4


Sketch showing the Progress of the Surveys
Locating the Boundary between
ALASKA AND BRITISH POSSESSIONS
IN NORTH AMERICA
Scale 1/1200 000
Nautical Miles
Statute Miles
Kilometres
Cape Yaktag
Icy Cape
Malaspina Glacier
Mt. Logan 19514
Mt. Newton
Mt. St. Elias
Mt. Huxley
Mt. Augusta
Mt. Vancouver 15666
Mt. Cook 13758
Mt. Hubbard
Crater
Pt. Manby
Mt. Seattle
Mt. Draper
YAKUTAT BAY
Khantaak I.
Ocean Cape
Yakutat
Mt. Pinta
Alsek River
Grand Plateau Glacier
Cape Fairweather
Mt. Fairweather
Harbor Point
Mt. Crillon
Mt. La Perouse
Icy Point
Cape Spencer
CROSS SOUND
Cape Cross
Pt. Adolphus
Port Frederick
Icy Strait
Glacier Bay
LYNN CANAL
Lincoln
Pt. Retreat
Pt. Augusta
Pt. Marsden
Sullivan I.
Seduction Pt.
Taku R.
CHICHAGOF ISLAND
Cape Edward
Cape Georgiana
Kruzof I.
Cape Edgecumbe
SITKA SOUND
SITKA
BARANOF ISLAND
CHATHAM STRAIT
ADMIRALTY ISLAND
STEPHENS PASSAGE
Killisnoo P.O.
Whale Bay
Pt. Gardner
FREDERICK SOUND
Port Houghton
KUPREANOF I.
Cape Ommaney
CHRISTIANA SOUND
Hazy Ids.
Coronation I.
Warren I.
Kosciusko I.
Zarembo I.
Wrangell
Wrangell I.
SUMNER STRAIT
IPHIGENIA BAY
Heceta I.
PRINCE OF WALES ISLAND
Cape Addington
Port Bucareli
Cape Bartolome
Wolf Rock
Forrester I.
CLARENCE STRAIT
Ernest Sound
CLEVELAND PENINSULA
Behm Canal
REVILLAGIGEDO ISLAND
Stikine R.
Devils Thumb
Unuk R.
BRITISH COLUMBIA

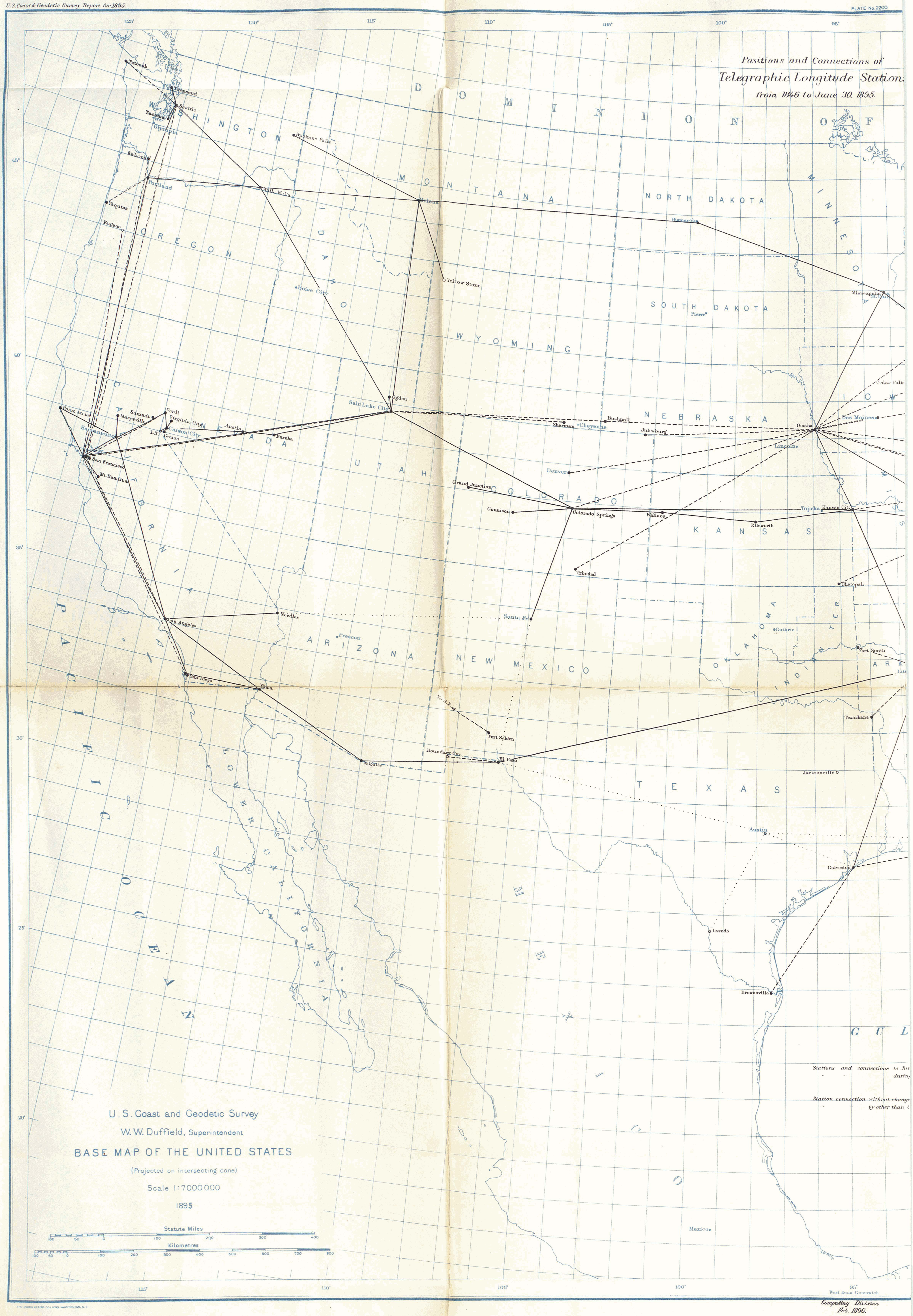
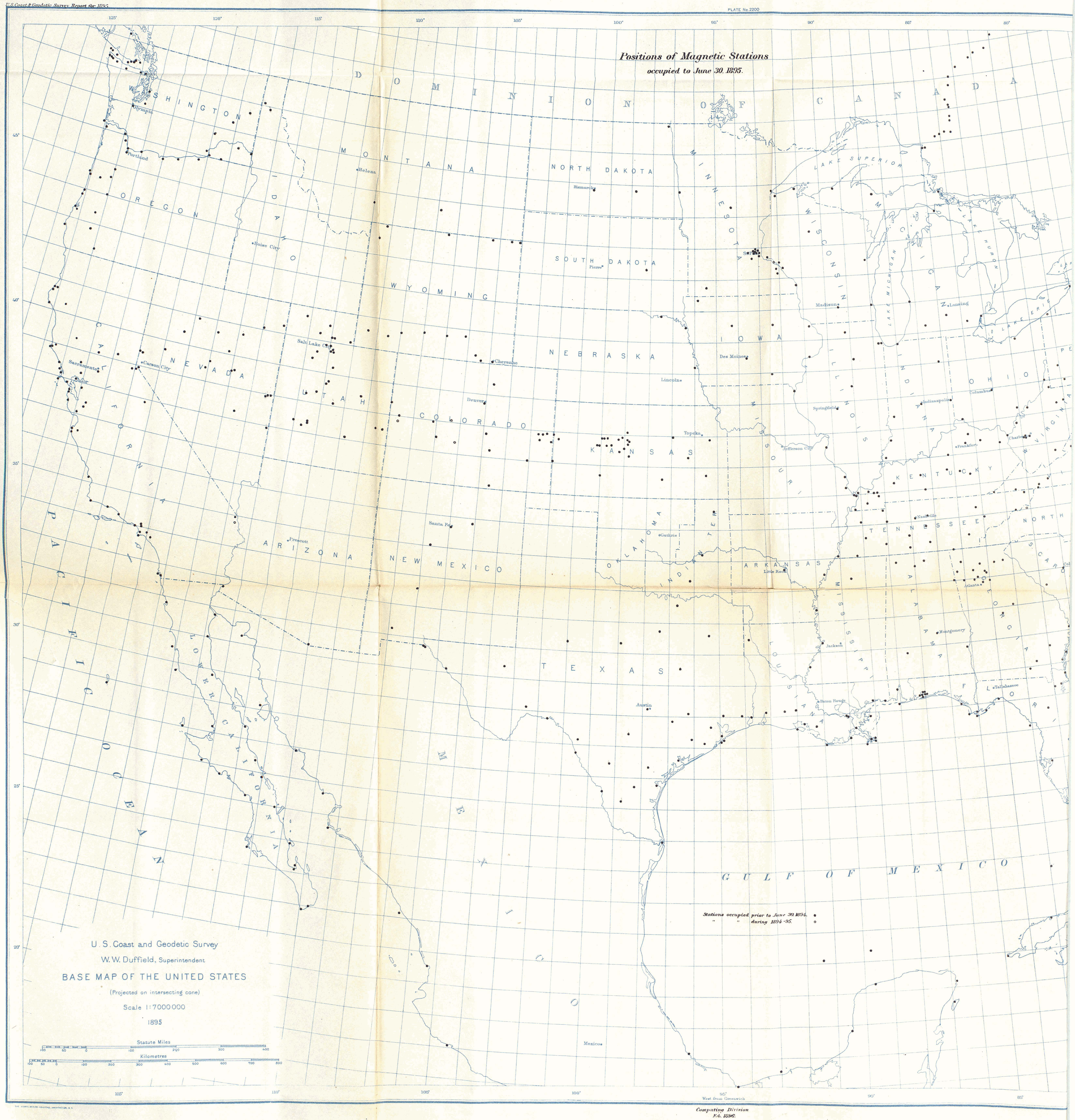
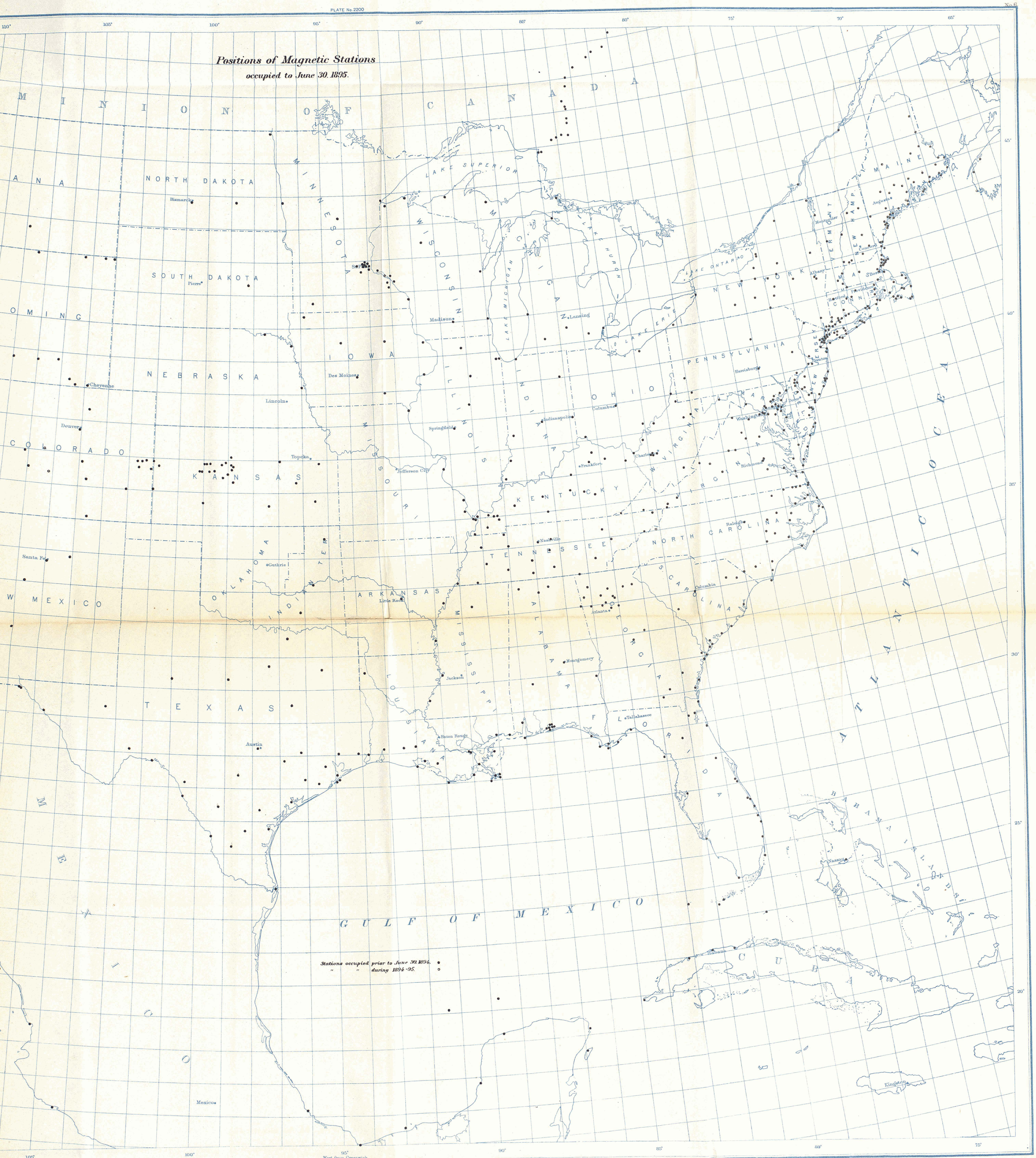

Positions and Connections of
Telegraphic Longitude Station
from 1846 to June 30, 1895.
U. S. Coast and Geodetic Survey
W. W. Duffield, Superintendent
BASE MAP OF THE UNITED STATES
(Projected on intersecting cone)
Scale 1:7000000
1895
Statute Miles
Kilometres
D O M I N I O N O F
WASHINGTON
OREGON
IDAHO
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
NEVADA
UTAH
COLORADO
KANSAS
CALIFORNIA
ARIZONA
NEW MEXICO
OKLAHOMA
INDIAN TER
TEXAS
LOWER CALIFORNIA
MEXICO
PACIFIC OCEAN
Tatoosh
Seattle
Tacoma
Olympia
Kalama
Portland
Yaquina
Eugene
Walla Walla
Spokane Falls
Helena
Yellow Stone
Bismarck
Minneapolis
Boise City
Ogden
Salt Lake City
Point Arena
Summit
Marysville
Sacramento
Verdi
Virginia City
Carson City
Genoa
Austin
Eureka
San Francisco
Mt. Hamilton
Los Angeles
Needles
San Diego
Yuma
Nogales
Prescott
Sherman
Cheyenne
Bushnell
Julesburg
Omaha
Lincoln
Des Moines
Cedar Falls
Denver
Grand Junction
Gunnison
Colorado Springs
Wallace
Ellsworth
Topeka
Kansas City
Trinidad
Santa Fe
Chetopah
Guthrie
Fort Smith
Fort Sylden
Boundary Cor.
El Paso
Texarkana
Jacksonville
Austin
Galveston
Laredo
Brownsville
Mexico
G U L
Stations and connections to Ju
Station connection without change
by other than
West from Greenwich
Computing Division
Feb. 1896.


PLATE No. 2200
No. 5.
Positions and Connections of
Telegraphic Longitude Stations
from 1846 to June 30. 1895.
DOMINION OF CANADA
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
IOWA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
MAINE
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
ARKANSAS
TEXAS
FLORIDA
OKLAHOMA
INDIAN TER.
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ATLANTIC OCEAN
GULF OF MEXICO
CUBA
BAHAMA ISLANDS
Stations and connections to June 30. 1894.
" " " during 1894-95.
Station connection without change of observers
" " by other than C.&G.S. parties
West from Greenwich
Computing Division
Feb. 1896.

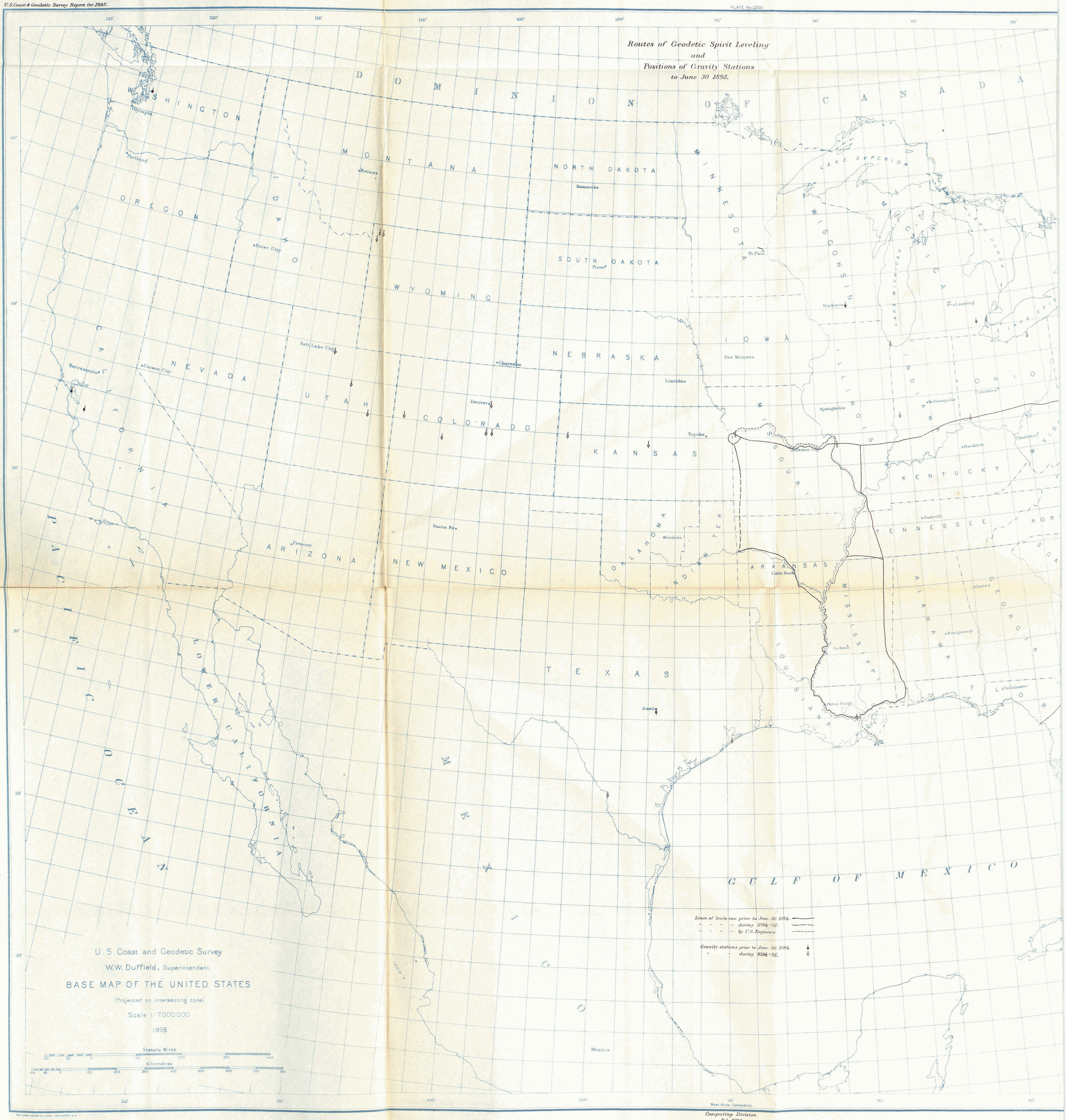
PLATE No. 2200



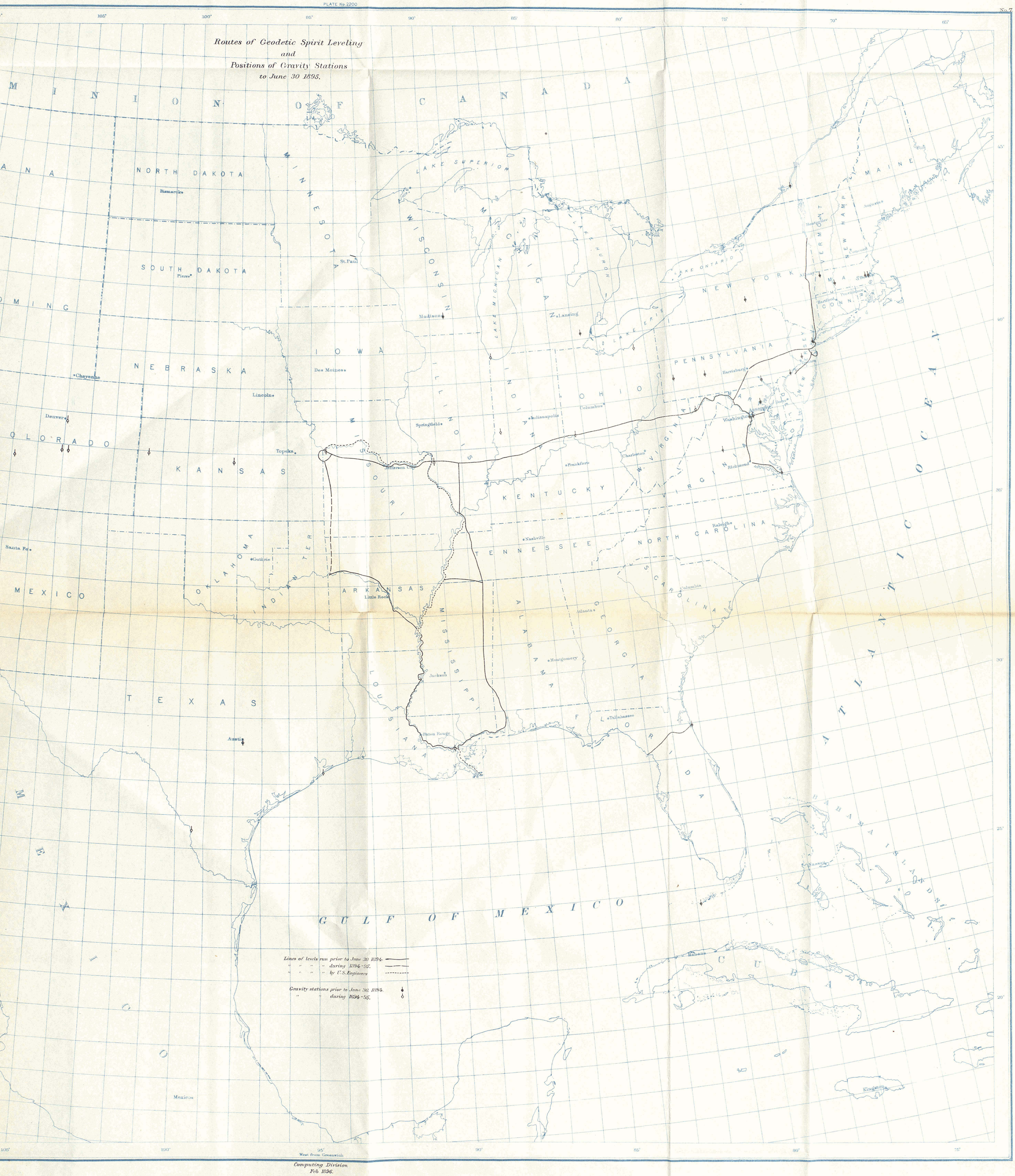
Computing Division
Feb. 1896.



Computing Division
Feb. 1896.

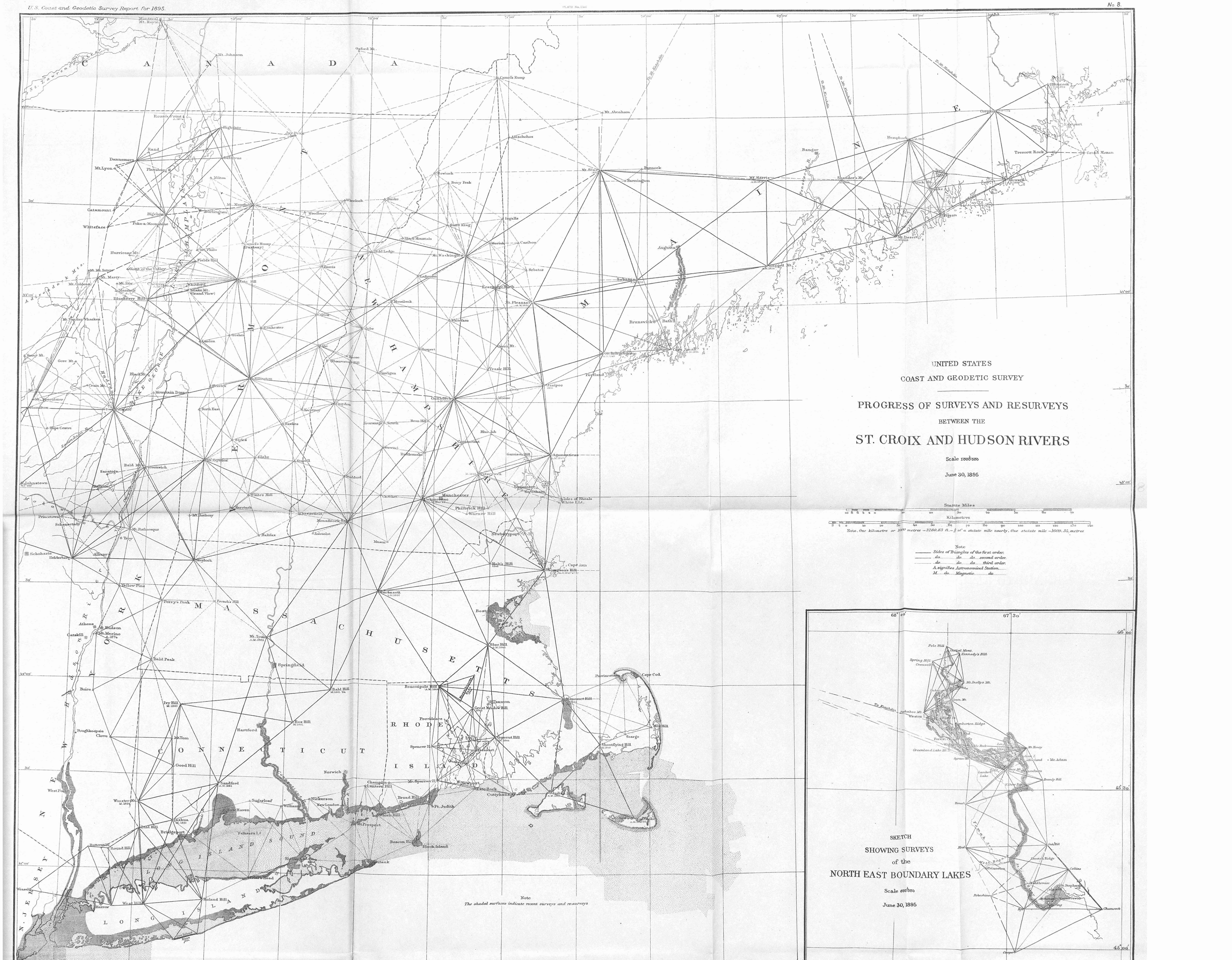


Computing Division
Feb 1896.



Computing Division
Feb. 1896.

8


UNITED STATES
COAST AND GEODETIC SURVEY
PROGRESS OF SURVEYS AND RESURVEYS
BETWEEN THE
ST. CROIX AND HUDSON RIVERS
Scale 1/1000000
June 30, 1895
Statute Miles
Kilometres
Note. One kilometre or 1000 metres = 3280.83 ft. = 5/8 of a statute mile nearly. One statute mile = 1609.35 metres
Note
Sides of Triangles of the first order.
do do do second order.
do do do third order.
A signifies Astronomical Station
M do Magnetic do
CANADA
MAINE
NEW HAMPSHIRE
VERMONT
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
NEW YORK
N. JERSEY
LONG ISLAND SOUND
LONG ISLAND
Note
The shaded surfaces indicate recent surveys and re-surveys
SKETCH
SHOWING SURVEYS
of the
NORTH EAST BOUNDARY LAKES
Scale 1/600000
June 30, 1895


UNITED STATES
COAST AND GEODETIC SURVEY
TRIANGULATION
BETWEEN THE
ATLANTIC COAST AND WEST VIRGINIA
June 30, 1895.
Kilometers
Statute Miles
NOTE
Note
The shaded sections indicate resurveys
Sketch
showing Progress of the Surveys
near Charleston, S. C.
PENNSYLVANIA
MARYLAND
VIRGINIA
WEST VIRGINIA
NEW JERSEY
DELAWARE
Philadelphia
Baltimore
Richmond
Petersburg
Norfolk
Cape Henry Lt.
Fredericksburg
Charleston

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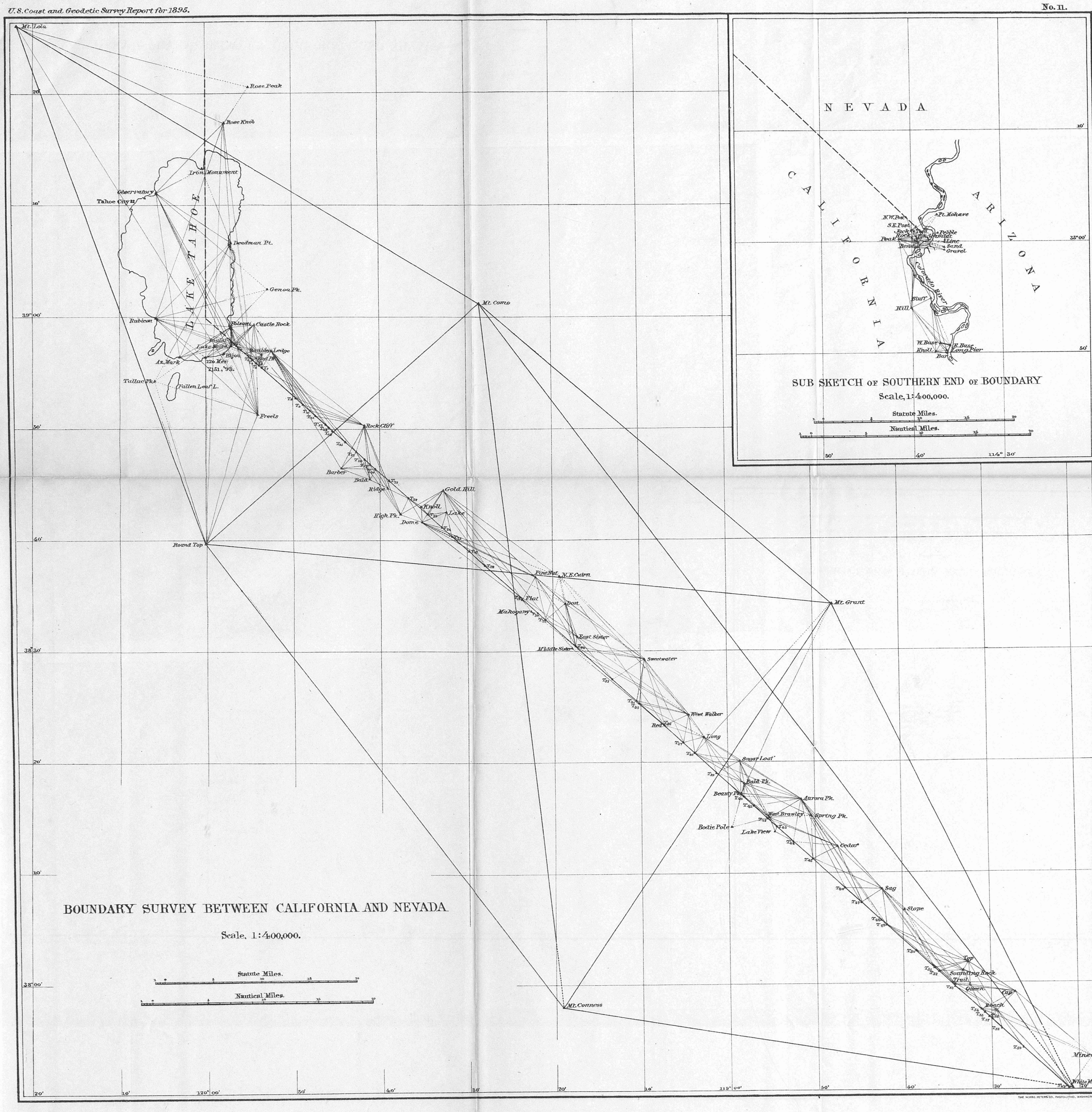
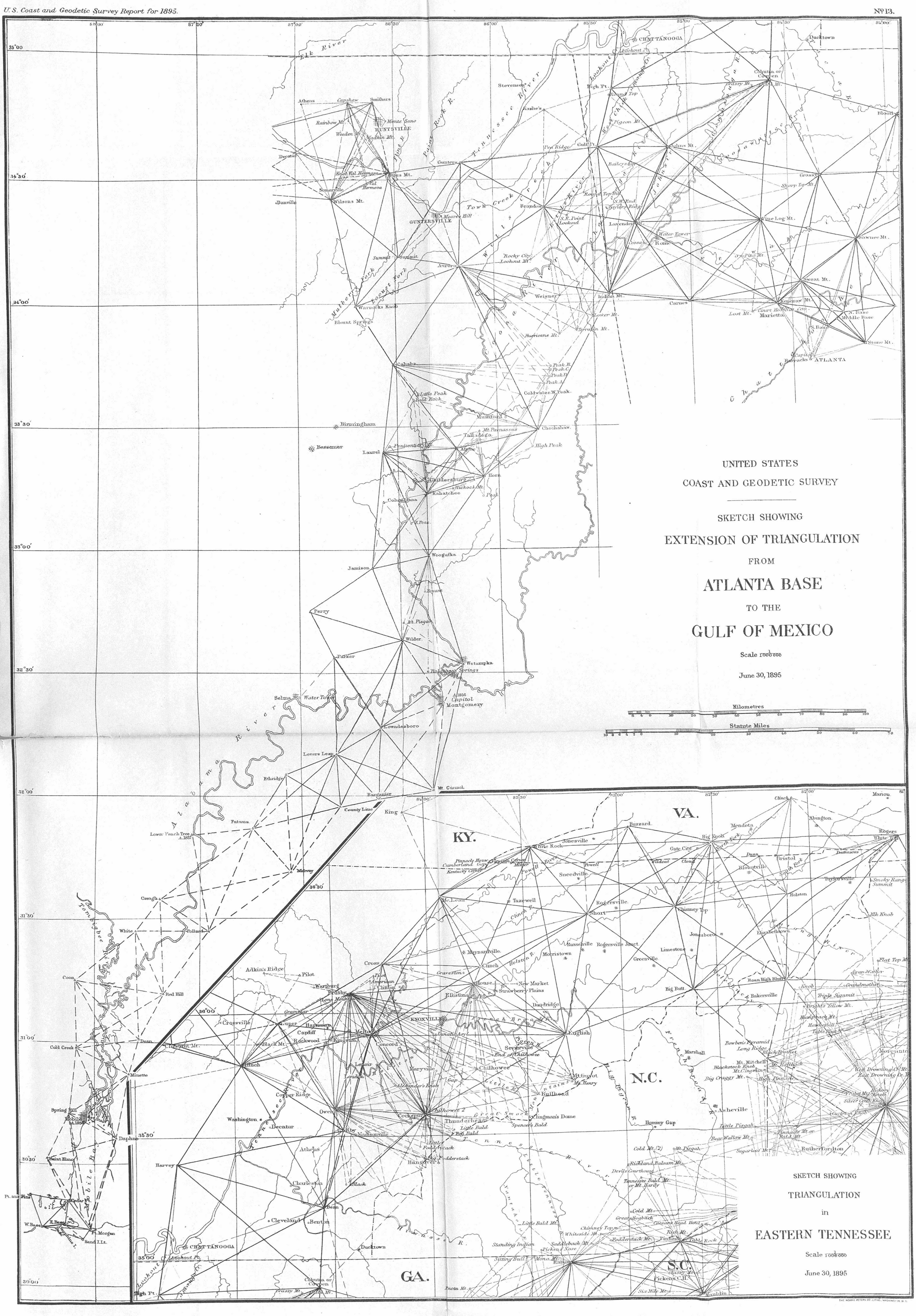
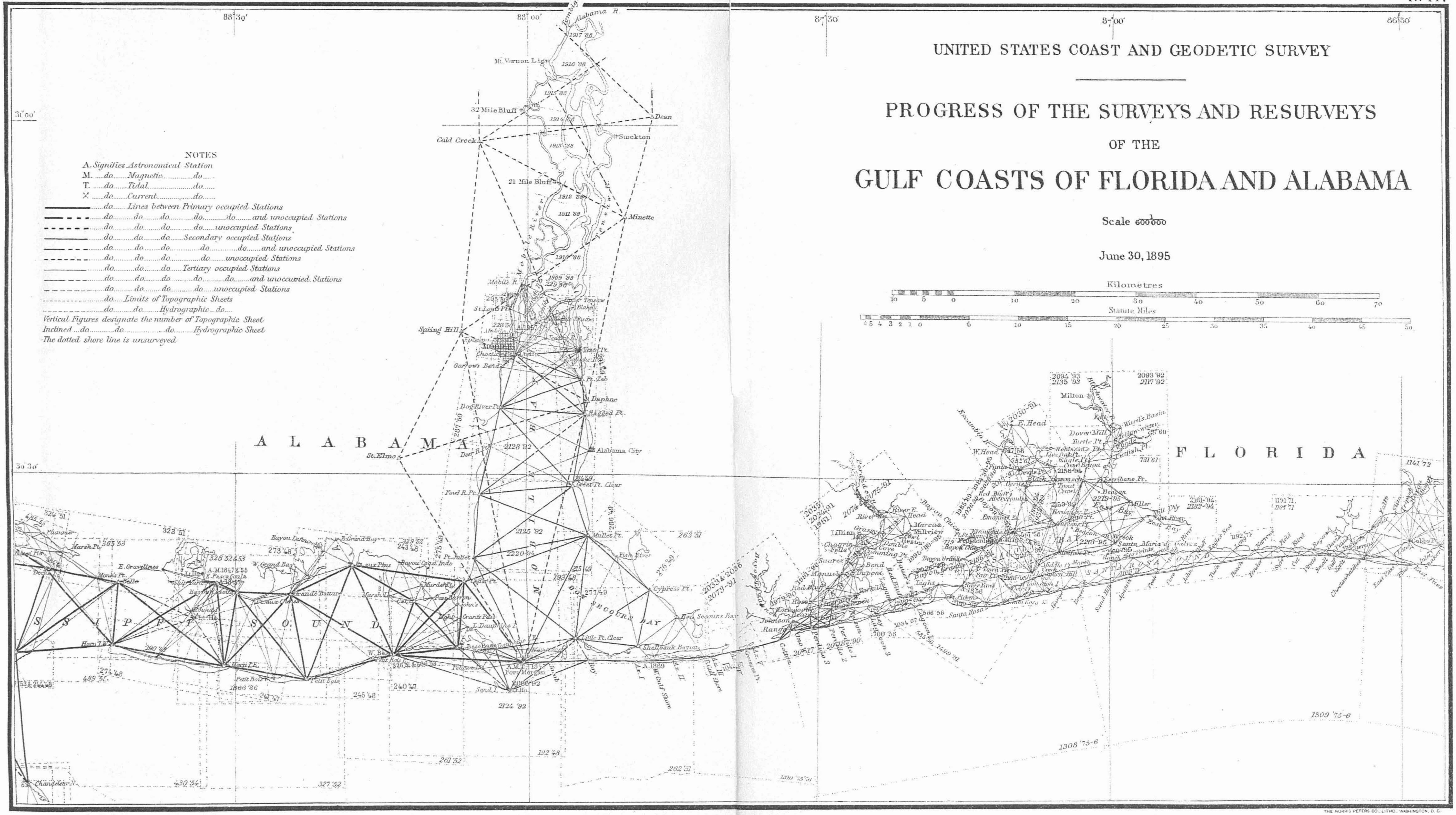


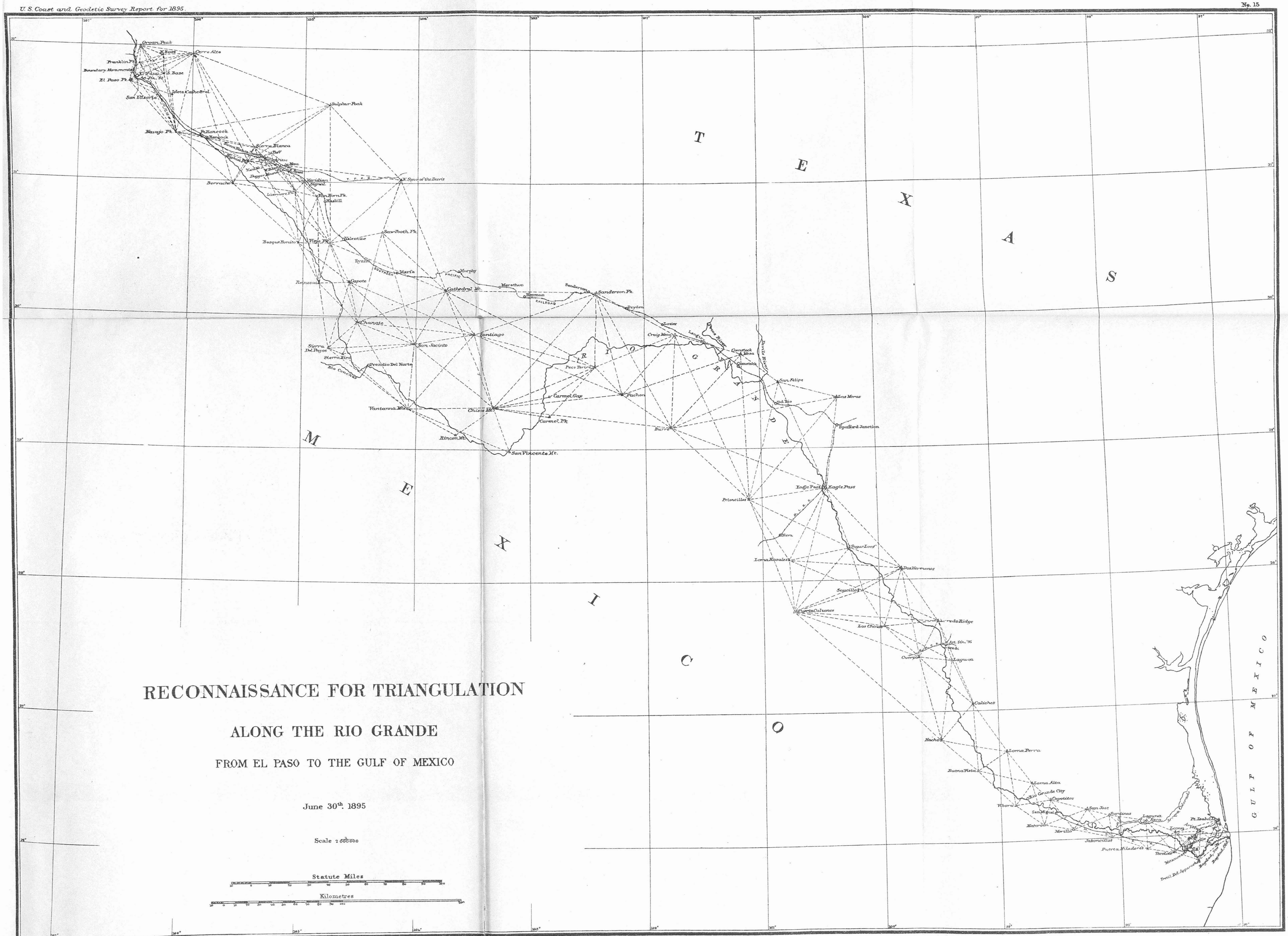
BOUNDARY SURVEY BETWEEN CALIFORNIA AND NEVADA.

