BUREAU.