REPORT OF THE COAST AND GEODETIC SURVEY FOR 1904.

THE report of the Coast and Geodetic Survey for 1904 is a record of manifold labors and results which have for their theater of action an area practically coterminous with that of the United States and all its island possessions. The main body of the report contains a detailed account of the wide range of important duties devolving upon this bureau, and in the appendices we have a presentation of discussions and results which must prove of great economical value and interest to surveyors, engineers, navigators and physicists.

The resurveys and developments imperatively required to show the changes in harbors and approaches, due to works of improvement or the ceaseless action of natural causes along the Atlantic, Pacific and Gulf coasts of the United States, and to meet the ever-increasing demands of our commerce and navy for up-to-date charts, particularly of the waters of Alaska, Porto Rico, Hawaii and the Philippines, gave constant employment to the eleven vessels available for these duties. The hydrography was prosecuted within the limits of the waters of sixteen states and territories and the topography was carried on in nine.

In Alaska the work included the continuation of the survey of Prince William Sound, the survey of Controller Bay and a deep-sea examination from the Strait of Juan de Fuca to Prince William Sound, preliminary to the laying of a deep-sea cable from Seattle to Valdez. The Porto Rico work was continued in certain bays and harbors as well as in the development of the conditions in the off-shore waters. In the Philippine Archipelago the survey has secured the cooperation of the insular government and a detailed résumé shows a most satisfactory progress of the triangulation, hydrographic, topographic, magnetic and astronomical operations. By utilizing native assistance in the Manila sub-office twenty-one charts were prepared for publication during the year, and the outcome of the experience with Filipinos as draftsmen, computers and engravers is the gratifying demonstration that they will prove equally as competent as the Hindoos have been found in the British Indian operations and the Malagassys have proved themselves in the French surveying work in Madagascar.

The reconnaissance for the primary triangulation along the 98th meridian was completed to the Canadian border and a scheme was extended eastward connecting this work with the triangulation of the Mississippi River Commission. The execution of the primary triangulation in the Dakotas and Texas was prosecuted at a rate which surpassed even the notable record which had already secured an enviable reputation for the geodetic operations along the 98th meridian, the total extension amounting to 300 miles (500 kilometers). An equal distinction must be accredited to similar work in California and Oregon whereon remarkable progress has been made in connecting the transcontinental arc work with Puget Sound.

The progress of the magnetic work is shown in detail in Appendix No. 3, which includes a table of results of the magnetic declinations, dip and intensity of force observed on land and sea during the year, this being supplemented with full descriptions of the magnetic stations occupied and meridian lines observed. A new feature is the inclusion of the observations of the three magnetic elements at sea by the Coast and Geodetic Survey vessels in the course of their regular surveying operations. The paper is replete with matters of interest to the surveyor, the mariner, the geographer and the geologist. Thus comprehensive examination has been made of certain locally disturbed areas, as for example, in Douglas Island, Alaska, in the region of the local magnetic pole found in 1900; and the completion of the magnetic survey of Louisiana in cooperation with the state geological survey revealed interesting and important results as regards both the magnetic distribution and the secular variation.

The table contains the magnetic results at 384 land stations distributed over 24 states and territories and 2 foreign countries. The table of sea results contains 52 entries of magnetic declination, 34 dips and 32 values of the total intensity of the magnetic force in the Atlantic and in the Pacific Oceans. The

methods and instruments adopted for the sea work, which have thus far proved successful, are described in detail. In a general retrospective consideration of the work of the past five years it is pointed out that in this period observations have been made at 1,636 stations of which about one eighth are points previously occupied by the survey and since used for observations to secure data for ascertaining the secular change of the magnetic elements. The work in about a dozen states has been practically completed except for special investigations and secular change observations. During the year a bureau of international research in terrestrial magnetism has been created by the Carnegie Institution of Washington, with the inspector of the magnetic work of the coast survey in charge as director, and the cooperation thus ensured is certain to prove extremely profitable in results.

The determination of the longitude of Manila from San Francisco, thus completing the first longitude circuit of the earth, was one of the astronomical events of the year, and in Appendix No. 4 is a comprehensive illustrated report on the various instruments and operations used in the undertaking with a comparative résumé of the various links and results from which the longitude of Manila had been determined from the westward. The generous cooperation of the Commercial Cable Company, through whose patriotic enterprise the work was made feasible, is gratefully acknowledged. The results of the determinations from the eastward and westward differ only by $0^s.006$ or about 8.8 feet. The other results of this expedition are the determinations by the telegraphic method of the longitudes of Honolulu, and Midway and Guam Islands.

The third attempt at representing the tide for the world at large, the first having been made by Whewell and Airy and the second by Berghaus, is described in Appendix No. 5. The advancement in recent years of the general use of the harmonic analysis and the greatly improved tidal data that are now obtainable for such a great part of the globe coordinate to make a new presentation of this subject very opportune. The theoretical discussion of the problems involved, the wide range of data and authorities consulted and referred to, the graphic presentation of the cotidal lines, the results presented and the conclusions deduced make a most suggestive paper and one which will be highly interesting to all students of the subject.