Scale, 1:400,000.


UNITED STATES
COAST AND GEODETIC SURVEY
PROGRESS OF THE SURVEYS
ON THE COAST OF
OREGON AND WASHINGTON
FROM
TILLAMOOK BAY TO THE BOUNDARY
Scale 1/600000
June 30, 1895
SKETCH
Showing Resurvey of
SAN FRANCISCO BAY
Scale 1/400000
June 30, 1895
Supplementary Surveys in San Francisco Bay
Resurvey of San Pablo Bay.
Resurvey of Suisun Bay.
NOTES
A. Signifies Astronomical Station
M. do. Magnetic do.
T. do. Tidal do.
PACIFIC
VANCOUVER I.
WASHINGTON
OREGON
Statute Miles
Kilometres


UNITED STATES
COAST AND GEODETIC SURVEY
SKETCH SHOWING
EXTENSION OF TRIANGULATION
FROM
ATLANTA BASE
TO THE
GULF OF MEXICO
June 30, 1895
Kilometres
Statute Miles
SKETCH SHOWING
TRIANGULATION
in
EASTERN TENNESSEE
June 30, 1895


UNITED STATES COAST AND GEODETIC SURVEY
PROGRESS OF THE SURVEYS AND RESURVEYS
OF THE
GULF COASTS OF FLORIDA AND ALABAMA
Scale 1/600000
June 30, 1895
Kilometres
Statute Miles
NOTES
A. Signifies Astronomical Station
M. ...do... Magnetic ... do...
T. ...do... Tidal ... do...
X ...do... Current ... do...
...do... Lines between Primary occupied Stations
...do... do... do... do... do... and unocupied Stations
...do... do... do... do... unoccupied Stations
...do... do... do... Secondary occupied Stations
...do... do... do... do... do... and unoccupied Stations
...do... do... do... do... unoccupied Stations
...do... do... do... Tertiary occupied Stations
...do... do... do... do... do... and unoccuvied Stations
...do... do... do... do... unoccupied Stations
...do... Limits of Topographic Sheets
...do... do... Hydrographic... do...
Vertical Figures designate the number of Topographic Sheet
Inclined ...do... do... do... Hydrographic Sheet
The dotted shore line is unsurveyed
A L A B A M A
F L O R I D A
Mobile
Mobile Bay
Spring Hill
Fort Morgan
Alabama R.
Dean
Stockton
Minette
Daphne
Alabama City
Milton
THE NORRIS PETERS CO., LITHO., WASHINGTON, D. C.



RECONNAISSANCE FOR TRIANGULATION

ALONG THE RIO GRANDE

FROM EL PASO TO THE GULF OF MEXICO

June 30th. 1895

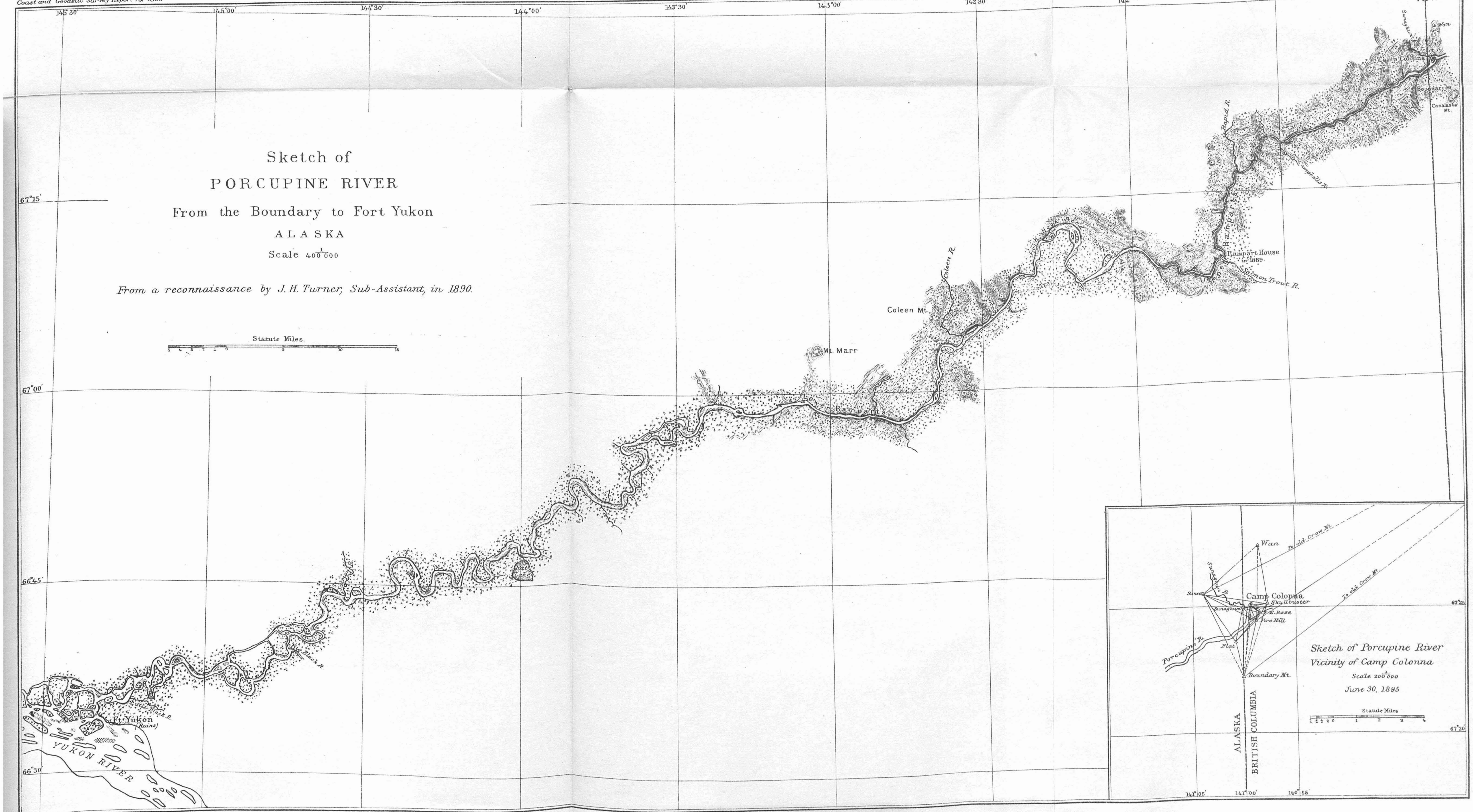
Scale 1/2000000

Statute Miles

Kilometres

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.


PLATE No. 2200
Distribution of the principal astronomic stations occupied by the U. S. Coast and Geodetic Survey for Latitude, Longitude and Azimuth to June 30, 1895.
D O M I N I O N O F C A N A D A
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
LAKE SUPERIOR
OREGON
IDAHO
SOUTH DAKOTA
WISCONSIN
MICHIGAN
LAKE HURON
LAKE MICHIGAN
LAKE ONTARIO
LAKE ERIE
NEW YORK
VERMONT
NEW HAMPSHIRE
MAINE
MASS.
CONN.
WYOMING
NEBRASKA
IOWA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW JERSEY
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
KENTUCKY
WEST VIRGINIA
VIRGINIA
MARYLAND
DEL.
CALIFORNIA
ARIZONA
NEW MEXICO
OKLAHOMA
INDIAN TER.
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
TEXAS
LOUISIANA
FLORIDA
P A C I F I C O C E A N
A T L A N T I C O C E A N
LOWER CALIFORNIA
M E X I C O
G U L F O F M E X I C O
BAHAMA ISLANDS
CUBA
Olympia
Portland
Helena
Bismarck
St. Paul
Boise City
Pierre
Madison
Lansing
Augusta
Montpelier
Concord
Boston
Hartford
Providence
Albany
Salt Lake City
Carson City
Sacramento
Cheyenne
Des Moines
Lincoln
Springfield
Indianapolis
Columbus
Harrisburg
Trenton
Washington
Denver
Topeka
Jefferson City
Frankfort
Charleston
Richmond
Raleigh
Nashville
Santa Fe
Prescott
Guthrie
Little Rock
Columbia
Atlanta
Montgomery
Jackson
Tallahassee
Baton Rouge
Austin
Nassau
Havana
Kingston
Mexico
125° 120° 115° 110° 105° 100° 95° 90° 85° 80° 75° 70° 65°
45° 40° 35° 30° 25° 20°
West from Greenwich
Explanation of Signs:
Latitude Stations
Longitude "
Azimuth "
Combination Stations with open dots for the year 1894½ to 1895½.
U. S. Coast and Geodetic Survey
W. W. Duffield, Superintendent
BASE MAP OF THE UNITED STATES
(Projected on intersecting cone)
Scale 1:7000000
1895
Statute Miles
Kilometres



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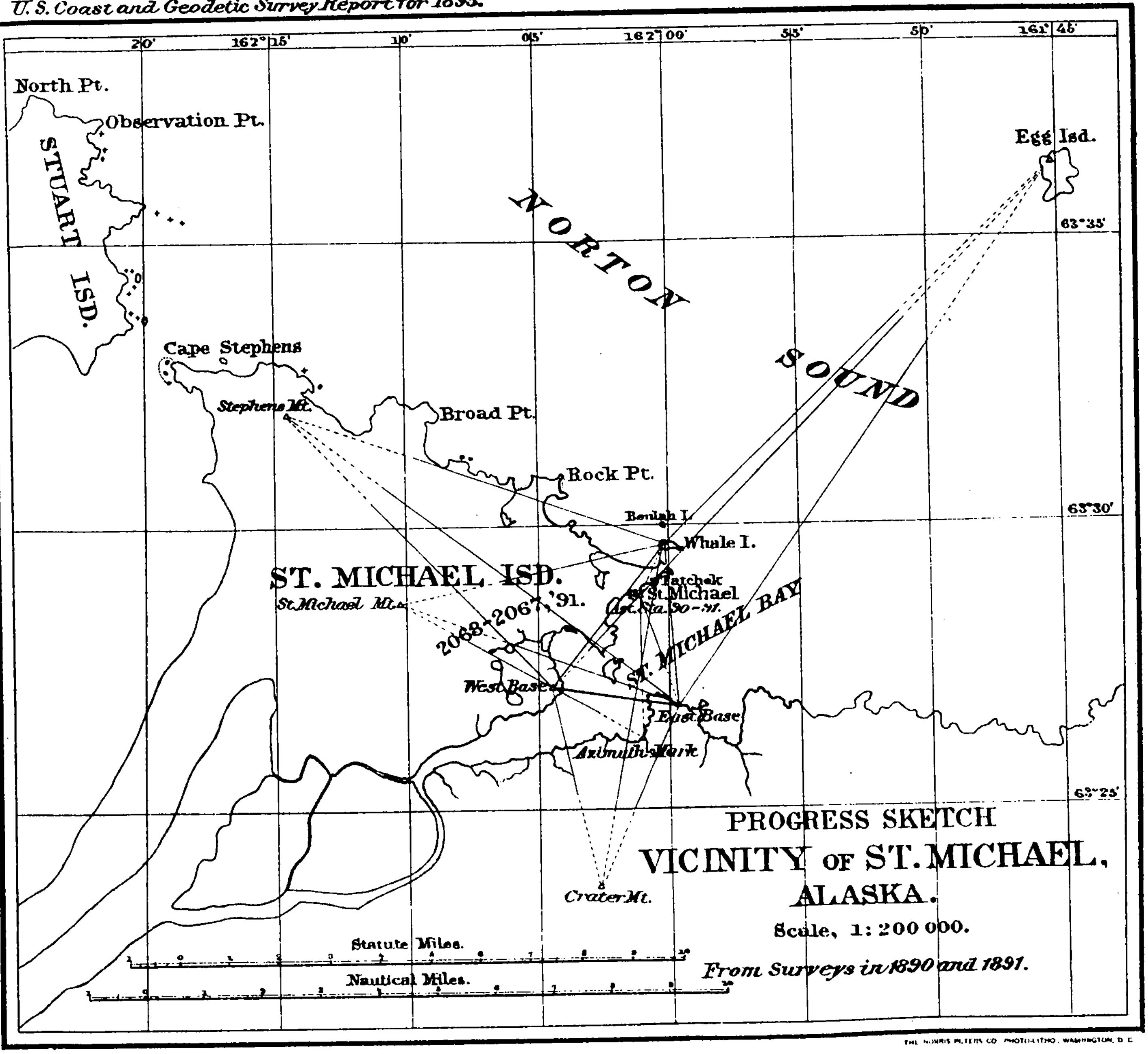

PROGRESS SKETCH

VICINITY OF ST. MICHAEL, ALASKA.

Scale, 1: 200 000.

From Surveys in 1890 and 1891.

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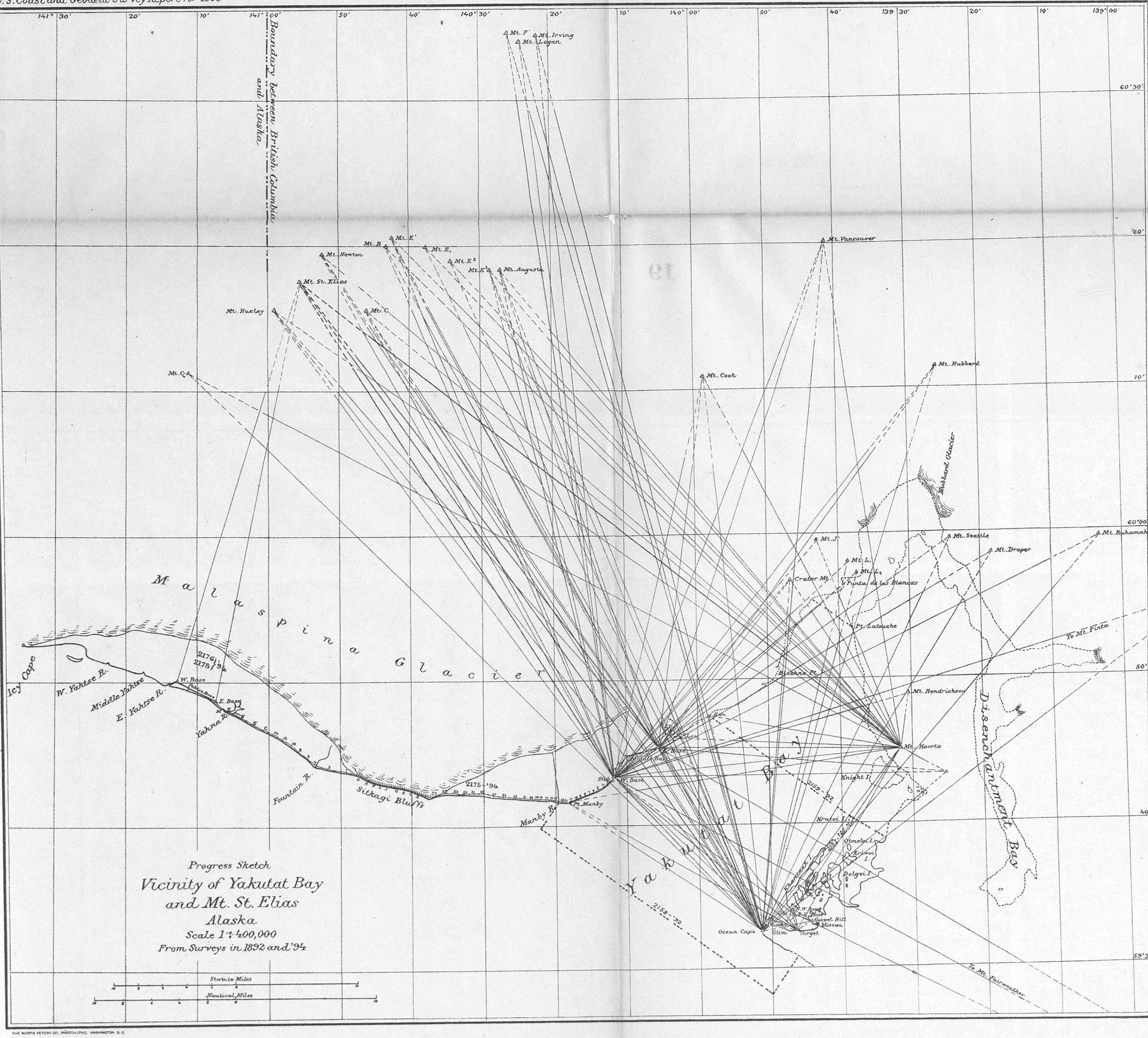

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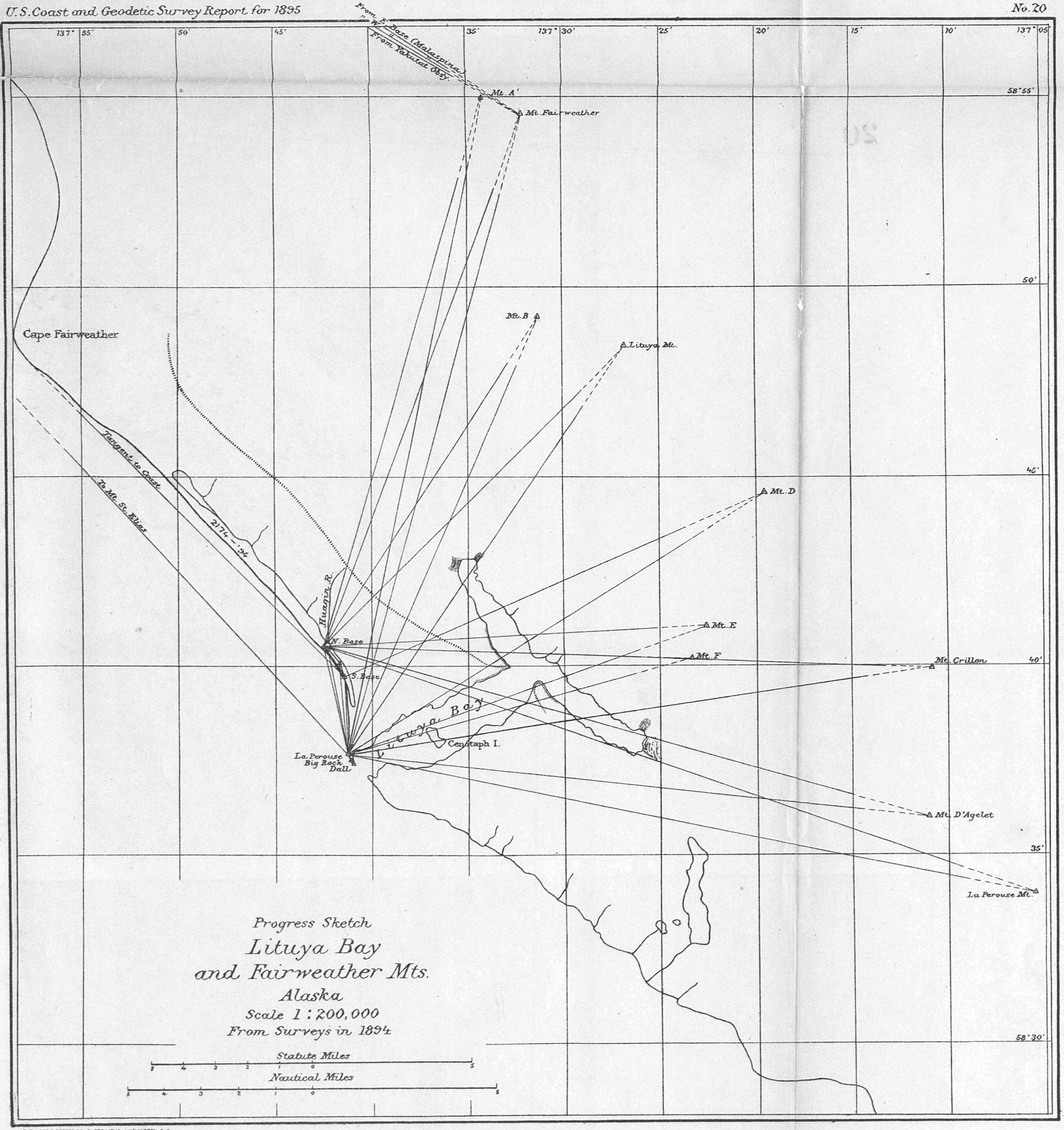

Progress Sketch
Lituya Bay
and Fairweather Mts.
Alaska
Scale 1 : 200,000
From Surveys in 1894

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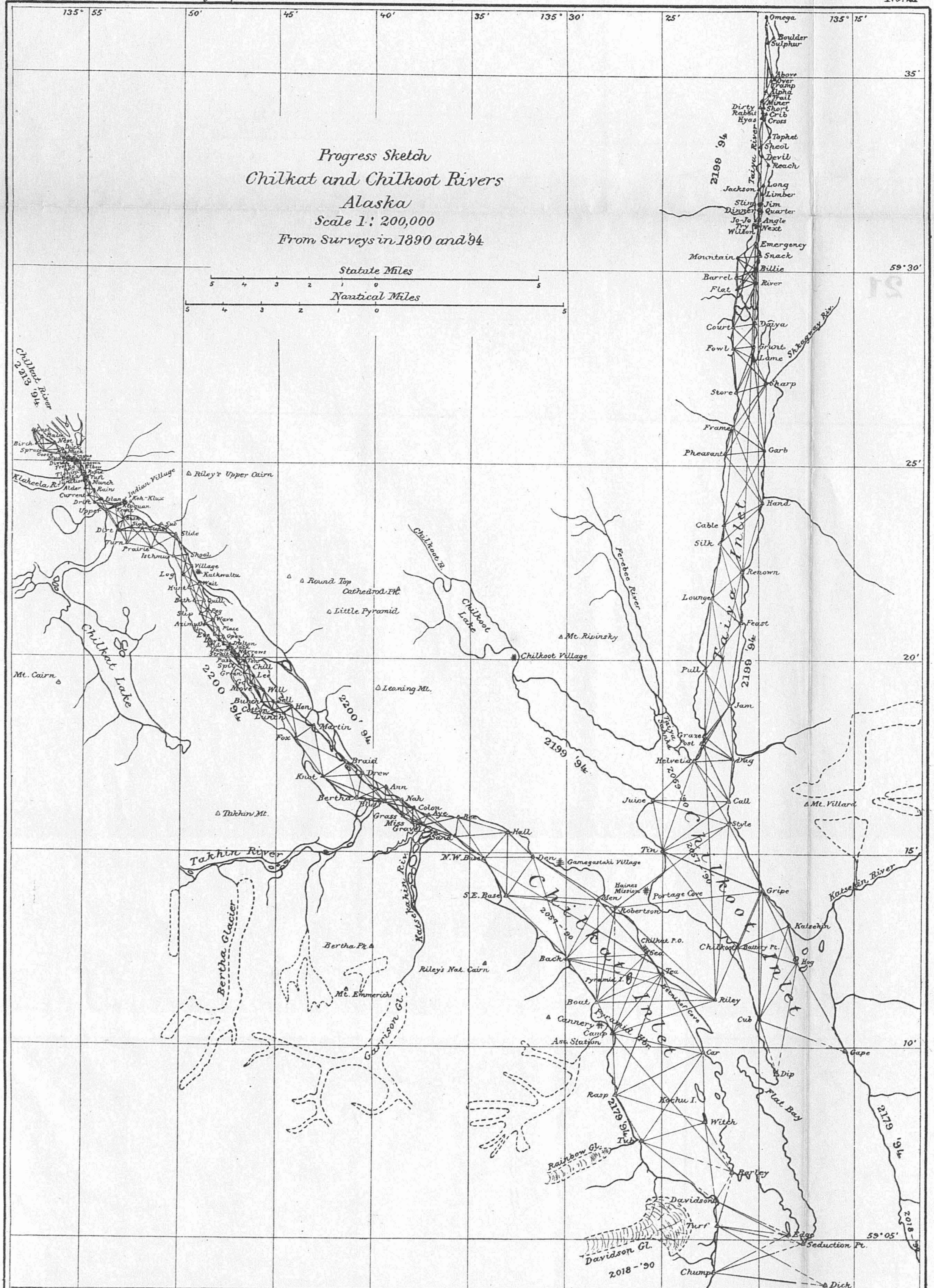

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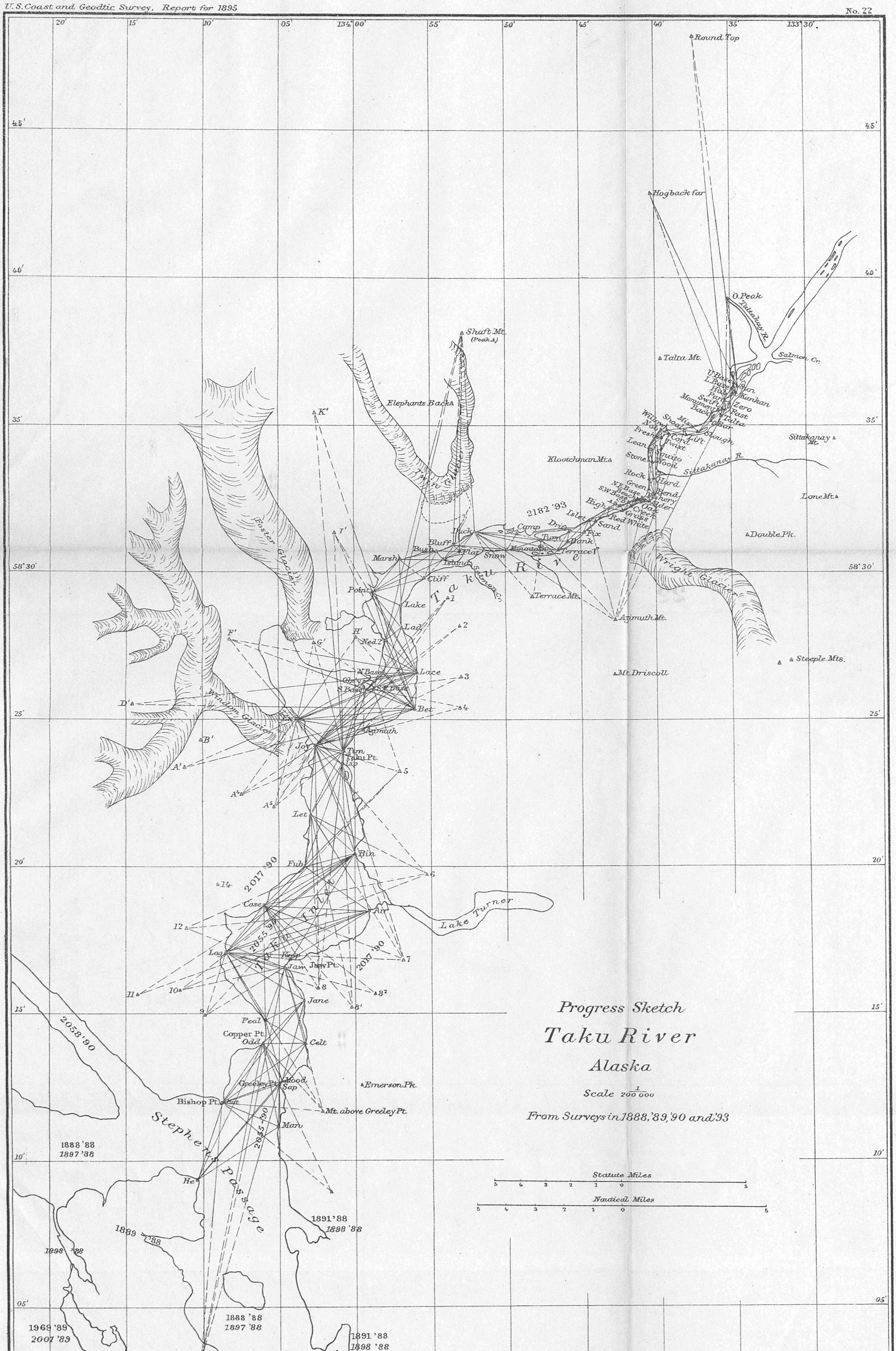

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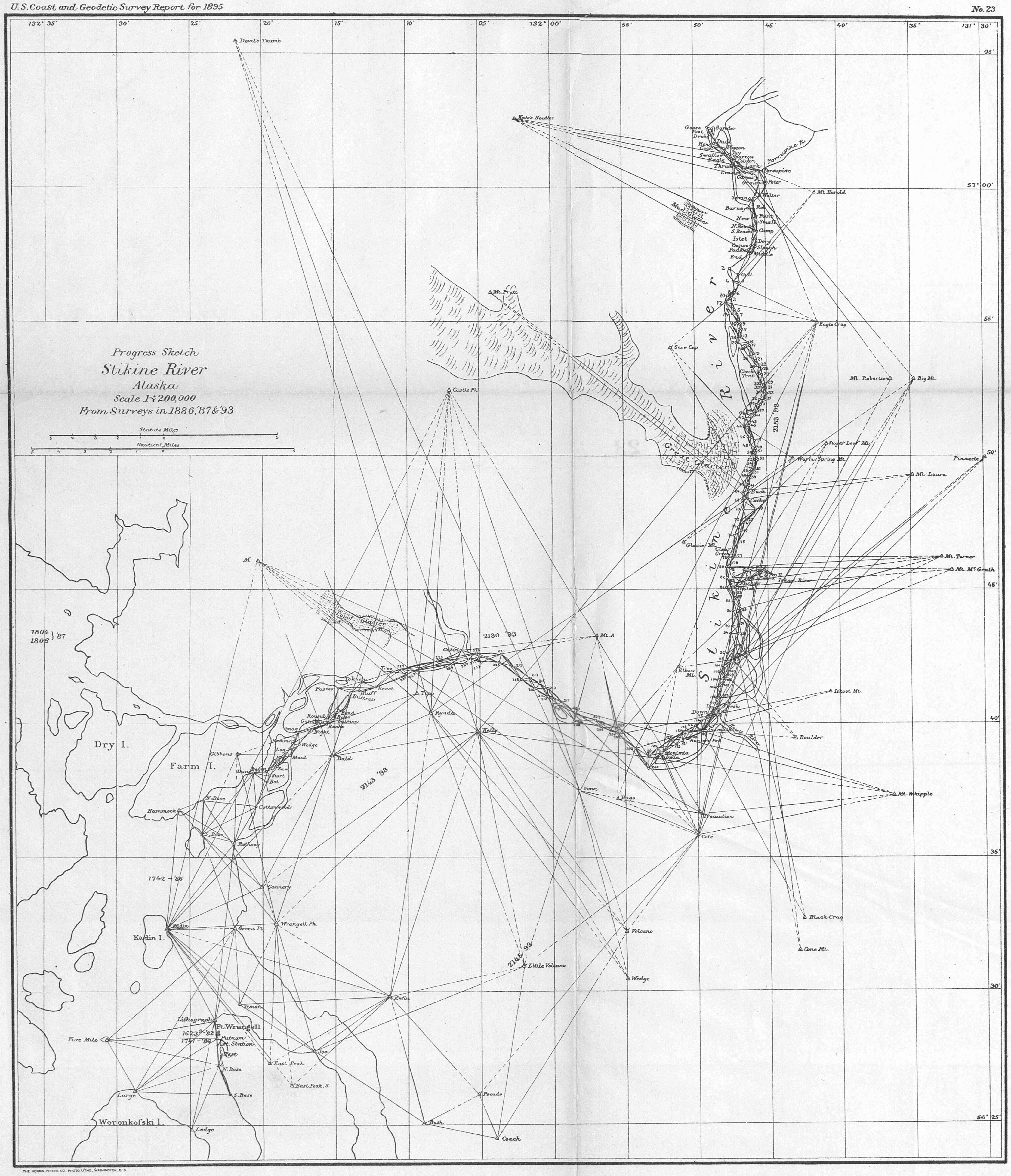

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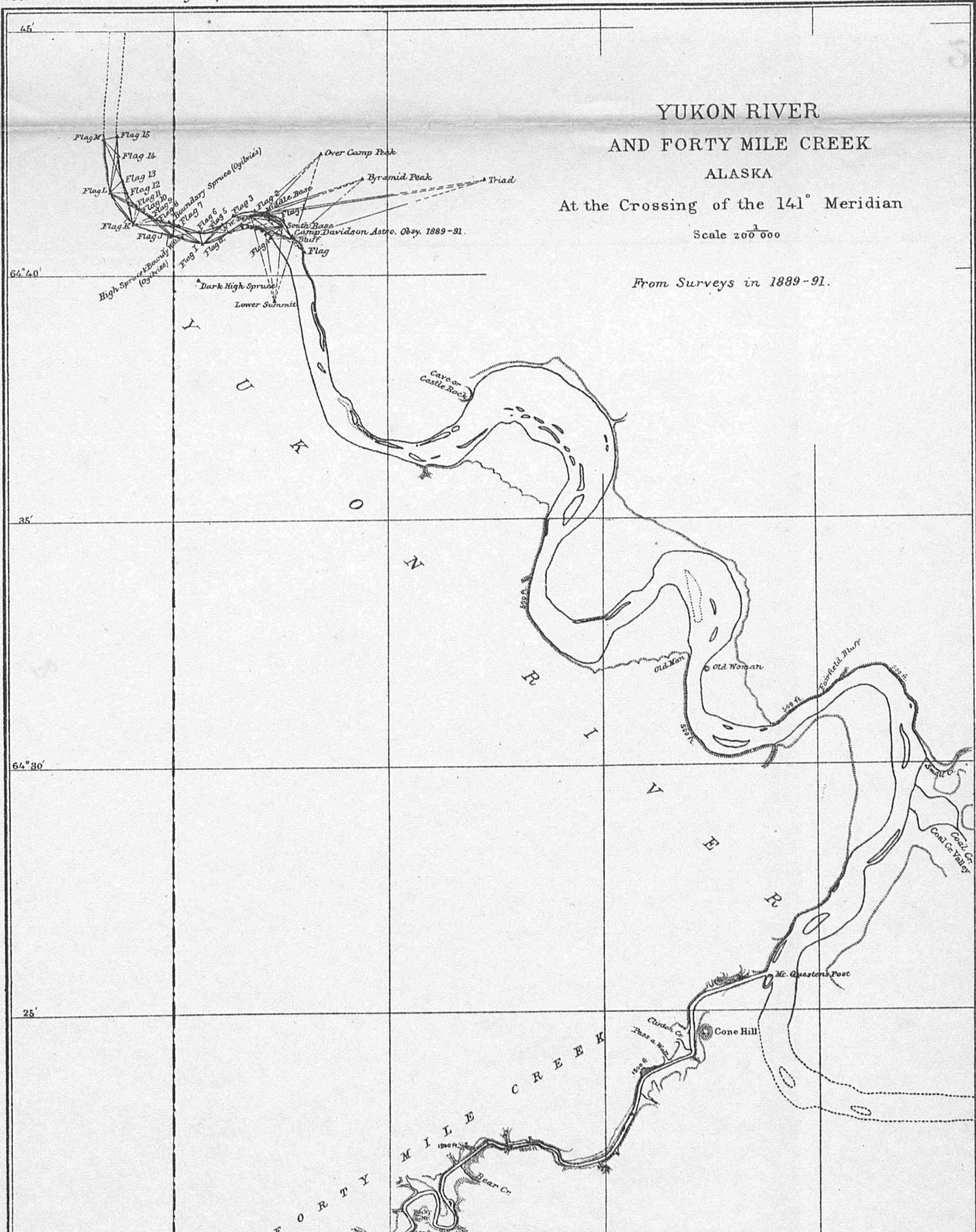

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D.C.

UNITED STATES COAST AND GEODETIC SURVEY.

PART II.

APPENDICES RELATING TO THE METHODS, DISCUSSIONS, AND RESULTS OF THE COAST AND GEODETIC SURVEY.

ILLUSTRATIONS.

TO APPENDIX NO. 1.

TO APPENDIX NO. 5.

TO APPENDIX NO. 6.

TO APPENDIX NO. 7.

TO APPENDIX NO. 8.

TO APPENDIX NO. 9.

APPENDIX No. 1—1895.

THE SECULAR VARIATION IN DIRECTION AND INTENSITY, OF THE EARTH'S MAGNETIC FORCE IN THE UNITED STATES AND IN SOME ADJACENT FOREIGN COUNTRIES.

By CHARLES A. SCHOTT,
Assistant, Coast and Geodetic Survey.

Eighth edition, with one chart and three plates.

Introduction.—In the magnetic researches of the Survey of preceding years, it has been pointed out that, in the present imperfect state of our knowledge of the secular variation of the magnetic declination, the deductions and expressions so far obtained need continued attention and improvements in order to keep them in close conformity with observations. Accordingly we shall present here the later results, up to date, since the publication of the last edition (seventh) of the "Secular variation of the magnetic declination in the United States, etc.," which forms Appendix No. 7 in the report for 1888,* and give special attention to those more restricted contributions to our knowledge of the secular variations of the magnetic inclination (or dip) and of the magnetic intensity. With respect to these latter variations the present discussion is simply an extension of what had been attempted in Parts II and III of the paper "Magnetic dip and intensity with their secular variation and geographical distribution in the United States," forming Appendix No. 6 in the report for 1885. The present paper thus comprises the results of a study of the secular variations separately of the declination and of the dip, as well as of their combination; in this way we gain a more comprehensive view of our subject. When first attempted, in the report for 1885, the combination was restricted to an average change at a few places in the New England States, and was there illustrated by a diagram. Following up this latter course, more satisfactory and fruitful results can be reached than by the separate discussions, still, so far as the United States is concerned, the dip observations are all of comparatively recent date, and the intensity measures in any country can only date from 1833 at the earliest. When first attempted this combination of the horizontal and vertical components of the direction of a freely suspended needle could yield but meager results in comparison with those which we may now derive from it after the lapse of ten years of additional data.

Of the several long period motions of the magnetic needle, that of its horizontal direction is of the most interest to the Survey, on account of its practical value, since charts must be supplied with the magnetic declination (variation of compass) for the date of issue, as well as with the annual change (due to the secular variation) in order that the information may be made to apply to any not very distant subsequent year. The discovery of a gradual change in the declination, which had at first been supposed by philosophers to be constant for any one place, is due to Gellibrand, of Gresham College, England. In 1635 he published a work entitled "A discourse mathemeticall on the Variation of the Magneticall Needle, together with its admirable diminution lately discovered." He based his conclusions upon the recorded observations of Boroughs (1580), of

*We shall, however, exclude from the present discussion the European and the southern hemisphere stations, formerly included, as no longer required in this connection.

Gunter (1622), and on his own observations (1633–34), showing that in the vicinity of London the direction of the needle had changed in the interval fully 7° to the westward. From this time the fact of the secular variation was completely established, and was verified at all stations where observations had been obtained at distant intervals; the motion, however, varying systematically in speed and direction, according to time and the geographical position of the place. The dip and intensity are undergoing similar variation. It remained for later times to develop the laws governing this remarkable change, and to endeavor to find out its cause. In this latter respect, so far, science has not met with any success, and in the absence of any promising theoretical support for the explanation of the phenomenon, our efforts and investigations should continue to be specially directed toward the elucidation of facts in order to provide for a basis upon which theory may be grounded, or by which it may be tested.

In order that the secular variation may not be confounded with any of the many other variations exhibited by the magnetic needle, a short account of some of the changes, periodic or otherwise, is here retained from the preceding editions.

The magnetic declination.—The magnetic declination (or variation of the compass, as it was formerly called by surveyors and still is by navigators) at any place is the angle contained between two vertical planes, one being the astronomic or true meridian and the other the plane in which the horizontal axis of a freely suspended magnet lies at the time. The former plane is fixed and the latter variable, since it is found that the needle is generally in a state of slow or tremulous motion. The magnetic declination varies with respect to space and time; it is therefore necessary to give with the statement of its measure the exact time (year, day, and hour) when an observation was made, as well as the geographic position of the place (the latitude and longitude to the nearest minute of arc will suffice). The declination is called "west" when the *north* end of the magnet points to the west of true north; algebraically this fact is indicated by a + sign, and if "east" by a — sign. It is a matter of observation that the magnet, when light and delicately suspended (by a single fiber of raw silk), is seldom or never at rest, but is always shifting its direction, or is in a state of oscillation or of tremor, or, it may be subject to sudden changes. These angular motions have been classified as regular (periodic) and irregular variations, and of these we propose to briefly notice the principal ones, such as may generally be exhibited within the limits of the United States.

The solar diurnal variation consists in a systematic angular movement of the magnet, having for its period the solar day. Its phases depend on local time, and its character is the same for the greater part of the northern hemisphere, *viz*, about the time of sunrise the *north* end of the needle is generally found approaching to or near its most *easterly* deflection or elongation from the magnetic meridian. This phase happens, for instance, at Philadelphia, on the yearly average, about 8^h a. m.; at Key West, Fla., about $8\frac{1}{4}^h$ a. m., and the same at Madison, Wis. It is subject to an annual variation, being about three-quarters of an hour later in the months when the sun is south of the equator, and about one-half of an hour earlier in the summer months, than its yearly average time of occurrence. The north end of the needle then begins its principal daily motion and reaches the opposite extreme position, or its western elongation, about half past 1 o'clock p. m. It is reached a few minutes earlier in summer and a few minutes later in winter, and hardly varies half an hour for different localities. After this epoch the needle takes up an easterly movement, and gradually returns nearly to the direction from which it set out in the morning. Frequently an interruption, or small reversed motion, is exhibited during the night. At Philadelphia the average daily direction is reached in summer about $10\frac{1}{4}^h$ a. m., and in winter about $10\frac{3}{4}^h$ a. m., and generally within half an hour of these times at other places. The magnetic meridian is crossed a second time, generally between 7 and 9 p. m. The angular range between the morning and afternoon elongations, or the diurnal range, is about $8'$ on the average at Philadelphia, and about $5\frac{1}{2}'$ at Key West; in higher magnetic latitudes it is more, in lower less. This range is subject to an annual inequality, being much more conspicuous in summer than in winter ($12'$ at Philadelphia in August and $5'$ in November). At Sitka, Alaska, the average range of the diurnal variation, from observations made between 1848 and 1862, was $10\frac{3}{4}'$, with the easterly extreme at 8 o'clock a. m. and the westerly extreme about $3\frac{1}{2}^h$ p. m. At Point Barrow, on the Arctic Ocean, in latitude 71° 18′, the daily range is nearly $40'$, with an easterly extreme declination about 8^h a. m.

and an apparently delayed westerly extreme about 5^h p. m. At Lady Franklin Bay, Grinnell Land, in latitude 81° 44′, the daily range on the yearly average rises to 1° 6′, with an easterly extreme apparently at the early hour of $1\frac{1}{2}^h$ a. m., and a westerly extreme about 1^h p. m. The diurnal variation is further subject to a periodic inequality related to the eleven-year cycle of the sun spots. It is least in years of minimum sun spots (as in 1856, 1867, 1878, and 1889, for instance) and greatest in years of maximum sun spots (as in 1860, 1870, and 1883), the factors being 0·7 and 1·3, about, of the average amount of these years, respectively. This daily variation appears at times intensified, at other times enfeebled, and during the winter months there are occasionally days on which it cannot be recognized. Observations must be corrected for time of day, in order to reduce the result to the average direction of the twenty-four hours. A table given for this purpose is found in Coast and Geodetic Survey Report for 1881, Appendix No. 8, article 6.

