

THE MEASUREMENT OF THE SANTA ELENA GEODETIC BASE BY THE HYDROGRAPHIC SERVICE OF THE ECUADOR NAVY.

(Summary of a Report presented to the Ministry of War and Marine) ()*

The Report is divided into two parts, the first of which deals with the measurement of Santa Elena Base and the second with the triangulation system in the Santa Elena region, the survey of the Guayas River, the necessity for increasing the staff of the Hydrographic Service, the purchase of instruments, etc. and the Estimates of the Hydrographic Service for 1934.

Don Luis G. TUFÍÑO states at the end of the first part :

“In closing this Memorandum the Hydrographic Service of the Navy of Ecuador has the great honour to present itself to the Directors and the eminent Members of the International Hydrographic Bureau of Monaco”.

He adds a note to the effect that this first part is that which is submitted to the International Hydrographic Bureau and its Members.

The first chapter of the Memorandum contains an appreciation of the technical efficiency of the staff of the Hydrographic Service, the reasons for preparing and the value of navigational charts, the official aims of the Hydrographic Service and a list of the officials employed in measuring the base near Santa Elena.

It is stated that pains were taken to measure this fundamental base with the greatest accuracy, in order that the hydrographic work and the triangulation dependent thereon would be as exact as possible and would connect and check up properly with the work and triangulation built up on three other bases which are shortly to be established at Guayaquil, Puná and Manta.

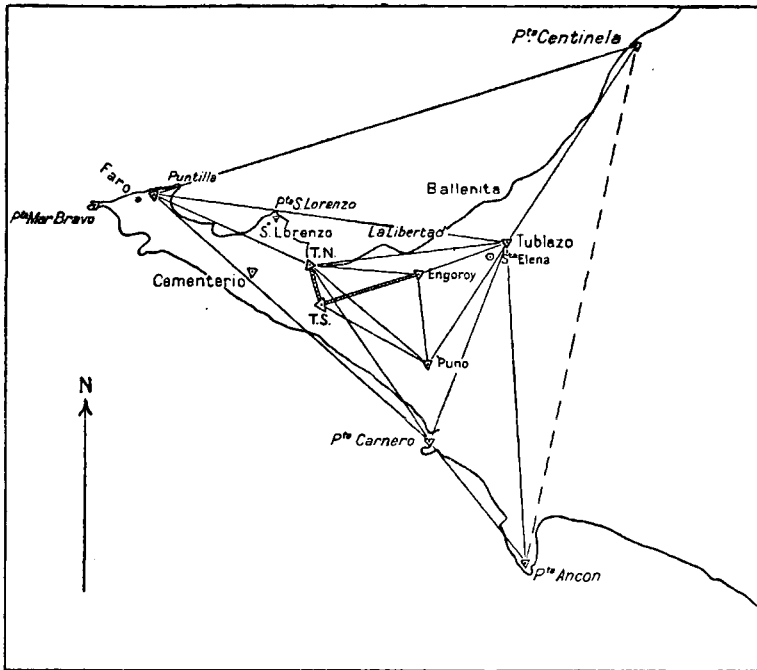
In chapter II some general considerations on the work at Santa Elena are discussed such as the general programme of the work, the principal characteristics of a geodetic base, the accuracy of the apparatus and instruments employed, the search for a suitable location for the base and the drawing up of a scheme for the proposed triangulation.

A JÄDERIN apparatus, as modified by Messrs. GUILLAUME and BENOIT, Directors of the International Bureau of Weights and Measures, constructed by the firm of SECRETAN of Paris under the direction of General PERRIER, Secretary of the International Geodetic and Geophysical Union, was employed for measuring the base. This is the same apparatus as was used in 1931 by the

(*) Medición de la Base geodésica de Santa Elena por el Servicio hidrográfico de la Armada. — Informe que el Señor Ingeniero Geografo y Consultor Técnico de la mencionada Institución Don Luis G. TUFÍÑO, presenta al Ministerio de Guerra y Marina, 1933, Quito, Talleres Tipográficos Nacionales.

(Measurement of the Santa Elena Geodetic Base by the Hydrographic Service of the Navy. — Memorandum presented to the Ministry of War and Marine by Don Luis G. TUFÍÑO, Geographical Engineer and Technical Advisor of the said Institution, Quito, 1933, National Printing Works).

Military Geographical Service of Ecuador to measure the Geodetic Base of Yaruquí. The preliminary reconnaissance of the district and sketch survey of the ground, made by compass and a ZEISS telemeter, are briefly described. The programme provided that, within about two months, commencing on 13th May 1933, the base should be measured, its ends marked and provided with beacons, the scheme of triangulation drawn up, the triangulation station beacons set up from El Centinela, through La Libertad, San Lorenzo, Salinas, La Puntilla de Santa Elena and Punta Carnero to Ancón, and that, while the latter work was being done, all the calculations in connection with the base should be made.



The sketch survey shows the main triangulation stations, seven of which are close to the shores of the Pacific Ocean. The selection of the location of the base was governed by two considerations, the first being the difficulty experienced in finding a suitable location of reasonable length (the base measured finally was 1624 metres long) and the second, the necessity of a good connection of the first quadrangle with the main triangulation. An interesting point in connection with the measurement of this base is the fact that the tongue of land lying to the westward of Santa Elena, which was the most suitable place for the base, is very frequently enveloped in fog. This obstacle, when it occurred, was overcome by the use of BERTRAM heliotropes using either the rays of the sun or acetylene lamps. The slope of the ground selected was barely 0.1 %.

In chapter III descriptions are given of the end-mark beacons of the base, the materials of which they were made and the preparation of the JÄDERIN apparatus.

Each end-mark beacon is a truncated cement obelisk 80 cm. (31.5 in.) high pierced by a vertical tube in the centre. The exact ends of the base are marked by thin golden rivets passed through silver plates let into the upper surfaces of large cubes of bronze. These cubes are embedded in marble slabs built into the cement bases of each of the end-mark beacons.

While the end-marks were being constructed the JÄDERIN apparatus was cleaned piece by piece and then assembled and tested. This test was used as a further course of practical instruction for the base measuring staff.

Chapter IV contains a full and detailed description of the JÄDERIN apparatus and its component parts, and of the various operations entailed by its use for base-measurement. Details of the levelling and of the daily routine carried out during this operation are included.

Six invar wires were provided, five of them 24 metres (78.7 ft.) and the sixth 8 metres (26.2 ft.) long. In addition an invar tape 4 metres (13.1 ft.) long was available. The wires were all wound on a single aluminium drum and the tape on a special wooden reel.

The levelling staves used were divided to 5 mm. (0.11 in.) on invar strips.

Chapter V gives full particulars of the calculations made, such as for :

- First reduction ;
- Expansion of wire (Invar) ;
- Reduction to the horizontal ;
- Reduction to the Ellipsoid (International) ;
- Determination of the Geographical Coordinates.

Chapter VI contains the details of (1) the measurement (in which, apparently, two invar wires only were used), (2) the precise levelling along the base, and (3) the calculation of the probable error.

The final accepted length of the base is 1624.0587 metres \pm 0.7 mm.

