THE SIXTY-SEVENTH ANNUAL REPORT OF THE COAST AND GEODETIC SURVEY.

The Report of the Superintendent of the Coast and Geodetic Survey for the year ending June 30, 1898, has just made its appearance from the Government Printing Office, in Washington. The publication has been somewhat delayed on account of numerous changes, both in form and matter.

A striking feature of the new report is the absence of large folded maps in the body of the work. The plan has been generally adopted of showing, by cuts, only such work as has been accomplished during the year, and to this end, all large illustrations are reduced to single or double page plates. Where clearness is equally served, small cuts are run in the text, thus very much adding to facility of description, as well as making the volume more convenient and economical. Two large progress maps are placed in a pocket at the end.

The type is of a pleasing character, known as French Old Style, and gives the page a clean open appearance. A departure has been made from the usual custom, in the matter of binding and margin. The type page is somewhat smaller, while no change has been made in the size of the leaf. The sombre black of the cover has been replaced by a grateful olive tint; the Coast and Geodetic Survey seal appears on the back, and the flag, a newly acquired insignia, ornaments the front. Withal, the book is not so large as the average one for previous years, owing partly to the elimination, already noticed, of the large unwieldy folded maps, and partly because of the omission of some matter hitherto published but now regarded as unessential in a general statement of the activity of the Bureau.

The whole subject is treated under four heads, viz:

I. The Survey and its Progress.
II. The Scientific and Technical Results.
III. The Administration.
IV. The Appendices.

Under the first head is an introduction, in which the appropriations are stated, and a general summary of the work of the year is given. This outlines the course of the work, and treats of the re-survey of Chesapeake Bay and San Francisco Bay; of the explorations in Alaska and the Pribilof Islands; and of the geodetic operations throughout the interior of the country. Notice is taken, also, of the forms of publication: (1) of charts and maps, and (2) the textual publications.

The aid given to the military and naval authorities in the war with Spain is touched upon. Soon after the outbreak of hostilities thirty officers were withdrawn from the service, and three vessels, the *Patterson*, *McArthur* and *Gedney*, on the Pacific Coast, were temporarily transferred by the President to the navy. On the Atlantic Coast, the *Bache* was used as a dispatch boat between Key West and Havana, and rendered important service in connection with the '*Maine* disaster.' In addition to the collation and preparation of information regarding maps of Puerto Rico, Cuba, Hawaii and the Philippines, the Survey furnished to the Navy Department, between April 1st and June 30th, over 27,600 charts.

Mention is made of the fact that at the close of the fiscal year there were 375 persons employed in the service, including petty officers and sailors. The total cost of the work is stated as follows:

Field expenses	$124,800
Vessels (including $75,000 for the *Pathfinder*,	110,000
Salaries	226,870
Office expenses	34,400
Making a total of	$496,070

To this is to be added an amount of $112,676, from the Naval Appropriation Bill, for pay and subsistence of enlisted men, as well as $45,354, for the pay of naval officers, making a grand total of

$654,100, as the cost of the survey during the fiscal year described.

Following the introduction is an historical sketch of the Coast Survey, stating briefly the phases through which it has passed since its inception, in 1807, and also giving a list of the Superintendents, from the beginning to the present time. As a matter of interest, a sketch is shown giving the outline of the first triangulation laid out on this work. It consists of 11 trigonometrical points in the vicinity of New York, suitably connected by triangulation, and determined and verified by the measurement of two base lines. This work was done as early as 1817.

Passing to the second division of the report, the scientific and technical results, we find the work classified into:

(1) Coast Work.
(2) Geodetic Work.
(3) Magnetic Work.
(4) Special Operations.
(5) Publication of Results.

Under *Coast Work*, a general statement is given of the progress made in Buzzard's Bay, Chesapeake Bay, Lake Pontchartrain, San Francisco Bay, Washington Sound and Alaska. Mention is made of some miscellaneous charts, and finally a list of hydrographic sheets is given, published through the courtesy of the United States Fish Commission, and referring to the work of the steamer *Albatross* in Southeastern Alaska, under the direction of Commander J. F. Moser, U. S. N.

The details of field operations comprise a description of the work accomplished in the different localities in hydrography, current observations, topography, etc.

Besides the regular coast work, a party was sent to the Pribilof Islands, and during the season, which was an exceptionally favorable one for surveying operations, a complete topographical survey was made of St. Paul, St. George, Walrus, and Otter islands, on the scale of 1/20,000. Not only this, but the seal rookeries, to the number of eighteen, were completely developed, and maps of them were carefully drawn, on a scale of 1/2000. These show every necessary detail, and furnish most valuable information touching upon the seal industry.

In January, 1898, an appropriation of $100,000 was made by Congress, in order that immediate information might be secured in regard to the mouth of the Yukon and other rivers leading to the gold producing regions of Alaska. Three parties were sent out in the spring, and valuable results were obtained from all the localities visited. Special attention was given to the mouths of the Yukon and Copper rivers, the region around the head of Lynn Canal, and the passes leading to the Klondike.

