

WEST AFRICAN LONGITUDES.

Telegraphic Determinations of Longitudes on the West Coast of Africa. From observations by Commander T. F. PULLEN, R. N., and W. H. FINLAY, Esq., M. A., F. R. A. S., made and reduced under the direction of DAVID GILL, Esq., F. R. S., Her Majesty's Astronomer at the Cape of Good Hope. London, Hydrographic Department, Admiralty, 1891 ; pp. 82.

IN this volume are recorded the last observations of the late Commander Pullen, who lost his life from malarial fever contracted while making night observations at Bonny, on the West African coast. The results have been worked out under the supervision of Dr. Gill, and the book contains not a few suggestions and remarks of interest to astronomers. The instrument employed was an altazimuth by Troughton and Simms, having a 14-inch vertical circle, read by four microscopes. This was selected as the most appropriate instrument available for the purpose ; for it was decided to determine time by altitudes, after a careful consideration of the relative merits of meridian observations, and those in the vertical of the pole star. Dr. Gill expresses a very favorable opinion of the latter method, which has so long been strongly advocated by Döllén of Pulcova. It was abandoned chiefly because there is no bright star near the Southern pole.

The results afterwards proved the wisdom of not depending on meridian transits : indeed, the conditions of the climate on the West African coast are so unfavorable that there would be an excessive loss of time if meridian observations only were employed. Throughout all the observations with the altazimuth a mean time chronometer was used, without a chronograph.

Before the commencement of the campaign, the two observers, Pullen and Finlay, met at the Royal Observatory, Cape Town, and their relative personal equations were carefully determined by simple but accurate methods. As a result of these determinations, the correction $+ 0^{\circ}.085$ was afterwards applied to the differences of longitude obtained for the various stations. The time observations with the altazimuth were made with "circle right" and "circle left," and pairs of stars were taken at nearly equal altitudes near the Eastern and Western prime verticals. The mean from any such pair was then regarded as a complete time determination ; and in this way the results came out very satisfactorily. The time determinations at the Cape were made by Mr. Finlay with the large meridian circle : and in the exchange of signals Thomson dead-beat galvanometers were used with success.

Several interesting remarks, due to Dr. Gill, occur in the book. The method of carrying chronometers (much affected by navy quartermasters) by means of a strap passed through the handles and over the top, is condemned. Indeed, it is possible to stop a chronometer, temporarily, when so carried, by a peculiar twist of the arm. Dr. Gill recommends holding the chronometer with both hands in front of the body, the elbows being pressed against the sides. The spring of the arms is then a great safeguard.

In another place, having called attention to the very high accuracy attained by Commander Pullen after comparatively little practice, Dr. Gill refers to an interesting remark of Professor Winnecke's to the effect that "the best training for an astronomical observer is a long course of *accurate work* on land with the sextant."

The ordinary method of circummeridian altitudes was used in measuring the latitudes of the stations. Stars were observed both North and South of the zenith, and certain systematic differences in the resulting latitudes are explained as the result of a looseness of the web-frame in the tube. The experience gained is summarized (p. 48) for the benefit of future observers with the portable altazimuth, and any one would do well to consult Dr. Gill's remarks before beginning work with this somewhat difficult instrument.

The positions of the various astronomical stations are carefully described, and the bearings of many surrounding permanent objects are set down. The places of the stars used are almost all taken from the Ephemerides and the Cape Catalogue. The volume concludes with several appendices containing various details and examples of observations and reductions.

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COLUMBIA COLLEGE, New York ; 1891, *September*.

SOUTH AMERICAN LONGITUDES.

Telegraphic Determination of Longitudes in Mexico, Central America, the West Indies, and on the North Coast of South America, with the Latitudes of the Several Stations. By Lieutenants J. A. NORRIS and CHARLES LAIRD, U. S. N., published by order of Commodore F. M. RAMSAY, U. S. N., Chief of Bureau of Navigation, Navy Department. Washington, Government Printing Office, 1891 ; pp. 189.

THE above volume contains the results of longitude determinations executed by order of the U. S. Navy Department