The *annual variation* of the declination is so small that a mere mention of its existence suffices; its amplitude is at most $1\frac{1}{2}$ minutes of arc.

The *variation* depending on the *solar rotation* has a period of about twenty-six days; its amplitude is likewise small in our latitude.

The lunar inequalities.—These we also pass over on account of their small amplitude. The principal inequality is the lunar diurnal variation, exhibiting the peculiarity of two maxima and two minima on each lunar day, thus partaking of the character of tides. The range of this inequality at Philadelphia is about 27″, and at Toronto, Canada, about 38″. Other lunar inequalities are of yet smaller order.

The *secular variation* of the magnetic declination—our subject proper—is most probably also of periodic character, but since it requires centuries for its full development, and since, as yet, no one cycle has actually been completed within the range of accurate observation, we are obliged, in the absence of any reliable theory, to follow up the phenomena by continuous observations. The secular motion may be compared with a wave motion or with an oscillation of a pendulum which comes to rest momentarily at its extreme positions or elongations, and moves fastest midway between these extremes. Smaller variations within this period have also been detected, but the general angular movement (say, of the north end) of the magnet may be described as follows: About the times of maximum deflection the magnet appears almost stationary or only slowly oscillating about the same average direction for several years (as observed by ordinary or rough instruments); soon, however, the effect of the secular change becomes perceptible, increasing gradually, year by year; this progressive angular motion soon reaches a maximum annual value, after which, still moving in the same direction, it slowly diminishes in speed and finally becomes again stationary when now at the opposite extreme digression, after which possibly it will return again to its first position. Within the area of the United States and south of latitude 49° a complete oscillation of this kind may require between two and a half and three and a half centuries, during which time the magnet would swing twice, i. e., once forward and once backward, through an arc of several degrees, generally keeping within limits of 5° and 8° of total range for our geographical boundaries according to present information; in other localities the period and range are very much greater.

To illustrate further the effect of the secular change, we may take the case of New York City. In this locality the needle was observed to be in nearly a stationary condition, about 1660, its north end pointing then about $9\frac{3}{4}$° to the west of north; it then moved easterly and reached its easternmost digression about 1784, showing at that time only $4\frac{1}{3}$° west declination. Ever since this epoch the motion has been westerly, its present value approaching 9° W.; the greatest annual change (nearly 5′) was apparently passed about the middle of the century. The times of these stationary epochs are different at different localities; the last epoch of eastern elongation was noted earliest in Maine toward the close of the past century, later in the Mississippi Valley, and it has now reached the coast of California and Washington. At present over nearly the whole of the United States, excepting Alaska, the effect of the secular change is to *increase* west declination or (what is the same) to *decrease* east declination; but on parts of the Pacific Coast and for some short distance in the interior the effect is still opposite, viz, an *increase* of east declination. There must, consequently, be a region or belt of no change at present, which will be referred to in detail further on. It is this regular motion, known as the secular variation, which renders it necessary to reconstruct isogonic charts from time to time and to change the compasses and magnetic bearings on our charts. Although this secular variation is supposed perfectly systematic, it may not always appear so, especially when deduced from few observations made at different places in the same general locality, either on account of small observing errors or in consequence of local deflections, or for the reason that ordinary periodic variations and inequalities have not been fully eliminated from the results. Among the latter irregularities must be classed the—

Magnetic disturbances or storms.—These may occur at any time, and are, when taken individually, beyond the power of prediction; but attacked by the statistical method, i. e., when classified, and when averages are taken of many thousands and then analyzed, they are found to be subject to various laws. Their presence is generally indicated by sudden deflections, and by rapid and great fluctuations in the direction of the needle as compared with its normal position, which otherwise might have been expected at that time of day and month. They often take place simultaneously over distant regions of the globe, and in duration may be confined to a few hours, or they may last a day or even for several days. They are frequently accompanied by auroral lights and by strong electric earth currents. When analyzed in large numbers they exhibit a solar-diurnal variation, the westerly and easterly disturbances, however, following different laws. They also have an annual variation and seem to depend largely on the sun-spot period or an eleven-year cycle. Irrespective of direction of the disturbing forces, the most disturbed hours of the day are generally those between 7^h and 10^h a. m., and the least disturbed those between 2^h and 6^h p. m. Westerly disturbances occur most frequently about 8^h a. m. and least about 8^h p. m.; they exhibit a single daily progression. Easterly disturbances reach a maximum about 8^h p. m. and a minimum about 2^h p. m.; they exhibit a double daily progression. Westerly and easterly disturbances appear to agree in their annual variation, in their times of maxima, i. e., in August, September, and October, and in their times of minima, i. e., in January and June. The disturbances are most frequent and considerable in the years of maximum sun-spot activity and the reverse in years of minimum sun spots. The following table of the observed disturbances, in a bi-hourly series at Philadelphia in the years 1840 to 1845, will give an idea of their relative frequency and magnitude:

Deviations from normal direction.	Number of disturbances.
3′·6 to 10′·8	2 189
10 ·8 to 18 ·1	147
18 ·1 to 25 ·3	18
25 ·3 to 32 ·6	3
Beyond.	0

At Key West, Fla., the maximum deflection noticed between 1860 and 1866 was 21′·4. At Madison, Wis., where the horizontal magnetic intensity is considerably less, very much larger deflections have been noticed. Thus, on October 12, 1877, one of 48′, and May 28, 1877, one of 1° 24′.

In high magnetic latitudes, where the horizontal component of the magnetic force is very feeble, the disturbances attain great intensity. Thus at Lady Franklin Bay, Lieutenant Greely noted an extreme range of declination of not less than 20° 28′, this occurring during the great November storm of 1882.

We now proceed to the consideration of the combined horizontal and vertical motion of a needle free to place itself in the line of the magnetic resulting force.

Supposing a freely suspended magnetic needle to indicate at any time the direction of the earth's total magnetic force, and to be placed with its middle point in the center of an imaginary sphere, and an eye placed there and looking in the direction of the north end of the needle, this momentary direction may be referred to the interior surface of the sphere; then successive positions, due to secular change, will give a series of points which for continuous motion will trace out a curve characteristic of the secular variation of the place. This curve is the intersection of an irregular conical surface generated by the motion of the directive line and the surface of the sphere, and if we imagine a plane surface placed tangent to the sphere at a point where the average direction would intersect it, we can get the secular trace projected on that plane, as seen from the center of the sphere. To construct it, we have given in the horizontal direction the observed variations in the declination, and secondly in the vertical direction we have the observed variations in the inclination; the former must be multiplied by the cosine of the dip to refer them to the depressed direction of the total force. It will be noticed that the direction of the motion in the trace given in the report for 1885 is the same as that of the hands of a clock; and this, from extended researches of Dr. L. A. Bauer, has since been proved to hold at all stations for which sufficient data were available.[1] The secular variation in the total intensity could also be indicated in the diagram by increasing the thickness of the trace in proportion to the increase of the force and thinning it out for decreasing force.

Restricting our attention to the secular variation of the declination and dip, experience has shown that either can be represented analytically by a periodic function, even in its most simple form as a sine or cosine function; at the same time there is ground for believing it to be ultimately of a complex character, consisting rather of a series of large and superposed small waves of definite period and amplitude than of a single forward and backward swing. We have as yet no proof of the phenomenon being truly periodic, so that the present recognized secular variation curve, as explained above, would be retraced hereafter; indeed it is far more probable that the period or periods are variable, such, for instance, as would give the curve a spiral aspect with varying convolutions. However this may be, the principal periods at present assigned to the several stations, as satisfying observations, are found not of a common length.

In Appendix No. 7, Report for 1888, it is pointed out that for stations near our Atlantic Coast, and for many places in the interior, the period implied and demanded in the representative formulæ is about two and one-half centuries; for stations on our western coast (south of Alaska) rather more than three centuries; and for Gulf stations about three and one-half centuries. On the other hand, I have shown in Appendix No. 3, Report for 1891 (part 2, octavo), that certain South American, South Atlantic, and South African stations demand for their representations a secular period of about five and one-third centuries, or fully double the time required at our North Atlantic stations. Besides this contrast in the duration, there is a still greater one in the range of the secular variation, the ratio of an average amplitude (half range) at stations on the New England coast (say of 3°) is to that for stations in the southern hemisphere, above referred to (say of 13½°), as is 1 to 4½. While this nonconformity to a common length of the secular variation period for the whole globe may render the ultimate explanation of its cause more difficult, it might be surmised that the apparent difference in the duration may be the result of an interference phenomenon between two long periods. Apparent irregularities (possibly loops in the secular trace), due to subordinate cycles, will demand special attention. Referring to the length of the period at any one station we assume at first, as most probable, that it is the same for the representation of the changes in declination, in inclination, and in intensity.

We have next to refer to the motion of the phases of the secular variation as first noticed in the United States. The westward propagation in time of the magnetic phases from our Atlantic coast across the continent to our Pacific coast was described[2] as early as the year 1859, and three years before glimpses of the phenomenon had been obtained. The following statements are taken from the Annual Report for 1874, p. 105: An examination of the column containing the times when the secular variation reached its easterly maximum deflection, shows that the needle attained a stationary condition and then commenced a reverse motion in the New England States toward the end of the past century; in the Atlantic States to the westward and southward, this condition was reached early in the present century, and in Mexico about the first third of the century; in California, Oregon, and Washington it has not yet reached this extreme value. The epoch of eastern magnetic elongation is traced from Halifax, Nova Scotia, where it occurred about 1711 to San

[1] See Beiträge zur Kenntniss des Wesens der Säcular-Variation des Erdmagnetismus, von Louis A. Bauer. Inaugural Thesis. Berlin, 1895. The author, who was at one time connected with the computing division of the Survey, here extends his researches to prominent stations in the northern and southern hemispheres, and finds the direction at all of them to be clockwise.

[2] Coast Survey Report for 1859, App. No. 24, p. 299; see also Rept. for 1856, p. 235.

Francisco, Cal., where it was predicted to occur about the year 1907. We are thus directed to the extreme Northeastern States for probable indications of what may be expected to follow in more Southern and Western States. Apparently considerably more than a century will have elapsed before the influence, which toward the close of the past century produced the change of motion of the north end of the needle from eastward to westward in Maine (increasing there the westerly declination), arrives and is noted in California and Oregon (diminishing there the easterly declination). By the time the *western* elongation is reached in Maine, we may expect to see the needle in California, Oregon and Washington not far from its *eastern* elongation, or in opposite phase. We have thus, as a fact, that a certain phase of the secular variation noted at a given station will be found to have at some previous time passed at another station east (magnetically) of it, and hence indicating what may be expected shortly to occur at the first station. This remark applies equally to other phases and to the variations in dip and intensity. Quite lately this feature of the secular variation in declination and inclination has been further successfully pursued by Mr. L. A. Bauer,[1] who followed it up so as to include stations all around the globe.

The earliest attempt on the part of the Survey to pass from the observed annual changes of the magnetic dip to the more comprehensive study of its secular variation was in 1856,[2] but it could not be called successful on account of the scanty material then available. Among the earliest dates of observation within the limits of the United States or adjacent thereto are those of the year 1778, on the west coast of North America, and on the eastern side the observations at Cambridge of 1780–1783; and here we have to note the earliest known dip observation in the United States, to which attention was lately called by Professor Abbe. Observed at Boston in 1722, it was recovered by Dr. L. A. Bauer and is quoted in his inaugural paper. The subject was left in abeyance till 1885,[3] when the investigation was resumed under more favorable conditions and in connection with that of the secular change of the horizontal component of the force and also of the total force.[4] In neither case, however, could periodic functions be employed on account of the shortness of the record and they are now only given for Cambridge and Boston.

Analytical representation of the secular variation.—The circular or harmonic functions which adapt themselves with facility to the representation of periodically recurring phenomena will here be used in all cases where the length of the period or of periods can be established together with the amplitude and epoch. This applies in general to the declination changes, but for the variations in dip and intensity we are frequently restricted to the use of a series of powers, which is undesirable on account of its limited application in time. Of the two forms the periodic formulæ—

$$D=\delta+r\sin(\alpha m+c)+r_{\prime}\sin(2\,\alpha m+c_{\prime})+r_{\prime\prime}\sin(3\,\alpha m+c_{\prime\prime})+\;.\;.\;.\;.$$

$$\text{and } D=\delta+r\sin(\alpha m+c)+r_{\prime}\sin(\,\alpha_{\prime}m+c_{\prime})+r_{\prime\prime}\sin(\,\alpha_{\prime\prime}m+c_{\prime\prime})+\;.\;.\;.\;.$$

the second one is preferred, as it directly admits of the introduction of subordinate waves; in general the first periodic term, however, is found sufficient.

When applied to the variation in declination, let—

m=number of years and fraction of year counted from a given fixed epoch t_0 for which 1850·0 has been adopted, hence for any time (year) t we have $m=t-t_0=t-1850{\cdot}0$.

$\alpha\ \alpha_{\prime}\ \alpha_{\prime\prime}$ . . . . are coefficients depending on the length of the periods $P\ P_{\prime}\ P_{\prime\prime}$ . . . . of the several terms; so that $\alpha=\frac{360}{P}$ $\alpha_{\prime}=\frac{360}{P_{\prime}}$ $\alpha_{\prime\prime}=\frac{360}{P_{\prime\prime}}$ and in general $\alpha_1=\frac{2\pi}{P_1}$. Thus the values for

α 0·9, 1·0, 1·2, 1·5 correspond to periods of 400, 360, 300 and 240 years, respectively.

$r\ r_{\prime}\ r_{\prime\prime}$ . . . . are the semi-ranges or amplitudes of the several waves.

$c\ c_{\prime}\ c_{\prime\prime}$ . . . . are epochal constants of the several waves.

δ=a constant representing an average or normal value of the declination about which the periodic fluctuations take place.

D=the value of the declination for the time t, assumed positive when the north end of the needle is west of the true meridian, and negative when east of it.

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[1] See his Inaugural Thesis of 1895.
[2] Appendices Nos. 32 and 33, Report for 1856.
[3] Appendix No. 6, Report for 1885.
[4] For first attempt, see Appendix No. 22, Report for 1861.

The quantities α $\alpha_{,}$ $\alpha_{,,}$ . . . . c $c_{,}$ $c_{,,}$ . . . . r $r_{,}$ $r_{,,}$ . . . . and δ must be determined for any one locality from the observations made there at various times and the most probable values must be found by application of the method of least squares. The annual change a of the declination due to the secular motion is positive for increasing west declination or diminishing east declination and negative for an opposite direction. Differentiating the expression for D we get

$$dD=r\alpha\cos(\alpha m+c)\,dm+r_{,}\alpha_{,}\cos(\alpha_{,}m+c_{,})\,dm+\ \ldots\ldots$$

For any time t and when a is expressed in minutes of arc

$$a=60\text{ arc }1^{\circ}\left[r\alpha\cos(\alpha m+c)+r_{,}\alpha_{,}\cos(\alpha_{,}m+c_{,})+\ \ldots\ldots\right]$$

Maxima and minima values of D follow from

$$o=r\alpha\cos(\alpha m+c)+r_{,}\alpha_{,}\cos(\alpha_{,}m+c_{,})+\ \ldots\ldots$$

The probable error e_0 of an observation (of unit weight) is found from the differences Δ of the n observed and computed values of D by means of

$$e_0=0{\cdot}674\sqrt{\frac{\Sigma\,\Delta^2}{n-n_{,}}}$$

where $\Sigma\,\Delta^2$=sum of squares of differences and $n_{,}$=number of unknown quantities entering into the expression for D and determined from the observations themselves, thus if but a single periodic term is used $n_{,}=4$. If different weights p $p_{,}$ $p_{,,}$ are assigned to the observations we must substitute $p\,\Delta^2$ for Δ^2 in the above expression to get the probable error of an observation of unit weight.

In applying the above formulæ the value of α is found by trial so as to produce the best general representation; if we put $\delta=\delta_{,}+x$ where $\delta_{,}$=an assumed approximate value of δ and x a correction to it, also take $y=r\cos c$ and $z=r\sin c$ then the conditional equations for any periodic term will take the form

$$o=\delta_{,}-D+x+y.\sin\alpha m+z.\cos\alpha m\ \checkmark$$

and the values of x, y, z are found from the normal equations; when weights enter, the conditional or observation equations must be multiplied by the square root of their respective weights p. Subordinate terms, short in time and small in range, are best introduced by Cauchy's method of interpolation in the form

$$d_{,}=\delta_{,}+r_{,}.\cos c_{,}\sin m\alpha_{,}+r_{,}.\sin c_{,}.\cos m\alpha_{,}.$$

For those stations where the scarcity of observations compels the use of a series of powers, as frequently occurs in the case of dips θ or intensities F we have the form

$$\theta=\theta_0+y\,(t-t_0)+z\,(t-t_0)^2+u\,(t-t_0)^3+\ \ldots\ldots$$

where for t_0 we adopt generally 1850·0 as before; putting $\theta=\theta_{,}+x$ where $\theta_{,}$=an approximate value for θ_0 we have the observation equation in the form

$$o=\theta_{,}-\theta+x+y\,m+z\,m^2+u\,m^3+\ \ldots\ldots$$

the annual change a is given by

$$\frac{d\,\theta}{d\,t}=a=y+2\,z\,(t-t_0)+3\,u\,(t-t_0)^2+\ \ldots\ldots$$

and the time of a maximum or minimum value is given by $o=y+2\,z\,(t-t_0)+3\,u\,(t-t_0)^2+\ \ldots\ldots$ also the point of inflexion by $\frac{d^2\,\theta}{d\,t^2}=o=2\,z+6\,u\,(t-t_0)+\ \ldots\ldots$

The principal difficulty met with in the reduction of the analytical formulæ to the numerical expressions for the magnetic stations is the disposal of the large discrepancies between certain computed and observed values, i. e., to decide whether the difference is due to defective observation or to inadequate representation by the formula. No general rule can here be given whether to reject an observation or to give it fractional weight, but with a knowledge of the magnitude of the probable observing error applicable to each century, and with the help of approximately contemporaneous observations at other stations in the vicinity, the difficulty can generally be overcome. It is not alone our object to render the sum of the squares of the residuals a minimum, but to establish an expression nearest to a physical truth. It may also be remarked in this place that in proportion as our knowledge of the law of secular variation is increasing in certainty, the material upon which it is based must be criticized with greater severity.

For a proper estimation of the length of applicability of our formulæ the fact should be borne in mind that however well they may represent the secular variation of the declination during the present century and during the greater part of the preceding one, when extended into the seventeenth and sixteenth centuries they weaken and fail. We can not altogether neglect the older data; crude as they are, and however defective, they possess, when properly weighted, some value by concurrent testimony; for instance, we can not assume that the agonic line for the year 1600 was totally in error when placed so far to the west as to traverse Mexico. (See Appendix No. 6, C. & G. S. Rept. for 1888.) To reconcile the older with the modern observations so as to bring them under the same analytical expression is a task yet to be performed.

The arrangement of the subject-matter of this paper is the same as that found in former reports, but the record and discussion of the declination is followed immediately by that of the dip and of the intensity. The observations and other related data for each station are collected chronologically, and the stations are arranged in geographic order, depending on their latitude, and the whole area of the United States is subdivided into three regions or groups of stations, viz:

Group I: All stations lying between the Atlantic Coast and the divide of the Appalachian range; it also includes some foreign stations to the north of it.

Group II: All stations in the central part of the United States between the Appalachian range and the Rocky Mountain divide; also some foreign stations, particularly in the West Indies.

Group III: All stations between the Rocky Mountain divide and the Pacific Coast; also the whole of Alaska, some stations in Mexico, and other foreign stations contiguous to our borders.

COLLECTION, DISCUSSION, AND RESULTS OF MAGNETIC DECLINATIONS, DIPS AND INTENSITIES IN THE UNITED STATES AND AT SOME CONTIGUOUS FOREIGN STATIONS.

This section of the paper may be regarded as a new edition of Appendix No. 7, Report for 1888, and with respect to dip and intensity as a second edition of Appendix No. 6, Report for 1885, with additions of new observations (and of old ones re-covered). It was therefore thought unnecessary to repeat the references or authorities to the observations with such fullness as was given in those papers, since they may be looked up there; the references to the new stations, however, are in full. As already remarked, observations at certain foreign stations, as also the discussion of observations made on our western coast by Spanish navigators during 1774–1790 have now been omitted, likewise the discussions of a number of declinations along our Atlantic Coast about the epochs 1700 and 1750 and the remarks about the position of the magnetic pole (where $\theta=90^\circ$) and some other matter, for which the reader may be referred to the 1888 report.

In order to properly estimate the magnitude of the discrepancies between computed and observed declinations ($C-O$ of the tables) it may be well to bear in mind that in the century following the time of Columbus and of the Cabots, navigators were content to note their variation to the nearest point or half point of the compass, and that the observations of Hudson and Champlain in the first decade of the seventeenth century are not to be depended on within about half a point, say $\pm 5^\circ$. About the beginning of the eighteenth century a great improvement in accuracy is notable; thus Bering's observations[1] in the vicinity of Kamchatka in the years 1725–1730 are found subject to a probable error of but $\pm 1\frac{1}{4}^\circ$; the observations made by Cook in the years 1768–1780 are estimated to be uncertain by about 1°; observations made by Spanish navigators[2] along our west coast between 1774–1790 were found subject to a probable error of $\pm 51'$ and this appears to have remained an ordinary uncertainty down to our time, owing to the disturbing influence of the masses of iron and steel since employed in shipbuilding and propulsion. It is otherwise on land, where compass bearings may be made with an uncertainty less than $\frac{1}{6}^\circ$ (provided the index error is attended to and allowance is made for the diurnal variation of the declination); since the portable declinometers came into use (after 1838) the purely observing error has practically disappeared, since it has been reduced below the variations of the declination from day to day.

[1] Coast and Geodetic Survey Report for *1891*, part 2, p. 272.
[2] Coast and Geodetic Survey Report for 1888, p. 269.

The general directions of the Survey recommend observations to be made on two or three days at the times of the morning and the afternoon elongations in order to secure a result which may be expected subject to a probable error of about $\pm 1'$.

When in any circumscribed locality different stations are occupied at different times, the effect of the regular as well as of any irregular distribution of the magnetism in this region should be allowed for; if this can not be done the effect appears as error. It is only in a few cases that this "reduction to station" could be made. This source of discrepancy between observed and computed values greatly weakens the values deduced for the secular variation. The amount can not be definitely stated, but not infrequently it exceeds 1°.

The earliest dip observations may be estimated as uncertain by $\frac{1}{4}°$; the probable error of an observed value in the earlier part of this century may be taken between $\pm 10'$ and $\pm 5'$, but this was greatly reduced with the introduction of the Kew circles, by means of which the dip may be had within $\pm 2'$ or even less.

As to the uncertainty of the results for the horizontal force it may be estimated as between $\frac{1}{300}$ and $\frac{1}{500}$ part of the force, for any one complete measure; for mere relative measure, and when starting from a magnetic observatory with a carefully determined value, much greater accuracy can be reached, but for absolute measures with portable magnetometers the instrumental constants require to be determined with the utmost care in order to exceed the accuracy implied above. The tabular values of H and F are now expressed in centimetre gramme second units. For converting measures expressed in f. g. s., or British units, into c. g. s. units we use the multiplier 0·0461080 (or log. factor: 8·663776) and for the converse operation the multiplier 21·6882 (or log. factor: 1·336224).

For convenience of reference I add here some relations between the quantities θ, H, V, and F.

$$F=(H^2+V^2)^{\frac{1}{2}} \qquad dF=\sec\theta\, dH+F\tan\theta\, d\theta \qquad \frac{dF}{F}=\frac{dH}{H}+\tan\theta\, d\theta$$

$$F=H\sec\theta \qquad dH=-F\sin\theta\, d\theta+\cos\theta\, dF \qquad \frac{dF}{F}=\cos^2\theta\,\frac{dH}{H}+\sin^2\theta\,\frac{dV}{V}$$

$$H=F\cos\theta \qquad d\theta=-\frac{dH}{F\sin\theta}+\frac{\cot\theta}{F}dF \qquad \frac{dV}{V}=\operatorname{cosec}^2\theta\,\frac{dF}{F}-\cot^2\theta\,\frac{dH}{H}$$

$$V=F\sin\theta=H\tan\theta \qquad dV=\operatorname{cosec}\theta\, dF-\cot\theta\, dH \qquad \frac{dV}{V}=\frac{d\theta}{\sin\theta\cos\theta}+\frac{dH}{H}$$

$$dV=H\sec^2\theta\, d\theta+\tan\theta\, dH$$

The application of our empirical formulæ should generally be limited in time to the period covered by the observations and in particular no undue extension should be made with respect to declinations to reach back to the sixteenth and seventeenth centuries, since indications are not wanting that not only considerable modification, but more probably entire reconstruction of the formulæ will be required to satisfy the law then prevailing. The tabular results should not be extended (either way) unless supported by observations.

In the following tables we have 47 stations in Group I, 39 in Group II, and 32 in Group III, or in all 118 stations, with an aggregate of nearly 1 435 declination observations (annual values), 577 dip results, and 479 intensity (horizontal component) measures.

GROUP I.

Secular variations of the magnetic declination, dip and intensity.

[Eastern stations.]

ST. JOHN'S, NEWFOUNDLAND.

$\varphi=47°\ 34'.4 \qquad \lambda=52°\ 41'.9$ W. of Gr.

[Government House.]

No.	Date.	D.	References and remarks.
		° ′	
1	1665—	14 W.	Approximate values taken from the isogonic charts of these years given in W. Van Bemelen's De Isogonen in de XVI en XVII Eeuw. Utrecht, 1893. His earlier charts do not seem to me trustworthy in this region. R. Dudley's Arcano del Mare, Florence, 1646-47, for about 1620, is less doubtful; it gives 15°. No use is made of it here. See Appendix No. 6, C. & G. S. Rep. for 1888.
2	1680—	13 W.	

Secular variations of the magnetic declination, dip and intensity—Continued.

ST. JOHN'S, NEWFOUNDLAND—Continued.

No.	Date.	D.	References and remarks.
		° ′	
3	1700—	15 W.	Edm. Halley's Tabula Nautica, Variationum Magneticarum index, etc.
4	1750—	17¾ W.	A value deduced by me from observations at various places about that period. C. and G. S. Bulletin No. 6, May, 1888. The value + 16° for 1787 depending on a chart of Hansteen's appears to be defective.
5	1833—	26½ W.	P. Barlow's isogonic chart.
6	1844, Oct.	29 36 W.	Capt. Bayfield, R. N.
7	1857, July.	31 21 W.	Capt. Dayman, R. N.
8	1862, Sept. 11.	31 20 W.	Capt. Orlebar, R. N.
9	1863, Sept. 22.	31 18 W.	
10	1864, June 3.	31 00 W.	
11	1866, Apr. to Oct.	30 55 W.	Near Government House.
12	1881, June 29.	30 26 W.	Lieut. C. P. Perkins, U. S. N.
	1881, Sept. 26, 27, 28.	30 37·3 W.	Lieut. S. W. Very, U. S. N.
13	1885—	30 45 W.	Brit. Adm'y Chart 298; with remark: "Mag'c Var'n nearly stationary."

$$D = +22°\cdot16 + 8\cdot71 \sin (1\cdot1\, m + 70°\cdot42)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C — O.	Date.	Obs'd D.	*p*.	Comp'd D.	C — O.
	°		°	°		°		°	°
1665·5	+14·0	½	+15·75	+1·75	1862·7	+31·33		+30·83	—0·50
1680·5	13·0	½	14·37	+1·37	1863·7	31·30		30·84	—0·46
1700·0	15·0	¾	13·48	—1·52	1864·4	31·00		30·84	—0·16
1750·0	17·75	½	16·61	—1·14	1866·5	30·92		30·87	—0·05
1833·0	26·5	¾	29·00	+2·50	1881·6	30·52		30·57	+0·05
1844·8	29·60		30·03	+0·43	1885·5	+30·75		+30·37	—0·38
1857·5	+31·35		+30·70	—0·65					

DIP AND INTENSITY AT ST. JOHN'S.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1881, Sept. 26, 27, 28.	74 37	0·1522	0·5736	Lieut. S. W. Very, U. S. N. About Government House.
2	1883, June 28.	74 47	0·1518	0·5784	W. H. Lamar and F. W. Ellis, U. S. Signal Corps; old cemetery on Church Hill.

QUEBEC, CANADA.

$\varphi = 46°\ 48'\cdot4 \qquad \lambda = 71°\ 14'\cdot5$ W. of Gr.

[Wolfe's monument.]

No.	Date.	D.	References and remarks.
		° ′	
1	1642—	16 W.	Padre Bressani.
2	1686—	15½ W.	De Hayes.
3	1700—	16 W.	Edm. Halley's Tabula Nautica } Mean used.
	1700—	16½ W.	C. & G. Survey Bulletin No. 6 } Mean used.
4	1750—	12½ W.	C. & G. Survey Bulletin No. 6.
5	1785—	12 35 W.	Surveyor-General Holland.
6	1789, June 30.	11 45 W.	L. Perrault.
7	1791, June 22.	13 00 W.	P. Beaupré.
8	1792, Mar. to May.	12 42 W.	J. B. Demers, A. Dezery, C. Turgeon, and F. Legendre. Mean value.
9	1793—	12 05 W.	Holland } Mean used.
	1793, Nov.	13 00 W.	J. C. Antill } Mean used.

Secular variations of the magnetic declination, dip and intensity—Continued.

QUEBEC, CANADA—Continued.

No.	Date.	D.	References and remarks.
		° ′	
10	1805, Apr.	11 35 W.	Department record.
11	1810—	11 00 W.	Becquerel } Mean used.
	1810, June 5.	12 15 W.	E. T. Fletcher } Mean used.
12	1811, June.	12 15 W.	Department record.
13	1814—	11 50 W.	Kent.
14	1820, Oct. and Nov.	12 32 W.	Bourdage, Fletcher, and Livingstone. Mean value.
15	1821, Aug. to Nov.	12 54 W.	J. McNaughton, A. Cattanach, W. Ware, and E. Tetu. Mean value.
16	1822, Jan. to May.	13 00 W.	J. Hamel, P. Verrault, P. J. Bureau, and Department record.
17	1823, Mar. to Nov.	13 00 W.	N. Le François, D. S. Ballantyne, J. Gamahe, A. Bochet, and L. Dorval.
18	1824, Mar. 2.	12 40 W.	A. Cattanach.
19	1831, July to Dec.	13 24 W.	Capt. Bayfield, T. Carroll, J. Hamel, H. Corey, and J. Newman. Mean value.
20	1832, May.	13 00 W.	Department record.
21	1833, May and July.	12 45 W.	" "
22	1834, Mar. and July.	13 19 W.	Capt. Bayfield, Fletcher, and Department record. Mean value.
23	1835, Dec.	13 10 W.	Department record.
24	1838–39	13 22 W.	" "
25	1840, May and Sept.	13 42 W.	R. M. Moore and Bouchette. Mean value.
26	1842, Dec.	14 01 W.	Anse des Mères, Lefroy. Mean value.
27	1846—	14 32 W.	La Canardière and Fletcher.
28	1847, Sept. and Oct.	14 38 W.	Department record.
29	1848, Feb. to Oct.	14 35 W.	Department record and Le François. Mean value.
30	1849, Mar. and July.	15 22 W.	Department record.
31	1850, Apr.	15 15 W.	" "
32	1851, autumn.	15 15 W.	" "
33	1853, Jan. 19.	15 30 W.	" "
34	1858, Oct. 8.	15 34 W.	Capt. Orlebar, R. N.
35	1859, July 19.	16 17 W.	C. A. Schott, U. S. Coast Survey.
36	1860, Oct. 12.	16 28 W.	Capt. Orlebar, R. N.
37	1865—	16 40 W.	E. T. Fletcher.
38	1879, Sept. 16, 19.	17 13·7 W.	J. B. Baylor, U. S. Coast and Geodetic Survey.
39	1887—	17 40 W.	Brit. Adm'y Chart No. 319, with note: Decl'n increasing 3′ annually.
40	1889, Jan. 1.	17 14 W.	Lieut. Aubry. Annuaire pour l'an 1891.
41	1890—	17 30 W.	U. S. Hyd. Office. Chart No. 1207, with remark: Variation nearly stationary. [Probably a computed value.]

$$D = +14^\circ{\cdot}66 + 3{\cdot}03 \sin(1{\cdot}4\, m + 4^\circ{\cdot}6) + 0^\circ{\cdot}61 \sin(4{\cdot}0\, m + 0^\circ{\cdot}3)$$

Date.	Obs'd D.	p.	Comp'd D.	C − O.	Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°		°		°	°
1642·5	+16·00		+17·00	+1·00	1834·4	+ 13·31		+13·22	−0·09
1686·5	15·50		17·33	+1·83	1835·9	13·17		13·36	+0·19
1700·0	16·25	½	16·49	+0·24	1839·3	13·37		13·70	+0·33
1750·0	12·50	½	12·14	−0·36	1840·5	13·71		13·81	+0·10
1785·5	12·58		12·24	−0·34	1842·7	14·02		14·07	+0·05
1789·5	11·75		12·22	+0·47	1846·5	14·53		14·49	−0·04
1791·5	13·00		12·20	−0·80	1847·7	14·64		14·63	−0·01
1792·3	12·42		12·20	−0·22	1848·5	14·58		14·72	+0·14
1793·6	12·54		12·17	−0·37	1849·4	15·37		14·84	−0·53
1805·3	11·58		12·08	+0·50	1850·3	15·25		14·93	−0·32
1810·5	11·62		12·08	+0·46	1851·7	15·00		15·10	+0·10
1811·5	12·25		12·09	−0·16	1853·1	15·50		15·26	−0·24
1814·5	11·83		12·14	+0·31	1858·8	15·57		15·89	+0·32
1820·8	12·54		12·33	−0·21	1859·5	16·28		15·97	−0·31
1821·7	12·90		12·36	−0·54	1860·8	16·47		16·09	−0·38
1822·2	13·00		12·39	−0·61	1865·5	16·67		16·54	−0·13
1823·6	13·00		12·45	−0·55	1879·7	17·23		17·38	+0·15
1824·2	12·67		12·49	−0·18	1887·5	17·67		17·51	−0·16
1831·7	13·40		12·99	−0·41	1889·0	17·23		17·51	+0·28
1832·4	13·00		13·05	+0·05	1890·5	+[17·50]		17·51	……
1833·5	+12·75		+13·14	+0·39					

Secular variations of the magnetic declination, dip and intensity—Continued.

QUEBEC, CANADA—Continued.

DIP AND INTENSITY AT QUEBEC.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1842, Sept. 1.	77 15·3	0·1394	0·6318	Sir J. H. Lefroy and Lieut. C. Younghusband. Near Artillery Barracks.
	1845, June 23.	77 08·8	0·1400		Sir J. H. Lefroy and Lieut. C. Younghusband. Near Wolfe and Montcalm monuments.
2	1859, June 18, 19.	77 17·5	0·1379	0·6270	C. A. Schott, U. S. Coast Survey. Near Wolfe's monument.
3	1879, Sept. 16, 19.	76 45·1	0·1431	0·6243	J. B. Baylor, U. S. Coast & G. S. Near Wolfe's monument.

CHARLOTTETOWN, PRINCE EDWARD ISLAND.

$\varphi = 46° 14'$ $\lambda = 63° 27'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1833—	19½ W.	P. Barlow's isogonic chart.
2	1842, June.	21 03 W.	Capt. Bayfield, R. N.
3	1857, May.	23 02 W.	Capt. Orlebar, R. N.
4	1858, May 18.	22 54 W.	
5	1859, May 20.	22 51 W.	
6	1860, May 17.	22 50 W.	
7	1861, May 14.	22 45 W.	
8	1862, May 27.	23 19 W.	
9	1875·3	23 03 W.	British officers, U. S. Hydr. Office Doc. 109*a*, Washington, 1895.
10	1876·3	23 32 W.	
11	1879·3	23 54 W.	
12	1880·3	22 49 W.	
13	1881·3	22 55 W.	
14	1882·3	22 51 W.	
15	1883·3	22 52 W.	
	1883, Aug. 29.	24 02 W.	Lieut. J. C. Rich, U. S. N. Red'n to town —45′. Mean of 3 values 23° 14′.
	1883, Sept. 22.	24 19 W.	Lieut. R. B. Peck, U. S. N.
16	1886·3	22 42 W.	British officers, U. S. Hydr. Office Doc. 109*a*, Washington, 1895.
17	1888—	22 52 W.	U. S. Hydr. Office, Chart No. 1068, variation decreasing 2′ annually. [Possibly a computed value.]

$D = +15°{\cdot}50 + 7{\cdot}72 \sin(1{\cdot}05m + 58°{\cdot}6)$. An approximate expression.

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.	Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°		°		°	°
1833·0	+19·50	½	+20·54	+1·04	1876·3	+23·53		+23·20	—0·33
1842·4	21·05		21·47	+0·42	1879·3	23·90		23·22	—0·68
1857·4	23·04		22·57	—0·47	1880·3	22·82		23·22	+0·40
1858·4	22·90		22·63	—0·27	1881·3	22·92		23·22	+0·30
1859·4	22·85		22·68	—0·17	1882·3	22·85		23·21	+0·36
1860·4	22·83		22·73	—0·10	1883·6	23·24		23·20	—0·04
1861·4	22·75		22·78	+0·03	1886·3	22·70		23·17	+0·47
1862·4	23·32		22·83	—0·49	1888·5	[+22·87]	½	+23·13	+0·26
1875·3	+23·05		+23·19	+0·14					

No observations (so far as known) for dip and intensity at Charlottetown.

Secular variations of the magnetic declination, dip and intensity—Continued.

MONTREAL, CANADA.

$\varphi = 45° 30'.5 \qquad \lambda = 73° 34'.6$ W. of Gr.

[McGill University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	14¾ W.	C. & G. Survey Bulletin No. 6.
2	1749, Aug. 1.	10 38 W.	M. Gillion in P. Kalm's travels, etc. London, 1771. Vol. 3.
	1750—	10⅓ W.	C. & G. Survey Bulletin No. 6. Not used.
3	1785—	8 24 W.	Surveyor-General Holland.
4	1793, July 26.	8 15 W.	J. McCarthey.
5	1814—	7 45 W.	Becquerel.
6	1834—	8 00 W.	Capt. Bayfield, R. N.
7	1835—	9 50 W.	Communicated by V. Colvin.
8	1842, Aug.	8 57·6 W.	Sir J. H. Lefroy.
9	1859, July 20.	12 21 W.	C. A. Schott, U. S. Coast Survey. Grounds of McGill University.
10	1879, Sept. 25.	13 40·5 W.	J. B. Baylor, U. S. Coast & G. S. Grounds of McGill University.
11	1893—	14 24 W.	U. S. Hydr. Office. Chart No. 1353, with note: increasing annually 3′. [Probably a computed value.]

$$D = +11°.87 + 4.33 \sin (1.45\, m - 18°.8)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1700·0	+14·75	½	+15·47	+0·72
1749·5	10·63		10·71	+0·08
1785·5	8·40		7·86	—0·54
1793·6	8·25		7·61	—0·64
1814·5	7·75		7·80	+0·05
1834·5	8·00		9·01	+1·01
1835·5	9·83		9·10	—0·73
1842·6	8·97		9·74	+0·77
1859·5	12·35		11·49	—0·86
1879·7	13·67		13·63	—0·04
1893·5	+14·40		+14·89	+0·49

DIP AND INTENSITY AT MONTREAL.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1833—	77 06	......	......	Capt. Back, R. N.
2	1838—	76 19 (?)	......	......	Estcourt.
3	1842, Sept. 16.	77 13·1	0·1400	0·6326	Sir J. H. Lefroy. At St. Helens Isle, near artillery barracks.
4	{ 1843, Apr. 25, 29.	77 08·8	0·1411	0·6344	Sir J. H. Lefroy.
	{ 1843, Aug.	....	0·1433	0·6280	Dr. A. D. Bache.
5	1845, June 20.	77 08·5	0·1389	0·6241	Lieut. C. Younghusband. Foot of Mountain.
6	1859, July 20.	76 51·4	0·1434	0·6307	C. A. Schott, U. S. Coast S. Grounds of McGill University.
7	1879, Sept. 25.	76 25·7	0·1471	0·6270	J. B. Baylor, U. S. Coast & G. S. Grounds of McGill University.

$$\Theta = 77°.08 - 0.011\,1\, m - 0.000\,382\, m^2$$
$$H = 0.140\,2 + 0.000\,015\, m + 0.000\,007\,3\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	°
1833·5	77·10	77·16	+0·06
1842·7	77·22	77·14	—0·08
1843·3	77·15	77·14	—0·01
1845·5	77·14	77·12	—0·02
1859·5	76·86	76·94	+0·08
1879·7	76·43	76·41	—0·02

Date.	Obs'd H.	Comp'd H.	C—O.
1842·7	0·1400	0·1405	+0·0005
1843·5	0·1422	0·1404	— 18
1845·5	0·1389	0·1403	+ 14
1859·5	0·1413	0·1410	— 03
1879·7	0·1471	0·1471	0·0000

Secular variations of the magnetic declination, dip and intensity—Continued.

MONTREAL, CANADA—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+ 8·7	77·15	......	......
1840	9·5	77·15	0·1408	0·6331
1850	10·5	77·08	402	271
1860	11·6	76·93	411	240
1870	12·6	76·70	434	233
1880	13·7	76·40	472	260
1890	14·6	76·02	525	312
1900	+15·4	75·57	0·1592	0·6388

EASTPORT, ME.

$\varphi = 44°54'·4$ $\lambda = 66°59'·2$ W. of Gr.

[Fort Sullivan.]

