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The results are shown upon two hydrographic sheets, including Norfolk Harbor and Elizabeth River, on scales of 1-5,000 and 1-10,000 respectively.

Lieutenant-Commander Thomas had the aid of the following-named officers: Lieut. C. C. Cornwell, U. S. N.; Master F. A. Wilner, U. S. N.; Master H. F. Reich, U. S. N.; Ensign E. M. Katz, U. S. N.; Ensign H. M. Witzel, U. S. N.; and Ensign J. M. Orchard, U. S. N.

Later in the season Lieutenant-Commander Thomas took up duty which will be referred to under the head of Section VI.

Hydrographic examinations for the Coast Pilot.—As already stated under the head of Section II, the inland waters between Delaware and Chesapeake Bays and the bays themselves were examined during that part of the fiscal year preceding October, 1881, by Assistant J. S. Bradford, with a view of collecting data for the third volume of the Atlantic Coast Pilot. Mr. Bradford's examinations were directed to all localities where he had reason to expect changes of importance either in topographical features, sailing directions, or positions of dangers, so as to bring the manuscript of the volume up to the latest date practicable previous to publication.

In this connection the office labors of the party under his charge may be referred to. In addition to the work on the third volume of the Coast Pilot, subdivision 3 of that work, including Penobscot Bay and tributaries, was revised, printed, and published in a new edition; subdivision 14, embracing the coast between New York and Delaware Entrance, was completed and published; twenty-six views of the coast were drawn and etched during the year by Mr. John R. Barker. This skillful draughtsman has completed in all one hundred and ten views for the Coast Pilot in a most satisfactory manner since his employment in this branch of the service. During the year he finished four views for the Topographical Manual under the direction of Assistant E. Hergesheimer.

Much time was devoted in the office by Mr. Bradford and his chief assistant, Mr. J. W. Parsons, to the revision and preparation for publication of the Table of Depths in the Harbors on the Atlantic and Gulf Coasts, a work involving great care and labor. The party was engaged, also, in the preparation of an elaborate article for the Light-House Board, showing the differences in names and geographical positions of points on the Atlantic and Gulf coasts between the publications of the Board and those of the Coast and Geodetic Survey.

Under the direction of Mr. Bradford, Mr. G. A. Morrison was engaged upon clerical duty during the year, chiefly in collating from Volumes I and II and arranging in convenient form the index for the forthcoming North Atlantic Coast Pilot (Eastport to Baltimore), which embraces within its limits Volumes I, II, and III of the first series.

Magnetic observations.—The usual annual determinations of the magnetic declination, dip, and intensity were made at the Washington magnetic observatory in charge of Assistant C. A. Schott. These observations were taken June 15, 16, and 17, 1881, by Assistant William Einbeck, and the results indicate a conformity with the laws of secular change heretofore recognized. The observatory was also used by Lieut. S. W. Very, U. S. N., Assistant Coast and Geodetic Survey, to establish the constants of intensity for his magnetic work on the northeastern coast of America. Subassistant J. B. Baylor also made use of the observatory for testing instrumental constants.

Force of gravity.—Absolute determinations of gravity were made during the year at Cambridge, Mass. (see Section I), at Baltimore, Md., and at Washington, D. C. At Baltimore a series of experiments was made to determine the influence of the walls of the Geneva receiver upon the period of oscillation of a pendulum swinging within it. Four invariable reversible pendulums were made in the office upon a new pattern. The distance between the knife-edges of three of these is one meter, and for the fourth one yard. Mr. Peirce had the aid during parts of the year of Assistant Edwin Smith, and of Messrs. E. D. Preston and H. Farquhar.

