

the case heretofore. The progress of coastal surveys permits one to envisage representations of the ocean floor by means of depth contours which depict the deepest feature of the abysmal depths. Deep-seated valleys, which cut out large indentations on the edges of the continental shelf, give the coastal configuration a particularly characteristic appearance, impossible to represent by means of mere depth-figures. The necessity of gigantic enterprises, the elaboration of which has become possible thanks to modern methods, is recognised; the examination of ancient charts alone was unable to show this necessity.

ON THE GRADUATION ERRORS OF CIRCLES USED IN GEODETIC OPERATIONS

and on Methods which make it possible to reduce their influence.

by

J. BAILLAUD.

Bulletin Géodésique No. 42, Apr.-May-June 1934, pages 37 to 68.

The Author, who is an Astronomer of the Paris Observatory, shows that the errors of graduation in azimuth circles are of great importance and are the cause of imperfections which are much less negligible than are other errors which geodesists take the greatest care to avoid. Astronomers study the divisions of their circles very closely and geodesists should do so also; however they do not require the same extreme accuracy. For this purpose the errors of some of the fundamental divisions (every 10th degree for example) should be determined by the MARTH method; this method has the advantage of avoiding the accumulation of errors but requires somewhat lengthy calculations. The intermediate divisions may be merely compared to a standard distance.

Provided that these errors of graduation be taken into account, the Author advocates, for observing angles, a return to the *repetition* method using two opposed microscopes only. With the present well constructed instruments this method no longer has the defects attributed to it; the principal advantage of the *reiteration* method was that by using a larger number of graduations it compensated the graduation errors to a certain extent.

After giving a diagram of a *repeating* azimuth circle based on the above principles, the author expresses the hope that geodesists will re-examine the question of using the repetition method.

P. V.

J. F. CAMPBELL, 1822-85, AND HIS REFRACTING QUADRANT.

(Extract from an article by R. T. GUNTHER published in *Nature* - London,

18th August, 1934, p. 251).

Last year I purchased at auction a well-made piece of optical apparatus which intrigued me because I could not divine its purpose. It looked like a sphere of glass with circles etched upon it, set in a block of wood. After cleaning, some writing and the initials J. F. C. appeared on the box which I finally recognised as those of J. F. CAMPBELL. But although his name as applied to the CAMPBELL-STOKES Sunshine Recorder is a household word, none of the physicists or meteorologists to whom I applied for information knew anything about the man. Nor have I been able to find that any obituary notice of him appeared in *Nature* or in the usual journals.

CAMPBELL OF ISLAY, as he liked to call himself, was born on December 29, 1822, and died at Cannes on February 17, 1885. He was educated at Eton and Edinburgh. His published works show his genius to have been of no ordinary kind. The best-known of these is perhaps his *Frost and Fire*, in two volumes, with a picture of Hecla and Strokr on the title-page, but no author's name either there or at the end of the preface, dated London, April 1865. Only in a postscript does he add the modest note: "My name will not help this comrade in his journey through the world; but my friends the publishers, to whom I am indebted for many favours, request me to sign this letter of introduction for their nursling *Frost and Fire*. I have then to ask indulgence for my rude work, and for myself. J. F. CAMPBELL".

In 1860 Messrs. CHANCE of Birmingham made for him a glass sphere, cast, ground and polished, now at Greenwich Observatory.

His work *Thermography*, from which these notes are taken, appeared in 1883, and has also supplied a clue to my box-sphere. It was CAMPBELL's Refracting Quadrant invented in 1853 and made in 1864 as an instrument for drawing to scale in true perspective and for measuring angles when travelling. It is not a complete sphere, but a lens with a hemispherical upper surface of radius 2 inches, and a hemispherical lower surface at 3 inches distance. It was intended to be set in gimbals for taking the sun's zenith distance at sea. With a suitable reflector the direction of movement of clouds overhead is well seen, and their rate of angular velocity can be measured on a scale. The description ends: "This invention has not been published, so one instrument only exists" (*Thermography*, p. 140); and this instrument has now been rescued from oblivion.

DONNÉES NUMÉRIQUES CONCERNANT LES MARÉES DES COTES DE FRANCE

(NUMERICAL DATA CONCERNING THE TIDES OF THE COASTS OF FRANCE.)

by

A. COURTIER, INGÉNIEUR HYDROGRAPHE EN CHEF.

The Bureau has received from the French Hydrographic Service an interesting pamphlet on the subject of the tides of the French coast. The Author, who is the Head of the Tidal Service and who has great experience in these questions, not only gives a great number of results and numerical data but he explains the origins thereof very clearly and accurately.

First he examines the tides at Brest which have been observed ever since 1711 and which served as the basis of the work of LAPLACE. The high and low waters at this port are still calculated from this work by means of CHAZALLON's formulae slightly amended. Systematic checks show that the results obtained are very accurate and better than those given, with more complication, by harmonic analysis. Besides, the two methods are compared in the *Note Annexe N° 1*; *Note Annexe N° 2* shows the method of approximate prediction by means of the "Chaldean Period" (18 yrs. 15 days).

The study of mean sea level at Brest and of its variations is very complete; it forms a very complete answer, for this port, to the enquiry which the International Association of Physical Oceanography is now making and in which the International Hydrographic Bureau is collaborating (Circular-Letters Nos. 4-H and 5-H of 1934).

Heads II and III deal with the tides of the other ports of France (Channel and Atlantic) and show how predictions therefor are made by means of tables of Concorances based on the tides at Brest.

Monsieur COURTIER has rendered a great service in setting out, in every detail, the method which the relative simplicity of the tides of the coasts of France makes it possible to employ and which speedily gives very satisfactory results.