No.	Date.	D.	References and remarks.	
		° ′		
1	1604–1612.	17 32 W.	Champlain. Observed on Douchet Island, St. Croix River.	
	1620, about.	13·4 W.	R. Dudley's Arcano del Mare. Not used.	
2	1700—	{13 W.	Edm. Halley's Tabula Nautica.	
		{13·3 W.	C. & G. S. Rept. for 1888, p. 306; value deduced from observations at 17 stations.	
3	1750—	11·4 W.	C. & G. S. Rept. for 1888, p. 308; value deduced from observations at 19 stations.	
4	1775—	12 40 W.	Des Barres' Atlantic Neptune. At Grand Menan Island.	
5	1797—	12 19 W.	Chart of mouth of St. Croix River. Red'n to Eastport—5′.	
6	1833—	14½ W.	P. Barlow's isogonic chart.	
	1857, Sept. 16, 19.	15 21·1 W.	G. W. Dean, U. S. Coast Survey, at Calais. Not used.	
7	1860, Aug. to Dec.	17 57·1 W.	G. B. Vose, U. S. Coast Survey.	At Fort Sullivan Magnetic Observatory.
8	1861, Jan. to Dec.	17 59·2 W.	G. B, Vose and S. Walker, U. S. Coast S.	
9	1862, Jan. to Dec.	18 00·6 W.	S. Walker, R. H. Talcott, and E. Goodfellow, U. S. Coast S.	
10	1863, Jan. to Dec.	18 02·3 W.	E. Goodfellow, U. S. Coast S.	
11	1864, Jan. to July, incl.	18 03·7 W.	E. Goodfellow, A. T. Mosman, and H. W. Richardson, U. S. Coast S.	
12	1865, July 22–25.	18 06·1 W.	H. W. Richardson, U. S. Coast S.	
13	1873, Sept. 2, 3.	18 56·0 W.	Dr. T. C. Hilgard, at Fort Sullivan.	
14	1879, Aug. 27, 28.	19 07·8 W.	J. B. Baylor, U. S. Coast & G. S. Parade Ground, Fort Sullivan.	
15	1887, Aug. 24–26.	18 35·2 W.		
16	1895, Aug. 10, 11.	18 53·2 W.		

$$D = +15°·18 + 3·79 \sin (1·25\,m + 31°·1)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.	Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°		°		°	°
1608·0	+17·53	⅓	+18·95	+1·42	1862·5	+18·01		+17·92	—0·09
1700·0	13·30	½	13·64	+0·34	1863·5	18·04		17·98	—0·06
1750·0	11·40		11·38	—0·02	1864·3	18·06		18·02	—0·04
1775·5	12·67		11·81	—0·86	1865·6	18·10		18·09	—0·01
1797·5	12·32		13·01	+0·69	1873·7	18·93		18·46	—0·47
1833·0	14·50	½	15·81	+1·31	1879·7	19·13		18·68	—0·45
1860·8	17·95		17·28	—0·13	1887·7	18·59		18·87	+0·28
1861·5	+17·99		+17·86	—0·13	1895·6	+18·89		+18·97	+0·08

Secular variations of the magnetic declination, dip and intensity—Continued.

EASTPORT, ME.—Continued.

DIP AND INTENSITY AT EASTPORT.

No.	Date.	Θ. ° ′	H.	F.	References.
1	1860, Jan. to Dec.	75 53·1	0·1525	0·6252	G. B. Vose, U. S. Coast S. } At Magnetic Observatory, Fort Sullivan.
2	1861, Jan. to Dec.	75 51·0	0·1525	0·6238	G. B. Vose and S. Walker, U. S. Coast S.
3	1862, Jan. to Dec.	75 48·5	0·1523	0·6211	S. Walker, R. H. Talcott and E. Goodfellow, U. S. Coast S.
4	1863, Jan. to Dec.	75 48·3	0·1526	0·6225	E. Goodfellow, U. S. Coast S.
5	1864, Jan. to July.	75 45·8	0·1528	0·6215	E. Goodfellow, A. T. Mosman, H. W. Richardson, U. S. Coast S.
6	1865, July 22–25.	75 44·7	0·1529	0·6211	Prof. H. W. Richardson, U. S. Coast S.
7	1873, Aug. 28–Sept. 4.	75 24·3	0·1551	0·6155	Dr. T. C. Hilgard. At Fort Sullivan.
8	1879, Aug. 27, 28.	75 12·2	0·1570	0·6146	} J. B. Baylor, U. S. Coast & G. S. At Fort Sullivan.
9	1887, Aug. 24, 26.	74 54·2	0·1573	0·6038	
10	1895, Aug. 10, 11.	74 37·6	0·1598	0·6028	

$$\Theta = 76^\circ{\cdot}31 - 0{\cdot}039\ 2\ m + 0{\cdot}000\ 053\ 4\ m^2$$
$$H = 0{\cdot}1502 + 0{\cdot}000\ 183\ m + 0{\cdot}000\ 000\ 6\ m^2$$

Date.	Obs'd Θ. °	Comp'd Θ. °	C—O. °
1860·5	75·88	75·90	+0·02
1861·5	·85	·86	+ ·01
1862·5	·81	·82	+ ·01
1863·5	·80	·79	— ·01
1864·3	·76	·76	·00
1865·6	·74	·71	— ·03
1873·7	·41	·41	·00
1879·6	75·20	75·19	— ·01
1887·6	74·90	74·91	+ ·01
1895·6	74·63	74·63	·00

Date.	Obs'd H. °	Comp'd H. °	C—O. °
1860·5	0·1525	0·1522	—0·0003
1861·5	25	23	— 2
1862·5	23	25	+ 2
1863·5	26	28	+ 2
1864·3	28	29	+ 1
1865·6	29	32	+ 3
1873·7	51	49	— 2
1879·6	70	62	— 8
1887·6	73	79	+ 6
1895·6	0·1598	0·1598	0

COMPUTED DECENNIAL VALUES.

Date.	D. °	Θ. °	H.	F.
1860	+17·79	75·92	0·1521	0·6252
1870	18·32	75·55	41	176
1880	18·71	75·18	62	107
1890	18·92	74·83	0·1584	053
1900	+19·0	74·48	0·1608	0·6010

BANGOR, ME.

$\varphi = 44^\circ\ 48'{\cdot}2$ $\lambda = 68^\circ\ 46'{\cdot}9$ W. of Gr.

[Thomas Hill.]

No.	Date.	D. ° ′	References and remarks.
1	1805—	11 15 W.	} J. Herrick.
2	1837—	13 04 W.	
3	1840—	13 22 W.	N. Barker.
4	1844, June to Oct., incl.	14 29 W.	W. P. Parrott and S. Nott.
5	1857, Oct. 13, 14, 15.	15 19·9 W.	G. W. Dean, U. S. Coast S. On Thomas Hill.
6	1879, Aug. 21.	16 29·3 W.	} J. B. Baylor, U. S. Coast and G. S. On Thomas Hill.
7	1890, Aug. 20, 21.	16 55·6 W.	
8	1895, Aug. 1, 2.	16 57·4 W.	

Secular variations of the magnetic declination, dip and intensity—Continued.

BANGOR, ME.—Continued.

$$D + 13^\circ{\cdot}60 + 3{\cdot}60 \sin (1{\cdot}30\, m + 14^\circ{\cdot}1)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C − O.
	°		°	°
1805·5	+11·25		+11·11	−0·14
1837·5	13·07		13·47	+0·40
1840·5	13·37		13·71	+0·34
1844·6	14·48		14·05	−0·43
1857·8	15·33		15·08	−0·25
1879·6	16·49		16·46	−0·03
1890·6	16·93		16·91	−0·02
1895·6	+16·96		+17·05	+0·09

DIP AND INTENSITY AT BANGOR.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1841, July.	76	11·6	......	......	Maj. J. D. Graham.
2	1857, Oct. 10–16.	76	14·7	0·1490	0·6265	G. W. Dean, S. Harris, H. W. Bache, U. S. Coast S. } On Thomas Hill.
3	1863, July 10.	76	05·3	0·1477	0·6143	C. A. Schott, U. S. Coast S. } On Thomas Hill.
4	1879, Aug. 21.	75	29·8	0·1529	0·6107	J. B. Baylor, U. S. Coast & G. S. } On Thomas Hill.
5	1890, Aug. 20, 21.	75	13·2	0·1540	0·6036	J. B. Baylor, U. S. Coast & G. S.
6	1895, Aug. 1, 2.	74	59·4	0·1558	0·6016	J. B. Baylor, U. S. Coast & G. S.

$$\Theta = 76^\circ{\cdot}23 - 0{\cdot}005\,2\, m - 0{\cdot}000\,497\, m^2$$
$$H = 0{\cdot}147\,2 + 0{\cdot}000\,117\, m + 0{\cdot}000\,001\,5\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C − O.
	°	°	°
1841·5	76·19	76·24	+0·05
1857·8	76·25	76·16	−0·09
1863·5	76·09	76·07	−0·02
1879·6	75·50	75·64	+0·14
1890·6	75·22	75·20	−0·02
1895·6	74·99	74·96	−0·03

Date.	Obs'd H.	Comp'd H.	C − O.
1857·8	0·1490	0·1482	−0·0008
1863·5	477	490	+ 13
1879·6	529	520	− 09
1890·6	540	545	+ 05
1895·6	0·1558	0·1557	−0·0001

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1840	+13·7	76·23	......	......
1850	14·48	76·23	0·1472	0·6184
1860	15·24	76·13	485	195
1870	15·92	75·93	501	174
1880	16·48	75·63	521	129
1890	16·89	75·23	543	0·6053
1900	+17·1	74·73	0·1569	0·5957

Secular variations of the magnetic declination, dip and intensity—Continued.

HALIFAX, NOVA SCOTIA.

$\varphi=44°39'.6 \quad \lambda=63°\ 35'.3$ W. of Gr.

[Naval yard observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1604–1612	15¼ W.	Champlain, at Cape La Have.
2	1620, about	14 W.	R. Dudley's Arcano del Mare. C. & G. S. Rept. for 1888, App. No. 6.
3	1700—	13 W.	Edm. Halley's Tabula Nautica.
		12½ W.	Rough value deduced from contemporaneous ob's. C. & G. S. Bull. No. 6.
4	1750—	12 W.	Reference as above.
5	1756—	12 50 W.	C. Morris.
6	1775—	13 35 W.	Des Barres' sailing directions.
7	1798—	16½ W.	T. Backhouse, plan of Halifax.
8	1818 (?)	17 28 W.	J. Napier's remark book.
9	1821, June to Nov.	17 36 W.	Reference as above.
10	1833—	17½ W.	P. Barlow's isogonic chart.
11	1852, Aug.—1853, Aug.	18 46 W.	J. Hill, remark book.
12	1852–53.	18 51 W.	Capt. Bayfield, R. N.
13	1860, July 22.	19 55 W.	Capt. Orlebar, R. N.
14	1866, Apr. 1, 3.	21 05.6 W.	Halifax Dock Yard.
15	1873, May 15.	21 35 W.	H. M. S. Challenger. At drill ground, Dock Yard.
16	1879, Sept. 8, 10.	20 43.3 W.	J. B. Baylor, U. S. Coast and G. S. Report for 1881.
17	1890—	21 00 W.	Brit. Admy. Chart 311, with note: Mag'c Var'n nearly stationary.

$$D=+16°.18+4.53 \sin(1.0\,m+46°.1)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1608.0	+16.25	½	+17.42	+1.17	1833.0	+17.50		+18.38	+0.88
1620.0	14.00	½	15.70	+1.70	1852.7	18.77		19.59	+0.82
1700.0	12.75	½	11.80	—0.95	1853.2	18.85		19.62	+0.77
1750.0	12.00	½	12.52	+0.52	1860.5	19.92		19.96	+0.04
1756.5	12.83		12.85	+0.02	1866.3	21.09		20.19	—0.90
1775.5	13.58		14.02	+0.44	1873.4	21.58		20.42	—1.16
1798.5	16.50		15.75	—0.75	1879.7	20.72		20.57	—0.15
1818.5	17.47		17.32	—0.15	1890.5	+21.00		+20.70	—0.30
1821.6	+17.60		+17.56	—0.04					

DIP AND INTENSITY AT HALIFAX.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1834, May 27.	75 33	0.1486	0.5966	Sir E. Home. Dock Yard Observatory.
2	1837, June 7.	74 58	0.1547		
3	1838.5.	74 45	......	......	Estcourt. Dock Yard Observatory.
4	1847.5.	75 37 (?)	0.1497	0.6026	G. W. Keely, U. S. Coast S. Dock Yard Observatory.
5	1873, May 13, 15, 16.	74 48.2	0.1561	0.5954	Macleer and Bromley, H. M. S. Challenger. Dock Yard drill ground.
6	1879, Sept. 8–10.	74 39.2	0.1592	0.6014	J. B. Baylor, U. S. Coast and G. S. Dock yard.
7	1881, Nov. 2.	74 29	0.1595	0.5962	Lieut. S. W. Very, U. S. N. Dock yard.

$$\Theta=74°.92-0.007\,7\,m^{*}$$
$$H=0.150\,1+0.000\,033\,m+0.000\,008\,8\,m^2\dagger$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1834.4	75.55	75.04	—0.51
1837.4	74.97	75.02	+0.05
1838.5	74.75	75.01	+0.26
1873.4	74.80	74.76	—0.04
1879.7	74.65	74.69	+0.04
1881.8	74.48	74.67	+0.19

Date.	Obs'd H.	Comp'd H.	C—O.
1835.9	0.1516	0.1514	—0.0002
1847.5	.1497	501	+ 4
1873.4	.1561	557	— 4
1879.7	.1592	0.1588	— 4
1881.8	0.1595	0.1600	+ 5

* An observation in 1896 demands $\Theta=74°.94-0.016\,1\,m$ † An observation in 1896 demands $H=0.151\,8+0.000\,130\,m+0.000\,002\,85\,m^2$

Secular variations of the magnetic declination, dip and intensity—Continued.

HALIFAX, NOVA SCOTIA—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+18·2	75·07	0·1529	0·5934
1840	18·9	75·00	06	819
1850	19·4	74·92	01	769
1860	19·9	74·84	13	785
1870	20·3	74·77	43	0·5873
1880	20·6	74·69	0·1590	0·6025
1890	20·7			
1900	+20·7			

BURLINGTON, VT.

$\varphi=44^\circ\ 28'\cdot 7 \qquad \lambda=73^\circ\ 12'\cdot 0$ W. of Gr.

[Burlington University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1793—	7 38 W.	Dr. Williams.
2	1805—	6 12 W.	J. Johnson.
3	1818—	7 30 W.	J. Johnson.
4	1822—	7 42 W.	J. Johnson.
5	1826—	7 36 W.	Prof. G. W. Benedict.
6	1830—	8 10 W.	J. Johnson.
7	1831—	8 15 W.	J. Johnson.
8	1832—	8 25 W.	J. Johnson.
9	1834—	8 50 W.	J. Johnson.
	1837—	9 45 W.	Prof. G. W. Benedict. Not used.
10	1840—	9 42 W.	J. Johnson.
11	1845, June 26.	9 22 W.	Dr. J. Locke.
12	1855, Aug. 28.	9 57·1 W.	C. A. Schott, U. S. Coast S. At encampment flagstaff near the lake shore.
13	1870, Nov. 12.	10 57 W.	G. A. Marr.
14	1873, Oct. 14, 15.	11 19·0 W.	Dr. T. C. Hilgard. At University station.
15	1890, Sept. 26, 27.	12 01·9 W.	J. B. Baylor, U. S. Coast and G. S. At University station.

$$D=+9^\circ\cdot 99+2\cdot 87\ \sin\ (1\cdot 40\ m-8^\circ\cdot 3)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.	Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°		°		°	°
1793·5	+7·63		+7·12	—0·51	1834·5	+ 8·83		+8·55	—0·28
1805·5	6·20	¼	7·28	+1·08	1840·5	9·70		8·94	—0·76
1818·5	7·50		7·72	+0·22	1845·5	9·37		9·27	—0·10
1822·5	7·70		7·90	+0·20	1855·7	9·95		9·98	+0·03
1826·5	7·60		8·10	+0·50	1870·9	10·95		11·02	+0·07
1830·5	8·17		8·32	+0·15	1873·8	11·32		11·20	—0·12
1831·5	8·25		8·38	+0·13	1890·7	+12·02	1½	+12·15	+0·13
1832·5	+8·42		+8·44	+0·02					

DIP AND INTENSITY AT BURLINGTON.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1845, June 26.	75 37·0	0·1564	0·6296	Dr. J. Locke.
2	1855, Aug. 28.	75 56·8	0·1579	0·6502	C. A. Schott, U. S. Coast S. At flagstaff north of city.
3	1873, Oct. 13, 14, 15.	75 24·2	0·1580	0·6271	Dr. T. C. Hilgard. Grounds of University.
4	1890, Sept. 26, 27, 28.	74 53·5	0·1604	0·6154	J. B. Baylor, U. S. Coast and G. S. Grounds of University.

Secular variations of the magnetic declination, dip and intensity—Continued.

BURLINGTON, VT.—Continued.

DIP AND INTENSITY AT BURLINGTON—Continued.

$$\Theta = 75^\circ \cdot 78 - 0 \cdot 019\ 1\ m$$
$$H = 0 \cdot 156\ 9 + 0 \cdot 000\ 078\ m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1845·5	75·62	75·87	+0·25
1855·7	75·95	75·67	—0·28
1873·8	75·40	75·33	—0·07
1890·7	74·89	75·00	+0·11

Date.	Obs'd H.	Comp'd H.	C—O.
1845·5	0·1564	0·1566	+0·0002
1855·7	0·1579	1573	— 6
1873·8	0·1580	1587	+ 7
1890·7	0·1604	0·1601	—0·0003

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1840	+ 8·90	75·97	0·1562	0·6443
1850	9·58	75·78	69	387
1860	10·27	75·59	77	336
1870	10·96	75·40	85	288
1880	11·58	75·21	0·1592	235
1890	12·11	75·02	0·1600	190
1900	+12·5	74·82	0·1608	0·6141

HANOVER, N. H.

$\varphi = 43^\circ\ 42'\cdot 3$ $\lambda = 72^\circ\ 17'\cdot 1$ W. of Gr.

[Dartmouth College Observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1765—	7 W.	Pres. Wheelock.
2	1810—	4 15 W.	" "
3	1839—	9 15 W.	Prof. C. A. Young.
4	1855, Sept. 18.	10 27 W.	J. M. Clark.
5	1873, Oct. 4–11.	10 49·6 W.	Dr. T. C. Hilgard. Near observatory.
6	1876, Aug. 3, 5.	11 05·3 W.	F. E. Hilgard. At White River Junction.
7	1879, Oct. 6.	10 50·5 W.	J. B. Baylor, U. S. Coast and G. S. Near observatory.
	1879, Oct. 7.	11 38·4 W.	" " " " " " " " " ¾ mile west of observatory.
8	1890, Sept. 20, 22, 23.	11 57·2 W.	" " " " " " " " " " " " "

$$D = +9^\circ \cdot 38 + 3 \cdot 75 \sin (1 \cdot 4\ m - 5^\circ \cdot 9)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1765·5	+ 7·00		+ 6·28	—0·72
1810·5	4·25		6·09	+1·84
1839·5	9·25		8·06	—1·19
1855·7	10·45		9·52	—0·93
1873·7	10·83		11·10	+0·27
1876·6	11·09		11·33	+0·24
1879·8	11·64		11·57	—0·07
1890·7	+11·95	1½	+12·30	+0·35

Secular variations of the magnetic declination, dip and intensity—Continued.

HANOVER, N. H.—Continued.

DIP AND INTENSITY AT HANOVER.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1873, Oct. 4–10.	75 21·1	0·1593	0·6299	Dr. T. C. Hilgard. Near observatory.
2	1879, Oct. 6.	74 55·8	0·1604	0·6168	J. B. Baylor, U. S. Coast and G. S. Near observatory.
	1879, Oct. 7.	75 02·7	0·1601	0·6205	J. B. Baylor, U. S. Coast and G. S. ¾ mile west of observatory.
3	1890, Sept. 20, 21, 22.	74 43·4	0·1608	0·6104	J. B. Baylor, U. S. Coast and G. S. ¾ mile west of observatory.

PORTLAND, ME.

$\varphi = 43° \ 38'·8 \qquad \lambda = 70° \ 16'·6$ W. of Gr.

[Bramhall Hill.]

No.	Date.	D.	References and remarks.
		° ′	
	1604–1612.	19 12 W.	Champlain, at the mouth of the Kennebec River. Not used.
	1620, about.	12½ W.	R. Dudley's Arcano del Mare.
1	1700—	12·4 W.	Edm. Halley's Tabula Nautica.
		11·8 W.	C. and G. S. Rept. for 1888, p. 306. Value deduced from obs'ns at 19 stations.
2	1750—	9·2 W.	C. and G. S. Rept. for 1888, p. 308. Value deduced from obs'ns at 17 stations.
3	1763—	7 45 W.	Prof. J. Winthrop at Falmouth.
4	1775—	8 30 W.	Des Barres' Atlantic Neptune.
5	1833—	10 W.	P. Barlow's isogonic chart.
6	1845, June 4.	11 28·3 W.	Dr. J. Locke.
7	1851, Aug. 18, 20.	11 41·1 W.	J. E. Hilgard, U. S. Coast Survey. At Bramhall Hill.
8	1859, July 15.	12 20 W.	C. A. Schott, U. S. Coast S. At Bramhall Hill.
	1863, July 6.	12 18·1 W.	C. A. Schott, U. S. Coast S. At Munjoy Observatory. Not used.
9	1863, July 15.	12 28·2 W.	C. A. Schott, U. S. Coast S. At Bramhall Hill.
10	1864, Aug. to Dec.	12 43·7 W.	Prof. H. W. Richardson, U. S. Coast S. At Bramhall Hill.
11	1865, Jan. to Dec.	12 42·3 W.	Prof. H. W. Richardson, U. S. Coast S. At Bramhall Hill.
12	1866, Jan. to Mar., incl.	12 42·9 W.	Prof. H. W. Richardson, U. S. Coast S. At Bramhall Hill.
13	1873, Sept. 8, 9, 11.	12 43·6 W.	Dr. T. C. Hilgard. At Munjoy Observatory. Red'n to B. Hill + 10′.
14	1887, Oct. 14, 15.	13 51·0 W.	J. B. Baylor U. S. Coast and G. S. At Bramhall Hill.
15	1895, July 26, 27.	14 16·2 W.	" " " " " " " " " " " "

$$D = +11°·40 + 3·28 \sin(1·30\, m + 2°·7)$$

Date.	Obs'd D.	p.	Comp'd D.	C − O.	Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°		°		°	°
1700·0	+12·10		+12·16	+0·06	1863·5	+12·47		+12·59	+0·12
1750·0	9·20		8·85	−0·35	1864·8	12·73		12·70	−0·03
1763·5	7·75		8·37	+0·62	1865·5	12·71		12·74	+0·03
1775·5	8·50		8·19	−0·31	1866·1	12·72		13·77	+0·05
1833·0	10·00		10·31	+0·31	1873·7	12·89		13·27	+0·38
1845·4	11·47		11·27	−0·20	1887·8	13·85		14·04	+0·19
1851·6	11·69		11·74	+0·05	1895·6	+14·27		+14·30	+0·03
1859·5	+12·33		+12·31	−0·02					

Secular variations of the magnetic declination, dip and intensity—Continued.

PORTLAND, ME.—Continued.

DIP AND INTENSITY AT PORTLAND.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1845, June 2.	75	13·7	0·1580	0·6197	Dr. J. Locke.
2	1851, Aug. 15, 20.	75	14·1	0·1591	0·6242	J. E. Hilgard, U. S. Coast S. On Bramhall Hill.
3	1859, July 15.	74	56·7	0·1593	0·6137	C. A. Schott, U. S. Coast S. On Bramhall Hill.
4	1863, July 6.	75	04·6	0·1577	0·6123	" " " " " " " " Munjoy "
	1863, July 15.	75	05·9	0·1583	0·6156	" " " " " " " "
5	1864, Aug. to Dec.	75	09·5	0·1593	0·6220	Prof. H. W. Richardson. At Bramhall Hill Magnetic Observatory.
6	1865, Jan. to Dec.	75	08·3	0·1595	0·6219	" " " "
7	1866, Jan. to Mar.	75	07·4	0·1593	0·6210	" " " "
8	1873, Sept. 8, 11.	74	57·9	0·1601	0·6171	Dr. T. C. Hilgard. On Munjoy Hill.
9	1887, Oct. 14, 15.	74	30·0	0·1628	0·6095	J. B. Baylor, U. S. Coast and G. S. On Bramhall Hill.
10	1895, July 26, 27.	74	04·6	0·1664	0·6065	J. B. Baylor, U. S. Coast and G. S. On Bramhall Hill.

$$\Theta = 75^\circ{\cdot}21 + 0{\cdot}001\ 1\ m - 0{\cdot}000\ 548\ m^2$$
$$H = 0{\cdot}158\ 5 - 0{\cdot}000\ 017\ m + 0{\cdot}000\ 004\ 0\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1845·4	75·23	75·20	—0·03
1851·6	75·24	·21	— ·03
1859·5	74·95	·17	+ ·22
1863·5	75·09	·12	+ ·03
1864·8	75·16	·11	— ·05
1865·5	75·14	·09	— ·05
1866·1	75·12	75·09	— ·03
1873·7	74·96	74·93	— ·03
1887·8	74·50	74·47	— ·03
1895·6	74·08	74·12	+ 0·04

Date.	Obs'd H.	Comp'd H.	C—O.
1845·4	0·1580	0·1586	+0·0006
1851·6	·1591	585	— 06
1859·5	·1593	587	— 06
1863·5	·1580	590	+ 10
1864·8	·1593	591	— 02
1865·5	·1595	592	— 03
1866·1	·1593	·1592	— 01
1873·7	·1601	·1603	+ 02
1887·8	·1628	·1635	+ 07
1895·6	0·1664	0·1659	—0·0005

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1840	+10·82	75·15	0·1591	0·6208
1850	11·56	75·21	·1585	209
1860	12·29	75·17	·1587	200
1870	12·97	75·01	·1597	176
1880	13·58	74·75	·1616	144
1890	14·08	74·38	·1642	098
1900	+14·4	73·90	0·1675	0·6040

RUTLAND, VT.

$\varphi = 43^\circ\ 36'{\cdot}2 \qquad \lambda = 72^\circ\ 55'{\cdot}0$ W. of Gr.

[City Park.]

No.	Date.	D.	References and remarks.
		° ′	
1	1789, Apr.	7 03 W.	Dr. Williams.
2	1810, May.	6 04 W.	
3	1811, Sept.	6 01 W.	
4	1859, July 21.	9 49 W.	C. A. Schott, U. S. Coast S. Near post-office.
5	1873, Oct. 17, 18.	10 40·2 W.	Dr. T. C. Hilgard. Near post-office.
6	1879, Oct. 14, 15.	11 09·0 W.	J. B. Baylor, U. S. Coast & G. S. Near post-office.
7	1890, Oct. 1, 2.	11 32·6 W.	J. B. Baylor, U. S. Coast & G. S. In city park.

Secular variations of the magnetic declination, dip and intensity—Continued.

RUTLAND, VT.—Continued.

$$D = +9^\circ{\cdot}80 + 3{\cdot}44 \sin (1{\cdot}42\, m - 21^\circ{\cdot}3).$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1789·3	+ 7·05		+6·52	—0·53
1810·4	6·07		6·44	+0·37
1811·7	6·02		6·47	+0·45
1859·6	9·82		9·34	—0·48
1873·8	10·67		10·54	—0·13
1879·8	11·15		11·03	—0·12
1890·7	+11·54	1½	+11·85	+0·31

DIP AND INTENSITY AT RUTLAND.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1859, July 21.	75	19·8	0·1597	0·6308	C. A. Schott, U. S. Coast S. Near post-office.
2	1873, Oct. 16, 17, 18.	75	05·1	0·1610	0·6257	Dr. T. C. Hilgard. Near post-office.
3	1879, Oct. 14, 15.	74	49·5	0·1637	0·6253	J. B. Baylor, U. S. Coast & G. S. Near post-office.
4	1890, Oct. 1, 2.	74	21·5	0·1638	0·6076	J. B. Baylor, U. Coast & G. S. In city park.

$$\Theta = 75^\circ{\cdot}70 - 0{\cdot}031\,0\, m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1859·5	75·33	75·41	+0·08
1873·8	75·08	74·96	—0·12
1879·8	74·82	74·78	—0·04
1890·7	74·36	74·44	+0·08

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	+ 8·55	75·70
1860	9·38	75·39
1870	10·22	75·08
1880	11·05	74·77
1890	11·80	74·46
1900	+12·4	74·15

PORTSMOUTH, N. H.

$\varphi = 43^\circ\ 04'{\cdot}3$ $\lambda = 70^\circ\ 42'{\cdot}5$ W. of Gr.

[Newcastle Light-House.]

No.	Date.	D.			References and remarks.
		°	′		
1	1771—	7	46	W.	Holland.
2	1775—	7	45	W.	Des Barres' Atlantic Neptune.
3	1833—	8	45	W.	P. Barlow's isogonic chart.
4	1844-45.	9	47	W.	Maj. J. D. Graham, U. S. E. At Boiling Rock.
5	1850, Aug. 28, Sept. 2.	10	30·2	W.	J. E. Hilgard, U. S. Coast S. At Kittery Point, Me.
6	1859, July 14.	11	15·0	W.	C. A. Schott, " " " " " " " "
7	1879, Aug. 13, 14.	12	31·3	W.	J. B. Baylor, U. S. Coast & G. S. At Kittery Point, Me.
8	1890, Aug. 28, 29.	12	44·3	W.	" " " " " " " " " " " " " "

Secular variations of the magnetic declination, dip and intensity—Continued.

PORTSMOUTH, N. H.—Continued.

$$D = +10^{\circ}.55 + 3.08 \sin(1.4\,m - 5^{\circ}.1)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1771.5	+ 7.77		+ 7.76	—0.01
1775.5	7.75		7.65	—0.10
1833.0	8.75		9.06	+0.31
1845.0	9.78		9.90	+0.12
1850.7	10.50		10.33	—0.17
1859.5	11.25		10.99	—0.26
1879.6	12.52		12.37	—0.15
1890.7	+12.74		+12.97	+0.23

DIP AND INTENSITY AT PORTSMOUTH.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1850, Aug. 29, Sept. 4.	74 57.2	0.1614	0.6216	J. E. Hilgard, U. S. Coast S. At Kittery Point, Me.
2	1859, July 14.	75 04.2	0.1612	0.6257	C. A. Schott, U. S. Coast S. At Kittery Point, Me.
3	1879, Aug. 13, 14.	74 26.2	0.1654	0.6166	J. B. Baylor, U. S. Coast & G. S. At Kittery Point, Me.
4	1890, Aug. 28, 29.	74 04.5	0.1657	0.6040	J. B. Baylor, U. S. Coast & G. S. At Kittery Point, Me.

$$\Theta = 75^{\circ}.12 - 0.024\,o\,m.$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1850.7	74.95	75.10	+0.15
1859.5	75.07	74.89	—0.18
1879.6	74.44	74.41	—0.03
1890.6	74.08	74.15	+0.07

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	+10.28	75.12
1860	11.03	74.88
1870	11.75	74.64
1880	12.40	74.40
1890	12.94	74.16
1900	+13.3	73.92

CHESTERFIELD, N. H.

$\varphi = 42^{\circ}\ 53'.5$ $\lambda = 72^{\circ}\ 24'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1813.0	6 25 W.	Nathan Wilde. The original series has been changed from annual to biennial values by taking means of consecutive years.
2	1815.0	6 12 W.	
3	1817.0	6 03 W.	
4	1819.0	6 02 W.	
5	1821.0	6 04 W.	
6	1823.0	6 21 W.	
7	1825.0	6 37 W.	
8	1827.0	6 40 W.	
9	1829.0	6 56 W.	
10	1831.0	7 08 W.	
11	1833.0	7 22 W.	
12	1835.0	7 37 W.	
13	1837.0	7 55 W.	A. C. Twining.
14	1874, Oct. 4.	10 26.6 W.	Dr. T. C. Hilgard. One mile east of Factory Village.
15	1890, Sept. 14, 16.	11 12.7 W.	J. B. Baylor, U. S. Coast & G. S. One mile east of Factory Village (1874 station).

Secular variations of the magnetic declination, dip and intensity—Continued.

CHESTERFIELD, N. H.—Continued.

$$D = +8^\circ\!\cdot\!67 + 3\cdot22 \sin\,(1\cdot45\, m - 1^\circ\!\cdot\!9) + 0\cdot21 \sin\,(9\, m + 168^\circ)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1813·0	+6·42		+5·96	—0·46	1829·0	+ 6·93		+ 6·87	—0·06
1815·0	6·20		5·99	—0·21	1831·0	7·13		7·07	—0·06
1817·0	6·05		6·05	0·00	1833·0	7·37		7·29	—0·08
1819·0	6·03		6·12	+0·09	1835·0	7·62		7·50	—0·12
1821·0	6·07		6·22	+0·15	1837·0	7·92		7·69	—0·23
1823·0	6·35		6·35	0·00	1874·7	10·45		10·57	+ 0·12
1825·0	6·62		6·51	—0·11	1890·7	+11·22		+11·39	+ 0·17
1827·0	+6·67		+6·68	+0·01					

DIP AND INTENSITY AT CHESTERFIELD.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1874, Oct. 4.	74 24·7	0·1659	0·6175	Dr. T. C. Hilgard. One mile east of Factory Village.
2	1890, Sept. 14, 16.	73 54·7	0·1677	0·6051	J. B. Baylor, U. S. Coast & G. S. One mile east of Factory Village.

NEWBURYPORT, MASS.

$\varphi = 42^\circ\ 48'\!\cdot\!9 \qquad \lambda = 70^\circ\ 49'\!\cdot\!2$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	8 14 W.	C. & G. S. Rept. for 1888, p. 306, deduced from obs'ns at 17 stations.
2	1775—	6 45 W.	Des Barres' Atlantic Neptune.
3	1781—	7 18 W.	Dr. Williams.
4	1833—	8½	P. Barlow's isogonic chart.
5	1850, Sept. 18, 19, 20.	10 06 W.	J. E. Hilgard, U. S. Coast S. On Plum Island.
6	1859, July 13.	10 58 W.	C. A. Schott, " " " " " " "
7	1887, Oct. 19, 20.	12 12 W.	J. B. Baylor, U. S. Coast & G. S. " " "

$$D = +10^\circ\!\cdot\!07 + 3\cdot02 \sin\,(1\cdot35\, m - 1^\circ\!\cdot\!0)$$

Date.	Obs'd D.	p.	Comp'd.	C—O.
	°		°	°
1750·0	+ 8·23	½	+ 7·97	—0·26
1775·5	6·75		7·11	+0·36
1781·5	7·30		7·06	—0·24
1833·0	8·50	½	8·84	+0·34
1850·7	10·09		10·07	—0·02
1859·5	10·97		10·69	—0·28
1887·8	+12·20		+12·38	+0·18

DIP AND INTENSITY AT NEWBURYPORT.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1850, Sept. 18, 19.	74 54·9	0·1628	0·6254	J. E. Hilgard, U. S. Coast S. On Plum Island.
2	1859, July 13.	74 52·9	0·1627	0·6238	C. A. Schott, " " " " " "
3	1887, Oct. 19, 20.	74 01·1	0·1662	0·6038	J. B. Baylor, " " "& G. S." " "

-COPY*

THE AMERICAN

SCENIC and HISTORIC PRESERVATION SOCIETY.

Tribune Building

New York City

March 3rd, 1910.

Hon. O. H. Tittmann,

Superintendent, C. & G. Survey,

Washington, D. C.

Dear Sir:

Referring to our recent correspondence in regard to the secular variation of the magnetic declination in the vicinity of New York, it occurs to me that perhaps I can in a very small measure, reciprocate your courtesy in sending me the two Government publications, by calling your attention to an error which may have some bearing on the future deductions of your expert on the subject of the magnetic declination in the vicinity of New York. In the table on page 207 of the Report for 1905, Part 2, Appendix No. 1, it is stated: "H. Hudson, on his third voyage found 8 degrees west on the Jersey shore a little below the mouth of the Hudson River. Probable error plus or minus 2° estimated." The date opposite this reference is "1609, Sept." The date should be "Sept 2." Referring now to page 191 of the same publication under the heading "Albany", N. Y." is the following entry: "1609, Sept. 13, 13° West. Robert Juet, sailing master of Hendrick Hudson's ship the "Half Moon" on tide water of Upper Hudson. Communicated by Verplanck Colvin 1893." Mr. Colvin is in error in locating this observation on the upper Hudson. Hudson was in New York harbor, according to the unanimous interpretation of Juet's Journal, until and including September 11th. On September 12th he entered the Hudson River proper and anchored somewhere opposite the present City of New York. On the 13th, the date of the observation, quoted by Mr. Colvin, he was still opposite the upper part of New York City or that vicinity, because his Journal of the 14th shows that he was obliged to proceed 12 leagues farther before he came to the narrow passage between Stony Point and Ver Planck's Point. So far as present investigation goes, therefore, the observation showing a magnetic declination of 13° was made near the northern boundary of New York City.

As on page 207, your expert intimates a probable error of 2° when Hudson's observation showed a declination of 8°, and as he doesn't intimate any error in connection with the observation of the 13th showing 13° variation, it may be that he would like to consider these figures further in a future publication.

Yours very truly,

(signed) Edward Hagaman Hall,

Secretary.

S/RF.

Secular variations of the magnetic declination, dip and intensity—Continued.

WILLIAMSTOWN, MASS.

$\varphi = 42° \ 42'.8$ $\lambda = 73° \ 13'.4$ W. of Gr.

[Astronomic observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	7 32 W.	C. & G. Survey Bulletin, No. 6.
2	1786—	5 52 W.	Dr. Williams.
3	1833—	6 15 W.	Prof. A. Hopkins.
4	1837—	7 45 W.	" " "
5	1876, July 28, 29.	10 31 W.	F. E. Hilgard. At North Adams.
6	1886, Aug. 22.	10 21 W.	A. Walker and Prof. T. H. Safford. Williams College Meridian.

$$D = +8°.84 + 3.13 \sin (1.4\, m - 14°.0)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1750.0	+ 7.53		+ 7.47	—0.06
1786.5	5.87		5.79	—0.08
1833.0	6.25		6.95	+0.70
1837.5	7.75		7.21	—0.54
1876.6	10.52		10.07	—0.45
1886.6	+10.35		+10.73	+0.38

DIP AND INTENSITY AT WILLIAMSTOWN, MASS.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1876, July 28, 29.	74 15.3	0.1710	0.6302	F. E. Hilgard. At North Adams.

ALBANY, N. Y.

$\varphi = 42° \ 39'.2$ $\lambda = 73° \ 45'.8$ W. of Gr.

[State capitol.]

No.	Date.	D.	References and remarks.
		° ′	
	1580—	10½ W.	De Isogonen in the XVI en XVII Eeuw., proefschrift door W. Van Bemelen, Utrecht, 1893. Not used.
1	1609, Sept. 13.	13 W.	Robert Juet, sailing master of Hendrick Hudson's ship, the Half Moon, on tide water of upper Hudson. Communicated by Verplanck Colvin, 1893.
	1610—	12 W.	De Isogonen, etc., W. Van Bemelen, 1893. Not used.
2	1625 about	12.2 W.	R. Dudley's Arcano del Mare. App. No. 6, C. & G. S. Rep. for 1888.
	1640—	11 W.	W. Van Bemelen's isogonic charts. Not used.
	1665—	12 W.	
	1680—	12 W.	
3	1686—	9 09 W.	Van Rensselaer's patent.
	1686—	10 33 W.	From a parchment map in City Engineer's Office, bearing date of Jan., 1773, and referring to the charter of the city. Communicated by Horace Andrews, city engineer, 1891. Weighted mean used in the discussion.
4	1712—	9 14 W.	Reference as for No. 3. (Horace Andrews, 1891.)
5	1735—	7 40 W.	From notes by J. R. Bleeker, surveyor. Communicated by Verplanck Colvin, 1893.
6	1764—	6 46 W.	From a parchment map in City Engineer's Office, bearing date of Nov. 29, 1800, and referring to boundary lines of the city. Signed by Simeon De Witt and John E. Van Alen. Communicated by H. Andrews, 1891.

Secular variations of the magnetic declination, dip and intensity—Continued.

ALBANY, N. Y.—Continued.

No.	Date.	D.	References and remarks.
		° ′	
7	1766—	6 24 W.	From a parchment map in City Engineer's Office, bearing date of Jan., 1773. Signed by J. Van Rensselaer. Communicated by H. Andrews, 1891.
8	1768—	6 39 W.	From notes by J. R. Bleeker, surveyor.
9	1787—	5 03 W.	Records of Livingstone Manor; referred to Albany, 5° 34′.
10	1789—	5 27 W.	New York Documentary History. Communicated by Verplanck Colvin, Jan. 23, 1893.
11	1798, Apr. (?).	5 00 W.	Note from Prof. Joseph Henry, deduced from obser's of 1825.
12	1805, July 30.	4 58 W.	Simeon De Witt, Surveyor-General.
13	1807, Sept. 4.	5 43 W.	" " " " "
14	1817, Oct. 4.	5 44 W.	
15	1818, Aug. 1.	5 45 W.	" " " " "
16	1825, Apr. 24.	6 00 W.	
	1828, Sept.	6 14 W.	
17	1828, Sept. 20.	6 16 W.	
	1828, Sept. 22.	6 18 W.	
18	1830, June.	6 18 W.	Geological Report, State of New York.
	1831, May 5.	6 25 W.	
19	1831, May.	6 32 W.	
	1831, Nov. 5.	6 40 W.	Regent's Report.
20	1833, Nov.	6 40 W.	" " Communicated by Verplanck Colvin, 1893.
21	1834, Oct. 1.	6 40 W.	
22	1836, Oct. 29.	6 47 W.	" "
23	1847, Nov.	7 35 W.	
24	1855, Aug. 31.	7 54·7 W.	C. A. Schott, U. S. Coast Survey. At Greenbush, opposite Albany.
25	1856, Sept 1.	8 39·2 W.	K. Friesach; corrected for diurnal variation 8° 35′.
26	1858, May 12, 13, 14.	8 17·0 W.	G. W. Dean, U. S. Coast S. At Dudley Observatory. (Old location.)
27	1874, July 25.	9 09 W.	Verplanck Colvin. At his residence in $\varphi=42°\ 39'\cdot7$, $\lambda=73°\ 46'\cdot6$.
28	1879, Oct. 21, 24.	9 51·7 W.	J. B. Baylor, U. S. Coast & G. S. At Dudley Observatory station of 1858.
29	1880, Apr. 10.	10 14 W.	
30	1881, Apr. 30.	10 20 W.	
31	1882, Apr.	10 12 W.	
32	1883, June.	10 17 W.	
33	1884, June 3.	10 24 W.	Verplanck Colvin. At his residence between Western avenue and State street; position as above (1874). The station is marked by a brownstone monument. Communicated Jan. 23, 1893.
34	1885, May 22.	10 13 W.	
35	1886, June 5.	10 16 W.	
36	1887, June 28.	10 21 W.	
37	1888, Apr. 25.	10 24 W.	
38	1889, May.	10 23 W.	
39	1890, July 19.	10 22 W.	
	1890, Oct. 7, 8.	10 10·1 W.	J. B. Baylor, U. S. Coast & G. S. Dudley Observatory station as in 1879 and 1858. Mean value used.
40	1891, Feb. 3.	10 30 W.	Verplanck Colvin, at his residence, as before.
41	1892, Nov. 22.	10 37 W.	