The work of the Coast Pilot Division is briefly stated, and mention is made of the fact that the issue of the U. S. Coast Pilot for the Atlantic Coast has increased from 1209 copies during the year 1897, to 1532 copies for the following year.

Prominent among the work accomplished in the Tidal Division during the year was the preparation and completion of Parts I. and II. of a 'Manual of Tides,' by Dr. R. A. Harris. These two parts were published as Appendices Nos. 8 and 9 of the Annual Report for 1897. It is proposed to treat the whole subject in five parts. Part III., because it was immediately wanted, appeared first, and was published as appendix No. 7 in the Report for 1894. Parts IV. and V. will appear shortly.

Part I. is a historical treatment of the subject. Part II. refers to tidal observations, the equilibrium theory, and harmonic analysis. Part II. is on connections between harmonic and non-harmonic quantities, including applications to the reduction and prediction of tides. Part IV. will treat of tidal theory; and part V. of tidal streams or currents.

The *Geodetic work* of the survey for the fiscal year considered, is treated under the subjects of reconnoissance, triangulation, hypsometry, astronomical, and gravity work. These have been carried on in all three divisions of the United States, the Eastern, Middle, and Western, and also in Alaska. Gravity work was done on the Pribilof Islands, with a standard set of pendulums.

The *magnetic work* has been generally distributed over Maryland, District of Columbia, Virginia, West Virgina, Ohio, North Carolina, California, Washington, and Alaska. The magnetic survey of Maryland, made by Dr. L. A. Bauer, under the auspices of the Geological Survey, is noted in connection with the regular work of the Coast and Geodetic Survey. This work was carried out with instruments loaned by the Survey, and in return for their use the Government was to have access to the results, when desired.

Of *Special Operations* may be cited the location of buoys, the establishment of speed trial courses for ships of the Navy; magnetic ranges and dock lines; State boundary lines, and detailed hydrographic surveys. Observers have been sent with exploring parties, where there was prospect of securing valuable geographical knowledge.

In the *Division of Publication* a description is given of the processes employed in chart production. The plane-table sheet, as it comes from the hands of the field officer, is followed through the different stages of reducing, engraving and printing, until it appears as a finished chart, ready for distribution. More than 100,000 charts were issued during the year.

Of the textual publications there are the annual reports and scientific appendices, the bulletins, notices to mariners, tide tables, coast pilot, and special publications. A bulletin, entitled, 'Tables of Depths for Channels and Harbors on the Coast of the United States,' has been issued. The regular notices to mariners, over 4000 copies of which are sent out monthly, and tide tables, which now include about 3000 ports throughout the world, were published during the year. The predicted time of every high and low water, throughout the year, is given for 70 principal ports, of which 25 are within the territory of the United States. As a special publication may be noted, 'Magnetic Ranges for Determining Deviation of the Compass in San Francisco Bay.' The catalogue of charts published by the Coast and Geodetic Survey at present contains a list of about 500 charts and maps.

Under the general head of 'Administration,' may be noted a table giving the details of field operations, followed by a summary of the work accomplished in the Office of the Assistant in Charge of Office and Topography, as well as in the Office of the Hydrographic Inspector and the Office of Standard Weights and Measures.

Under the title *Assistant in Charge of Office and Topography*, the routine work and the results obtained in the following divisions are described:

(1) Computing.
(3) Tidal.
(3) Drawing and Engraving.
(4) Chart.
(5) Instrument.
(6) Library and Archives.
(7) Miscellaneous.
(8) Disbursing.

In the report of the *Hydrographic Inspector* appear statements in regard to vessels and officers; the hydrographic section, and the coast pilot party.

The important work of the *Office of Standard Weights and Measures* is given only in outline. Much time was given by Mr. Braid, the officer then in charge, to the consideration of questions relating to sugar importation. Standard bars of length were supplied to the Ordnance Department of

the Army, for use in the manufacture of great rifles. Progress was made in designing apparatus for the comparison of electrical standards; and standards of length and mass were furnished as requested, to State and municipal authorities, to corporations, and to individuals.

As a special feature in the operations of the fiscal year for which the report is made, may be mentioned the tide and current observations in Seymour Narrows, Alaska; where, by permission of the Canadian Government, a tide gauge was established, and times of slack water during day hours, from April 18th to October 14th, were observed. Predictions based on this and other information have since appeared in the tide tables, and are a valuable acquisition to the information there found.

During the year a contract was let for the steamer *Pathfinder*, to be constructed especially for the Alaskan work. She is the largest of the Coast Survey fleet, now numbering 11 steamers and five sailing vessels, and has a displacement of about 875 tons, with a steaming radius of 7000 miles. This vessel has already made the trip from New York to San Francisco, by way of Cape Horn, and has proved herself to be an admirable sea-going vessel. She is now stationed in the Hawaiian Islands, engaged in hydrographic work, but will soon come north to take up the operations for which she is especially fitted by her construction, namely, the hydrography on the rock-bound coasts of the Aleutian Islands.