The results of the precise leveling operations for the year are published in Appendices Nos. 6 and 7, which submit them in a detail that makes them immediately available for the requirements of surveyors and engineers. These extend the precise level net, as previously published, six hundred miles to the westward, from Red Desert, Wyoming, to Owyhee in eastern Idaho; and from Holland, Texas, two hundred miles southwest, to Seguin, Texas. An interesting feature is an account of the change in the manner of support for the leveling rods, with the comparative discussion of the old and the new methods and the consequent confirmation of the importance of the new system.

The account of operations submitted by the assistant in charge gives the story of the work of the various computing, drawing, engraving and chart divisions of the office, in which the results of the field work are discussed or prepared for the publications and charts wherein they are placed at the service of the public.

A full account of the first recording transit micrometer devised for use in the telegraphic longitude determinations of the Coast and Geodetic Survey is submitted in Appendix No. 8, with an account of the exhaustive tests it was subjected to and a recapitulation of the results of experience with this form of instrument, mainly in Europe, during the last thirteen years. The results of these experiments indicate that with the transit micrometer the accuracy of telegraphic longitudes may be considerably increased, if desirable, or the present standard of accuracy may be maintained at much less cost than formerly.

The results of all triangulation in California south of the latitude of Monterey Bay are printed in the concluding appendix in full, including descriptions of stations, as well as their latitudes and longitudes and the lengths and azimuths of the lines joining them. In

compact and convenient form there is given all the information in regard to this triangulation that is needed by an engineer or surveyor who wishes to utilize the results in controlling and checking surveys or in constructing maps or charts. The locations of more than 1,300 points are accurately fixed by this triangulation.

The report, in addition to the details of the foregoing operations and results, contains a record of a wide range of important work for which the aid of a survey was sought because of the special training of its officers. The superintendent attended the Fourteenth General Conference of the International Geodetic Association as delegate for the United States and maintained direction of the observatories at Gaithersburg, Maryland, and Ukiah, California, supported by the International Geodetic Association for the purpose of measuring the variations of latitude; he was also detailed for duty in connection with the presentation of the case of the United States before the Alaska Boundary Tribunal being assisted by one of the officers of the survey. As commissioner of the United States he continued the work of remarking the boundary line between the United States and Canada from the Rocky Mountains westward, two of the officers of the survey being employed in the field; and as commissioner of the United States in the International Delimitation Commission he inaugurated the work of marking the boundary between Alaska and Canada, one of the parties being under the direction of an assistant of the survey. One officer continued on duty as a member of the Mississippi River Commission. One officer having completed the field work of the survey of Mason and Dixon's line, the boundary between Maryland and Pennsylvania, was then detailed to prepare the maps and report showing the results of the work. Another officer, at the application of the municipal authorities, remained in charge of the triangulation of the Greater New York territory, and one representative of the survey in cooperation with the Louisiana Oyster Commission continued the survey of the natural oyster beds and reefs for the state of Louisiana.

THE PRESERVATION OF AMERICAN ANTIQUITIES.

AT a joint meeting of the committees on preservation of American antiquities of the Archeological Institute of America and the American Anthropological Association, held at the Cosmos Club in Washington, on the evening of January 10, the subject of pending legislation was considered. It was decided that a memorandum should be prepared embodying such provisions from pending measures, as in the judgment of the joint committee should be incorporated into law, and the same presented to the House of Representatives' Committee on Public Lands, with the request that a bill should be prepared by this committee based on these suggestions.

Present: For the Archeological Institute of America, Dr. Seymour, Chairman, Dr. Putnam, Mr. Holmes, Mr. Bowditch, Dr. Kelsey, Dr. Carroll; for the Anthropological Association, Mr. Holmes, Chairman, Dr. Putnam, Miss Fletcher, Professor Saville, Dr. Gordon, Mr. Culin, Dr. Kroeber, Mr. Hewett.

The memorandum was submitted by the committee at the hearing before the Public Lands Committee on Wednesday, the eleventh.

At the meeting of this committee held on the sixteenth instant it was ordered to strike out all except the enacting clause of S. 5603 (the act known as the Lodge-Rodenburg bill which passed the senate last April) and insert instead "an amendment in the form of a substitute"; said substitute being, with a few minor amendments, the memorandum prepared by the joint committe above referred to. The bill as reported back, referred to the House Calendar, and ordered printed, is as follows:

Sec. 1. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That for the purpose of preserving and protecting from despoliation the historic and prehistoric ruins, monuments, archeological objects and other antiquities, on the public lands of the United States, all said historic and prehistoric ruins, monuments and other objects of antiquity are hereby placed under the care and custody of the Secretary of the Interior.

Sec. 2. That the Secretary of the Interior may make temporary withdrawals of the land on