Secular variations of the magnetic declination, dip and intensity—Continued.

ALBANY, N. Y.—Continued.

$$D = +8^{\circ}{\cdot}76 + 3{\cdot}33 \sin (1{\cdot}25\, m - 18^{\circ}{\cdot}0)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.	Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°		°		°	°
1609·7	+13·00	¼	+10·97	—2·03	1836·8	+6·78		+6·87	+0·09
1625·0	12·20		11·73	—0·47	1847·9	7·58		7·59	+0·01
1686·5	10·08		11·00	+0·92	1855·7	7·91		8·13	+0·22
1712·5	9·23		9·33	+0·10	1856·7	8·58		8·20	—0·38
1735·5	7·67		7·68	+0·01	1858·4	8·28		8·32	+0·04
1764·5	6·77		6·03	—0·74	1874·6	9·14		9·50	+0·36
1766·5	6·40		5·95	—0·45	1879·6	9·86		9·85	—0·01
1768·5	6·65		5·87	—0·78	1880·3	10·23		9·89	—0·34
1787·5	5·57		5·45	—0·12	1881·3	10·33		9·96	—0·37
1789·5	5·45		5·44	—0·01	1882·3	10·20		10·03	—0·17
1798·3	5·00		5·46	+0·46	1883·5	10·28		10·11	—0·17
1805·6	4·97		5·57	+0·60	1884·4	10·40		10·17	—0·23
1807·7	5·72		5·61	—0·11	1885·4	10·21		10·23	+0·02
1817·8	5·73		5·93	+0·20	1886·4	10·27		10·30	+0·03
1818·6	5·75		5·96	+0·21	1887·5	10·36		10·37	+0·01
1825·3	6·00		6·25	+0·25	1888·3	10·41		10·42	+0·01
1828·6	6·27		6·41	+0·14	1889·4	10·38		10·48	+0·10
1830·5	6·30		6·52	+0·22	1890·7	10·27		10·57	+0·30
1831·6	6·54		6·58	+0·04	1891·1	10·50		10·59	+0·09
1833·9	6·67		6·71	+0·04	1892·9	+10·62		+10·70	+0·08
1834·8	+6·67		+6·76	+0·09	(*)				

The diagram on Plate A shows the observed and computed declinations, the latter by the S-shaped curve; apparently the horizontal needle has moved through a complete cycle of about two hundred and eighty-eight years.

DIP AND INTENSITY AT ALBANY.

No.	Date.	Θ	H.	F.	References.
		° ′			
1	1833, Apr.	74 51·1	......	......	Prof. J. Henry and Capt. T. J. Cram.
2	1834, Aug.	74 40·1	......	......	Dr. A. D. Bache.
3	1835—	....	0·1650	0·6238	" " " " and Prof. E. H. Courtenay.
4	1839, Sept.	74 51·3	......	......	Prof. E. Loomis.
5	1841, Aug.	74 39·9	......	......	Prof. J. N. Nicollet.
	1841—	74 40·1	......	......	Dr. A. D. Bache.
6	1842, Oct. 21.	74 44·6	0·1651	0·6275	Sir J. H. Lefroy.
7	1844, June 14.	74 40·2	0·1652	0·6248	Dr. J. Locke. At Albany.
	1844, June 14.	74 43·1	0·1650	0·6261	" " " At Greenbush.
8	1855, Aug. 31.	75 11·1	0·1654	0·6469	C. A. Schott, U. S. Coast S. At Greenbush.
9	1856, Sept.	74 56	0·1678 (?) 48	0·6455	K. Friesach.
10	1858, May 13–19.	74 55·6	0·1653	0·6357	G. W. Dean, U. S. Coast S. At Dudley Observatory.
11	1879, Oct. 21–24.	74 18·9	0·1681	0·6217	J. B. Baylor, U. S. Coast & G. S. At Dudley Observatory.
12	1890, Oct. 7, 8, 9.	74 01·0	0·1677	0·6091	J. B. Baylor, U. S. Coast & G. S. At Dudley Observatory.

* An observation in 1896 makes C — O = zero.

Secular variations of the magnetic declination, dip and intensity—Continued.

ALBANY, N. Y.—Continued.

DIP AND INTENSITY AT ALBANY—Continued.

$$\Theta = 74°\cdot91 + 0\cdot003\,7\,m - 0\cdot000\,653\,m^2$$
$$H = 0\cdot165\,2 + 0\cdot000\,033\,m + 0\cdot000\,001\,0\,m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	°
1833·3	74·85	74·67	—0·18
1834·6	74·67	74·70	+0·03
1839·7	74·86	74·80	—0·06
1841·5	74·67	74·83	+0·16
1842·8	74·74	74·85	+0·11
1844·4	74·69	74·87	+0·18
1855·7	75·18	74·91	—0·27
1856·7	74·93	74·91	—0·02
1858·4	74·93	74·90	—0·03
1879·8	74·32	74·44	+0·12
1890·8	74·02	73·98	—0·04

Date.	Obs'd H.	Comp'd H.	C — O.
1835·5	0·1650	0·1649	—0·0001
1842·8	50	50	00
1844·4	51	50	— 01
1855·7	54	54	00
1856·7	48	54	+ 06
1858·4	53	55	+ 02
1879·8	81	71	— 10
1890·8	0·1677	0·1683	+0·0006

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+ 6·49	74·57	0·1650	0·6201
1840	7·07	74·81	50	297
1850	7·73	74·91	52	345
1860	8·44	74·88	56	349
1870	9·17	74·72	62	306
1880	9·87	74·43	71	226
1890	10·52	74·01	82	0·6106
1900	+11·1	73·46	0·1695	0·5954

SALEM, MASS.

$\varphi = 42°\ 31'\cdot9 \qquad \lambda = 70°\ 52'\cdot5$ W. of Gr.

[Fort Lee.]

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	7 53 W.	U. S. Coast & G. S. Bulletin No. 6.
2	1781, Aug.	7 02 W.	Pres. Willard. At Beverly, reduction to Salem — 8′.
3	1805, Nov.	5 57 W.	Dr. N. Bowditch. At Salem.
4	1808, June.	5 20 W.	" " " Near Salem.
5	1810, Apr.	5 31 W.	" " " " " Mean 5° 57′ W.
	1810, Apr., to 1811, May.	6 23 W.	
6	1833—	8½ W.	P. Barlow's isogonic chart.
7	1849, Aug. 20.	10 14·5 W.	Prof. G. W. Keely. At Fort Lee.
8	1855, Aug. 25.	10 49·7 W.	C. A. Schott, U. S. Coast S. At Fort Lee.
9	1877·5.	11½ W.	I. K. Harris.
10	1887, Oct. 22, 23.	12 38·1 W.	J. B. Baylor, U. S. Coast & G. S. At Fort Lee.

Secular variations of the magnetic declination, dip and intensity—Continued.

SALEM, MASS.—Continued.

$D = +9^\circ.98 + 3.85 \sin (1.4\, m - 5^\circ.1)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1750.0	+ 7.89	½	+ 7.78	—0.11
1781.6	6.90		6.20	—0.70
1805.8	5.95		6.44	+0.49
1808.5	5.33	¼	6.54	+1.21
1810.8	5.95		6.65	+0.70
1833.0	8.50	½	8.12	—0.38
1849.6	10.23		9.60	—0.63
1855.6	10.83		10.16	—0.67
1877.5	11.50		12.10	+0.60
1887.8	+12.63		+12.83	+0.20

DIP AND INTENSITY AT SALEM.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1849, Aug. 18.	....	0.1608	......	Prof. G. W. Keely. At Fort Lee.
2	1855, Aug. 25.	75 36.9	0.1609	0.6474	C. A. Schott, U. S. Coast S. At Fort Lee.
3	1887, Oct. 22, 23.	74 24.8	0.1631	0.6070	J. B. Baylor, U. S. Coast & G. S. At Fort Lee.

OXFORD, N. Y.

$\varphi = 42^\circ\ 26'.5 \qquad \lambda = 75^\circ\ 40'.5$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1792–1895.	3 W.	E. B. McCall.
2	1817—	3 W.	E. B. McCall.
3	1828, July 7.	4½ W.	E. B. McCall.
4	1834, Oct. 9.	3 52 W.	Regent's report.
5	1836, Oct. 5.	4 09 W.	Regent's report.
6	1837—	4 30 W.	Regent's report.
7	1838, July 6.	4 30 W.	At Guilford; 4° 27′ when reduced to Oxford.
8	1849, Nov. 27.	5 11 W.	E. B. McCall.
9	1857, Apr. 4.	5 44 W.	E. B. McCall.
10	1858, Feb. 4.	5 47 W.	E. B. McCall.
11	1858, Dec.	5 50 W.	E. B. McCall.
12	1873, Dec. 1.	6 52 W.	E. Taintor.
13	1874, May 29 to June 6.	6 55.7 W.	Dr. T. C. Hilgard. About ¾ mile north of R. R. depot.
14	1885, Sept. 23, 24, 25.	7 43.3 W.	J. B. Baylor, U. S. Coast & G. Survey.

$D = +6^\circ.19 + 3.24 \sin (1.35\, m - 18^\circ.9)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1794.0	+3.00		+2.96	—0.04	1849.9	+5.18		+5.14	—0.04
1817.5	3.00		3.31	+0.31	1857.3	5.73		5.68	—0.05
1828.5	4.50	½	3.79	—0.71	1858.1	5.78		5.74	—0.04
1834.8	3.87		4.13	+0.26	1859.0	5.83		5.81	—0.02
1836.8	4.15		4.26	+0.11	1873.9	6.87		6.94	0.07
1837.5	4.50		4.30	—0.20	1874.4	6.93		6.97	+0.04
1838.5	+4.45		+4.36	—0.09	1885.7	7.72		+7.77	+0.05

Secular variations of the magnetic declination, dip and intensity—Continued.

OXFORD, N. Y.—Continued.

DIP AND INTENSITY AT OXFORD.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1874, June 4.	74 05·8	0·1718	0·6270	Dr. T. C. Hilgard. ¼ mile N. of R. R. Depot.
2	1885, Sept. 23, 24, 25.	73 45·8	0·1715(?) 0·1689	0·6128(?) 0·6036	J. B. Baylor, U. S. Coast & G. S. ¼ mile N. of R. R. Depot. Lower value of H. and F. preferred.

CAMBRIDGE, MASS.

$\varphi = 42° \; 22'.9 \qquad \lambda = 71° \; 07'.7$

[Harvard College Observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1708—	9 W.	Brattle.
2	1742—	8 W.	Prof. J. Winthrop's table.
3	1750—	7·8 W.	C. & G. S. Rept. for 1888, p. 308, deduced from observations at 19 stations.
4	1757—	7 20 W.	Prof. J. Winthrop's table.
5	1761—	7 14 W.	Dr. Williams.
6	1763—	7 00 W.	Prof. J. Winthrop.
7	1780—	7 02 W.	Dr. Williams.
8	1782—	6 44 W.	Dr. Williams and Prof. Sewall.
9	1783—	6 52 W.	Dr. Williams.
10	1788—	6 38 W.	Dr. Williams.
11	1810—	7 30 W.	Prof. Farrar.
	1833—	8 W.	P. Barlow's isogonic chart. Not used.
12	1835—	8 51 W.	Prof. Farrar.
13	1837—	9 09 W.	Mem. Amer. Acad.
14	1840·4	9 18 W.	W. C. Bond.
15	1842·2	9 35 W.	Prof. J. Lovering.
16	1844—	9 39 W.	W. C. Bond, Harvard Observatory.
17	1845, June 2.	9 32 W.	Dr. J. Locke, Harvard Observatory.
18	1850, Aug. 9.	9 30 W.	Lieut. J. C. Ives, Harvard Observatory.
19	1852—	10 08 W.	W. C. Bond, Harvard Observatory.
20	1854—	10 39 W.	W. C. Bond, Harvard Observatory.
20	1854, May 10.	9 46 W.	Lieut. J. C. Ives, Harvard Observatory.
21	1855, May 22, 23.	10 54·6 W.	W. C. Bond, Harvard Observatory.
22	1856, May 16.	10 50·3 W.	W. C. Bond, Harvard Observatory.
22	1856, July 17.	10 06 W.	K. Friesach, Harvard Observatory.
23	1859, Mar.	10 48 W.	Lieut. W. P. Smith, Harvard Observatory.
24	1866–67–68.	10 41 W.	Prof. J. Winlock, Harvard Observatory.
25	1879, Aug. 7, 9.	11 46·3 W.	J. B. Baylor, U. S. Coast & G. S., Harvard Observatory.
26	1895, July 17, 19.	12 22·3 W.	" " " " " " " " " Grounds of Harvard Observatory.

$$D = +9°.68 + 2.81 \sin (1.32\, m + 5°.9)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1708·5	+9·00		+9·72	+0·72	1840·4	+9·30		+9·35	+0·05
1742·5	8·00		7·73	—0·27	1842·2	9·57		9·46	—0·11
1750·0	7·80		7·41	—0·39	1844·5	9·65		9·61	—0·04
1757·5	7·33		7·16	—0·17	1845·4	9·53		9·67	+0·14
1761·5	7·23		7·06	—0·17	1850·6	9·50		10·01	+0·51
1763·5	7·00		7·01	+0·01	1852·5	10·13		10·13	0·00
1780·5	7·03		6·87	—0·16	1854·5	10·21		10·25	+0·04
1782·5	6·75		6·88	+0·13	1855·4	10·91		10·31	—0·60
1783·5	6·87		6·90	+0·03	1856·5	10·47		10·38	—0·09
1788·5	6·63		6·96	+0·33	1859·2	10·80		10·55	—0·25
1810·5	7·50		7·65	+0·15	1867·5	10·70		11·04	+0·34
1835·5	8·85		9·04	+0·19	1879·6	11·77		11·67	—0·10
1837·5	+9·15		+9·16	+0·01	1895·5	+12·37	2	+12·25	—0·12

Secular variations of the magnetic declination, dip and intensity—Continued.

CAMBRIDGE, MASS.—Continued.

DIP AND INTENSITY AT CAMBRIDGE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1722 ⅔	68 22	......	......	Capt. Othniel Beal, Boston Harbor. W. Whiston's "The calculation of solar eclipses, etc., with an account of some late observations made with the dipping needles, etc." Cited by Dr. L. A. Bauer, p. 33 of his inaugural dissertation "Beiträge zur Kentniss der Secular-Variation des Erdmagnetismus." Berlin, 1895.
2	1780, Dec. 25.	69 51	......	......	Dr. Williams.
3	1782, June 2.	69 41	......	......	Dr. Williams.
4	1783, Dec. 23.	69 41	......	......	Dr. Williams.
5	1839, Sept.	74 20·1	......	......	Prof. E. Loomis.
6	1840—	74 21·6	......	......	Prof. J. Lovering and W. C. Bond.
7	1841, June.	74 17·3	......	......	Maj. J. D. Graham and W. C. Bond.
8	1842—	74 19·5	0·1677	0·6205	Sir J. H. Lefroy. Grounds of Harvard Observatory.
8	1842-	74 17·8	......	......	Maj. J. D. Graham. Grounds of Harvard Observatory.
8	1842, May 4.	74 14·9	0·1688	0·6219	Dr. J. Locke. Grounds of Harvard Observatory.
9	1844, Dec.	74 18·2	......	......	Maj. J. D. Graham. Grounds of Harvard Observatory.
10	1845, June 2.	74 19·4	0·1668	0·6174	Dr. J. Locke. Grounds of Harvard Observatory.
11	1850, Aug. 9.	74 34	......	......	Lieut. J. C. Ives and A. W. Whipple. Prob. red'n —10′. Grounds of Harvard Observatory.
12	1854, May 10.	74 33	......	......	Lieut. J. C. Ives and A. W. Whipple. Prob. red'n —10′. Grounds of Harvard Observatory.
13	1856, July 19.	74 12	0·1633	0·5997	K. Friesach. Grounds of Harvard Observatory.
14	1859, Mar. 7.	74 20	0·1658	0·6140	Lieut. W. P. Smith. Grounds of Harvard Observatory.
15	1879, Aug. 7, 9.	73 48·4	0·1709	0·6128	J. B. Baylor, U. S. Coast & G. S. Grounds of Harvard Observatory.
16	1895, July 17, 19.	73 15·6	0·1731	0·6010	J. B. Baylor, U. S. Coast & G. S. Grounds of Harvard Observatory.

$$\Theta = 71°{\cdot}22 + 3{\cdot}28 \sin (1{\cdot}5\, m + 76°{\cdot}3)$$
$$H = 0{\cdot}166\ 1 - 0{\cdot}000\ 090\, m + 0{\cdot}000\ 005\ 8\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1722·8	68·37	68·24	—0·13
1781·0	69·85	69·72	—0·13
1782·4	69·68	69·83	+0·15
1784·0	69·68	69·95	+0·27
1839·7	74·33	74·09	—0·24
1840·5	74·36	74·12	—0·24
1841·4	74·29	74·15	—0·14
1842·4	74·29	74·19	—0·10
1844·9	74·30	74·28	—0·02
1845·4	74·32	74·29	—0·03
1850·6	74·40	74·42	+0·02
1854·4	74 38	74·47	+0·09
1856·5	74·20	74·49	+0·29
1859·2	74·33	74·50	+0·17
1879·6	73·81	74·04	+0·23
1895·5	73·26	73·13	—0·13

Date.	Obs'd H.	Comp'd H.	C—O.
1842·4	0·1682	0·1671	—0·0011
1845·4	668	666	— 02
1856·5	633	659	+ 26
1859·2	658	658	00
1879·6	709	685	— 24
1895·5	0·1731	0·1740	+ 09

Secular variations of the magnetic declination, dip and intensity—Continued.

CAMBRIDGE, MASS.—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1720	+ 9·0	68·34	......	......
1730	8·4	68·03	......	......
1740	7·85	67·94	......	......
1750	7·41	68·07	......	......
1760	7·09	68·42	......	......
1770	6·91	68·95	......	......
1780	6·88	69·65	......	......
1790	6·99	70·44	......	......
1800	7·24	71·30	......	......
1810	7·63	72·14	......	......
1820	8·12	72·93	......	......
1830	8·70	73·59	......	......
1840	9·32	74·10	0·1676	0·6118
1850	9·97	74·41	661	181
1860	10·60	74·50	658	204
1870	11·18	74·37	666	183
1880	11·68	74·02	686	124
1890	12·08	73·49	718	·6045
1900	+12·4	72·79	0·1761	0·5952

BOSTON, MASS.

$\varphi = 42° \ 21'·5 \qquad \lambda = 71° \ 03'·9$ W. of Gr.

[State House.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	10 W.	Edm. Halley's Tabula Nautica.
		10 W.	Prof. J. Winthrop's table.
2	1708—	9 W.	Mathews.
3	1741—	7½ W.	
4	1750—	7·8	C. & G. S. Rept. for 1888, p. 308, deduced from observations at 19 stations.
5	1775–76.	7 40 W.	Des Barres' Atlantic Neptune.
6	1782—	7 00 W.	Dr. N. Bowditch.
7	1793—	6 30 W.	Mem. Amer. Acad.
8	1807—	6 05 W.	W. Rotch.
9	1833—	8 00 W.	P. Barlow's isogonic chart.
10	1839—	9 06 W.	W. C. Bond. At Dorchester.
11	1846, Sept. 6, 8.	9 31 W.	Lieut. T. J. Lee. In South Boston.
12	1855, Aug. 24.	10 14 W.	C. A. Schott, U. S. Coast Survey. In South Boston.
13	1872, Sept. 28–30, Oct. 1.	11 15 W.	A. H. Scott, " " " " " " "
14	1877·5.	11 36 W.	I. K. Harris. On Boston Common.
	1884, Oct. 18.	11 31 W.	Lieut. C. C. Cornwell. Not used, reduction to Boston uncertain.
15	1890, Sept. 8, 9.	12 05 W.	J. B. Baylor, U. S. Coast & G. Survey. On Boston Common.

$$D = +9°·54 + 2·90 \sin (1·32\, m + 3°·7)^*$$

Date.	Obs'd D.	p.	Comp'd D.	C − O.	Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°		°		°	°
1700·0	+10·00		+10·26	+0·26	1833·0	+ 8·00		+ 8·61	+0·61
1708·5	9·00		9·70	+0·70	1839·5	9·10		9·03	−0·07
1741·5	7·50		7·66	+0·16	1846·7	9·52		9·51	−0·01
1750·0	7·80		6·97	−0·83	1855·6	10·23		10·10	−0·13
1776·0	7·67	¾	6·65	−1·02	1872·8	11·25		11·15	−0·10
1782·5	7·00		6·65	−0·35	1877·5	11·60		11·40	−0·20
1793·5	6·50		6·65	+0·15	1890·8	+12·08		+11·99	−0·09
1807·5	+ 6·08	¾	+ 7·24	+1·16					

* An observation in 1896 demands $D = +9°·58 + 2·90 \sin (1·32\, m + 5°·0)$.

Secular variations of the magnetic declination, dip and intensity—Continued.

BOSTON, MASS.—*Continued.*

DIP AND INTENSITY AT BOSTON.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1722 ⅔	68 22	......	......	Capt. Othniel Beal. Boston Harbor. Cited by Dr. L. A. Bauer, p. 33 of his inaugural dissertation, Berlin, 1895, from W. Whiston's "The calculations of solar eclipses, etc."
2	1839—	74 19	......	......	W. C. Bond. South Boston Heights.
	1839—	74 16	0·1687	0·6221 / 174 (?)	Prof. E. Loomis.
3	1841, July.	74 09·4	......	......	Maj. J. D. Graham.
4	1842, May 2.	74 05·7	0·1692	0·6178	Dr. J. Locke.
	1842, Oct. 1.	74 12·8	0·1672	0·6145	Sir J. H. Lefroy. South Boston near Grove Hill.
5	1846, Sept. 3–7.	74 12·7	0·1654	0·6079	Capt. T. J. Lee and R. H. Fauntleroy, U. S. Coast S. South Boston Heights.
6	1855, Aug. 24.	74 29·5	0·1634	0·6114	C. A. Schott, U. S. Coast S. South Boston near Blind Asylum.
7	1872, Sept. 27, Oct. 5.	73 30·5	0·1694	0·5969	A. H. Scott and E. Goodfellow, U. S. Coast S. Station as before.
8	1890, Sept. 8, 9.	73 21·3	0·1726	0·6026	J. B. Baylor, U. S. Coast & G. S. Boston Common.

$$\Theta = 71°\cdot 23 + 3\cdot 10 \sin(1\cdot 5\, m + 79°\cdot 2)$$
$$H = 0\cdot 166\,0 - 0\cdot 000\,121\, m + 0\cdot 000\,007\,4\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1722·8	68·37	68·25	—0·12
*1782·5	69·74	70·07	+0·33
1839·5	74·29	74·00	—0·29
1841·5	74·16	74·06	—0·10
1842·5	74·15	74·10	—0·05
1846·7	74·21	74·21	0·00
1855·6	74·49	74·33	—0·16
1872·7	73·51	74·08	+0·57
1890·7	73·36	73·21	—0·15

* Cambridge value.

Date.	Obs'd H.	Comp'd H.	C—O.
1839·5	0·1687	0·1681	—0·0006
1842·5	682	673	— 09
1846·7	654	665	+ 11
1855·6	634	655	+ 21
1872·7	694	671	— 23
1890·7	0·1726	0·1736	+0·0010

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1720	+ 8·9	68·44	......	......
1730	+ 8·3	68·19	......	......
....	......	......	......	......
1830	+ 8·42	73·58	0·1714	0·6063
1840	9·06	74·02	680	102
1850	9·73	74·27	660	123
1860	10·38	74·32	655	124
1870	10·99	74·16	666	104
1880	11·53	73·79	691	057
1890	11·96	73·25	731	·6006
1900	+12·3	72·58	0·1786	0·5966

Secular variations of the magnetic declination, dip and intensity—Continued.

PROVINCETOWN, MASS.

$\varphi = 42^\circ\ 03'{\cdot}1 \qquad \lambda = 70^\circ\ 11'{\cdot}3$ W. of Gr.

[Town Hall.]

No.	Date.	D.	References and remarks.
		° ′	
	1609, July 28.	6 W.	H. Hudson. On third voyage, off the Isles of Shoals. } Not used.
	1609, July 29.	5½ W.	" " Near Cape Cod. } Not used.
1	1620, about.	12·2 W.	R. Dudley's Arcano del Mare.
2	1700—	9½ W.	Edm. Halley's Tabula Nautica.
	1700—	9·6 W.	C. & G. S. Rept. for 1888, p. 306, deduced from obs'ns at 17 stations.
3	1750—	7·7 W.	" " " " " " " " 308, " " " " 19 "
4	1776—	6½ W.	Chart of Nantucket. Reduction to Provincetown + 45.
5	1833—	8¼ W.	P. Barlow's isogonic chart.
6	1835, Sept.	9 20 W.	Maj. J. D. Graham.
7	1860, Sept. 14, 15.	11 23·5 W.	C. A. Schott, U. S. Coast Survey. Near Town Hall.
8	1890, Sept. 2, 3.	12 37·8 W.	J. B. Baylor, U. S. Coast & G. S. Close to station of 1860.
9	1895, July 11, 12.	12 59·2 W.	" " " " " " " " " Station near Pilgrim House.

$$D = +9^\circ{\cdot}76 + 3{\cdot}20 \sin\,(1{\cdot}30\,m + 10^\circ{\cdot}7)$$

Date.	Obs'd D.	p.	Comp. D.	C—O.
	°		°	°
1620·0	+12·20	¼	+12·80	+0·60
1700·0	9·55	½	10·00	—0·45
1750·0	7·70	½	6·97	—0·73
1776·5	6·50		6·57	+0·07
1833·0	8·25	½	9·13	+0·88
1835·7	9·33		9·38	+0·05
1860·7	11·39		11·09	—0·30
1890·7	12·63	2	12·63	0·00
1895·5	+12·99		+12·76	—0·23

DIP AND INTENSITY AT PROVINCETOWN.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1860, Sept. 14, 15.	74 09·7	0·1686	0·6177	C. A. Schott, U. S. Coast S. Near Town Hall.
2	1890, Sept. 2, 3.	73 15·0	0·1724	0·5983	J. B. Baylor, U. S. Coast & G. S. Near Town Hall.
3	1895, July 11, 12.	73 03·4	0·1747	0·5995	J. B. Baylor, U. S. Coast & G. S. Near Pilgrim House.

PROVIDENCE, R. I.

$\varphi = 41^\circ\ 50'{\cdot}2 \qquad \lambda = 71^\circ\ 23'{\cdot}8$

[Brown University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1717—	9 36 W.	R. Jackson.
2	1769—	6½ W.	Dr. B. West.
3	1815—	6 30 W.	M. Brown, B. Lockwood, and G. Sheldon.
4	1819—	6 37 W.	B. Lockwood (?).
5	1835—	7 34 W.	Silliman's Journal.
6	1840—	8 25 W.	Silliman's Journal.
7	1841—	8 31 W.	Silliman's Journal.
8	1842—	8 39 W.	Silliman's Journal.
9	1843—	8 46 W.	Silliman's Journal.
10	1855, Aug. 20.	9 31·5 W.	C. A. Schott, U. S. Coast S. East of Brown University.
11	1884, June 20.	11 07·7 W.	O. T. Sherman.
12	1885, Apr. 11, 13, 14.	11 09·6 W.	J. B. Baylor, U. S. Coast & G. S. East of Brown University.
13	1895, Aug. 19, 20.	11 35·2 W.	" " " " " " " " " Station of Brown University.

Secular variations of the magnetic declination, dip and intensity—Continued.

PROVIDENCE, R. I.—Continued.

$$D=9^{\circ}\cdot 09+3\cdot 00 \sin\left(1\cdot 40\, m-2^{\circ}\cdot 8\right)+0\cdot 15 \sin\left(6\, m+117^{\circ}\right)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C−O.	Date.	Obs'd D.	*p.*	Comp'd D.	C−O.
	°		°	°		°		°	°
1717·5	+9·60		+9·62	+0·02	1842·5	+ 8·65		+ 8·54	−0·11
1769·5	6·50		6·36	−0·14	1843·5	8·77		8·62	−0·15
1815·5	6·50		6·61	+0·11	1855·6	9·52		9·43	−0·09
1819·5	6·62		6·81	+0·19	1884·5	11·13		11·14	+0·01
1835·5	7·57		7·99	+0·42	1885·3	11·16		11·15	−0·01
1840·5	8·42		8·39	−0·03	1895·6	+11·59		11·79	+0·20
1841·5	+8·52		+8·47	−0·05					

DIP AND INTENSITY AT PROVIDENCE.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1834, Aug.	74	02·8	......	......	Dr. A. D. Bache. North of Brown University.
2	1835—	....		0·1738	0·6326	" " " " and Prof. E. H. Courtenay. North of Brown University.
3	1839, Sept.	73	59·6	0·1718	0·6230	Prof. E. Loomis. Steamboat landing.
4	1841—	74	02·8	......	......	Dr. A. D. Bache.
5	1842, Sept. 28.	74	00·0	0·1713	0·6215	Sir J. H. Lefroy. Near steamboat landing.
6	1855, Aug. 20.	74	15·9	0·1655	0·6105	C. A. Schott, U. S. Coast S. East of Brown University.
7	1884, June 20.	73	16·6	0·1738	0·6064	O. T. Sherman.
8	1885, Apr. 11, 13, 14.	73	10·5	0·1760	0·6091	J. B. Baylor, U. S. Coast and G. S. East of Brown University.
9	1895, Aug. 19, 20.	72	51·6	0·1776	0·6027	J. B. Baylor, U. S. Coast and G. S. East of Brown University.

$$\Theta=74^{\circ}\cdot 11-0\cdot 001\ 4\ m-0\cdot 000\ 614\ m^2$$
$$H=0\cdot 168\ 6-0\cdot 000\ 198\ m+0.000\ 009\ 5\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C−O.
	°		°
1834·6	74·05	73·98	−0·07
1839·7	73·99	74·06	+0·07
1841·5	74·05	74·08	+0·03
1842·7	74·00	74·09	+0·09
1855·6	74·26	74·08	−0·18
1884·5	73·28	73·33	+0·05
1885·3	73·18	73·30	+0·12
1895·6	72·86	72·77	−0·09

Date.	Obs'd H.	Comp'd H.	C−O.
1835·5	0·1738	0·1735	−0·0003
1839·7	718	717	− 01
1842·7	713	706	− 07
1855·6	655	678	+ 23
1884·5	738	732	− 06
1885·3	760	736	− 24
1895·6	0·1776	0·1794	+0·0018

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+ 7·67	73·89	0·1764	0·6357
1840	8·49	74·06	715	244
1850	9·06	74·11	686	158
1860	9·67	74·03	676	092
1870	10·23	73·84	685	054
1880	10 85	73·52	713	038
1890	11·48	73·07	760	043
1900	+12·0	72·51	0·1862	0·6195

Secular variations of the magnetic declination, dip and intensity—Continued.

HARTFORD, CONN.

$\varphi = 41^\circ\ 45'\cdot 9 \qquad \lambda = 72^\circ\ 40'\cdot 4$ W. of Gr.

[State House.]

No.	Date.	D.	References and remarks.
		° ′	
1	1713—	8 57 W.	From information communicated by Arthur W. Rice in letter dated Hartford, July 25, 1891. According to Mr. Rice, the present (1891·5) declination on the boundary line between townships Hartford and Wethersfield, from records of 1786 and 1825, is 9° 58′ W., deduced from the line west of stone N. F., and 10° 25′ W. from line east of stone N. F.; mean value + 10° 11′·5. From observations recently made near Hartford, 5 values are given, viz: By H. G. Loomis, C. E., + 10° 20′; by Prof. Luther, of Trinity College, + 10°; by Mr. Hale, in Wethersfield, 4 miles south of Hartford, + 10° 06′; by two other engineers of Hartford, + 10° 15′; and by Mr. Rice, in New Britain, about 10 miles from Hartford, + 10°. Mean of 5 values, + 10° 08′, hence I adopt for 1891·5 the value + 10° 10′. The east line bore in 1713, according to record, N. 90° E.; in 1793 it bore N. 86° E.; and in 1891 it bore S. 88° 47′ E.; hence the declination in 1713 was 1° 13′ less than in 1891·5, i. e., 8° 57′ W. Also in 1793 it was 5° 13′ less than in 1891·5, or 4° 57′ W. The west line bore in 1817 S. 85° 15′ W., according to record, and S. 89° 49′ W. in 1891; hence declination in 1817 4° 34′ less than in 1891, or 5° 36′ W.
2	1750—	6·78 W.	According to C. & G. Survey Bulletin No. 6.
3	1786—	5 25 W.	Dr. Williams.
4	1793—	4 57 W.	See above note by A. W. Rice.
5	1810—	4 46 W.	Asher Miller, at East Hartford.
6	1817—	5 36 W.	See above note by A. W. Rice.
7	1824—	5 45 W.	N. Goodwin.
8	1828–29.	6 03 W.	N. Goodwin.
9	1859, July 27.	7 17·0 W.	C. A. Schott, U. S. Coast S. In City Park. Reduction to normal value of region + 42′.
10	1867, Aug. 15, 17.	7 49·3 W.	C. A. Schott, U. S. Coast S. Near the Athenæum. Reduction as above.
11	1875 (?).	8 58 W.	T. C. Ellis.
12	1879, July 24, 25, 26.	8 34·0 W.	J. B. Baylor, U. S. Coast & G. S. Station of 1859. Reduction as above.
13	1890, Oct. 13, 14.	9 01·5 W.	J. B. Baylor, U. S. Coast & G. S. Station of 1859. Reduction as above.
14	1891—	10 10 W.	See above note by A. W. Rice.

$$D = +8^\circ\cdot 06 + 2\cdot 98 \sin(1\cdot 35\, m - 16^\circ\cdot 1)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1713·5	+8·95		+9·10	+0·15	1829·0	+6·05		+5·97	—0·08
1750·0	6·78		6·62	—0·16	1859·6	7·99		7·90	—0·09
1786·5	5·42		5·14	—0·28	1867·6	8·52		8·46	—0·06
1793·5	4·95		5·08	+0·13	1875·5	8·97		9·00	+0·03
1810·5	4·77		5·27	+0·50	1879·6	9·27		9·27	0·00
1817·5	5·60		5·48	—0·12	1890·8	9·73		9·93	+0·20
1824·5	+5·75		+5·76	+0·01	1891·5	+10·17		+9·97	—0·20

DIP AND INTENSITY AT HARTFORD.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839, Sept.	73 58·1	......	......	Prof. E. Loomis. Northwest of statehouse.
2	1859, July 27.	74 07·4	0·1713	0·6262	C. A. Schott, U. S. Coast S. In park.
3	1867, Aug. 15, 17.	73 20·5	0·1753	0·6114	" " " " " Back of Prospect street.
4	1879, July 24, 25.	73 25·7	0·1744	0·6116	J. B. Baylor, U. S. Coast & G. S. In park.
5	1890, Oct. 13, 14.	73 06·0	0·1748	0·6014	" " " " " " "

Secular variations of the magnetic declination, dip and intensity—Continued.

HARTFORD, CONN.—Continued.

DIP AND INTENSITY AT HARTFORD—Continued.

$\Theta = 73°{\cdot}94 - 0{\cdot}010\ 9\ m - 0{\cdot}000\ 250\ m^2$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1839·7	73·97	74·03	+0·06
1859·6	74·12	73·81	—0·31
1867·6	73·34	73·67	+0·33
1879·5	73·43	73·40	—0·03
1890·8	73·10	73·08	—0·02

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1830	+ 6·02	74·06
1840	6·59	74·03
1850	7·24	73·94
1860	7·93	73·81
1870	8·62	73·62
1880	9·29	73·39
1890	9·89	73·10
1900	+10·4	72·77

NEW HAVEN, CONN.

$\varphi = 41°\ 18'{\cdot}5 \qquad \lambda = 72°\ 55'{\cdot}7$ W. of Gr.

[Yale College.]

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	6·24 W.	U. S. Coast & G. S. Bulletin No. 6.
2	1761—	5 47	Pres. Stiles.
3	1775—	5 25	Prof. Strong.
4	1780—	5 15	Pres. Stiles.
5	1811—	5 10	N. Redfield.
	1818, Aug.	5 45	De Witt. Not used.
	1819—	4 35	Prof. Fisher. Not used.
6	1819, May. 1820, Apr.	4 25·4	" "
7	1828—	5 17	N. Goodwin.
8	1834, Nov. 1835, Nov.	5 40·6	Prof. E. Loomis.
	1835—	5 52	Prof. E. Loomis's collection. Not used.
9	1836—	5 55	E. C. Herrick.
10	1837, Nov.	5 50	"
11	1840—	6 10	"
12	1844, Aug. 28.	5 45·1	Prof. J. Renwick, U. S. Coast S. At Pavilion Hotel.
13	1845, Sept. 10.	6 17·3	"
	1847, Sept. 25, 28, Oct. 1, 2.	7 27·2	R. H. Fauntleroy, U. S. Coast Survey. At Fort Wooster. Not used.
	1848, Aug. 21, 29.	7 25·5	J. S. Ruth, U. S. Coast Survey. At Fort Wooster. Not used.
14	1848, Aug. 10, 12, 14. 1848, Aug. 30, Sept. 1.	6 37·9 6 31·9	J. S. Ruth, U. S. Coast S. Mean = + 6°·58. At Pavilion Hotel. At Oyster Point.
15	1855, Aug. 17.	7 02·7	C. A. Schott, U. S. Coast S. At Oyster Point.
	1871, Mar.	7 22	G. H. Mann. Not used. On College Green.
16	1872—	8 27·5	R. M. Bache, U. S. Coast S.
17	1878, July 18.	8 41·2	Dr. T. E. Thorpe. In Prof. Silliman's garden.
18	1884, Jan. to May. 1884, June to Dec.	8 50·9 9 01·0	O. T. Sherman. At Yale College observatory grounds. " " " " "
	1884, July 22.	8 46·2	O. T. Sherman. At South End. Not used.
19	1885, Jan. to June.	9 00·3	O. T. Sherman. At Yale College observatory grounds.
20	1895, Aug. 24, 26.	9 36·3 W.	J. B. Baylor, U. S. Coast & G. S. At station north of Yale College.

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW HAVEN, CONN.—Continued.

$$D = +7^\circ{\cdot}72 + 3{\cdot}03 \sin (1{\cdot}35\, m - 21^\circ{\cdot}9)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C − O.	Date.	Obs'd D.	*p*.	Comp'd D.	C − O.
	°		°	°		°		°	°
1750·0	+6·24		+6·53	+0·29	1840·5	+6·17		+6·00	−0·17
1761·5	5·78		5·83	+0·05	1844·6	5·75		6·24	+0·49
1775·5	5·42		5·17	−0·25	1845·7	6·29		6·31	+0·02
1780·5	5·25		4·99	−0·26	1848·6	6·58		6·50	−0·08
1811·5	5·17		4·81	−0·36	1855·6	7·05		6·97	−0·08
1819·8	4·42		5·03	+0·61	1872·5	8·46		8·17	−0·29
1828·5	5·28		5·37	+0·09	1878·5	8·69		8·59	−0·10
1835·3	5·68		5·71	+0·03	1884·5	8·93		8·99	+0·06
1836·5	5·92		5·77	−0·15	1885·2	9·00		9·03	+0·03
1837·9	+5·83		+5·85	+0·02	1895·6	+9·60		+9·66	+0·06

DIP AND INTENSITY AT NEW HAVEN.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839, Sept.	73 26·7	0·1767	0·6201	Prof. E. Loomis. Burial Ground.
2	1842, Apr. 21.	73 29·8	0·1761	0·6201	Dr. J. Locke.
	1842, Oct. 18.	73 27·4	0·1766	0·6203	Sir J. H. Lefroy. Near Cemetery.
3	1844, Aug. 27–29.	73 21·0	0·1760	0·6144	Prof. J. Renwick, U. S. Coast S. At Yale College. (Sir E. Sabine.)
		73 27·5	0·1787	0·6276	
4	1847, Sept. 27–Oct. 2.	74 16·6	0·1691	0·6238	R. H. Fauntleroy, U. S. Coast S. At Fort Wooster.
5	1848, Aug. 14–18.	73 31·9	0·1741	0·6142	J. S. Ruth, U. S. Coast S. At Pavilion.
	1848, Aug. 21–26.	74 12·6	0·1668	0·6129	J. S. Ruth, U. S. Coast S. At Fort Wooster.
	1848, Aug. 30, 31.	73 32·9	0·1738	0·6137	J. S. Ruth, U. S. Coast S. At Oyster Point.
6	1855, Aug. 17.	73 44·5	0·1701	0·6076	C. A. Schott, U. S. Coast S. At Oyster Point.
7	1878, July 17, 18.	73 05·4	0·1780	0·6120	Dr. T. E. Thorpe. In Silliman's garden.
8	1884, Jan.–Dec.	72 49·6	0·1785	0·6046	O. T. Sherman. Yale College Observatory.
9	1885, Apr. 22.	72 47·6	0·1798	0·6078	" " " " " "
10	1895, Aug. 24–27	72 28·2	0·1806	0·5996	J. B. Baylor, U. S. Coast & G. S. North of Yale College.

$$\Theta = 73^\circ{\cdot}55 + 0{\cdot}003\,5\, m - 0{\cdot}000\,642\, m^2$$
$$H = 0{\cdot}173\,1 - 0{\cdot}000\,151\, m + 0{\cdot}000\,008\,2\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C − O.
	°	°	°
1839·7	73·45	73·45	0·00
1842·5	73·48	73·49	+0·01
1844·6	73·40	73·51	+0·11
1848·6	73·54	73·54	0·00
1855·6	73·74	73·55	−0·19
1878·5	73·09	73·13	+0·04
1884·5	72·83	72·91	+0·08
1885·3	72·79	72·87	+0·08
1895·6	72·47	72·37	−0·10

Date.	Obs'd H.	Comp'd H.	C − O.
1839·7	0·1767	0·1755	−0·0012
1842·5	763	747	− 16
1844·6	773	742	− 31
1847·7	691	735	+ 44
1848·6	716	733	+ 17
1855·6	701	725	+ 24
1878·8	780	756	− 24
1884·5	785	777	− 08
1885·3	798	780	− 18
1895·6	0·1806	0·1832	+0·0026

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+5·44	73·22	0·1794	0·6214
1840	5·97	73·45	754	158
1850	6·59	73·55	731	113
1860	7·28	73·53	724	081
1870	7·99	73·37	734	059
1880	8·69	73·08	760	047
1890	9·33	72·66	802	046
1900	+9·9	72·12	0·1861	0·6061

Secular variations of the magnetic declination, dip and intensity—Continued.