In April, 1882, Major J. Herschel, R. E., of the India Survey, came to this country under the direction of his Government, to oscillate the Kater invariable pendulums at Hoboken, N. J., and at Washington, D. C., thus connecting the American pendulum work with the English. Advantage was taken of the presence of Major Herschel to hold an informal conference on the subject of pendulum work with special reference to its future prosecution in the Coast and Geodetic Survey by the most desirable methods, and by plans involving the greatest economy consistent with scientific accuracy. At this conference there were present, together with Major Herschel, the

Superintendent of the Coast and Geodetic Survey, and Assistants George Davidson, C. A. Schott, and C. S. Peirce, on the part of geodesy; and Professor Simon Newcomb, Superintendent of the Nautical Almanac, on the part of astronomy. Major J. W. Powell, Director of the United States Geological Survey (invited to attend on the part of geology), was unable to come. After an extended discussion, the conclusions arrived at having been formulated in several propositions and unanimously adopted, the conference adjourned. For a statement of these conclusions see Appendix No. 22.

Telegraphic longitudes.—At the opening of the fiscal year the longitude parties in charge respectively of Assistants G. W. Dean and Edwin Smith were established at Charlestown, W. Va., and Washington, D. C. At the instance of Assistant Dean, special instructions had been given by Mr. C. W. Smith, general manager of the Chesapeake and Ohio Railway, and by Messrs. J. W. Kates and David Flannery, superintendent and assistant superintendent of the Western Union Telegraph Company, to all operators on the line to afford every facility for the exchange of longitude signals, and notwithstanding the bad condition of a portion of the line, an exchange was effected on one night, but a severe storm followed, and immediately after that the continued occupation of all lines centering at Washington by the event of the 2d of July rendered it advisable to postpone the determination Washington-Charlestown to a more favorable opportunity.

Arrangements were at once made for determining the difference of longitude, Washington-Cincinnati, Assistant Smith conducting the operations at the Naval Observatory, Washington, and Assistant Dean those at Mount Lookout, Cincinnati. Between July 18 and 25 four nights were obtained for exchange of longitude signals; the observers then exchanged places, and completed the determination on five more nights between August 2 and 8.

In the longitude triangle, Cincinnati-Nashville-Saint Louis, the determination of which was next taken up, the longitude exchanges began on the line Cincinnati-Nashville, and will be referred to under Sections XIII, XIV, and XV.

Telegraphic longitudes.—In conformity with instructions dated near the close of the fiscal year, Subassistant C. H. Sinclair and Mr. F. H. Parsons began the preliminary arrangements for the determination of the longitude of a station at the University of Virginia, Charlottesville, by exchange of telegraphic signals from Washington. The details of the progress and completion of this work will be given in my next annual report.

Topography.—The detailed topographical survey of the District of Columbia, begun during the last fiscal year, at the request of the Commissioners of the District, was continued by Assistant J. W. Donn, with the aid during part of the year of Mr. W. C. Hodgkins, and of Subassistant D. B. Wainwright after the detachment of Mr. Hodgkins in June, 1882. At the close of the fiscal year ending with June, 1881, the work had been completed along Boundary Avenue from Lincoln Avenue to Sixteenth street, and as far north as the park of the Soldiers' Home, including the northwestern portion of those grounds. Much marginal work in the vicinity of Mount Pleasant Village, Seventh street road, and along the line of the Metropolitan Branch of the Baltimore and Ohio Railroad, between Terra Cotta Station and the Riggs road, was also shown upon the plane-table sheet. During July, August and September, the efforts of the party were directed towards the completion of sheet (No. 1) scale 1-4,800 between the north boundary of the Soldiers' Home and the northeast boundary of the District, and although progress was somewhat retarded by the difficulty of running contour lines in a country much covered by woods, orchards, and bushes, the whole area was completed with the exception of the portion lying to the north and southeast of Fort Totten, and that to the southeast of Fort Bunker Hill, these portions consisting mostly of woods. In order to advance without cutting through wooded areas, it was decided to postpone this part of the work till winter or early spring, when the trees were not in leaf. During the period between the beginning of October and the middle of February the survey was advanced southward from the Bunker Hill and Harewood roads, and was completed as to Sheet No. 1, the final work having been done in the complicated wooded areas of the Soldiers' Home and Glenwood Cemetery.

The Engineer Commissioner of the District then requested that, in view of the proposed extension of the Washington Aqueduct from its present terminus at the "Twin Reservoirs" to Meridian Hill, the survey of the route be at once taken up. A belt of topography, covering the line of the proposed extension, was finished between the beginning of March and the end of June.