

REPORT OF THE SUPERINTENDENT

OF THE

# U. S. COAST AND GEODETIC SURVEY

SHOWING

THE PROGRESS OF THE WORK

DURING THE

FISCAL YEAR ENDING WITH

JUNE, 1885.

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Great care was taken to establish a sufficient number of tide-gauges to obtain accurate planes of reference for the reduction of soundings. Box and staff gauges were fixed at the steamboat wharf, Cape May Point, and referred to a bench-mark on the beach. A box-gauge was established in the vicinity of Maurice River light-house, and referred to a bench-mark on the foundation wall of the building. Five gauges were set up near Hut Station, six miles nearly northwest of Mispillion light. These gauges were all compared with each other by simultaneous observations to guard against mishap in case of storms. They were also compared with the gauge at the United States iron pier on the Delaware Breakwater, day and night tides being observed at both places for several days.

Lieutenant Hanus, in his report of the season's work, gives full details in regard to the locality of the several gauges established, and the methods followed in obtaining comparisons of readings.

With reference to the mode of planting water signals devised by himself two years ago, and described on page 34 of the Report of 1883, he observes that a large number of these were used in the hydrographic work, and that a long tree, large at the base, was found to be better than a signal made of scantling. One of these trees, forty feet in length, was planted in fifteen feet of water. These tree pump-signals withstood every gale that occurred during the season.

Ensigns A. L. Hall, J. H. Hetherington, E. F. Leiper, and G. R. French, U. S. N., were attached to the party.

Soundings were completed according to the scheme of operations, November 12, and about a week later Lieutenant Hanus took the Endeavor to Norfolk to prepare for work on the Southern coast. Reference to this will be made under the headings of Sections V and VI.

For the Delaware Bay and entrance hydrography, the statistics are:

Miles run in sounding .....	1,530
Angles measured .....	11,022
Number of soundings .....	49,813

### SECTION III.

MARYLAND, DISTRICT OF COLUMBIA, VIRGINIA, AND WEST VIRGINIA, INCLUDING BAYS, SEAPORTS, AND RIVERS.

(SKETCHES NOS. 1, 4, 15, 17, AND 18.)

*Gravity determinations and experimental researches at Washington, D. C., and in Virginia.*—Instructions issued to Assistant Charles S. Peirce in July, 1884, directed him to proceed to Fortress Monroe, Virginia, to determine gravity there, and subsequently to reconnoiter for one or two stations suitable for gravity determinations in the mountain region of Virginia, West Virginia, and North Carolina.

Mr. Peirce was occupied at Fortress Monroe till about September 1 in determining the intensity of gravity. He had some difficulty in finding a suitable casemate in which to swing his pendulum, Peirce No. 3. Finally, after making some experiments with the noddy to determine the amplitude of swaying of the pendulum support (see Appendix No. 15, Report for 1884), he swung the pendulum heavy end up and heavy end down on alternate days until an ample number of oscillations had been secured in both positions. With reference to these observations Mr. Peirce remarks, "Peirce No. 3 has therefore been swung in a particularly satisfactory manner, and I consider it unnecessary to swing another pendulum here, owing to the fact of this pendulum being reversible as well as invariable. The results here will be quite as good as at Allegheny."

In September Mr. Peirce reconnoitered for a gravity station in the mountains of Virginia; but no station could be found which would meet the views of the Superintendent as to elevation above the sea-level and at the same time not be too expensive to occupy.

On returning to Washington Mr. Peirce was appointed, October 1, to the charge of the Office of Weights and Measures. The duties of this position he fulfilled till February 22, when he declined further service.

During this time, under instructions, he carried through an elaborate occupation of the initial

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gravity station at the Smithsonian Institution with four reversible pendulums—"Peirce Nos. 1, 2, 3, and 4."

In November he was directed to attend the meeting at Newport of the National Academy of Sciences, of which body he is a member, and to present there a memoir upon the gravitation and other surveys. Also to attend the December meeting of the American Metrological Society and read a memoir upon the determination of gravity. This memoir will be printed by the society.

During the winter, under instructions from the Superintendent, Mr. Peirce proceeded to Boston, Providence, Hartford, New York, and Philadelphia, and conferred with the manufacturers of gauges and machinery, and also with electricians and others with reference to the resolutions passed by the United States Electrical Conference concerning weights and measures, and the best way of meeting the wants of the country. In January, 1885, he was summoned before the Congressional Commission and testified on the subject.

Towards the end of February, instructions were given to Mr. Peirce to proceed to Key West and make gravity determinations there. Mention of his operations in that locality will be made under the heading of Section VI.

*Annual determination of the magnetic declination, dip, and intensity at the station on Capitol Hill, Washington.*—In order to determine the annual effect of the secular change in the magnetic elements, observations for magnetic declination, dip, and intensity have been made at least once a year during the past thirty years at a magnetic station upon Capitol Hill, Washington, D. C. During that period, the declination has increased gradually from  $2^{\circ} 24'$  W. of N. to  $4^{\circ} 12'$ .

Assistant Charles A. Schott, by whom or under whose direction the observations have been made, observed on June 13 and 15, 1885. The secular variation of the magnetic declination in the United States and at some foreign stations was discussed by Mr. Schott in a paper published as Appendix No. 12 to the Report for 1882. In this Report will appear (Appendix No. 6) Mr. Schott's discussion of the secular variation of the magnetic dip and intensity, based upon observations made within the United States from the earliest to the present time.

*Continuation of the detailed topographical survey of the District of Columbia.*—Favorable progress has been made in the detailed topographical survey of the District of Columbia during the nine months spent by the party of Assistant J. W. Donn in field-work. This survey, made at the request of the Commissioners of the District of Columbia, and carried on since February, 1881, under their general direction, has for its main object, to quote a recent report of the Engineer Commissioner, the supplying "of data for laying out new, and extending old, roads, and for properly subdividing county property as it is laid out in suburban streets and lots.

"But its minute accuracy will make it useful for all time in planning public works of every description. It saved the necessity for the preliminary surveys in connection with the extension of the water-works now in progress, and it will accomplish the same purpose when the city sewerage has to be extended into the country. From the maps of this survey, so far as completed, and from such other data as were available, was compiled during the last year a new map of the entire District on a scale of four inches to the mile, to take the place of the Boschke map of 1855, of which the edition was exhausted, and which, in spite of many errors, was the only topographical map of the District in existence. The new map was handsomely lithographed and printed in four colors by Bien & Co., of New York.

"In connection with this survey, during the past season the four corner monuments of the District, as established by Ellicott in 1791, were identified and located. It was discovered that the District is not exactly a ten-mile square, the length of the four sides being as follows:

"Southwest 53,031.3 feet, or 231.3 feet too long.

"Southeast 52,871.3 feet, or 71.3 feet too long.

"Northwest 52,863.6 feet, or 63.6 feet too long.

"Northeast 53,063.8 feet, or 263.8 feet too long.

"The total area of the original District was 100.6 square miles. The north point is 116.6 feet west of the meridian of the south point, and the east point is 138.6 feet south of the west point. Considering the character of the instruments with which Ellicott made his survey, and the nature of the country, then practically a wilderness, through which he ran his lines, one cannot but be surprised at the accuracy of his results.

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