NANTUCKET, MASS.

$\varphi = 41° 17'.0$ $\lambda = 70° 06'.0$ W. of Gr.

[Mitchell's Observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	8¼ W.	Edm. Halley's Tabula Nautica.
	1700—	8.6 W.	C. & G. S. Rept. for 1888, p. 306, deduced from observations at 17 stations.
2	1750—	6.9 W.	C. & G. S. Rept. for 1888, p. 308, deduced from observations at 19 stations.
3	1775—	6½ W.	Des Barres' Atlantic Neptune.
	1776—	6½ W.	Chart. Not used.
4	1833—	7½ W.	P. Barlow's isogonic chart.
5	1834—	8 27 W.	W. Mitchell.
6	1838–39.	9 02.3 W.	W. Mitchell.
7	1842, Aug. and Sept.	9 09 W.	W. Mitchell.
8	1843, Sept.	9 10 W.	W. Mitchell.
9	1846, July 30, 31.	9 14.0 W.	Lieut. T. J. Lee, U. S. E.
10	1855, Aug. 22.	9 58.3 W.	C. A. Schott, U. S. Coast S. Near Harbor light.
11	1867, May 28, 29, 30.	10 19.9 W.	C. O. Boutelle, U. S. Coast S. At the Cliff.
12	1879, July 31, Aug. 2.	11 27.9 W.	J. B. Baylor, " " " & G. S. At the Cliff.
13	1883, June 10.	11 38 W.	Lieut. E. S. Prime, U. S. N. Reduction to station—12′.
14	1895, June 28, 29.	12 11.1 W.	J. B. Baylor, U. S. Coast & G. S. Station of 1879.

$$D = +9°.21 + 3.03 \sin(1.23\, m + 6°.9)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1700.0	+8.42	¼	+9.08	+0.66	1843.7	+ 9.17		+ 9.17	0.00
1750.0	6.90	¼	6.49	—0.41	1846.6	9.23		9.35	+0.12
1775.5	6.50		6.19	—0.31	1855.6	9.97		9.93	—0.04
1833.0	7.50	½	8.48	+0.98	1867.4	10.33		10.65	+0.32
1834.5	8.45		8.57	+0.12	1879.6	11.46		11.29	—0.17
1839.0	9.04		8.86	—0.18	1883.4	11.43		11.46	+0.03
1842.7	+9.15		+9.10	—0.05	1895.5	+12.19		+11.91	—0.28

DIP AND INTENSITY AT NANTUCKET.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1843, Sept.	73 41.2	......	......	W. Mitchell.
2	1846, July 29, Aug. 2.	73 44.4	0.1684	0.6015	Lieut. T. J. Lee, U. S. E. On north beach.
3	1855, Aug. 22.	74 00.6	0.1672	0.6068	C. A. Schott, U. S. Coast S. On beach west of light-house.
4	1867, May 28, June 5.	73 37.6	0.1726	0.6121	C. O. Boutelle, U. S. Coast S. Cliff station.
5	1875, Sept. 15, 17.	73 24.1	0.1760	0.6161	J. M. Poole, " " " "
6	1879, July 31, Aug. 2.	73 15.1	0.1752	0.6078	J. B. Baylor, " " " & G. S. At the cliff.
7	1895, June 28, 29, July 8.	72 40.3	0.1780	0.5976	J. B. Baylor, U. S. Coast & G. S. At the cliff.

$$\Theta = 73°.80 + 0.002\,8\, m - 0.000\,633\, m^2$$
$$H = 0.168\,0 + 0.000\,281\, m - 0.000\,001\,2\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1843.7	73.69	73.76	+0.07
1846.6	73.74	73.78	+0.04
1855.6	74.01	73.80	—0.21
1867.4	73.63	73.66	+0.03
1875.7	73.40	73.45	+0.05
1879.6	73.25	73.33	+0.08
1895.5	72.67	72.62	—0.05

Date.	Obs'd H.	Comp'd H.	C—O.
1846.6	0.1684	0.1670	—0.0014
1855.6	672	695	+ 23
1867.4	726	725	— 01
1875.7	760	745	— 15
1879.6	752	753	+ 01
1895.5	0.1780	0.1784	+0.0004

Secular variations of the magnetic declination, dip and intensity—Continued.

NANTUCKET, MASS.—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1840	+ 8·93	73·71	0·1651	0·5886
1850	9·57	73·80	680	·6022
1860	10·21	73·76	707	104
1870	10·79	73·60	732	135
1880	11·31	73·32	754	111
1890	11·72	72·90	774	·6033
1900	+12·03	72·36	0·1792	0·5914

COLD SPRING HARBOR, LONG ISLAND, N. Y.

$\varphi=40^\circ\ 52'{\cdot}5$ $\lambda=73^\circ\ 28'{\cdot}0$ W. of Gr.

No.	Date.	D.	References.
		° ′	
1	1750—	5·7 W.	C. & G. Survey Bulletin No. 6.
2	1771, June 13.	5 07 W.	H. Lefferd.
3	1818, May.	4 52 W.	E. Hicks.
4	1844, Sept. 15.	6 11·6 W.	Prof. J. Renwick, U. S. Coast S. Mean=6° 31′ W. At Lloyd's Harbor.
	1844, Sept. 16.	6 50·5 W.	
5	1864, Dec. 28.	7 47 W.	S. V. Whiting.
6	1886, July 7.	8 34 W.	J. and E. Jones.
	1886, Nov. 25.	8 55 W.	E. Jones; from bearings of line Cold Spring Beach to Roswell's Mill. Mean=+8°·74.
7	1888, Sept. 16, Dec. 13.	8 46 W.	E. Jones. Means of 5, 2, 6, 5, 6 values respectively.
8	1890, June 2–Dec. 22.	8 44 W.	
9	1891, Jan. 13–Dec. 16.	8 49 W.	
10	1892, Mar. 9–Oct. 15.	8 59 W.	
11	1893, Apr. 24–Oct. 15.	9 06 W.	
12	1894, Aug. 22–Dec 26.	9 10 W.	E. Jones. Means of 39, 22, and 4 values respectively. Letter of Feb. 3, 1896.
13	1895, May 2–Dec. 28.	9 12 W.	
14	1896, Jan. 28, 29.	9 14 W.	

$$D=+7^\circ{\cdot}19+2{\cdot}52\sin(1{\cdot}35\,m-11^\circ{\cdot}4)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1750·0	+5·70	½	+5·80	+0·10
1771·4	5·12		4·96	−0·16
1818·4	4·87		5·15	+0·28
1844·7	6·52		6·39	−0·13
1865·0	7·78		7·58	−0·20
1887·7	8·74		8·75	+0·01
1888·8	8·76		8·84	+0·08
1890·7	8·73		8·92	+0·19
1891·4	8·82		8·96	+0·14
1892·3	8·99		8·99	0·00
1893·7	9·10		9·05	−0·05
1894·8	9·17		9·09	−0·08
1895·7	9·20		9·12	−0·08
1896·1	+9·23		+9·14	−0·09

DIP AND INTENSITY AT COLD SPRING HARBOR.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1844, Sept. 15.	72 50·6	0·1778	0·6029	Prof. J. Renwick, U. S. Coast S. At Lloyd's Harbor, Huntington.
	1844, Sept. 16, 17.	72 58·5	0·1795 0·1823	0·6131 0·6229	Prof. J. Renwick, U. S. Coast S. At Oyster Bay. (Sir E. Sabine.)
2	1865, Aug. 10–21.	72 56·8	0·1812	0·6178	Dr. A. D. Bache and E. Goodfellow, U. S. Coast S. At West Hills.

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW YORK CITY AND VICINITY.

$\varphi = 40^{\circ}\ 42'\cdot 7$ $\lambda = 74^{\circ}\ 00'\cdot 4$ W. of Gr.

[City Hall.]

No.	Date.	D. °	D. ′	Reference and remarks.
	1580—	10	W.	De Isogonen in the XVI en XVII Eeuw, proefschrift door W. Van Bemelen, Utrecht, 1893. Not used.
	1610—	11	W.	
1	1609, Sept.	8	W.	H. Hudson on his third voyage found 8° W. on the Jersey shore a little below the mouth of the Hudson River. Prob. error ± 2°, estimated.
	1610—	12	W.	De Isogonen, etc., door W. Van Bemelen. Not used.
2	1625, about.	11½	W.	R. Dudley's Arcano del Mare.
	1680—	12	W.	De Isogonen, etc., door W. Van Bemelen; not used. The same remark applies to his charts for 1640 and 1665, which apparently all give too high values.
3	1684—	8¾	W.	P. Welles. [Dr. P. Kalm's "Travels into North America," translated by J. R. Foster, Warrington, 1770.]
4	1686—	9	W.	G. Keith. At Sandy Hook. Variation adopted for line run between E. and W. New Jersey in 1687.
5	1691—	8¾	W.	Duxbury's patent. On Staten Island.
6	1700—	8	20 W.	E. Halley's Tabula Nautica.
		8·1		U. S. Coast and G. S. Bulletin No. 6. Not used.
7	1714—	8¾	W.	J. Beatty. On Livingston Manor.
8	1723—	7	20 W.	G. Burnet.
	1724—	7	20 W.	C. Colden. [Dr. Kalm's Travels, as above.]
9	1750—	6	22 W.	Alexander.
		5	28 W.	U. S. Coast & G. S. Bulletin No. 6. Mean + 5°·92.
10	1755—	5	00 W.	Evans.
	1775—	7	W.	Des Barres' Atlantic Neptune. Not used.
11	1789—	4	20 W.	Prof. E. Loomis' collection.
12	1824—	4	40 W.	Blunt's map.
	1833—	3	W.	P. Barlow's isogonic chart. Not used.
13	1834—	4	50 W.	Capt. Owen.
14	1837—	5	40 W.	Prof. J. Renwick. At Columbia College, near City Hall.
15	1840, June 16 to July 11.	5	01 W.	Lieut. S. C. Rowan, U. S. N. At Howard Station, Staten Island. Mean + 5°·45.
	1840, July 18 to Oct. 16.	5	53 W.	Lieut. S. C. Rowan, U. S. N. At Bergen Neck.
16	1841—	6	06 W.	Douglas' Map of New Jersey.
	1841—	5	52 W.	W. C. Wetmore, U. S. N. At Court-house, $\phi = 40^{\circ}\ 43'$, $\lambda = 74^{\circ}\ 04'$ Winfield's Land Titles. Prof. G. H. Cook's Magnetic Survey of New Jersey, Trenton, 1888. Mean + 5°·98.
17	1842, Sept.	5	32·5 W.	U. S. Coast S. At Sandy Hook, N. J. Reduction to New York + 20′.
	1844, Jan.	5	51·1 W.	Lieut. G. M. Bache and J. Hall, U. S. N. At Sandy Hook, N. J. Not used.
	1844, Aug. 20, 22.	5	51·0 W.	Prof. J. Renwick. Location as above. Not used.
18	1844, Aug. 24.	6	13·1 W.	" " " At Columbia College, as in 1837.
19	1845, Sept. 4.	6	25·3 W.	" " " " " " "
20	1846, Apr. 30.	5	09·7 W.	Dr. J. Locke. At Bloomingdale Asylum.
	1846, May 4.	4	57·4 W.	" " " " Mt. Prospect, formerly Flatbush, Brooklyn.
	1846, May 7.	5	37·4 W.	" " " " Station Cole, Staten Island.
	1846, May 14.	5	35·1 W.	" " " " Newark. Mean value + 5°·57.
21	1847, Oct. 16–20.	5	41·0 W.	R. H. Fauntleroy, U. S. Coast S. At station Legget, near Hell Gate.
22	1855, Aug. 7.	6	39·6 W.	C. A. Schott, U. S. Coast S. At Governors Island.
	1855, Aug. 8.	7	02·1 W.	" " " " " " " " Bedloes Id. (now Liberty Id).
	1855, Aug. 11.	6	28·0 W.	" " " " " " " " Receiving Reservoir (now Central Park).
	1855, Aug. 14.	6	11·2 W.	C. A. Schott, U. S. Coast S. At Sandy Hook, N. J. Not used.
23	1860, Sept. 21, 22.	6	44 W.	" " " " " " " " Mount Prospect, Brooklyn.
	1872, Oct. 31, Nov. 1, 2.	8	45·8 W.	A. H. Scott, " " " " " " Central Park.
24	1873, Nov. 5, 6, 7, 9.	7	09·0 W.	Dr. T. C. Hilgard. At Sandy Hook, N. J. Reduction to New York + 20′.
25	1874, Aug.	7	23 W.	Chart of Way Reef, Hell Gate.
26	1879, July 17, 18.	7	32·0 W.	J. B. Baylor, U. S. Coast and G. S. At Sandy Hook, N. J. Reduction to New York + 20′.
	1883, Aug. 24.	7	16 W.	Lieut. R. B. Beck. Naval Professional Papers No. 19. Reduction to Sandy Hook − 9′. Not used.
	1884, May 1.	7	00 W.	" U. Sebree.
	1884, July 17.	7	34 W.	" R. B. Beck.
27	1885, Sept. 30, Oct. 1–4.	7	52·8 W.	J. B. Baylor, U. S. Coast & G. S. At Sandy Hook. Reduction to New York + 20′.
	1885, Oct. 16, 17, 18.	8	59·7 W.	J. B. Baylor, U. S. Coast & G. S. At Riverside Park. Not used.

See letter 19 at page "[illegible]"

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW YORK CITY AND VICINITY—Continued.

No.	Date.	D.	References and remarks.	
28	1890, Oct. 19, 20.	8 06·8 W.	J. B. Baylor, U. S. Coast and G. S. At Sandy Hook, near station of 1879.	Reduction to New York +20′.
29	1895, June 21, 22.	8 24·8 W.	J. B. Baylor, U. S. Coast and G. S. At Sandy Hook, near station of 1879.	

$D = +7^\circ{\cdot}04 + 2{\cdot}77 \sin(1{\cdot}30\,m - 18^\circ{\cdot}1) + 0{\cdot}14 \sin(6{\cdot}3\,m + 64^\circ)$

Date.	Obs'd. D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1609·7	+ 8·00		+8·40	+0·40	1841·5	+6·10		+5·70	—0·40
1625·0	11·50	½	9·56	—1·94	1842·6	5·91		5·75	—0·16
1684·5	8·75		9·26	+0·51	1844·6	6·22		5·87	—0·35
1686·5	9·00		9·19	+0·19	1845·6	6·42		5·93	—0·49
1691·5	8·75		8·97	+0·22	1846·3	5·57		5·96	+0·39
1700·0	8·33		8·55	+0·22	1847·8	5·68		6·05	+0·37
1714·5	8·75		7·73	—1·02	1855·6	6·72		6·52	—0·20
1724·0	7·33		7·13	—0·20	1860·7	6·73		6·84	+0·11
1750·0	5·92		5·58	—0·34	1873·8	7·48		7·65	+0·17
1755·5	5·00		5·30	+0·30	1874·6	7·38		7·71	+0·33
1789·5	4·33		4·29	—0·40	1879·5	7·87		8·00	+0·13
1824·5	4·67		4·88	+0·21	1885·7	8·21		8·35	+0·14
1834·5	4·83		5·33	+0·50	1890·8	8·45		8·54	+0·09
1837·5	5·67		5·48	—0·19	1895·6	+8·75		+8·84	+0·09
1840·6	+ 5·45		+5·65	+0·20					

DIP AND INTENSITY AT NEW YORK AND VICINITY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1822, Dec.	73 00·5	0·1836(?)	0·6280(?)	Sir E. Sabine. At Columbia College (old site).
2	1825, Mar.	73 27·0	......	......	Sir J. Franklin. Not used.
3	1831, Apr. 19.	73 00	......	......	Prof. Joslyn.
4	1833, Apr.	72 49·3 72 14(?)	......	......	Capt. Back.
5	1834, Aug.	72 51·7	......	......	Dr. A. D. Bache. At Columbia College (old site).
6	1835—	....	0·1832	0·6215	Dr. A. D. Bache and Prof. E. H. Courtenay. At Columbia College (old site).
7	1839, Sept.	72 52·2	0·1850	0·6280	Prof. E. Loomis. At Columbia College (old site).
8	1841, Apr. 19.	72 41	0·1854	0·6229	Dr. J. Locke. At Columbia College (old site).
	1841, Apr. 20.	72 21	0·1890	0·6233	" " " At new Asylum, near Harlem.
	1841, Apr. 20.	72 39·6	0·1853	0·6217	" " " " Bloomingdale Asylum.
	1841, Dec.	72 39·6	0·1851	0·6211	Dr. A. D. Bache.
9	1842—	72 37·2	0·1858	0·6220	Dr. J. Locke. At Columbia College (old site).
	1842, Sept. 26.	72 35·6	0·1848	0·6190	Sir J. H. Lefroy. At Bloomingdale Asylum.
10	1844, Apr. 26.	72 41·7	0·1847	0·6211	Dr. J. Locke. At Columbia College.
	1844, Apr. 27.	72 42·6	0·1848	0·6215	Dr. J. Locke. " " "
	1844, Aug. 8–31.	72 37·8	0·1877 0·1905(?)	0·6289 0·6400(?)	Prof. J. Renwick. At Columbia College. (Sir E. Sabine).
	1844—	72 28·9	......	......	Maj. J. D. Graham. At Columbia College.
	1844, Sept. 3.	72 49·5	0·1886 0·1848	0·6386 0·6257	Prof. J. Renwick and Sir J. H. Lefroy. At Bloomingdale Asylum.
11	1845, Sept. 4.	72 40·6	......	......	Prof. J. Renwick. At Columbia College.
12	1846, Apr. 27, 30.	72 39·0	0·1848	0·6198	Dr. J. Locke. At Bloomingdale Asylum.
	1846, May 6.	72 27·6	0·1869	0·6202	Dr. J. Locke. At Mount Prospect, Brooklyn.
	1846, Nov.	72 39·3	......	......	Officer of corvette Nordstiernen.
13	1853, May 19.	72 55·6	......	......	Dr. E. K. Kane and A. Sonntag.
14	1855, Aug. 7.	72 46·3	0·1810	0·6109	On Governors Island, C. A. Schott, U. S. Coast S.
	1855, Aug. 8.	72 59·2	0·1807	0·6178	On Bedloes Island, C. A. Schott, U. S. Coast S.
	1855, Aug. 10.	72 44·4	0·1816	0·6119	In Central Park Rec. Reservoir, C. A. Schott, U. S. Coast S.
15	1860, Sept. 20, 21, 22.	72 40·8	0·1868	0·6275	At Mount Prospect, Brooklyn, C. A. Schott, U. S. Coast S.
16	1872, Nov. 1, 4.	72 35·8	0·1836	0·6138	E. Goodfellow and A. H. Scott, U. S. Coast S. Central Park.
17	1885, Oct. 16, 17, 18.	72 12·0	0·1862	0·6090	J. B. Baylor, U. S. Coast & G. S. Riverside Park.

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW YORK CITY AND VICINITY—Continued.

AT SANDY HOOK, N. J

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1844, Aug. 20, 22.	72 37·9	0·1880	0·6299	Prof. J. Renwick.
2	1855, Aug. 14.	72 52·0	0·1806	0·6132	C. A. Schott, U. S. Coast S.
3	1873, Nov. 5–9.	72 29·6	0·1863	0·6192	Dr. T. C. Hilgard.
4	1879, July 17, 18.	72 08·3	0·1880	0·6131	J. B. Baylor, U. S. Coast & G. S.
5	1885, Sept. 30, Oct. 1, 2.	71 52·3	0·1876	0·6023	" " " "
6	1890, Oct. 19, 20.	71 54·1	0·1870	0·6020	" " " "
7	1895, June 21, 22.	71 48·2	0·1894	0·6065	" " " "

For New York. $\Theta = 72°·73 - 0·009\ 8\ m - 0·000\ 160\ m^2$

" " " $H = 0·184\ 7 + 0·000\ 024\ m + 0·000\ 000\ 5\ m^2$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1822·9	73·00	72·88	−0·12
1831·3	73·00	72·86	−0·14
1833·3	72·82	72·85	+0·03
1834·6	72·86	72·84	−0·02
1839·7	72·87	72·80	−0·07
1841·5	72·59	72·80	+0·21
1842·6	72·61	72·79	+0·18
1844·5	72·67	72·78	+0·11
1845·7	72·68	72·77	+0·09
1846·5	72·59	72·76	+0·17
1853·4	72·93	72·70	−0·23
1855·6	72·83	72·67	−0·16
1860·7	72·68	72·61	−0·07
1872·8	72·60	72·42	−0·18
*1879·5	72·25	72·30	+0·05
1885·8	72·20	72·17	−0·03
*1890·8	72·01	72·06	+0·05
*1895·5	71·91	71·94	+0·04

* Reduced to New York.

To reduce Sandy Hook to New York series we have the following comparison:

Year.	S. H.	N. Y.
	°	°
1844	72·63	72·67
1855	72·87	72·83
1873	72·50	72·60
1885	71·87	72·20
Mean	72·47	72·58
Diff.		+0·11

Date.	Obs'd H.	Comp'd H.	C—O.
1823·0	0·1836	0·1844	+0·0008
1835·5	832	45	+ 13
1839·7	850	45	− 05
1841·5	862	45	− 17
1842·6	853	46	− 07
1844·5	863	46	− 17
1846·3	858	46	− 12
1855·6	811	48	+ 37
1860·7	868	50	− 18
1872·8	836	55	+ 19
*1879·5	867	58	− 09
1885·8	862	62	00
*1890·8	857	65	+ 08
*1895·5	0·1881	0·1868	−0·0013

* Reduced to New York.

To reduce Sandy Hook to New York series we have the following comparison:

Year.	S. H.	N. Y.
1844	0·1880	0·1863
1855	806	811
1873	863	836
1885	876	862
Mean	0·1856	0·1843
Diff.		−0·0013

COMPUTED DECENNIAL VALUES (FOR NEW YORK).

Date.	D.	Θ.	H.	F.
	°	°		
1820	+4·61	72·88	0·1844	0·6264
1830	4·98	72·86	44	·6257
1840	5·61	72·81	45	·6243
1850	6·31	72·73	47	·6222
1860	6·91	72·62	50	·6193
1870	7·40	72·47	54	·6155
1880	7·90	72·29	59	·6111
1890	8·49	72·08	64	·6058
1900	+9·1	71·84	0·1871	0·6003

Secular variations of the magnetic declination, dip and intensity—Continued.

SOUTH BETHLEHEM, PA.

$\varphi = 40° 36'.4 \qquad \lambda = 75° 22'.9$ W. of Gr.

[Sayre Observatory, Lehigh University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1742·8	6 33 W.	R. W. Walker, from bearings of old lines. Correction in time made by Prof. M. Merriman; letter of Sept. 24, 1891.
2	1784—	2 53 W.	Reference as above.
3	1799—	1 52 W.	
4	1841, July 23.	3 26 W.	Dr. A. D. Bache, at Easton; reduction to Bethlehem — 12′.
5	1851·5	3 50·6 W.	R. W. Walker, from bearings of old lines.
6	1874, June 20.	5 19·5 W.	Dr. T. C. Hilgard, near Lehigh University. $\varphi = 40° 36'.5$, $\lambda = 75° 23'.1$.
7	1878·2	5 37·2 W.	R. W. Walker, from bearings of old lines.
8	1881·2	5 52 W.	Prof. C. L. Doolittle, Lehigh University.
9	1882·7	6 05·4 W.	R. W. Walker. Result from 80 observations made by students.
10	1884·0	6 06·6 W.	" " "
11	1885·3	6·15 W.	Communicated by Prof. M. Merriman, letter of July 14, 1892. In accordance with this letter + 0°·11 was added to each observed value to refer it to Hilgard's station of 1874.
12	1887·3	6·17 W.	
13	1888·3	6·30 W.	
14	1889·3	6·37 W.	
15	1892·3	6·47 W.	
16	1894·7	7·05 W.	Letter of Prof. M. Merriman of Feb. 11, 1895.

$$D = +5°.27 + 3.05 \sin (1.46m - 34°.8)$$

Date.	Obs'd D.	p.	Comp'd D.	C — O.	Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°		°		°	°
1742·8	+6·55	½	+5·86	—0·69	1882·7	+6·09		+5·95	—0·14
1784·5	2·88		2·95	+0·07	1884·0	6·11		6·05	—0·06
1799·5	1·87		2·38	+0·51	1885·3	6·15		6·15	0·00
1841·6	3·43		3·04	—0·39	1887·3	6·17		6·30	+0·13
1851·5	3·84		3·63	—0·21	1888·3	6·30	1½	6·37	+0·07
1874·5	5·32		5·32	0·00	1889·3	6·37	1½	6·44	+0·07
1878·2	5·62		5·61	—0·01	1892·3	6·47	1½	6·65	+0·18
1881·2	+5·87		+5·84	—0·03	1894·7	+7·05		+6·82	—0·23

DIP AND INTENSITY AT SOUTH BETHLEHEM.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1841, July.	72 39·0	0·1900	0·6371	Dr. A. D. Bache. At Easton.
2	1874, June 20.	73 38·9	0·1770	0·6288	Dr. T. C. Hilgard. Near Lehigh College Observatory.

HUNTINGDON, PA.

$\varphi = 40° 31' \qquad \lambda = 78° 02'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	4¼ W.	U. S. Coast & G. S. Bulletin No. 6.
2	1794—	0 51 W.	J. S. Lytle.
3	1840, July 30.	1 52·3 W.	Dr. A. D. Bache.
4	1849, May 21.	{1 59 W. / 2 23 W.}	Report of Secretary of Internal Affairs, Pa.
5	1852, Apr.	2 16 W.	" " " " " "
6	1858, Sept. 10.	2 34 W.	
7	1860, Apr. 19.	2 41 W.	H. Wilson.
8	1874, Aug.	3 34 W.	Report of Secretary of Internal Affairs, Pa.
9	1879, Aug. 19.	4 07 W.	Letter of J. S. Africa.
10	1880, Sept. 24.	4 15·0 W.	Report of Secretary of Internal Affairs, Pa.
11	1881, June 20.	4 23·4 W.	
12	1883, Apr. 9.	4 33·7 W.	
13	1884, May 26.	4 37·5 W.	
14	1885, Dec. 24.	4 38·0 W.	

Secular variations of the magnetic declination, dip and intensity—Continued.

HUNTINGDON, PA.—Continued.

$$D = +3^\circ{\cdot}76 + 2{\cdot}93 \sin (1{\cdot}48\, m - 35^\circ{\cdot}2)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1750·0	+4·25	½	+3·92	−0·33	1874·6	+3·57		+3·82	+0·25
1794·0	0·85		1·18	+0·33	1879·6	4·12		4·20	+0·08
1840·6	1·87		1·55	−0·32	1880·7	4·25		4·28	+0·03
1849·3	2·18		2·03	−0·15	1881·5	4·39		4·34	−0·05
1852·3	2·27		2·22	−0·05	1883·3	4·56		4·47	−0·09
1858·7	2·57		2·65	+0·08	1884·4	4·62		4·55	−0·07
1860·3	+2·68		+2·76	+0·08	1886·0	+4·63		+4·67	+0·04

DIP AND INTENSITY AT HUNTINGDON.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1840, July.	72 17·8	0·1895	0·6238	Dr. A. D. Bache.

NEW BRUNSWICK, N. J.

$\varphi = 40^\circ\ 29'{\cdot}9$ $\lambda = 74^\circ\ 26'{\cdot}8$ W. of Gr.

[Rutgers College.]

No.	Date.	D.	References and remarks.
		° ′	
1	1800—	2 24 W.	G. Hill . . } From bearings of old lines.
2	1804—	2 30 W.	M. Cobb. } From bearings of old lines.
3	1811—	3 19 W.	From bearings of old lines.
4	1814·6	3 07 W.	G. Hill. From bearings of old lines. Not used.
5	{ 1815·9	3 13 W.	
	{ 1830·5	3 34 (?) W.	
6	1836·6	4 40 W.	
7	1838·5	4 45 W.	
8	1846·0	5 23 (?) W.	
9	1848·6	5 10 W.	
10	1850·8	5 23 W.	
11	1863·0	6 09 W.	Deed reported by G. Hill.
12	1864—	6 10 W.	G. H. Cook at County Meridian.
13	1866—	6 00 (?) W.	T. N. Doughty.
14	1870—	6 24 W.	From bearings from old lines.
15	1880—	7 15 W.	Prof. E. A. Bowser.
16	1884—	7 30 W.	M. Cobb.
17	1886—	7 30 W.	G. Hill.
18	{ 1887—	7 32 W.	G. Hill. At Rutgers College and at several stations to the northward.
	{ 1887·8	7 34 W.	
19	1895, Sept. [illegible]	7 47·0 W.	J. B. Baylor, U. S. Coast & G. S. Grounds of Rutgers College.

$$D = 5^\circ{\cdot}11 + 2{\cdot}94 \sin (1{\cdot}30\, m + 4^\circ{\cdot}2)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1800·5	+2·40		+2·56	+0·16	1863·0	+6·15		+6·17	+0·02
1804·5	2·50		2·70	+0·20	1864·5	6·17		6·26	+0·09
1811·5	3·32		3·00	−0·32	1866·5	6·00		6·38	+0·38
1814·6	3·12		3·15	+0·03	1870·5	6·40		6·62	+0·22
1815·9	3·22		3·22	0·00	1880·5	7·25		7·14	−0·11
1836·6	4·67		4·44	−0·23	1884·5	7·50		7·33	−0·17
1838·5	4·75		4·56	−0·19	1886·5	7·50		7·41	−0·09
1846·0	5·38		5·06	−0·68	1887·7	7·55		7·46	−0·09
1848·6	5·17		5·23	+0·06	1895·7	+7·78		+7·74	−0·04
1850·8	+5·38		+5·38	0·00					

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW BRUNSWICK, N. J.—Continued.

DIP AND INTENSITY AT NEW BRUNSWICK.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1844, May 24.	72 43·2	0·1848	0·6224	Dr. J. Locke.
2	1895, Sept. 3, 4, 5.	71 54·4	0·1879	0·6051	J. B. Baylor, U. S. Coast & G. S. At Rutgers College.

JAMESBURG, N. J., AND VICINITY.

$\varphi = 40° \; 21'$ $\lambda = 74° \; 27'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1761—	4 33 W.	H. M. Thomas. From bearings of old lines.
2	1795—	3 11 W.	
3	1799—	2 43 W.	
4	1815—	3 12 W.	
5	1826—	3 50 W.	
6	1829—	3 52 W.	
7	1887—	7 25 W.	

$$D = +6°{\cdot}03 + 2{\cdot}94 \sin (1{\cdot}40\, m - 22°{\cdot}4)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	
1761·5	+4·55		+4·40	—0·15
1795·5	3·18		3·13	—0·05
1799·5	2·72		3·10	+0·38
1815·5	3·20		3·23	+0·03
1826·5	3·83		3·62	—0·21
1829·5	3·87		3·75	—0·12
1887·5	+7·42		+7·51	+0·09

DIP AND INTENSITY AT JAMESBURG.

(No observations so far as known.)

HARRISBURG, PA.

$\varphi = 40° \; 15'{\cdot}9$ $\lambda = 76° \; 52'{\cdot}9$ W. of Gr.

[State Capitol.]

No.	Date.	D.	References and remarks.
		° ′	
1	1795, Aug. 19.	0 26 E.	From map by T. Foster.
2	1840, July 26.	3 12·5 W.	Dr. A. D. Bache. In Capitol Grounds.
3	1843—	2 35 W.	From map by J. Roberts.
4	1854, autumn.	3 06 W.	J. Roberts and S. Hoffer. In grounds of Statehouse.
5	1857, Apr. 29.	3 18·3 W.	J. Ferguson, J. Aspach, and D. Hoffman.
	1857, June 3.	3 20 W.	S. Hoffer.
6	1860–1861.	3 30 W.	H. Page.
7	1862, July 28, 29.	3 44·5 W.	C. A. Schott, U. S. Coast S. In grounds of Statehouse.
8	1874, Oct. and Nov.	4 51 W.	H. Alricks and J. S. Africa.
9	1876, Dec. 2.	5 10 W.	Report of Secretary of State, Pa.
10	1877, Sept. 25, 26.	4 53·5 W.	E. Smith, U. S. Coast S. In grounds of Statehouse.
11	1881, May 25.	5 17 W.	J. B. Kaufman. In Capitol Grounds.
12	1885, Aug. 17, 18, 19.	5 21·9 W.	J. B. Baylor, U. S. Coast & G. S. In Capitol Grounds.
13	1888, Sept. and Oct.	5 31·2 W.	J. S. Wall and J. H. Campbell. " " "
14	1889, Feb. 21.	5 30·9 W.	J. B. Kaufman. In Capitol Grounds.
15	1895, Sept. 19, 20.	6 06·3 W.	J. B. Baylor, U. S. Coast & G. S. On Forster Island.

Secular variations of the magnetic declination, dip and intensity—Continued.

HARRISBURG, PA.—Continued.

$$D = +3^{\circ}\cdot12 + 2\cdot98 \sin(1\cdot55\, m - 4^{\circ}\cdot2)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1795·6	—0·43	¼	+0·14	+0·57	1876·9	+5·17		+4·93	—0·24
1840·5	+3·21	½	2·15	—1·06	1877·7	4·89		4·98	+0·09
1843·5	2·58		2·38	—0·20	1881·4	5·28		5·21	—0·07
1854·8	3·01		3·29	+0·28	1885·6	5·36		5·44	+0·08
1857·4	3·32		3·50	+0·18	1888·8	5·52		5·59	+0·07
1861·0	3·50		3·78	+0·28	1889·1	5·52		5·60	+0·08
1862·6	3·74		3·91	+0·17	1895·7	+6·10		+5·86	—0·24
1874·8	+4·85		+4·79	—0·06					

DIP AND INTENSITY AT HARRISBURG.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1840, July.	72 20·5	0·1880	0·6198	Dr. A. D. Bache.
2	1862, July 28, 29.	72 31·6	0·1863	0·6205	C. A. Schott, U. S. Coast S. Grounds of State-house.
3	1877, Sept. 27.	72 20·5	0·1901	0·6267	E. Smith and J. B. Baylor, U. S. Coast S. Grounds of Statehouse.
4	1885, Aug. 17, 18.	71 45·1	0·1908	0·6091	J. B. Baylor, U. S. Coast & G. S. Grounds of Statehouse.
5	1895, Sept. 19, 20.	71 43·0	0·1908	0·6083	J. B. Baylor, U. S. Coast & G. S. On Forster Island.

$$\Theta = 72^{\circ}\cdot48 + 0\cdot006\,7\, m - 0\cdot000\,563\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1840·5	72·34	72·36	+0·02
1862·6	72·53	72·47	—0·06
1877·7	72·34	72·23	—0·11
1885·6	71·75	71·91	+0·16
1895·7	71·72	71·71	—0·01

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1840	+2·1	72·35
1850	2·90	72·48
1860	3·70	72·49
1870	4·46	72·39
1880	5·12	72·17
1890	5·64	71·85
1900	+6·0	71·41

Secular variations of the magnetic declination, dip and intensity—Continued.

HATBORO, PA.

$\varphi = 40° 12'$ $\lambda = 75° 07'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1680.	+8 28 W.	Series communicated by E. W. Beans, in letter of March 1, 1852. This series is supposed to rest on reliable observations, but they are now concealed by interpolation. It does not appear to have any connection with values observed at Philadelphia.
2	1690.	8 15 W.	
3	1700.	7 55 W.	
4	1710.	7 28 W.	
5	1720.	7 00 W.	
6	1730.	6 25 W.	
7	1740.	5 35 W.	
8	1750.	4 55 W.	
9	1760.	4 00 W.	
10	1770.	2 55 W.	
11	1780.	2 05 W.	
12	1790.	1 50 W.	
13	1800.	1 55 W.	
14	1810.	2 00 W.	
15	1820.	2 27 W.	
16	1830.	3 00 W.	
17	1840.	3 50 W.	
18	1850.	+4 25 W.	

$$D = +5°{\cdot}17 + 3{\cdot}16 \sin (1{\cdot}54\, m - 16°{\cdot}7) + 0{\cdot}22 \sin (4{\cdot}1\, m + 157°)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.	Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°		°		°	°
1680·5	+8·47		+8·31	—0·16	1770·5	+2·92		+3·07	+0·15
1690·5	8·25		8·16	—0·09	1780·5	2·08		2·38	+0·30
1700·5	7·92		7·86	—0·06	1790·5	1·83		1·95	+0·12
1710·5	7·47		7·45	—0·02	1800·5	1·92		1·84	—0·08
1720·5	7·00		6·96	—0·04	1810·5	2·00		2·05	+0·05
1730·5	6·42		6·38	—0·04	1820·5	2·45		2·50	+0·05
1740·5	5·58		5·66	+0·08	1830·5	3·00		3·08	+0·08
1750·5	4·92		4·83	—0·09	1840·5	3·83		3·73	—0·10
1760·5	+4·00		+3·93	—0·07	1850·5	+4·42		+4·39	—0·03

DIP AND INTENSITY AT HATBORO.

(No observation so far as known.)

PHILADELPHIA, PA.

$\varphi = 39° 56'{\cdot}9$ $\lambda = 75° 09'{\cdot}0$ W. of Gr.

[Statehouse.]

No.	Date.	D.	References and remarks.
		° ′	
	1620, about.	11¼ W.	R. Dudley's Arcano del Mare. Not used.
1	1701—	8½ W.	Scull.
2	1710—	8½ W.	T. Whitney.
3	1750—	5¾ W.	Dr. P. Kalm's "Travels into North America." English translation by J. R. Foster, 1770.
4	1793—	1½ W.	T. Whitney.
	1793—	1½ W.	Brooks.
5	1802—	1½ W.	Howell.
6	1804—	2 W.	Several observers.
	1804—	2 10 W.	T. Whitney.
7	1813—	2 25 W.	D. McClure.
	1813—	2 27 W.	T. Whitney.
8	1837—	3 25 W.	W. R. Johnson.

Secular variations of the magnetic declination, dip and intensity—Continued.

PHILADELPHIA, PA.—Continued.

No.	Date.	D.	References and remarks.
		° ′	
9	1840, June.	3 37 W.	Dr. A. D. Bache. Grounds of Girard College.
10	1841, July 20 to Nov. 1.	3 53·7 W.	" " " " " " " "
11	1846, May 23.	3 51·1 W.	" J. Locke. " " " "
12	1855, Sept. 5.	4 31·7 W.	C. A. Schott, U. S. Coast S. Grounds of Girard College.
13	1862, Aug. 15, 16.	5 00·0 W.	" " " " " " " " " " " "
14	1872, Oct. 19, 20, 21.	5 27·8 W.	A. H. Scott, " " " " " " " "
15	1877, Oct. 2, 3, 5, 6.	6 02·2 W.	J. B. Baylor, " " " " " " " "
16	1884, Sept. 3, 10, 11.	6 21·6 W.	E. Smith, " " " & G. S. Grounds of Girard College.
17	1890, Nov. 1, 3.	6 31·4 W.	J. B. Baylor, " " " " " " " " " "
18	1895, Sept. 12, 13.	7 10·5 W.	" " " " " " " " " " In Pennsylvania Hospital Grounds.

$$D = +5^\circ{\cdot}36 + 3{\cdot}17 \sin(1{\cdot}50m - 26^\circ{\cdot}1) + 0{\cdot}19 \sin(4{\cdot}0m + 146^\circ)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C — O.	Date.	Obs'd D.	*p.*	Comp'd D.	C — O.
	°		°	°		°		°	°
1701·5	+8·50		+8·13	—0·37	1841·7	+3·90		+3·57	—0·33
1710·5	8·50		7·81	—0·69	1846·4	3·85		3·85	0·00
1750·5	5·75		5·28	—0·47	1855·7	4·53		4·45	—0·08
1793·5	1·50		2·22	+0·72	1862·6	5·00		4·90	—0·10
1802·5	1·50		2·14	+0·64	1872·8	5·46		5·64	+0·18
1804·5	2·08		2·09	+0·01	1877·7	6·04		6·03	—0·01
1813·5	2·43		2·23	—0·20	1884·7	6·36		6·57	+0·21
1837·5	3·87		3·31	—0·56	1890·8	6·52		7·03	+0·51
1840·5	+3·62		+3·49	—0·13	1895·7	+7·18		+7·40	+0·22

DIP AND INTENSITY AT PHILADELPHIA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1834, July.	72 00·2	......	......	Dr. A. D. Bache and Prof. E. H. Courtenay, Chestnut street.
2	1835—	....	0·1934	0·6261	Dr. A. D. Bache and Prof. E. H. Courtenay, Chestnut street.
3	1836, Sept.	....	0·1918	0·6206	Dr. A. D. Bache, Chestnut street.
4	1838, July.	71 43·9	......	......	" " " " Rittenhouse Square.
5	1839, Sept.	72 07·1	0·1913	0·6231	Prof. E. Loomis, Chestnut street.
6	1840, July, Sept., Oct.	71 53·0	......	......	Dr. A. D. Bache.
7	1841, Mar. 30, 31, Apr. 26.	72 00·1	0·1925	0·6230	Dr. A. D. Bache and Dr. J. Locke. (At Girard College.)
	1841, Apr. 26, July 20, Oct. 9, Nov. 1.	71 58·7	0·1925	0·6222	Dr. A. D. Bache. (At Girard College.)
	1841, June.	71 54·5	......	......	Maj. J. D. Graham and Dr. A. D. Bache. (At Girard College.)
8	1842, May 15.	72 01	0·1926	0·6238	Dr. J. Locke. (At Girard College.)
	1842, Oct. 6.	71 59·0	0·1925	0·6224	Sir J. H. Lefroy. (At Girard College.)
	1842—	72 01·8	......	......	Maj. J. D. Graham. (At Girard College.)
	1842, Jan. to Dec.	72 00·1	0.1925	0·6230	Dr. A. D. Bache. (At Girard College.)
9	1843, Apr. to Dec.	71 58·2	0·1924	0·6216	" " " " (At Girard College.)
10	1844, Apr. 19.	71 59·2	0·1917	0·6199	Dr. J. Locke. (At Girard College.)
	1844, May.	72 09·2	......	......	Maj. J. D. Graham, Rittenhouse Square.
	1844, Jan. to July.	71 57·6	0·1922	0·6206	Dr. A. D. Bache. (At Girard College.)
11	1845, Jan. to June.	....	0·1921	......	" " " " (At Girard College.)
12	1846, May 23.	72 01·0	0·1910	0·6186	Dr. J. Locke. (At Girard College.)
13	1855, Sept. 5.	72 17·7	0·1942	0·6386	C. A. Schott, U. S. Coast S. (At Girard College.)
14	1862, Aug. 15, 16.	72 05·8	0·1897	0·6173	" " " " " " " " (At Girard College.)
15	1865, Oct. 24.	....	0·1913	......	Prof. W. Harkness, U. S. N. At Navy Yard.
16	1872, Oct. 19–22.	72 15·4	0·1919	0·6296	E. Goodfellow and A. H. Scott, U. S. Coast S. Girard College.