The reconnoissance and the triangulation has been carried on along ninety-eighth meridian, and much progress has been made. This is later to be connected with the Mexican work on the south and the British on the north, and altogether will furnish an arc of the meridian, second to none, for the determination of the earth's figure. The great arc across Russia, from the North Cape to the Baltic, was considered a great achievement, but the combined British, American and Mexican arc will probably stand without a rival for many years to come. This, combined with the arc of the parallel, the results of which are now deduced, and the report of which is running through the press, will completely determine the earth's figure for the continent of North America.

The important connection across the Peninsula of Florida, from Fernandina on the east to Cedar Keys on the west, has been made and is reported in the present volume. This completely binds together the somewhat loose tertiary triangulation on the eastern coast with that on the western, and aids materially in the correct determination of all geographical positions on the coast of Florida.

Following the traditions of the Coast and Geodetic Survey in the question of State boundaries, assistants were detailed to aid the commissioners of Maryland and Virginia in the location of the line between the two states. This was completed in January of the fiscal year. Other important side operations were the special hydrographic examination of the Tybee Submerged Breakwater, made at the request of the War Department; services on the Mississippi River Commission; hydrographic surveys at Key West and the Tortugas, made at the request of the Navy Department; and operations undertaken in compliance with special acts of Congress. Under the last head may be stated the survey of the Brunswick Outer Bar, Ga., which, on account of the extreme accuracy required, necessitated prolonged and careful examination. Aid was given in the private expedition undertaken during the year, to Mt. St. Elias, and although the expedition was unable to reach the top, valuable information of the region was procured.

In the fourth part of the work appear the Appendices. Of these there are nine, and the subjects treated are:

Nos. (1), (2), (3) Precise Leveling, in Kansas and Colorado.

No. (4) The Peruvian Arc, its relative Value, etc.

No. (5) Physical observations made in connection with the Pribilof Islands Expedition of 1897; in which the magnetic irregularity on St. George Island, the sea water densities in the North Pacific and Bering Sea, and the determination of the force of gravity on St. Paul Island, are all treated.

No. (6) A report on the Proceedings of the International Geodetic Association, and on Geodetic Operations in the United States; comprising statements with reference to the international latitude service, gravity measures, the figure of the earth, the Peruvian arc, and the longitudes of Paris and Greenwich. Under Geodetic Operations in the United States are treated; base lines, triangulations and arcs, astronomical work, miscellaneous operations; past and future operations, and the work of the United States Engineers.

No. (7) The Determination of Time, Longitude, Latitude, and Azimuth; in which the method of making these observations and computations is treated fundamentally. This paper is the fourth edition of an appendix to previous Coast Survey reports. It is now brought up to date, and embodies the most recent knowledge on the subject. A description is given of the most approved practical methods developed from field experience during half a century.

No. (8) A Plane Table Manual, in which are given the field methods employed with this valuable and convenient instrument. The subject is treated under: I. A preliminary statement; II. The instruments and adjustments; and III. The field work. Under the latter head the three-point problem is treated at length, and numerous tables are given, among which may be noted one for computing differences of elevation, one showing heights corresponding to angles of elevation, and one giving corrections for effect of curvature and refraction.

No. (9) Problems of Physiography concerning Salinity and Temperature of the Pacific Ocean—closes the report and is treated in three heads: Bering Sea, Okhotsk Sea, and the Central Pacific Ocean.

There are 25 cuts in the body of the work, besides 55 in the different appendices. Many of these are half-tone illustrations and add materially to the value and appearance of the Report.

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SCIENTIFIC BOOKS.

Clark University, 1889–1899. Decennial Celebration. Worcester, Mass., Published by the University. 1899. 4to. Pp. 566.

Of the three verbs to *be*, to *do*, and to *know*, the great majority of young men unhesitatingly regard the second as expressing the ultimate purpose and end of life. This is, as a matter of course, the idea of the practical man, who knows what he wants, and does not desire to want anything else. The average trustee of an American college will think it a very commendable thing for a professor to employ all the time he can possibly save in making money; but if he devotes much energy to any purely theoretical research, the trustees will look upon him askance, as a barely respectable squanderer of his opportunities. In England, this notion takes a turn that really makes it a little less gross; yet being foreign, perhaps we can discern its error more easily than in its more familiar guise. Thus, Dr. Karl Pearson, in the introduction to his 'Grammar of Science,' deliberately lays down the principle that no end whatever is to be approved without a reason, except the end of the preservation of society; and applying this rule, declares that the only valid excuse for the encouragement of scientific activity lies in its tending to maintain 'the stability of society.' This is a truly British phrase, meaning the House of Lords and vested rights and all that. Only recently, we have seen an American man of science and of weight