

38TH CONGRESS,
2d Session.

HOUSE OF REPRESENTATIVES.

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No. 15.

REPORT

OF

THE SUPERINTENDENT

OF THE

COAST SURVEY,

SHOWING

THE PROGRESS OF THE SURVEY

DURING

THE YEAR 1864.

TEXAS TECHNOLOGICAL
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GEOGRAPHICAL POSITIONS.

In Appendix No. 15 the publication of geographical positions is resumed in part, in continuation of similar lists given biennially in my report for 1859 and preceding years. The register of positions on the southern coast is still reserved in the office. The total number of positions thus far given in latitude and longitude deduced from the triangulation is eight thousand two hundred and seventeen. Any small differences between the publications since the year 1851 are due to the effect of later and accumulated material, geodetic and astronomical, which has been brought to bear on the results.

GEODESY.

The geodetic connexion of the Epping base line with the primary triangulation passing through the eastern States, offers so instructive an example of the process of reduction followed in the computations of the Coast Survey, and of the application of the method of least squares, that I have given in full Assistant Schott's report on the subject, in Appendix No. 14; that paper may be regarded as an extension of Appendix No. 33 S, in my annual report for 1854. It exhibits the combination of resulting angles from measures of directions and from measures of angles by repetition, and assigns the relative weights to the results. The residuals in the sum of the angles of the triangles are shown, and proper weights are given to the conditional equations depending upon the closing of the triangles as well as (primarily) upon the probable errors of the measured directions or angles. The thirty-five normal equations were solved by the indirect method of elimination.

The report by Mr. Schott concludes with a statement of the resulting angles and computations of the sides of the triangles.

It is proper to remark that the length used for the Epping base in this report, though very nearly so, is not the final length, which can be deduced only from certain comparisons that remain to be made.

LONGITUDE.

The computations for the longitude of American stations from the European meridian, by Pleiades occultations, have been continued under the direction of Professor Benjamin Peirce, of Harvard, according to the comprehensive plan developed by him, and before alluded to in my annual reports. His remarks (Appendix No. 11) give such promise of agreement in results as will justify the expectations founded on the adoption of the method.

The computations of differences of longitude between American stations, determined heretofore by the telegraphic method, have been continued by Dr. B. A. Gould. In addition to the results formerly reported, the longitudes of Raleigh, N. C., Wilmington, N. C., and Columbia, S. C., have been definitely settled, giving a total of twelve stations determined in longitude south of Washington. The report of Dr. Gould is given in Appendix No. 12.

The telegraphic difference of longitude between New York and Washington, deduced some years ago without the advantage of recent improvements in instruments, is somewhat uncertain. There is also a small geodetic difference which enters into that determination. It is, therefore, desirable that the telegraphic method should be again applied for a new determination of the difference of longitude between the two cities.

The list of fundamental star places, used in longitude determinations, has been submitted to a new discussion, and the declinations of the time star list have also been determined.

The investigation of the diurnal motion in azimuth of the transit instruments has been continued, and new results found strongly confirmatory of previous inferences. This subject is receiving attention in other quarters. Hereafter it must be brought into the determination of star places in order to obtain the best results practicable.

MAGNETISM.

The series of papers containing a discussion of the magnetic observations made at Girard College, Philadelphia, from 1840 to 1845, contained in some of the preceding annual reports, is brought to a close this year by the insertion of the last three parts, Nos. X, XI, and XII, contained in the Appendix, Nos. 16, 17, and 18. To facilitate the reference to the separate parts, I herewith give an abstract of the headings and general contents:

SECTION I.—Part I—Coast Survey report, 1859, Appendix No. 22—Investigation of the eleven (or ten) year period in the amplitude of the solar-diurnal variation, and of the disturbances of the magnetic declination. Part II—Coast Survey report, 1860, Appendix No. 23—The solar-diurnal variation in the magnetic declination and its annual inequality. Part III—Coast Survey report, 1860, Appendix No. 24—Influence of the moon on the magnetic declination.

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Folding-room.—The work of backing with muslin the sheets intended for use by the plane-table and hydrographic parties has been performed by *Mr. G. W. Francis*. He has also backed with paper the sailing charts intended for distribution from the office for the use of the navy.

Instrument shop.—The charge of the shop has remained with *Mr. T. J. Hunt*, who is assisted by one workman and three apprentices—the least force that has for years past carried on the necessary operations. As a consequence, the work has been almost exclusively confined to the repairing of instruments used in the field. The finished work of the year consists of six metre scales, six 7-inch German-silver protractors, one prismatic compass, three stands for theodolites, and one pair of magnets. The repair of instruments during the year consists, in part, of twenty-seven theodolites, twenty plane-tables, nine reconnoitring telescopes, six levelling instruments, sixteen sextants, seven prismatic compasses, six marine glasses, four 3-arm protractors, six heliotropes, four surveyors' compasses, twelve metre chains, two hair frames, one astronomical eye-piece, two pantographs, one large astronomical telescope, one tide-gauge, one camera, one astronomical clock, two telegraphic instruments, and two spring governors; in addition to which a great variety of miscellaneous work has been accomplished for office and field purposes.

Carpenter shop.—*Mr. A. Yeatman* still remains in charge of the shop, and is assisted by one workman. During the year the work has included the construction of a large camera, with stands and rail-tracks; two large first-class map cases for the Navy Department; fifteen map and paper cases for the office; thirty-one cases for instruments, such as theodolites, plane-table, &c.; nine new stands for theodolites, plane-table, &c.; two levelling rods; seven plane-table boards; fourteen drawing-boards; seventeen wooden pans and frames for photographic purposes; twelve frames for electrotype purposes; one stand for a large portfolio; rollers and cornices for twenty-two maps; eighty-four tin cases for holding original sheets of the survey have been printed and numbered; and one hundred and twenty-three rough packing boxes for the transportation of instruments and records. In addition to the above, the office buildings and wood-work of instruments have been kept in repair.

APPENDIX No. 11.

REPORT OF PROFESSOR BENJAMIN PEIRCE, OF HARVARD, ON COMPUTATIONS FOR LONGITUDE FROM OCCULTATIONS OF THE PLEIADES.

CAMBRIDGE, December 5, 1864.

DEAR SIR: I have the honor to report to you the progress of the computations of the occultations of the Pleiades up to the present date. The group of observations from 1838 to 1842 is wholly under my special charge, with the assistance of *Mr. Charles S. Peirce*. The computations of the equations of condition are all made for the first time, and the duplicate computation is also almost completed. The preliminary examination of these equations show the most extraordinary agreement of all the observations of each occultation made at good observatories and by experienced observers, and fully justifies the expectations of their value. The agreement, with the tables of Hansen, is also such as to confirm the anticipations of the excellence of those tables; but there are some undoubted discrepancies with observation, which seem to indicate recondite sources of error in the tables, which it may require much time and thought to investigate. Thus the occultations of March 19, 1839, clearly demonstrate an error of the tables of about five seconds of arc. It is easy enough to see what this is not; it is not error of semi-diameter, or of parallax, or of elliptic elements, or of the coefficients of the parallactic equation; but what it is is still a mystery.

The last group of the Pleiades occultations has been put into the hands of computers in the office at Washington by *Mr. Schott*, under my directions, and is rapidly advancing towards completion.

Very respectfully,

BENJAMIN PEIRCE.

A. D. BACHE, LL.D.,

Superintendent United States Coast Survey.