Secular variations of the magnetic declination, dip and intensity—Continued.

PHILADELPHIA, PA.—Continued.

DIP AND INTENSITY AT PHILADELPHIA—Continued.

No.	Date.	Θ.		H.	F.	References.
		°	′			
17	1877, Oct. 2–6.	71	41·3	0·1942	0·6180	J. B. Baylor, U. S. Coast S. Girard College.
18	1884, Aug. 29, 30, 31.	71	30·7	0·1935	0·6101	E. Smith, U. S. Coast & G. S. Exhibition Laboratory.
	1884, Sept. 3–11.	71	27·4	0·1951	0·6136	E. Smith, U. S. Coast & G. S. Girard College.
19	1890, Nov. 1, 3.	71	20·3	0·1934	0·6045	J. B. Baylor, U. S. Coast & G. S. Girard College.
20	1895, Sept. 12, 13.	71	03·4	0·1950	0·6007	J. B. Baylor, U. S. Coast & G. S. Pennsylvania Hospital grounds.

$$\Theta = 72^\circ{\cdot}13 + 0{\cdot}010\ 1\ m - 0{\cdot}000\ 743\ m$$
$$H = 0{\cdot}191\ 8 - 0{\cdot}000\ 022\ m + 0{\cdot}000\ 002\ 0\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1834·5	72·00	71·80	—0·20
1838·5	71·73	71·92	+0·19
1839·7	72·12	71·95	—0·17
1840·7	71·88	71·97	+0·09
1841·5	71·96	71·99	+0·03
1842·5	72·01	72·01	0·00
1843·6	71·97	72·04	+0·07
1844·3	72·03	72·05	+0·02
1846·4	72·02	72·08	+0·06
1855·7	72·29	72·16	—0·13
1862·6	72·10	72·14	+0·04
1872·8	72·26	71·97	—0·29
1877·7	71·69	71·84	+0·15
1884·7	71·48	71·59	+0·11
1890·8	71.34	71·31	—0·03
1895·7	71·06	71·04	—0·02

Date.	Obs'd H.	Comp'd H.	C—O.
1835·5	0·1934	0·1925	—0·0009
1836·7	918	24	+ 06
1839·7	913	22	+ 09
1841·5	925	21	— 04
1842·5	925	21	— 04
1843·6	924	20	— 04
1844·3	920	20	00
1845·2	921	20	— 01
1846·4	910	19	+ 09
1855·7	942	17	— 25
1862·6	897	19	+ 22
1865·8	913	20	+ 07
1872·8	919	24	+ 05
1877·7	942	27	— 15
1884·7	943	34	— 09
1890·8	934	42	+ 08
1895·7	0·1950	0·1950	0·0000

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+2·91	71·63	0·1930	0·6124
1840	3·46	71·96	22	6206
1850	4·07	72·13	18	6250
1860	4·73	72·16	18	6261
1870	5·44	72·03	22	6230
1880	6·20	71·76	29	6163
1890	6·97	71·35	41	6070
1900	+7·7	70·78	0·1957	0·5945

Secular variations of the magnetic declination, dip and intensity—Continued.

CHAMBERSBURG, PA.

$\varphi = 39° 56'$ $\lambda = 77° 39'$ W. of Gr.

No.	Date.	D.			References and remarks.
		°	′		
1	1736, Nov. 4.	4	15	W.	Z. Butcher.
2	1744, Sept. 11.	3	40	W.	T. Cookson.
3	1746, Mar. 25.	3	19	W.	
4	1754—	3	16	W.	From land patent.
5	1768, May 6, Nov. 1.	1	30	W.	Col. J. Armstrong.
6	1770, Apr. 25.	1	30	W.	
7	1786, Mar. 31.	0	15	W.	M. Henderson.
8	1787, Mar. 7.	0	15	E.	
9	1794—	0	30	E.	
10	1807–'08–'09.	0	42	E.	J. Snively.
11	1816, Nov. 18.	0	30	E.	W. S. Davis.
12	1818, May.	0	22	E.	W. Cummins.
13	1822, Nov. 21.	0	15	E.	W. S. Davis.
14	1825, Dec. 6.	0	00		
15	1830, Nov. 5.	0	15	W.	
16	1836, Mar. 25.	0	27	W.	
17	1840, Aug. 24.	0	54·4	W.	Dr. A. D. Bache. At Irwinsville; reduction to Chambersburg + 5′.
18	1850, Apr. 29.	1	30	W.	J. B. Kaufman.
19	1852, Apr. 12.	1	42	W.	
20	1859, Oct. 24.	2	12	W.	
21	1863, Mar. 25.	2	15	W.	
22	1864, Mar. 31.	2	19	W.	
23	1865, June 1, 19.	2	24	W.	
24	1866, Feb. 23.	2	25	W.	
25	1867, Oct. to Dec.	2	35	W.	
26	1869, May 24.	2	40	W.	
27	1871, Apr., May, and June.	2	55	W.	
28	1873, Apr.	3	00	W.	
29	1876, Apr.	3	15	W.	
	1876, Oct.	3	10	W.	Annual Report Secretary of Internal Affairs, Pa.
30	1877, June.	3	20	W.	J. B. Kaufman.
31	1878, Apr. 22.	3	24	W.	Reduction to mean of day —3′
32	1879, Apr. 12.	3	31	W.	" " " " " —3.
33	1880, Apr. 19.	3	36	W.	" " " " " —4.
34	1881, Apr. 30.	3	41	W.	" " " " " —5.
35	1882, Apr. 19.	3	45	W.	" " " " " —4′.
36	1883, Apr. 30.	3	51	W.	
	1883, Oct. 20.	3	47	W.	
37	1884, Apr. 8.	3	49	W.	
38	1885, Apr. 14.	3	54	W.	
	1885, July 8.	3	55	W.	
39	1886, Mar. 4.	3	54	W.	
	1886, Apr. 6.	3	56	W.	
	1886, Apr. 27.	3	57	W.	
	1886, June 4.	3	51	W.	
	1886, Oct. 1.	3	56	W.	
40	1887, Jan. 19.	3	59	W.	
	1887, Jan. 20.	3	58	W.	
	1887, Jan. 21.	3	53	W.	
	1887, Jan. 22.	4	00	W.	
	1887, Mar. 11.	4	00	W.	
	1887, Apr. 26.	4	01	W.	
41	1888, Jan. to Oct.	4	02	W.	
42	1889, Jan. 31, Mar. 6.	4	05	W.	
43	1891, Apr. 6–24.	4	22	W.	J. B. Kaufman at County Meridian. Result reduced to mean of day. Letter of June 27, 1891.
	1891, July 3, 4.	4	27	W.	J. B. Kaufman, near Upper Strasburg. Result reduced to mean of day. Letter of July 6, 1891.
44	1892, Apr. 12.	4	18	W.	J. B. Kaufman, near Chambersburg at County Meridian. Result reduced to mean of day. Letter of May 2, 1892.
45	1893, Apr. 18.	4	32	W.	A. S. Winger. Result reduced to mean of day. Letter of Jan. 18, 1894.

Secular variations of the magnetic declination, dip and intensity—Continued.

CHAMBERSBURG, PA.—Continued.

$$D = +2^\circ\!\cdot 79 + 3\cdot 10 \sin(1\cdot 55\, m - 30^\circ\!\cdot 6) + 0\cdot 20 \sin(4\cdot 6\, m + 124^\circ)$$

Date.	Obs'd D. *p*.	Comp'd D.	C—O.	Date.	Obs'd D. *p*.	Comp'd D.	C—O.
	°	°	°		°	°	°
1736·8	+4·25	+4·03	—0·22	1866·1	+2·42	+2·43	+0·01
1744·7	3·67	3·53	—0·14	1867·8	2·58	2·54	—0·04
1746·2	3·32	3·43	+0·11	1869·4	2·67	2·65	—0·02
1754·5	3·27	2·86	—0·41	1871·4	2·92	2·79	—0·13
1768·6	1·50	1·76	+0·26	1873·3	3·00	2·93	—0·07
1770·3	1·50	1·62	+0·12	1876·5	3·21	3·17	—0·04
1786·2	+0·25	0·36	+0·11	1877·4	3·33	3·24	—0·09
1787·2	—0·25	+0·29	+0·54	1878·3	3·35	3·31	—0·04
1794·5	0·50	—0·13	+0·37	1879·3	3·47	3·38	—0·09
1808·5	0·71	0·48	+0·23	1880·3	3·53	3·47	—0·06
1816·9	0·50	0·38	+0·12	1881·3	3·60	3·54	—0·06
1818·4	0·37	0·33	+0·04	1882·3	3·72	3·63	—0·09
1822·9	—0·25	0·17	+0·08	1883·6	3·78	3·72	—0·06
1825·9	0·00	—0·04	—0·04	1884·3	3·82	3·78	—0·04
1830·8	+0·25	+0·22	—0·03	1885·4	3·88	3·87	—0·01
1836·2	0·45	0·52	+0·07	1886·4	3·88	3·95	+0·07
1840·6	0·99	0·79	—0·20	1887·1	4·00	4·01	+0·01
1850·3	1·50	1·39	—0·11	1888·5	4·04	4·13	+0·09
1852·3	1·70	1·52	—0·18	1889·1	4·09	4·17	+0·08
1859·8	2·20	2·01	—0·19	1891·4	4·41	4·31	—0·10
1863·2	2·25	2·23	—0·02	1892·3	4·30	4·37	+0·07
1864·2	2·32	2·30	—0·02	1893·3	+4·53	+4·51	—0·02
1865·4	+2·40	+2·38	—0·02				

DIP AND INTENSITY AT CHAMBERSBURG.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1842, Apr. 9.	71 57·1	0·1935	0·6248	Dr. J. Locke.

WEST CREEK, LITTLE EGG HARBOR, N. J.

$\varphi = 39^\circ\ 38'$ $\lambda = 74^\circ\ 19'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
	1609, Oct. 4.	6 W.	H. Hudson, on the coast of New Jersey in $\varphi = 39^\circ\ 30'$, on his third voyage. Prof. E. Loomis in Sill. Jour., vol. XXXIX, 1840. Not used.
1	1687—	9 W.	George Keith, at south end of division line between East and West New Jersey, at Little Egg Harbor. "Report of the Committee of the Council of Proprietors of West New Jersey in relation to the Province Line between East and West New Jersey (1887). Camden, N. J., 1888." Pp. 9, 10. Communicated by Henry S. Haines, Surveyor-General, N. J., letter of July 10, 1891. Prof. G. H. Cook, State Geologist, names Sandy Hook as the place of observation.
2	1700—	6·9 W.	Edm. Halley's Tabula Nautica, Var'n Mag'n Index, juxta obser's anno 1700, per Edm. Halley. Reproduced in Greenwich astronomical observations of 1869.
3	1745—	5 25 W.	Jacob Dennis; see above pamphlet on the division line between East and West New Jersey. J. Lawrence's note on map at West Creek.
4	1860, Aug. 27, 28.	5 18 W.	C. A. Schott, U. S. Coast S., at Long Beach in $\varphi = 39^\circ\ 32'$ $\lambda = 74^\circ\ 15'\!\cdot 6$ W. of Gr. App. No. 9, C. and G. S. Report for 1881. The reduction to West Creek is zero, or nearly so.
5	1887—	7 10 W.	Henry S. Haines, Surveyor-General, N. J. At West Creek, near the south end of Keith's line of 1687. Reference as above for 1687.
6	1891—	7 25(?)W.	An interpolated value, for temporary use, derived from observation of 1887 and the known annual increase of $3'\!\cdot 6$ on this coast.

Secular variations of the magnetic declination, dip and intensity—Continued.

WEST CREEK, LITTLE EGG HARBOR, N. J.—Continued.

$$D = +5^{\circ}\cdot 50 + 2\cdot 78 \sin (1\cdot 5\, m - 18^{\circ}\cdot 4)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1687·5	+9·00		+8·25	—0·75
1700·0	6·90	¼	7·99	+1·09
1745·5	5·42		5·27	—0·15
1860·7	5·31		5·38	+0·07
1887·5	7·17		7·20	+0·03
1891·5	+7·42 (?)		+7·43	+0·01

DIP AND INTENSITY AT WEST CREEK AND VICINITY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1846, Nov. 7, 9.	72 12·3	0·1873	0·6130	Capt. T. J. Lee, U. S. E. At Tuckerton.
2	1860, Aug. 24-28.	71 58·5	0·1916	0·6193	C. A. Schott, U. S. Coast S. At Long Beach.

BALTIMORE, MD.

$\varphi = 39^{\circ}\ 17'\cdot 8$ $\lambda = 76^{\circ}\ 37'\cdot 0$ W. of Gr.

[Washington Monument.]

No.	Date.	D.	References and remarks.
		° ′	
	1620, about.	11(?) W.	R. Dudley's Arcano del Mare. Not used.
1	1640—	9 W.	De Isogonen in de XVI en XVII Eeuw; Proefschrift door W. Van Bemelen. Utrecht, 1893.
2	1679·0	5·25 W.	
3	1683·5	6·25 W.	
4	1703·5	5·12 W.	
5	1720·5	4·21 W.	
6	1729·2	4·02 W.	Derived from magnetic bearings of old lines, 52 cases. Communicated by Thomas Kelbaugh, Aug. 17 and 24, 1877, and Apr. 28, 1879.
7	1754·5	2·28 W.	
8	1756·9	2·88 W.	
9	1771·0	1·11 W.	
10	1776·1	1·75 W.	
11	1780·5	0·77 W.	
12	1787·5	0·37 W.	
13	1808·5	0 12·5 W.	D. Byrnes.
14	1840, Aug. 27.	2 16 W.	Dr. A. D. Bache.
15	1847, Apr. 29.	2 19 W.	Capt. T. J. Lee, U. S. E. At Fort McHenry.
16	1856, Sept. 13.	2 29 W.	C. A. Schott, U. S. Coast S. Near Fort McHenry.
17	1875·5	3·74 W.	T. Kelbaugh, as above.
18	1877, Oct. 10, 11, 12.	4 11 W.	J. B. Baylor, U. S. Coast S. Near Fort McHenry.
19	1885, Aug. 5, 6, 7.	4 29 W.	" " " " " " & G. S. Near Fort McHenry.
20	1895, Sept. 27, 28.	5 20·3 W.	" " " " " " " " Grounds of Fort McHenry.

2·72

$$D = +3^{\circ}\cdot 38 + 27\cdot 2 \sin (1\cdot 4\, m - 22^{\circ}\cdot 3)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.	Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°		°		°	°
1640·5	+9·00	¼	+5·28	—3·72	1780·5	+0·77		+1·02	+0·25
1679·0	5·25	½	6·07	+0·82	1787·5	0·37		0·82	+0·45
1683·5	6·25		6·01	—0·24	1808·5	0·21		0·70	+0·49
1703·5	5·12		5·38	+0·26	1840·7	2·27		1·81	—0·46
1720·5	4·21		4·47	+0·26	1847·3	2·31		2·18	—0·13
1729·2	4·02		3·92	—0·10	1856·7	2·49		2·77	+0·28
1754·5	2·28		2·27	—0·01	1875·5	3·74		4·01	+0·27
1756·9	2·88		2·13	—0·75	1877·8	4·18		4·16	—0·02
1771·0	1·11		1·39	+0·28	1885·6	4·49		4·64	+0·15
1776·1	+1·75		+1·17	—0·58	1895·7	+5·34		+5·19	—0·15

Secular variations of the magnetic declination, dip and intensity—Continued.

BALTIMORE, MD.—Continued.

DIP AND INTENSITY AT BALTIMORE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1832, July.	....	0·1949	....	Prof. J. N. Nicollet. Near Washington Monument.
2	1834, July.	70 58·6	......	......	Prof. E. H. Courtenay and Dr. A. D. Bache. At St. Mary's College.
3	1839, Sept.	71 50·3	......	......	Prof. E. Loomis. In Howard's Woods.
4	1840, Aug.	71 34·1	0·1967	0·6221	Dr. A. D. Bache. " " "
5	1841, Apr. 28.	71 34·1	0·1967	0·6221	Dr. J. Locke. At St. Mary's College and near Washington Monument.
	1841, Apr. 28.	71 39·2	0·1956	0·6215	
	1841, Apr. to Sept.	71 43·4	......	......	Maj. J. D. Graham.
	1841, Apr. to Nov.	71 41·5	......	......	Prof. J. D. Nicollet.
6	1842—	71 39·7	......	......	Maj. J. D. Graham. Near Washington Monument.
	1842, Oct. 8.	71 43·3	0·1952	0·6224	Sir J. H. Lefroy. In Howard's Woods and
7	1844, July.	71 36·0	......	......	Maj. J. D. Graham. at St. Mary's College.
8	1856, Sept. 13.	71 45·8	0·1938	0·6192	C. A. Schott, U. S. Coast S. Outside near Fort McHenry.
9	1877, Oct. 11, 12, 13.	71 36·5	0·1958	0·6205	J. B. Baylor, U. S. Coast S. Outside near Fort McHenry.
10	1885, Aug. 5, 6, 7.	71 02·8	0·1945	0·5988	J. B. Baylor, U. S. Coast & G. S. Outside near Fort McHenry.
11	1895, Sept. 27, 28.	71 00·3	0·1956	0·6010	J. B. Baylor, U. S. Coast & G. S. Outside near Fort McHenry.

$$\Theta = 71°·74 + 0·014\,5\, m - 0·000\,752\, m^2$$
$$H = 0·195\,2 - 0·000\,027\, m + 0·000\,000\,72\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C − O.
	°	°	°
1834·5	70·98	71·34	+0·36
1839·5	71·84	71·51	−0·33
1840·7	71·57	71·54	−0·03
1841·4	71·62	71·56	−0·06
1842·6	71·69	71·60	−0·09
1844·5	71·60	71·64	+0·04
1856·7	71·76	71·81	+0·05
1877·8	71·61	71·57	−0·04
1885·6	71·05	71·31	+0·26
1895·7	71·00	70·83	−0·17

Date.	Obs'd H.	Comp'd H.	C − O.
1832·5	0·1949	0·1959	+0·0010
1840·6	967	55	− 12
1841·3	962	55	− 07
1842·8	952	54	+ 02
1856·7	938	50	+ 12
1877·8	958	50	− 08
1885·6	945	51	+ 06
1895·7	0·1956	0·1955	−0·0001

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+1·29	71·15	0·1960	0·6066
1840	1·77	71·52	55	·6168
1850	2·35	71·74	52	·6230
1860	2·99	71·81	50	·6247
1870	3·65	71·73	49	·6217
1880	4·30	71·50	50	·6145
1890	4·89	71·12	53	·6035
1900	+5·4	70·59	0·1957	0·5889

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE MAY, N. J.

$\varphi=38° 56'.0$ $\lambda=74° 57'.6$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	6¼ W.	Edm. Halley's Tabula Nautica.
2	1750—	3·8 W.	U. S. C. & G. S. Rept. for 1888, Appendix No. 7, p. 308. Value deduced from observations at 19 stations.
3	1833—	2½ W.	Peter Barlow's isogonic chart. Phil. Trans. Roy. Soc. 1833.
4	1846, June 28.	3 05 W.	Dr. John Locke. Near light-house. App. No. 9, Rept. for 1881.
5	1849·7	3 05 W.	N. C. Price in $\varphi=38° 56'$, $\lambda=74° 56'$. Magnetic survey of New Jersey, 1887; Prof. G. H. Cook, geologist in charge.
6	1850·7	3 11 W.	Observer and reference as before.
7	1855, Aug. 3.	3 45·4 W.	C. A. Schott, U. S. Coast S. Near light-house. Appendix No. 9, Rept. for 1881.
8	1857·7	3 30 W.	N. C. Price, reference as before.
9	1874, June 25.	4 38 W.	Dr. T. C. Hilgard. Near the light-house. Appendix No. 9, Rept. for 1881.
10	1881—	5 06 W.	N. C. Price, reference as before.
11	1887·8	5 11 W.	Average of several stations between Cape May City and the light-house. Magnetic survey of New Jersey, 1887; Prof. G. R. Cook, geologist in charge.
12	1891, May 27, 28, 29.	5 40·7 W.	G. R. Putnam, U. S. C. & G. S. Near astronomic station in $\varphi=38° 55'.8$, $\lambda=94° 55'.8$.

$$D=+4°.31+2.40 \sin (1.4\, m-26°.7).$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1700·0	+6·25	½	+6·32	+0·07
1750·0	3·80	½	3·76	—0·04
1833	2·50	½	2·46	—0·04
1846	3·08		3·03	—0·05
1849·7	3·08		3·22	+0·14
1850·7	3·18		3·27	+0·09
1855	3·75		3·50	—0·25
1857·7	3·50		3·65	+0·15
1874	4·63		4·60	—0·03
1881·5	5·10		5·03	—0·07
1887·8	5·18		5·37	+0·19
1891·4	+5·68		+5·54	—0·14

DIP AND INTENSITY AT CAPE MAY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	{ 1846, June 29.	71 25·8	0·1962	0·6160	Dr. J. Locke.
	{ 1846, June 30.	71 23·6	0·1968	0·6169	Dr. J. Locke. At Townbank.
2	1855, Aug. 3.	71 34·4	0·1928	0·6100	C. A. Schott, U. S. Coast S. Near light-house.
3	1874, June 27.	71 28·5	0·1975	0·6216	Dr. T. C. Hilgard. Near light-house.
4	1891, May 26–29.	70 37·1	0·1996	0·6016	G. R. Putnam, U. S. Coast & G. S. At astronomic station.

$$H=0.1951-0.000\,073\, m+0.000\,004\,66\, m^2$$

Date.	Obs'd H.	Comp'd H.	C—O.
1846·5	0·1965	0·1954	—0·0011
1855·6	928	48	+ 20
1874·4	975	0·1961	— 14
1891·4	0·1996	0·2000	+0·0004

Secular variations of the magnetic declination, dip and intensity—Continued.

WASHINGTON, D. C.

$\varphi = 38^\circ\ 53'.3 \qquad \lambda = 77^\circ\ 00'.6.$

[United States Capitol dome.]

No.	Date.	D. ° ′	References and remarks.
1	1754·5	2·03 W.	In the place of the value 3°·3 W. formerly used for 1750 and temporarily adopted in order to strengthen the expression for the secular change, I now take the value 2°·03 for 1754·5 depending on the change —0°·37 observed at Baltimore between 1754 and 1855 and applying it to my observation of 1854·5 at Washington. Weight assigned, ½.
2	1780·5	0·30 W.	In a manner similar to the above we have — 2°·25 the observed difference at Baltimore between 1780 and 1861, and applying this difference to the mean of the Washington observations of 1860 and 1862, or + 2°·55, we get + 0°·30. Weight assigned, ¼.
3	1791–92	0·42 E.	Mean of 27 declinations inscribed on boundary stones of the District of Columbia; extracted from "Surveys and Maps of the District of Columbia," by Marcus Baker. Published by the National Geographic Society, Nov., 1894. Weight assigned, 2.
4	1809, Dec.	0 52 W.	N. King. Weight assigned, ¼.
5	1841·0	1 20 W.	Lieut. J. M. Gilliss. North of United States Capitol.
6	1842·0	1 23·9 W.	
7	1855, July.	2 24 W.	C. A. Schott, U. S. Coast Survey. On Capitol Hill near Gilliss station.
8	1856, Aug. 14, 20.	2 21 W.	Near old office building south of Capitol. mean 2° 11′ W.
	1856, Aug.	2 00·9 W.	Park east of Capitol.
9	1857, Mar. 9.	2 24·8 W.	W. Reed. Near Capitol, south side.
10	1860, Aug. 16–Sept. 26.	2 26·7 W.	C. A. Schott, U. S. Coast S. Near old Office building, south of Capitol.
11	1862, Aug. 18, 19.	2 39·4 W.	
12	1863, June 18–July 28.	2 41·8 W.	
13	1866, Nov. 1.	2 44·2 W.	W. Harkness, U. S. N. Grounds of U. S. Naval Observatory (old site). Reduction to C. & G. S. Office station + 12′·7 or +0°·21.
14	1867, Jan. to Dec.	2 48·1 W.	C. A. Schott, U. S. Coast S. At observatory in Schott's garden, corner of Second and C streets SE., Capitol Hill. Reduction to C. & G. Survey Office station + 11′ or + 0°·18.
15	1868, Jan. to Dec.	2 51·2 W.	
16	1869, Jan. to June incl.	2 53·0 W.	
17	1870, June 13, 14, 15.	2 53·6 W.	
18	1871, June 14, 15, 16.	2 56·9 W.	
19	1872, June 14, 15, 17.	3 00·0 W.	
20	1873, June 14, 16, 17.	3 00·1 W.	
21	1874, June 13, 15, 16.	3 07·4 W.	
	1874, July 20, 21, 22.	3 05·2 W.	
22	1875, June 12, 14, 15.	3 15·5 W.	
23	1876, May 1, 2.	3 18·8 W.	
24	1877, June 14, 15, 16.	3 42·1 W.	C. A. Schott, U. S. Coast S. At observatory in Schott's garden on First and B streets SE., Capitol Hill. Reduction to C. & G. Survey Office station — 10′ or —0°·16.
	1877, Aug. 17.	3 36·8 W.	A. Braid, " " "
25	1878, June 14, 15, 17.	3 47·5 W.	C. A. Schott, " " "
	1878, Sept. 8.	3 43·0 W.	Dr. T. E. Thorpe.
26	1879, June 9, 10, 11.	3 50·4 W.	C. A. Schott and Wm. Eimbeck, U. S. Coast & G. S.
27	1880, Feb. 23, 24, 25.	3 52·4 W.	M. Baker, U. S. Coast & G. S.
	1880, Apr. 3.	3 57·2 W.	J. B. Baylor, " " "
	1880, June 12, 14, 17.	3 57·1 W.	" " " "
28	1882, June 15, 16, 17.	3 55·4 W.	W. Eimbeck, " " "
29	1883, June 18, July 5.	4 00·2 W.	C. A. Schott, " " "
30	1884, Feb. 5, 7.	3 57·9 W.	J. E. Maxfield.
	1884, June 16, 17.	4 05·2 W.	C. A. Schott, U. S. Coast & G. S.
31	1885, June 13, 15.	4 11·5 W.	
32	1886, June 14, 15, 16.	4 08·5 W.	
33	1887, July 28, 29.	4 05·0 W.	J. B. Baylor, U. S. Coast & G. S. Near stations of 1856 and 1857, in lot south of new C. & G. S. Office building (1871). $\varphi = 38^\circ\ 53'.2$ $\lambda = 77^\circ\ 00'.5$.
34	1888, June 19, 20.	4 08·8 W.	
	1888, Jan. to Dec.	3 58·8 W.	C. C. Marsh, ensign U. S. N. At the U. S. Naval Observatory (old site). $\varphi = 38^\circ\ 53'.7$, $\lambda = 77^\circ\ 03'.1$. Reduction to C. & G. Survey Office station + 12′·7 or + 0°·21. Mean adopted + 4°·19.

Secular variations of the magnetic declination, dip and intensity—Continued.

WASHINGTON, D. C.—Continued.

No.	Date.	D.	References and remarks.
		° ′	
35	1889, Jan. to Dec.	4 01·5 W.	J. A. Hoogewerff, ensign U. S. N. At the U. S. Naval Observatory (old site). Reduction to C. & G. S. Office station + 12′·7.
	1889, Sept. 24, 25, 26.	4 15·1 W.	F. D. Preston, U. S. Coast & G. S. Station south of new office, established in 1887.
36	1890, Jan. to Dec.	4 05·8 W.	At U. S. Naval Observatory (old site). Reduction to standard station + 12′·7.
37	1891, Jan. to Dec.	4 09·7 W.	
	1891, Oct. 10, 11, 12.	4 24·3 W.	J. B. Baylor, U. S. Coast & G. S. At standard station in lot south of new C. & G. S. Office building (1871).
38	1892, Jan. to Dec.	4 14·2 W.	At U. S. Naval Observatory (old site). Reduction to standard station + 12′·7.
39	1893, Jan. 3, 4, 5, 6.	4 26·7 W.	R. L. Faris, U. S. Coast & G. S. At standard station.
40	1895, Apr. 16, 17, 18, 19.	4 47·0 W.	

$$D = +2^\circ{\cdot}53 + 2{\cdot}64 \sin (1{\cdot}45\, m - 16^\circ{\cdot}6)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.	Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°		°		°	°
1754·5	+2·03	½	+1·42	—0·61	1874·5	+3·29		+3·39	+0·10
1780·5	+0·30	¼	+0·19	—0·11	1875·5	3·44		3·45	+0·01
1792·0	—0·42	2	—0·07	+0·35	1876·3	3·49		3·50	+0·01
1809·9	+0·87	¼	—0·02	—0·89	1877·5	3·50		3·58	+0·08
1841·0	1·34		+1·23	—0·11	1878·6	3·59		3·64	+0·05
1842·0	1·40		1·28	—0·12	1879·4	3·68		3·69	+0·01
1855·5	2·40		2·13	—0·27	1880·3	3·76		3·74	—0·02
1856·6	2·19		2·21	+0·02	1882·5	3·77		3·87	+0·10
1857·2	2·41		2·24	—0·17	1883·5	3·84		3·93	+0·09
1860·7	2·44		2·48	+0·04	1884·3	3·87		3·97	+0·10
1862·7	2·66		2·61	—0·05	1885·5	4·03		4·04	+0·01
1863·6	2·70		2·67	—0·03	1886·5	3·99		4·09	+0·10
1866·8	2·95		2·89	—0·06	1887·6	4·08		4·15	+0·07
1867·5	2·98		2·93	—0·05	1888·5	4·19		4·20	+0·01
1868·5	3·03		3·00	—0·03	1889·5	4·23		4·25	+0·02
1869·3	3·06		3·05	—0·01	1890·5	4·31		4·30	—0·01
1870·5	3·07		3·13	+0·06	1891·5	4·37		4·35	—0·02
1871·5	3·13		3·20	+0·07	1892·5	4·45		4·40	—0·05
1872·5	3·18		3·26	+0·08	1893·0	4·45		4·42	—0·03
1873·5	+3·18		+3·32	+0·14	1895·3	+4·78		+4·53	—0·25

DIP AND INTENSITY AT WASHINGTON, D. C.

No.	Date.	Θ.	H.	F.	References.	
		° ′				
1	1838—	71 13	......	......	C. Wilkes, U. S. N.	Capitol Park and vicinity.
2	1839, Feb.	71 17·5	......	......	" " " " " and Prof. E. Loomis.	
	1839, Sept.	71 21·4	......	......	Prof. E. Loomis.	
3	1840–41.	71 20·2	......	......	Lieut. J. M. Gilliss.	
4	1841, June and Aug.	71 15·2	......	......	Prof. J. N. Nicollet.	
	1841, July.	71 14·4	......	......	Maj. J. D. Graham and Prof. J. N. Nicollet.	
	1841, Sept.	71 15·9	......	......	Dr. A. D. Bache.	
5	1841–42.	71 18·0	......	......	Lieut. J. M. Gilliss.	
	1842—	71 13·1	......	......	Maj. J. D. Graham.	
	1842, Oct. 10.	71 13·8	0·1990	0·6185	Sir J. H. Lefroy.	
6	1843, Jan.	....	0·1992	......	Dr. A. D. Bache. Near War Department.	
7	1844, Apr. 6.	71 39·3	0·1972	0·6266	Dr. J. Locke. Magnetic Observatory, Capitol Hill.	
	1844, Apr. 8.	71 34·8	0·1971	0·6238	Georgetown.	
	1844, Apr. 9.	71 13·4	0·1987	0·6174	Capitol Park.	
	1844, Apr. 10.	71 15·0	0·1978	0·6155	Near Patent Office.	
	1844, Apr. 11.	71 20·5	0·1986	0·6210	Near War Department.	
	1844, July.	71 10·6	......	......	Maj. J. D. Graham. Near Capitol.	

Secular variations of the magnetic declination, dip and intensity—Continued.

WASHINGTON, D. C.—Continued.

DIP AND INTENSITY AT WASHINGTON, D. C.—Continued.

No.	Date.	Θ.		H.	F.	References.
		°	′			
8	1845, Jan. to May and Nov.	71	33·9	0·1953	0·6178	Capt. T. J. Lee. Survey Office, south of Capitol.
9	1852, May, June.	71	16·1	0·1967	0·6127	J. E. Hilgard, U. S. Coast S. Northwest of Capitol Hill.
10	1853, May 28.	71	21·4	......	......	Lieut. J. N. Gilliss. Near White House and Navy Department.
11	1855, July and Sept.	71	27·0	0·2000	0·6285	C. A. Schott, U. S. Coast S. Grounds of Smithsonian Institution.
12	1856, Aug. 15.	71	19·6	0·1986	0·6202	Capitol Hill near C. S. Office.
	1856, Aug. and Sept.	71	21·7	0·1986	0·6215	Capitol Hill near C. S. Office.
13	1857, Mar.	71	22·5	......	......	W. Reed. Capitol Hill near C. S. Office.
14	1858, June 2.	71	22·6	0·1962	0.6144	C. A. Schott, U. S. Coast S. Capitol Hill near C. S. Office.
15	1859, June and July.	71	24·4	0·1986	0·6229	
16	1860, Aug. and Sept.	71	15·9	0·1991	0·6200	
17	1861—	71	18·3	......	......	S. Walker, U. S. Coast S. Capitol Hill near C. S. Office.
18	1862, July, Aug., Sept.	71	18·5	0·1971	0·6152	C. A. Schott, U. S. Coast S. Capitol Hill near C. S. Office.
19	1863, July 18–28.	71	14·3	0·1980	0·6157	
20	1865, June 27.	71	11·7	......	......	
21	1866, Nov. 1.	72	02	0·1983	0·6425	W. Harkness, U. S. N. At U. S. Naval Observatory. Reduction to C. S. Office station —40′·0 for dip, + 20 for H and —154 for F.
			—40·0	+20	—0154	
22	1867, May 6.	71	58	......	......	
			—40·0	......	......	
	1867, May 6.	71	26	......	......	W. Harkness, U. S. N. C. S. Office station. Corner 2d and C streets SE.
	1867, Jan. to Dec.	71	06·7	0·1992	0·6154	C. A. Schott and E. Goodfellow, U. S. Coast S.
23	1868, Jan. to Dec.	71	03·4	0·1998	0·6155	C. A Schott, U. S. Coast S.
24	1869, May 15.	71	19·2	......	......	Prof. A. Hall, U. S. N.
	1869, Jan. to July.	70	57·9	0·2004	0·6145	C. A. Schott, U. S. Coast S.
25	1870, June 13, 14, 15.	70	55·3	0·2007	0·6139	
26	1871, June 14, 15, 16.	70	59·9	0·2008	0·6168	
27	1872, June 14, 15, 17.	71	00·6	0·2010	0·6178	
28	1873, June 14, 16, 17.	70	58·5	0·2003	0·6144	
29	1874, June 13, 15, 16.	70	52·4	0·2005	0·6119	
30	1875, June 12, 14, 15.	70	51·0	0·2007	0·6119	
31	1876, May 1, 2.	70	47·3	0·2009	0·6104	C. A. Schott, U. S. Coast S., and F. E. Hilgard.
32	1877, June 14, 15, 16, Aug. and Dec.	70	49·1	0·2015	0·6130	C. A. Schott and A. Braid, U. S. Coast S.
33	1878, June, Sept. Dec.	70	48·1	0·2014	0·6124	C. A. Schott, J. B. Baylor, U. S. Coast & G. S., and Dr. T. E. Thorpe. Corner 1st and B streets SE.
34	1879, June 9, 10, 11.	70	48·4	0·2015	0·6126	C. A. Schott and Wm. Eimbeck, U. S. Coast & G. S.
35	1880, June 12–17, July 9, 10, 12.	70	44·9	0·2018	0·6115	J. B. Baylor, U. S. Coast & G. S.
36	1881, Apr. 26.	....		0·2020	......	J. B. Baylor, U. S. Coast & G. S.
	1881, June 25, Dec. 17, 23.	70	42·8	......	......	Lieut. S. W. Very, U. S. N.
37	1882, May.	70	47·8	0·2012	0·6101	B. A. Colonna and Wm. Eimbeck, U. S. Coast & G. S.
	1882, June 15, 16, 17.	70	44·1			
	1882, Sept. and Oct.	70	45·2			
38	1883, June 18, July 5.	70	40·8	0·2016	0·6095	C. A. Schott, U. S. Coast & G. S.
39	1884, Jan. and Feb.	70	38·6	0·2017	0·6082	J. E. Maxfield and Wm. Eimbeck, U. S. Coast & G. S.
	1884, June 16, 17.	70	33·2	0·2027	0·6088	C. A. Schott, U. S. Coast & G. S.
40	1885, June 13, 15.	70	32·9	0·2027	0·6089	" " " " "
41	1886, June 14, 15, 16, 17, 18.	70	30·3	0·2030	0·6085	" " " and E. D. Preston, U. S. Coast & G. S.
42	1887, June 14.	....		0·2031	......	C. A. Schott, U. S. Coast & G. S.
	1887, July 28, 29, 30.	70	26·9	0·2007	0·5996	J. B. Baylor, U. S. Coast & G. S. At C. and G. Survey Office station, in lot south of building.
43	1888, May 10, 12, 15.	70	25·3	......	......	J. B. Baylor, U. S. Coast & G. S.
	1888, June 19, 20.	....		0·2006	0·5985	J. B. Baylor, U. S. Coast & G. S.
44	1889, Sept. 24, 25, 26.	70	25·8	0·2012	0·6007	E. D. Preston, U. S. Coast & G. S.
	1889, Jan. to Dec.	71	06·0	0·1987	0·6134	J. E. Hoogewerff, U. S. N. At U. S. Naval Observatory (old site).
			—40·0	+20	—·0141	

Secular variations of the magnetic declination, dip and intensity—Continued.

WASHINGTON, D. C.—Continued.

DIP AND INTENSITY AT WASHINGTON, D. C.—Continued.

No.	Date.	Θ.	H.	F.	References.
		° ′			
45	1890, Jan. to Dec.	71 04·5 —40·0	0·1986 +20	0·6124 —·0141	J. E. Hoogewerff, U. S. N. At U. S. Naval Observatory (old site).
46	1891, Oct. 10, 11, 12.	70 24·2	0·2003	0·5974	J. B. Baylor, U. S. Coast & G. S. At C. & G. Survey Office station.
	1891, Jan. to Dec.	71 05·0 —40·0	0·1986 +20	0·6125 —·0141	J. E. Hoogewerff, U. S. N. At U. S. Naval Observatory (old site).
47	1892, Jan. to Dec.	71 03·9 —40·0	0·1985 +20	0·6117 —·0141	J. E. Hoogewerff, U. S. N. At U. S. Naval Observatory (old site).
48	1893, Jan. 3, 4, 5, 6, 16, 23.	70 12·1	0·2022	0·5967	R. L. Faris, U. S. Coast & G. S. At C. & G. Survey Office station.
49	1895, Apr. 16–19.	70 15·5	0·2011	0·5954	

The observations at Washington for dip and intensity are too numerous to be conveniently used; they were, therefore, first combined into sets of four observations each. The local deflection of the dip at the old Naval Observatory was ascertained by direct comparison, as were also the differences in H and in F, viz:

CORRECTIONS TO OBSERVED VALUES OF THE DIP, THE HORIZONTAL AND TOTAL INTENSITY AT THE OLD NAVAL OBSERVATORY TO REFER THEM TO THE COAST AND GEODETIC SURVEY OFFICE STATION, SOUTH OF THE CAPITOL.

$\Delta\Theta$ in 1866	—39′·2	Mean reduction —40′·0
1867	—32·0	
1889	—41·0	
1890	—41·2	
1891	—40·8	
1892	—45·7	

ΔH in 1866	+0·0009	Mean reduction +0·0020
1889	25	
1890	21	
1891	17	
1892	+0·0027	

and ΔF for the years 1889–1892. Mean = —0·0140.

$$\Theta = 71^\circ{\cdot}36 - 0{\cdot}002\ 27\ m - 0{\cdot}000\ 540\ m^2$$
$$H = 0{\cdot}197\ 9 + 0{\cdot}000\ 123\ m - 0{\cdot}000\ 000\ 717\ m^2$$

Date.*	Obs'd Θ.*	Comp'd Θ.	C—O.
	°	°	°
1840·0	71·29	71·33	+0·04
1846·2	71·36	71·36	0·00
1855·7	71·38	71·33	—0·05
1860·0	71·34	71·28	—0·06
1864·6	71·28	71·21	+0·07
1868·9	71·10	71·12	+0·02
1873·0	70·96	70·02	+0·06
1878·0	70·82	70·87	+0·05
1881·0	70·76	70·77	+0·01
1885·0	70·58	70·62	+0·04
1889·0	70·43	70·45	+0·02
1894·3	70·21	70·20	—0·01

Date.*	Obs'd H.*	Comp'd H.	C—O.
1843·9	0·1978	0·1971	—0·0007
1855·8	979	986	+ 07
1861·6	982	992	+ 10
1868·0	0·1999	0·1999	00
1872·0	0·2007	0·2003	— 04
1876·0	009	006	— 03
1880·0	017	010	— 07
1884·0	019	013	— 06
1888·0	016	016	00
1891·9	009	018	+ 09
1895·8	0·2024	0·2020	—0·0004

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1820	+0·2	.....	0·1936	0·5929
1830	0·65	71·19	52	0·6054
1840	1·17	71·33	66	141
1850	1·77	71·36	79	192
1860	2·43	71·28	0·1991	205
1870	3·10	71·10	0·2001	177
1880	3·72	70·81	010	114
1890	4·28	70·40	017	0·6014
1900	+4·7	69·9	0·2023	0·5886

*Observed values combined in groups of four, inclusive of an observation of 1896; last value of H the mean of two observations.

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE HENLOPEN, DEL.

$\varphi = 38° 46'.7$ $\lambda = 75° 05'.0$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
	1609, Aug. 12.	10 W.	H. Hudson. Off the coast of Maryland in $\varphi = 38° 13'$.
	1609, Oct. 4.	6 W.	H. Hudson. " " " " New Jersey in $\varphi = 39° 30'$. Declination about $7\frac{1}{2}° \pm 3°$; too uncertain for use.
	1620, about.	10½ W.	R. Dudley's Arcano del Mare. Not used.
1	1700—	6 W.	Edm. Halley's Tabula Nautica.
2	1750—	3⅓ W.	C. & G. S. Rept. for 1888, p. 308; value deduced from observations at 19 stations.
3	1795—	0 55 W.	From "Aurora," at Lewiston.
4	1833.0	1 15 W.	P. Barlow's isogonic chart.
	1841, May.	4 42 W.	Barnett. Not used.
5	1843, Oct. and Nov.	2 26.0 W.	S. P. Lee, U. S. N. Near the light-house.
6	1846, July 1.	2 45.0 W.	Dr. J. Locke. At Lewis Landing.
7	1856, Aug. 27.	3 03.9 W.	C. A. Schott, U. S. Coast S. At the light-house.
8	1885, July 29, 30, 31.	4 59.6 W.	J. B. Baylor, U. S. Coast and G. S. At the light-house.

$$D = +4°.01 + 3.22 \sin (1.35\, m - 25°.2)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1700.0	+6.00	¼	+6.39	+0.39
1750.0	3.33	½	2.92	—0.41
1795.5	0.92	½	0.83	—0.09
1833.0	1.25		1.61	+0.36
1843.8	2.43		2.23	—0.20
1846.5	2.75		2.40	—0.35
1856.6	3.07	2	3.11	+0.04
1885.6	+5.00	2	+5.26	+0.26

DIP AND INTENSITY AT CAPE HENLOPEN.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1846, July 2.	71 18.5	0.1978	0.6172	Dr. J. Locke. At Pilot Town.
2	1856, Aug. 27.	71 22.0	0.1976	0.6183	C. A. Schott, U. S. Coast S. At light-house.
3	1885, July 29, 30, 31.	70 39.6	0.1985	0.5996	J. B. Baylor, U. S. Coast & G. S. At light-house.

