THE

EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

SECOND SESSION OF THE FORTY-EIGHTH CONGRESS.

1884-'85.

IN THIRTY-FOUR VOLUMES.

VOLUME 22—No. 43.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1885.

tions were obtained to be used for a comparison with the tides at the iron pier. For the tides at this last named point, Lieutenant Hanus has submitted a full tide-table, derived from observations made during one lunation.

Many recommendations are made by Lieutenant Hanus in regard to changes in the location of buoys in the lower bay, some of which are deserving of careful consideration. He has made notes also of changes desirable in the sailing directions as depending upon facts brought out during the progress of his survey. The intended closing of the gap between the eastern end of the ice breaker and the western end of the Breakwater will, he observes, very much improve the harbor. The current being then compressed between the eastern end of the Breakwater and Cape Henlopen Point will gradually wear away the latter, and lead to a deepening of the water in the harbor.

The following-named officers were attached to the party: Lieut. W. G. Cutler, U. S. N.; Ensigns E. F. Leiper and G. R. French, U. S. N.

Statistics reported are:

Miles run in sounding	946
Angles measured	4,717
Number of soundings	43,996

Other hydrographic duty assigned to Lieutenant Hanus during the year will be referred to under the heads of Sections III, IV, and IX.

SECTION III.

MARYLAND, VIRGINIA, AND WEST VIRGINIA, INCLUDING BAYS, SEAPORTS, AND RIVERS.

(SKETCHES Nos. 1, 4, AND 5.)

Determinations of gravity by pendulum experiments, and comparisons of standards in Europe and in the United States.—The special duty assigned to Assistant Charles S. Peirce in Europe towards the beginning of the present fiscal year was referred to in my last annual report. In June and July, 1883, he carefully compared the Coast and Geodetic Survey standard yard No. 57 with the imperial yard No. 1, and also with the iron yard No. 58 at the British Standards Office, London.

At the Kew Observatory he determined the flexure of the pier used for pendulum experiments in 1878. This could not be done at the time because the Kew Observatory is built upon the ruins of an ancient monastery, and the pier used rested upon three stories of old vaulting. It was impossible to get to the bottom of this, it being filled up with old rubbish. There was, therefore, nothing to rest a microscope upon so that it would be immovable while the pier swayed, and the attempt to determine the flexure was at the time abandoned. Subsequently Mr. Peirce invented the method of measuring the flexure by a noddy or inverted pendulum, which is set in motion by the swaying of the pier. A memoir upon this subject appears in Appendix No. 15. Also in Appendix 16 a paper on the effect of the flexure of a pendulum upon its period of oscillation.

Afterwards, in Geneva, he measured the flexure of the table upon which his pendulum support rested in the experiments of 1875, these experiments having been made just before his discovery of the importance of taking account of the flexure of pendulum supports.

Arriving in Paris, he directed further work on the designs of the new Gautier pendulums, and continued to give attention to this subject after his return to the United States in September, 1883.

Having resumed the direction of the pendulum work at the Coast and Geodetic Survey Office, he was engaged there during part of the winter in swinging the yard and meter pendulums at high and low temperatures, thus determining the ratio of the yard to the meter, and also the coefficient of expansion of the two pendulums.

At the pendulum station at the Smithsonian Institution, pendulums Nos. 2 and 3 were oscillated and the length of pendulum No. 3 was measured.

From February 1 to June 30, 1884, Subassistant F. H. Parsons was attached to Mr. Peirce's party, and observed oscillations at the office.

Comparative determinations of gravity with the Kater pendulums at Washington.—Special refe