WILLIAMSBURG, VA.

$\varphi = 37° 16'.2$ $\lambda = 76° 42'.4$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1694—	5 W.	Madison.
2	1750—	1 56 W.	C. & G. S. Rept. for 1888, p. 308; value deduced from observations at 19 stations.
3	1780—	0 50 W.	President Madison.
4	1809—	0 30 E.	President Madison.
5	1840—	0 45 W.	Sir E. Sabine's isogonic chart for 1840.
6	1874, Dec. 4-9.	2 12 W.	J. B. Baylor, U. S. Coast S. Grounds of William and Mary College.
7	1887, Apr. 9, 11, 12.	3 02.9 W.	J. B. Baylor, U. S. Coast & G. S. Grounds of William and Mary College.

Secular variations of the magnetic declination, dip and intensity—Continued.

WILLIAMSBURG, VA.—Continued.

$D = +2^\circ\cdot20 + 2\cdot48 \sin (1\cdot5\,m - 32^\circ\cdot2)$

Date.	Obs'd D.	p.	Comp'd D.	C−O.
	°		°	°
1694·5	+5·00		+4·67	−0·33
1750·0	+1·93		+2·29	+0·36
1780·5	+0·83		+0·49	−0·34
1809·5	−0·55		−0·28	+0·27
1840·0	+0·75		+0·38	−0·37
1874·9	+2·20		+2·43	+0·23
1887·3	+3·05		+3·20	+0·15

DIP AND INTENSITY AT WILLIAMSBURG.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1874, Dec. 4–10.	69 27·6	0·2135	0·6088	J. B. Baylor, U. S. Coast S. College Grounds.
2	1887, Apr. 9–12.	68 56·5	0·2111	0·5874	" " " " & G. S. " "

CAPE HENRY, VA.

$\varphi = 36^\circ\ 55'\cdot6 \qquad \lambda = 76^\circ\ 00'\cdot4$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	4 W.	Edm. Halley's Tabula Nautica.
2	1728, Mar. 6.	3 W.	W. Byrd, at head of Currituck Sound. Reduction to Cape Henry + 20′.
3	1732—	4 42 W.	W. Hoxton, 7 miles from Cape Henry. Reduction to cape − 10′.
	1732—	4 40 W.	Douglass. Not used.
4	1750—	1 47 W.	C. & G. S. Rept. for 1888, p. 308; value deduced from observations at 19 stations.
	1775—	5 00 W.	Des Barres' Atlantic Neptune. Not used.
5	1809—	0 00	President Madison, observation at Norfolk. Reduction to cape doubtful.
6	1832, June 9, 11.	0 45 W.	Prof. J. N. Nicollet.
7	1856, Sept. 11, 12.	1 28 W.	C. A. Schott, U. S. Coast S. Near the light-house.
8	1874, Nov. 26, 27, 28.	2 39·4 W.	Dr. T. C. Hilgard. Near the light-house.
9	1879, May and June.	2 32 W.	Lieut. S. W. Very, U. S. N. Obs'd at the Rip Raps. Reduction to cape + 10′.
10	1881, June 16.	3 11 W.	Lieut. C. P. Perkins, U. S. N. Reduction to cape + 5′.
11	1883, Jan. 2.	3 10 W.	Lieut. G. A. Norris, U. S. N. Reduction to cape + 5.
11	1883, June 30.	3 06 W.	Lieut. C. Belknap, U. S. N. Reduction to cape 0.
11	1883, Aug. 29.	3 35 W.	Lieut. H. W. Lyon, U. S. N. Reduction to cape − 5.
11	1883, Dec. 10.	3 39 W.	Lieut. C. Belknap, U. S. N. Reduction to cape 0.
12	1884, May 10.	3 37 W.	Lieut. F. Hanford, U. S. N. Reduction to cape − 15.
12	1884, Oct. 10.	2 55 W.	Lieut. C. C. Cornwell, U. S. N. Reduction to cape + 5.
13	1887, Apr. 14, 15, 16.	3 20·1 W.	J. B. Baylor, U. S. Coast & G. S. Near old light-house.
14	1895, June 13, 14.	3 56·5 W.	J. B. Baylor, U. S. Coast & G. S. Near old light-house.

$D = +2^\circ\cdot42 + 2\cdot25 \sin (1\cdot47\,m - 30^\circ\cdot6)$

Date.	Obs'd D.	p.	Comp'd D.	C−O.	Date.	Obs'd D.	p.	Comp'd D.	C−O.
	°		°	°		°		°	°
1700·0	+4·00		+4·55	+0·55	1874·9	+2·66		+2·66	0·00
1728·2	3·33		3·60	+0·27	1879·4	2·70		2·91	+0·21
1732·5	4·53		3·31	−1·22	1881·4	3·27		3·02	−0·25
1750·0	1·78		2·33	+0·55	1883·5	3·37		3·14	−0·23
1809·5	0·00		0·17	+0·17	1884·5	3·18		3·19	+0·01
1832·4	0·75		0·54	−0·21	1887·3	3·34		3·34	0·00
1856·7	+1·47		+1·62	+0·15	1895·5	+3·94		+3·75	−0·19

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE HENRY, VA.—Continued.

DIP AND INTENSITY AT CAPE HENRY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1856, Sept. 11.	69 39·0	0·2132	0·6128	C. A. Schott, U. S. C. S. } Near light-house.
2	1874, Nov. 26, 27, 28.	69 19·0	0·2134	0·6043	Dr. T. C. Hilgard. } Near light-house.
3	1887, Apr. 14, 15.	68 57·6	0·2131	0·5936	J. B. Baylor, U. S. Coast and G. S. } Near light-house.
4	1895, June 13, 14.	68 07·3	0·2201	0·5906	J. B. Baylor, U. S. Coast and G. S. } Near light-house.

$$\Theta = 70^\circ{\cdot}04 - 0{\cdot}035\ 9\ m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1856·7	69·65	69·80	+0·15
1874·9	69·32	69·15	—0·17
1887·3	68·96	68·70	—0·26
1895·5	68·12	68·41	+0·29

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	+1·27	70·04
1860	1·80	69·68
1870	2·37	69·32
1880	2·94	68·96
1890	3·48	68·60
1900	+4·0	68·24

NEWBERN, N. C.

$\varphi = 35^\circ\ 06'$ $\lambda = 77^\circ\ 02'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	0·3 W.	C. & G. S. Rept. for 1888, p. 308; value deduced from observations at 19 stations.
2	1779—	2 09 E.	H. A. Brown, letter of Nov. 6, 1893; from 3 bearings of streets in 1779 and 1810 at which epochs they were the same.
3	1796—	2 40 E.	} J. Price.
4	1806—	2 00 E.	} J. Price.
5	1809—	1 45 E.	} J. Price.
6	1810, Apr. 23.	2 09 E.	H. A. Brown, see above. Diff. of bearings 1810·3 and 1893·8, 4° 23′·3; for 1893·8 I asume 2° 14′ W.
7	1840—	0 00	Sir E. Sabine's isogonic chart for 1840.
8	1874, Dec. 21, 23, 24.	1 20·4 W.	J. B. Baylor U. S. Coast S. At Cemetery.
9	1887, Mar. 19, 20.	1 54·4 W.	" " " " & G. S. At Cemetery.

$$D = +0^\circ{\cdot}41 + 2{\cdot}53 \sin(1{\cdot}45\ m - 11^\circ{\cdot}6)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1750·5	+0·30	½	—0·62	+0·92
1779·5	—2·15		—1·90	+0·25
1796·5	—2·67		—2·12	+0·55
1806·5	—2·00		—2·03	—0·03
1809·5	—1·75		—1·97	—0·22
1810·3	—2·15		—1·96	+0·19
1840·5	0·00		—0·68	—0·68
1874·9	+1·34		+1·46	+0·12
1887·2	+1·91		+2·11	+0·20

DIP AND INTENSITY AT NEWBERN.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1874, Dec. 21, 24.	67 30·6	0·2286	0·5977	J. B. Baylor, U. S. Coast S. At Cemetery.
2	1887, Mar. 19, 20.	67 02·0	0·2269	0·5815	" " " " & G. S. At Cemetery.

Secular variations of the magnetic declination, dip and intensity—Continued.

MILLEDGEVILLE, GA.

$\varphi = 33° 04'.2$ $\lambda = 83° 12'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	2·05 E.	C. & G. S. Rept. for 1888, p. 308, value deduced from observations at 19 stations.
2	1805—	5 30 E.	J. Bethune.
3	1835—	4 40 E.	" "
4	1838—	5 51 E.	Geological Survey of Georgia.
5	1875, June 15.	4 14·1 E.	J. M. Poole. Bache Fund Observer for National Academy.
6	1887, Mar. 8, 9.	3 36·4 E.	J. B. Baylor, U. S. Coast & G. S.

$D = -3°.10 + 2.53 \sin (1.4\, m - 61°.9)$. A rough expression.

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1750·0	—2·05		—2·16	—0·11
1805·5	5·50		5·18	+0·32
1835·5	4·67	½	5·61	—0·94
1838·5	5·85	½	5·57	+0·28
1875·5	4·24		4·22	+0·02
1887·2	—3·61		—3·53	+0·08

DIP AND INTENSITY AT MILLEDGEVILLE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1887, Mar. 8, 9.	64 34·4	0·2495	0·5812	J. B. Baylor, U. S. Coast & G. S. Capitol Grounds.

CHARLESTON, S. C.

$\varphi = 32° 46'.6$ $\lambda = 79° 55'.8$

[St. Michael's Church.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	½ E.	Edm. Halley's Tabula Nautica.
	1700—	½ W.	C. & G. S. Rept. for 1888, p. 307; deduced from observations at 17 stations. Not used.
	1742—	5 23 E.	English Pilot, 1794. Not used.
2	1750—	1 39 E.	C. & G. S. Rept. for 1888, p. 308; deduced from observations at 19 stations.
3	1775—	3 48 E.	Des Barres' Atlantic Neptune.
	1777—	3 48 E.	From a chart. Not used.
4	1784, Feb.	5 15 E.	} J. Purchell.
5	1785, Oct.	5 45 E.	}
6	1824–25.	3 45 E.	Lieut. Sherburne, U. S. N.
7	1833·0	4 00 E.	P. Barlow's isogonic chart.
8	1837—	2 54 E.	Capt. Missroom.
9	1840—	2 44 E.	Dr. C. Davies.
10	1841, May.	2 24 E.	Barnet.
11	1847, Oct.	2 15 E.	Parker.
12	1849, Apr. 1–22.	2 16·5 E.	C. O. Boutelle, U. S. Coast S. At Breach Inlet.
13	1874, May 27, 28, 29.	0 58·2 E.	" " " Fort Marshall.
14	1880, Jan. 21, 22.	0 25·6 E.	J. B. Baylor, U. S. Coast & G. S. " " "
15	1885, Dec. 29, 30.	0 14·2 E.	" " Near Breach Inlet.
16	1895, June 5, 6.	0 19·3 W.	" " " " "

Secular variations of the magnetic declination, dip and intensity—Continued.

CHARLESTON, S. C.—Continued.

$$D = -1^\circ.82 + 2.75 \sin (1.40\, m - 12^\circ.1)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1700·0	—0·50	½	+0·06	+0·56	1840·5	—2·73		—2·99	—0·26
1750·0	1·65		—3·10	—1·45	1841·4	2·40		2·93	—0·53
1775·5	3·80		4·28	—0·48	1847·8	2·25		2·53	—0·28
1784·1	5·25		4·48	+0·77	1849·3	2·28		2·43	—0·15
1785·8	5·75		4·51	+1·24	1874·4	0·97		0·76	+0·21
1825·0	3·75		3·83	—0·08	1880·1	0·43		0·42	+0·01
1833·0	4·00		3·42	+0·58	1886·0	—0·24		—0·08	+0·16
1837·5	—2·90		—3·17	—0·27	1895·4	+0·32		+0·33	+0·01

DIP AND INTENSITY AT CHARLESTON.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1833, Jan.	....	0·2730(?)	......	Prof. J. N. Nicollet.
2	1849, Apr. 6–25.	64 31·9	0·2558	0·5947	C. O. Boutelle, J. Hewston, and G. W. Dean, U. S. Coast S. At Breach Inlet.
3	1874, May 27, 28.	....	0·2550	......	C. O. Boutelle, U. S. Coast S. At Fort Marshall.
4	1880, Jan. 21, 22.	64 13·7	0·2550	0·5864	J. B. Baylor, U. S. Coast & G. S. At Breach Inlet.
5	1885, Dec. 29, 30.	64 02·7	0·2518	0·5753	J. B. Baylor, U. S. Coast & G. S. At Breach Inlet.
6	1895, June 5, 6.	63 59·0	0·2519	0·5742	J. B. Baylor, U. S. Coast & G. S. At Breach Inlet.

$$\Theta = 64^\circ.53 - 0.012\ 1\ m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1849·3	64·53	64·54	+0·01
1880·1	64·23	64·17	—0·06
1886·0	64·05	64·09	+0·04
1895·4	63·98	63·99	+0·01

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1840	—3·03	64·75
1850	2·39	64·53
1860	1·73	64·41
1870	1·07	64·29
1880	—0·45	64·17
1890	+0·09	64·05
1900	+0·5	63·93

SAVANNAH, GA.

$\varphi = 32^\circ\ 04'.9 \qquad \lambda = 81^\circ\ 05'.5$

No.	Date.	D.	References and remarks.
		° ′	
1	1750—	2·2 E.	C. & G. S. Rept. for 1888, p. 308, value deduced from observations at 19 stations.
2	1817—	4 E.	Becquerel's Cartes du Depot.
3	1833·0	5 E.	P. Barlow's isogonic chart.
4	1838—	5 05 E.	Geological Survey.
5	1839—	3 31 E.	Dr. Posey.
6	1852, Apr. 26, 27, 28.	3 40·3 E.	J. E. Hilgard, U. S. Coast S. On Hutchinsons Island.
7	1857, May 1, 2.	3 27·5 E.	C. A. Schott, " " " " " "
8	1874, Mar. 8, 9, 10.	2 16·9 E.	F. Blake and C. Tappan, U. S. Coast S. On Hutchinsons Island.
9	1886, Jan. 6, 7.	1 37·2 E.	J. B. Baylor, U. S. Coast & G. S. " " "
10	1895, May 29, 30.	0 57·2 E.	" " " " " " "

Secular variations of the magnetic declination, dip and intensity—Continued.

SAVANNAH, GA.—Continued.

$$D = -1^{\circ}\cdot94 + 2\cdot75 \sin (1\cdot35\, m - 42^{\circ}\cdot0)$$

Date.	Obs'd D.	p. Comp'd D.	C—O.
	°	°	°
1750·0	—2·20	—2·08	+0·12
1817·5	4·00	4·68	—0·68
1833·0	5·00	4·43	+0·57
1838·5	5·08	4·26	+0·82
1839·5	3·52	4·22	—0·70
1852·3	3·67	3·67	0·00
1857·3	3·46	3·40	+0·06
1874·2	2·28	2·39	—0·11
1886·0	1·62	1·62	0·00
1895·4	—0·95	—1·03	—0·08

DIP AND INTENSITY AT SAVANNAH.

No.	Date.	Θ.	H.	F.	References.	
		° ′				
1	1852, Apr. 24–27.	63 40·0	0·2594	0·5847	J. E. Hilgard, U. S. Coast S.	Hutchinsons Island.
2	1857, May 1, 2.	63 44·3	0·2612	0·5902	C. A. Schott, "	
3	1874, Mar. 5–10.	63 53·9	0·2563	0·5823	C. Tappan and F. Blake, U. S. Coast S.	
4	1886, Jan. 6, 7.	63 18·3	0·2562	0·5704	J. B. Baylor, U. S. Coast and G. S.	
5	1895, May 29, 30.	63 16·7	0·2552	0·5676	J. B. Baylor, U. S. Coast and G. S.	

$$\Theta = 63^{\circ}\cdot63 + 0\cdot021\ 1\ m - 0\cdot000\ 682\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1852·3	63·67	63·69	+0·02
1857·3	63·74	63·76	+0·02
1874·2	63·90	63·75	—0·15
1886·0	63·30	63·52	+0·22
1895·4	63·28	63·19	—0·09

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	—3·78	63·64
1860	3·25	63·78
1870	2·65	63·79
1880	2·01	63·66
1890	1·37	63·39
1900	—0·8	62·98

FERNANDINA, FLA.

$\varphi = 30^{\circ}\ 40'\cdot3$ $\lambda = 81^{\circ}\ 27'\cdot7$ W. of Gr.

[Astronomic station of 1856-57.]

No.	Date.	D.	References and remarks.
		° ′	
1	1849—	4 30 E.	U. S. Deputy Surveyor at Fernandina in $\varphi = 30^{\circ}\ 40'\cdot6$, $\lambda = 81^{\circ} 27'\cdot6$. Letter of W. P. Paret, U. S. assistant engineer, dated Jan. 24, 1891.
2	1857, Apr. 20.	4 02 E.	C. A. Schott, U. S. Coast S. At geodetic station "Fernandina" in $\varphi = 30^{\circ}\ 40'\cdot6$, $\lambda = 81^{\circ}\ 27'\cdot6$. Appendix No. 9, Rept. for 1881.
3	1875, May 14.	2 55 E.	J. M. Poole, Bache Fund observer to National Academy. Appendix No. 14, Rept. for 1882. At station of 1857.
4	1879, Feb. 3, 4, 12.	2 30 E.	S. M. Ackley, Lieut. U. S. N. and Asst. C. & G. S. On Indian mound near geodetic station, $\varphi = 30^{\circ}\ 40'\cdot3$, $\lambda = 81^{\circ}\ 27'\cdot3$. Appendix No. 9, Rept. for 1881.
5	1889—	1 57 E.	W. P. Paret, U. S. assistant engineer. At Amelia light-house in $\varphi = 30^{\circ}\ 40'\cdot4$, $\lambda = 81^{\circ}\ 26'\cdot4$. Letter of Jan. 24, 1891.

Secular variations of the magnetic declination, dip and intensity—Continued.

FERNANDINA, FLA.—Continued.

$$D = -3^\circ\cdot18 - 0\cdot065\,(1870\cdot2 - t)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1849·5	—4·50		—4·52	—0·02
1857·3	4·03		4·01	+0·02
1875·4	2·92		2·84	+0·08
1879·1	2·50		2·60	—0·10
1889·5	—1 95		—1·96	—0·01

DIP AND INTENSITY AT FERNANDINA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1857, Apr. 6, 10, 20.	62 07·3	0·2715	0·5807	C. A. Schott, U. S. Coast S.
2	1879, Feb. 3–12.	61 53·6	0·2701	0·5733	Lieut. S. M. Ackley, U. S. N.

GROUP II.

Secular variations of the magnetic declination, dip and intensity.

[Central stations.]

YORK FACTORY, HUDSON BAY.

$\varphi = 56^\circ\ 59'\cdot9$ $\lambda = 92^\circ\ 26'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1725—	19 W.	Capt. Middleton.
2	1787—	5 W.	Hansteen's isogonic chart.
3	1819, Sept.	6 00 E.	Sir J. Franklin.
4	1843, July 24, 26.	9 01 E.	Sir J. H. Lefroy.
5	1857, Aug.	7 37 E.	R. B. Blakiston.
	1878—	5 30 E.	A. R. C. Selwyn. Not used.
6	1879—	7 00 E.	A. R. C. Selwyn.
7	1884, Sept. 12, 13.	6 40 E.	O. J. Klotz.

$D = +7^\circ\cdot34 + 16\cdot03 \sin\,(1\cdot10\,m - 97^\circ\cdot9)$. Approximate expression.

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1725·5	+19·00	¼	+20·43	+1·43
1787·0	+ 5·00		+ 3·79	—1·21
1819·7	— 6·00		— 4·69	+1·31
1843·6	9·01		8·12	+0·89
1857·6	7·62		8·66	—1·04
1879·5	7·00		7·22	—0·22
1884·7	— 6·66		— 6·48	+0·18

Secular variations of the magnetic declination, dip and intensity—Continued.

YORK FACTORY, HUDSON BAY—Continued.

DIP AND INTENSITY AT YORK FACTORY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1843, July 24–26.	83 47·2	0·0701	0·6479	Sir J. H. Lefroy, Diary Magnetic Survey of Canada, London, 1883.
2	1845, Nov. 5, 1846, May 16.	83 42·6	......	......	J. Rae.
3	1847, Sept. 18.	83 47·0	......	......	J. Rae.
4	1857, Aug.	83 53	......	......	R. B. Blakiston.
5	1884, Sept. 11.	83 46·9	0·0696	0·6421	O. J. Klotz.

FORT ALBANY.

$\varphi = 52° 22'$ $\lambda = 82° 38'$ W. of Gr.

No.	Date.	D.	References and remarks.
		°	
1	1668—	19¼ W.	C. Hansteen's Magnetismus der Erde.
2	1730, Aug. 22.	23 W.	Capt. Middleton.
3	1774, Sept. 14.	17 W.	Hutchins.
4	1840–45.	7½ W.	Sir E. Sabine's isogonic chart.
5	{ 1880—	11 W.	Equal magnetic variation chart, Brit. Admiralty.
	{ 1880—	10 W.	" " " " Deutsche Seewarte.

$D = +15°·78 + 6·95 \sin(1·20\, m - 99°·6)$. An approximate expression.

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1668·5	+19·25		+20·48	+1·23
1730·6	23·00		21·97	—1·03
1774·7	17·00		16·99	—0·01
1842·5	7·50		9·19	+1·69
1880·0	+10·50	2	+ 9·56	—0·94

DIP AND INTENSITY AT FORT ALBANY.

No.	Date.	Θ.	H.	F.	Reference.
		° ′			
1	1775—	79 20	......	......	Hutchins. Hansteen's Erdmagnetismus.

DULUTH, MINN., AND SUPERIOR CITY, WIS.

$\varphi = 46° 45'·5$ $\lambda = 92° 04'·5$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
	1824·5	12½ E.	Capt. Bayfield, R. N.; near Fond du Lac. Not used.
1	1859, July.	9 25 E.	Lieut. W. P. Smith. At Minnesota Point.
2	1861—	10 12 E.	Survey of N. and NW. Lakes.
3	1870, Sept. 20.	10 30 E.	Gen. C. B. Comstock. At Superior City, Wis., Fourth street and Becker avenue.
4	1871, June 20, 27.	10 40 E.	Gen. C. B. Comstock. At North Base, Minnesota Point.
	1873, Aug. 13, 15.	11 52 E.	Capt. A. N. Lee. At Duluth. Not used.
5	1880, Aug. 21, 23.	9 45 E.	J. B. Baylor, U. S. Coast & G. S. At Superior City, Wis.
	1891, Aug. 25.	12 46·9 E.	" " " " " " Duluth. Not used; supposed locally affected.

Secular variations of the magnetic declination, dip and intensity—Continued.

DULUTH, MINN., AND SUPERIOR CITY, WIS.—Continued.

$D=-7°\cdot70+2\cdot41 \sin (1\cdot4m-120°\cdot0)$. Very uncertain.

Date.	Obs'd D. p.	Comp'd D.	C—O.
	°	°	°
1859·5	— 9·42	—10·01	—0·59
1861·5	10·20	10·04	+0·16
1870·7	10·50	10·11	+0·39
1871·5	10·67	10·11	+0·56
1880·6	— 9·76	—10·05	—0·29

DIP AND INTENSITY AT DULUTH AND SUPERIOR CITY.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1859, July 22.	76 44	0·1486	0·6473	Lieut. W. P. Smith, U. S. Lake S. At Minnesota Point.
2	1871, June 16–25.	76 23·5	0·1518	0·6453	Gen. C. B. Comstock, U. S. Lake S. At Minnesota Point Base.
3	1873, Aug. 12, 13, 14.	76 17	0·1565	0·6602	Capt. A. N. Lee, U. S. Lake S. At Duluth.
4	1880, Aug. 21, 23.	76 26·1	0·1504	0·6410	J. B. Baylor, U. S. Coast & G. S. At Superior City.
5	1891, Aug. 25.	76 25·8	0·1468	0·6257	J. B. Baylor, U. S. Coast & G. S. Not used; supposed locally affected. [Sch.]

SAULT STE. MARIE, MICH.

$\varphi=46° 29'\cdot9$ $\lambda=84° 20'\cdot1$ W. of Gr.

[Garden at Fort Brady.]

No.	Date.	D.	References and remarks.
		° ′	
1	1790—	0 -	Alex. Mackenzie.
	1819, May 2.	2 33 E.	Sir J. Franklin. Not used.
2	1843—	1 08 E.	Sir J. H. Lefroy.
3	1844, Nov. 4.	1 01 E.	Sir J. H. Lefroy.
4	1845—	0 46 E.	Sir J. H. Lefroy.
5	1846, Nov.	0 40 E.	Lieut. G. C. Westcott.
6	1856, Sept. 29.	0 32 E.	K. Friesach.
7	1873, July 22, 23.	0 05 W.	Capt. A. N. Lee, U. S. Lake S.
8	1879, Nov. 12.	1 01 W.	City Surveyor. At Fort Brady.
9	1880, July 11, 13, 14, 17, 19.	0 53·7 W.	Lieut. S. W. Very, U. S. N. In vegetable garden at Fort Brady.
9	1880, Aug. 6, 7.	1 04·5 W.	J. B. Baylor, U. S. Coast & G. S. In military post garden.
10	1891, July 29.	1 50·6 W.	" " " " " " " " "

$D=+1°\cdot54+2\cdot70 \sin (1\cdot45\, m-58°\cdot5)$

Date.	Obs'd D. p.	Comp'd D.	C—O.
	°	°	°
1790·5	0·00	+0·01	+0·01
1843·5	—1·13	—0·96	+0·17
1844·8	1·02	0·93	+0·09
1845·5	0·77	0·91	—0·14
1846·8	0·67	0·87	—0·20
1856·7	—0·54	—0·49	+0·05
1873·6	+0·08	+0·43	+0·35
1879·8	1·02	0·82	—0·20
1880·6	0·99	0·88	—0·11
1891·6	+1·84	+1·63	—0·21

Secular variations of the magnetic declination, dip and intensity—Continued.

SAULT STE. MARIE, MICH.—Continued.

DIP AND INTENSITY AT SAULT STE. MARIE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1841, Aug.	77 29·7	......	......	Prof. E. Loomis. SE. of Fort Brady.
2	1843, June.	77 30·2	0·1404	0·6492	Dr. J. Locke.
3	1856, Sept. 29.	77 44	0·1407	0·6624	K. Friesach.
4	1873, July 22, 23.	77 30	0·1404	0·6485	Capt. A. N. Lee, U. S. Lake S.
5	{ 1880, July 11, 13, 19.	....	0·1383	......	Lieut. S. W. Very, U. S. N.
	{ 1880, Aug. 6, 7.	77 24·0	0·1409	0·6460	J. B. Baylor, U. S. Coast & G. S.
6	1891, July 29.	77 00·2	0·1416	0·6297	" " " " "

$$\Theta = 77°·63 + 0·011\ 78\ m - 0·000\ 653\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1841·6	77·50	77·49	—0·01
1843·5	77·50	77·53	+0·03
1856·7	77·73	77·68	—0·05
1873·6	77·50	77·54	+0·04
1880·6	77·40	77·38	—0·02
1891·6	77·00	76·99	—0·01

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1840	—1·04	77·45
1850	—0·76	·63
1860	—0·34	·68
1870	+0·21	·61
1880	+0·84	·39
1890	+1·52	77·06
1900	+2·2	76·59

PIERREPONT MANOR, N. Y.

$\varphi = 43°\ 44'·5$ $\lambda = 76°\ 03'·0$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1823, Sept. 18.	2 16 W.	W. C. Pierrepont.
2	1847, Sept. 18.	4 23 W.	V. Colvin.
3	1856, Nov. 25.	5 10 W.	
4	1860, July 15-16.	5 36 W.	
5	1863, July 10.	5 44 W.	
6	1864, Apr. 12.	5 50 W.	
7	1865, May 4, June 4.	6 00 W.	
8	1866, Sept. 11.	6 15 W.	
9	1867, July 27.	6 10 W.	
10	1868, May 12.	6 10 W.	
11	1869, May 11.	6 18 W.	
12	1870, May 27, Sept. 21.	6 04 W.	
13	{ 1874—	6 44 W.	
	{ 1874, Oct. 20.	6 12 W.	Dr. T. C. Hilgard. On Pierrepont's meridian line, stone in pasture.

$$D = +5°·95 + 3·78 \sin (1·4\ m - 22°·2)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1823·7	+2·27		+2·71	+0·44	1866·7	+6·25		+6·03	—0·22
1847·7	4·38		4·33	—0·05	1867·6	6·17		6·11	—0·06
1856·9	5·17		5·13	—0·04	1868·4	6·17		6·19	+0·02
1860·5	5·60		5·45	—0·15	1869·4	6·30		6·28	—0·02
1863·5	5·73		5·73	0·00	1870·5	6·06		6·38	+0·32
1864·3	5·83		5·81	—0·02	1874·8	+6·55		+6·77	+0·22
1865·4	+6·00		+5·91	—0·09					

Secular variations of the magnetic declination, dip and intensity—Continued.

PIERREPONT MANOR, N. Y.—Continued.

DIP AND INTENSITY AT PIERREPONT MANOR.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1874, Oct. 20.	75 25·1	0·1600	0·6354	Dr. T. C. Hilgard.
2	1884, June 6, 7, 9.	....	0·1599	......	J. B. Boutelle, U. S. Coast & G. S. At Mannsville.

TORONTO, CANADA.

$\varphi = 43° \ 39'.4 \qquad \lambda = 79° \ 23'.3$ W. of Gr.

[Magnetic Observatory.]

No.	Date.	D.	References and remarks.
		° ′	
1	1840, Jan.	1 27 W.	Capt. C. J. B. Riddell.
2	1841·5	1 14·3 W.	Toronto Magnetical and Meteorological Observatory. Abstracts of results from 1841 to 1871. Toronto, 1875. G. T. Kingston, Director.
3	1842·5	1 19·1 W.	
4	1845·5	1 29·1 W.	
5	1846·5	1 30·8 W.	
6	1847·5	1 33·2 W.	
7	1848·5	1 35·4 W.	
8	1849·5	1 36·9 W.	
9	1850·5	1 38·6 W.	
10	1851·5	1 40·9 W.	
11	1853, July and Aug.	1 46·1 W.	
12	1854, Feb., Mar., Apr.; June.	1 48·0 W.	
13	1855, Aug. to Dec., incl.	1 52·3 W.	
14	1856·5	1 56·3 W.	
15	1857·5	2 00·5 W.	
16	1858·5	2 04·5 W.	
17	1859·5	2 07·4 W.	
18	1860·5	2 10·6 W.	
19	1861·5	2 14·3 W.	
20	1862·5	2 15·7 W.	
21	1863·5	2 19·1 W.	
22	1864·5	2 21·9 W.	
23	1865·5	2 24·8 W.	
24	1866·5	2 27·6 W.	
25	1867·5	2 29·8 W.	
26	1868·5	2 33·2 W.	
27	1869·5	2 37·1 W.	
28	1870·5	2 41·9 W.	
29	1871·5	2 47·9 W.	
30	1872·5	2 53·0 W.	C. Carpmael, Director of Observatory.
31	1873·5	2 58·3 W	
32	1874·5	3 04·1 W.	
33	1875·5	3 11·7 W.	
34	1876·5	3 18·5 W.	
35	1877·5	3 24·9 W.	
36	1878·5	3 31·4 W.	
37	1879·5	3 37·3 W.	
38	1880, Oct. 18.	3 41·1 W.	C. Carpmael.
39	1884, Aug.	3 57·2 W.	O. J. Klotz.
40	1895, Mar.	4 46·8 W.	Communication by O. J. Klotz, dated Ottawa, Apr. 4, 1895.

Secular variations of the magnetic declination, dip and intensity—Continued.

TORONTO, CANADA—Continued.

$$D = +3^{\circ}\cdot60 + 2\cdot82 \sin(1\cdot4\, m - 44^{\circ}\cdot7) + 0\cdot09 \sin(9\cdot3\, m + 136^{\circ}) + 0\cdot08 \sin(19\, m + 247^{\circ})$$

Date.	Obs'd D.	p.	Comp'd D.	C − O.	Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°		°		°	°
1840·1	+1·45		+1·36	—0·09	1863·5	+2·32		+2·33	+0·01
1841·5	1·24		1·40	+0·16	1864·5	2·36		2·37	+0·01
1842·5	1·32		1·45	+0·13	1865·5	2·41		2·41	0·00
1845·5	1·48		1·52	+0·04	1866·5	2·46		2·45	—0·01
1846·5	1·51		1·54	+0·03	1867·5	2·50		2·50	0·00
1847·5	1·55		1·56	+0·01	1868·5	2·55		2·55	0·00
1848·5	1·59		1·57	—0·02	1869·5	2·62		2·62	0·00
1849·5	1·62		1·59	—0·03	1870·5	2·70		2·69	—0·01
1850·5	1·64		1·62	—0·02	1871·5	2·80		2·78	—0·02
1851·5	1·68		1·66	—0·02	1872·5	2·88		2·88	0·00
1853·5	1·77		1·76	—0·01	1873·5	2·97		2·98	+0·01
1854·5	1·80		1·82	+0·02	1874·5	3·07		3·09	+0·02
1855·5	1·87		1·88	+0·01	1875·5	3·19		3·20	+0·01
1856·5	1·94		1·95	+0·01	1876·5	3·31		3·30	—0·01
1857·5	2·01		2·02	+0·01	1877·5	3·41		3·41	0·00
1858·5	2·07		2·08	+0·01	1878·5	3·52		3·50	—0·02
1859·5	2·12		2·14	+0·02	1879·5	3·62		3·58	—0·04
1860·5	2·18		2·20	+0·02	1880·8	3·68		3·67	—0·01
1861·5	2·24		2·25	+0·01	1884·6	3·95		3·87	—0·08
1862·5	+2·26		+2·29	+0·03	1895·2	+4·78		+4·51	—0·27

DIP AND INTENSITY AT TORONTO MAGNETICAL AND METEOROLOGICAL OBSERVATORY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1841, 12 months.	75 16·6	......	......	Capts. C. J. B. Riddell and C. Younghusband.
2	1842, Oct. 26.	14·7	0·1630	0·6407	Sir J. H. Lefroy.
	1842, 12 months.	16·4	......	......	Capt. C. Younghusband.
3	1843, Aug.	11·4	0·1631	0·6385	Dr. A. D. Bache.
	1843, 12 months.	14·7	......	......	Capt. C. Younghusband.
4	1844, June 19.	12·5	0·1633	0·6400	Dr. J. Locke.
	1844, June 20.	13·4	0·1632	0·6409	
	1844, 12 months.	14·8	......	......	Capt. C. Younghusband and Sir J. H. Lefroy.
5	1845, "	15·5	0·1636	0·6428	Sir J. H. Lefroy.
6	1846, "	15·1	0·1633	0·6415	
7	1847, "	15·3	0·1631	0·6409	
8	1848, "	18·3	0·1629	0·6423	
9	1849, "	18·8	0·1631	0·6433	
10	1850, "	20·0	0·1629	0·6432	
11	1851, "	20·4	0·1628	0·6431	
12	1852, "	20·5	0·1621	0·6405	
13	1853, "	22·2	......	......	Sir J. H. Lefroy and G. T. Kingston.
14	1854, "	23·0	......	......	G. T. Kingston.
15	1855, 12 months for Θ, Sept. to Dec. for H and F.	23·5	0·1621	0·6427	
16	1856, 12 months.	24·1	0·1616	0·6411	
17	1857, "	24·3	0·1608	0·6383	
18	1858, "	24·4	0·1609	0·6387	
19	1859, June 25, 30.	24	0·1605	0·6363	Lieut. W. P. Smith, U. S. Lake S.
	1859, 12 months.	25·0	0·1606	0·6374	G. T. Kingston.
20	1860, "	24·6	0·1604	0·6368	
21	1861, "	23·8	0·1606	0·6371	
22	1862, "	23·2	0·1607	0·6369	
23	1863, "	21·5	0·1609	0·6364	
24	1864, "	20·9	0·1611	0·6368	
25	1865, "	21·0	0·1610	0·6368	
26	1866, "	19·2	0·1611	0·6355	
27	1867, "	18·8	0·1613	0·6361	
28	1868, "	20·1	0·1613	0·6371	
29	1869, "	16·7	0·1613	0·6349	
30	1870, "	16·3	0·1613	0·6345	
31	1871, "	75 16·8	0·1614	0·6352	
32	1885, Apr.	74 52	0·1656	0·6343	C. Carpmael.
33	1895, Mar.	74 33·7	0·1664	0·6252	O. J. Klotz.

Secular variations of the magnetic declination, dip and intensity—Continued.

TORONTO, CANADA—Continued.

DIP AND INTENSITY AT TORONTO MAGNETICAL AND METEOROLOGICAL OBSERVATORY—Continued.

Combining the dip observations up to 1869, inclusive, to form groups of 4, the means can be represented by the expression

$$\Theta = 75^{\circ}{\cdot}341 + 0{\cdot}008\,784\, m - 0{\cdot}000\,589\, m^2$$

and combining the values of the horizontal component of force similarly, the latter can be expressed by

$$H = 0{\cdot}162\,30 - 0{\cdot}000\,154\, m + 0{\cdot}000\,005\,8\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	°
1843·0	75·26	75·25	—0·01
1847·0	·27	·31	+ ·04
1851·0	·33	·35	+ ·02
1855·0	·39	·37	— ·02
1859·0	·41	·37	— ·04
1863·0	·37	·35	— ·02
1867·0	·33	·32	— ·01
1870·5	·27	·28	+ ·01
1871·5	75·28	75·26	— ·02
1885·3	74·87	74·92	+ ·05
1895·2	74·56	74·53	— ·03

Date.	Obs'd H.	Comp'd H.	C — O.
1844·1	0·1632	0·1634	+0·0002
1848·0	·1631	·1626	— 05
1852·6	·1625	·1619	— 06
1858·0	·1610	·1615	+ 05
1862·0	·1606	·1613	+ 07
1866·0	·1611	·1613	+ 02
1870·0	·1613	·1615	+ 02
1871·5	·1614	·1617	+ 03
1885·3	·1656	·1641	— 15
1895·2	0·1664	0·1672	+0·0008

COMPUTED DECENNIAL VALUES.

Year.	D.	Θ.	H.	F.
	°	°		
1840	+1·32	75·19	0·1644	0·6434
1850	1·60	·34	1623	414
1860	2·17	·37	1613	388
1870	2·66	·28	1615	357
1880	3·62	75·07	1629	325
1890	4·12	74·75	1654	289
1900	+4·8	74·31	0·1691	0·6251

GRAND HAVEN, MICH.

$\varphi = 43^{\circ}\ 05'{\cdot}2$ $\lambda = 86^{\circ}\ 12'{\cdot}6$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1825—	3¾ to 6 E.	L. Lyon.
2	1837—	4½ and 6¼ E.	Geologic Report.
3	1859, Aug. 18.	4 24 E.	Lieut. W. P. Smith.
4	1865—	4 15 E.	Col. Raynolds, Survey N. and NW. Lakes.
	1865, Sept.	4 20 E.	J. de la Camp.
5	1871, July 31.	3 33 E.	L. Foote.
6	1873, Aug. 28, 29.	3 28 E.	Capt. A. N. Lee, U. S. Lake S.
7	1880, July 20, 21.	2 25·7 E.	J. B. Baylor, U. S. Coast & G. S. Grounds of the county court-house.
8	1891, July 22.	1 39·1 E.	

Secular variations of the magnetic declination, dip and intensity—Continued.

GRAND HAVEN, MICH.—Continued.

$D = -4^\circ.95 + 0.038\,0\,m + 0.001\,15\,m^2$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1825.5	—5.25		—5.16	+0.09
1837.5	5.08		5.24	—0.16
1859.6	4.40		4.47	—0.07
1865.6	4.25		4.07	+0.18
1871.6	3.55		3.57	—0.02
1873.7	3.47		3.38	+0.09
1880.5	2.43		2.72	—0.29
1891.5	—1.65		—1.39	+0.26

DIP AND INTENSITY AT GRAND HAVEN.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1859, Aug. 18.	74 10	0.1759	0.6449	Lieut. W. P. Smith, U. S. Lake S.
2	1873, Aug. 27, 28, 29.	73 58	0.1775	0.6427	Capt. A. N. Lee, "
3	1880, July 20, 21.	73 53.7	0.1774	0.6395	J. B. Baylor, U. S. Coast & G. S. Grounds of county court-house.
4	1891, July 22.	73 34.7	0.1773	0.6271	

$\Theta = 74^\circ.37 - 0.017\,8\,m$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1859.6	74.17	74.20	+0.03
1873.7	73.97	73.95	—0.02
1880.5	73.90	73.83	—0.07
1891.6	73.58	73.63	+0.05

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	—4.95	74.37
1860	4.45	74.19
1870	3.71	74.01
1880	2.73	73.84
1890	—1.6	73.66
1900	......	73.48

MILWAUKEE, WIS.

$\varphi = 43^\circ\ 02'.5 \qquad \lambda = 87^\circ\ 54'.2$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1859, Aug. 20.	6 20 E.	Lieut. W. P. Smith, U. S. Lake S.
2	1871, May.	6 43 E.	Maj. D. C. Houston.
3	1873, Aug. 22.	6 22 E.	Capt. A. N. Lee, U. S. Lake S.
4	1882, Sept.	4 55 E.	Maj. D. C. Houston. At breakwater.
5	1888, Aug. 25, 27.	4 22.3 E.	J. B. Baylor, U. S. Coast & G. S. West of North Point light-house.

$D = -4^\circ.12 + 3.60 \sin(1.45\,m - 64^\circ.5)$. A weak expression.

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1859.6	—6.34		—6.90	—0.56
1871.4	6.72		6.11	+0.61
1873.6	6.37		5.94	+0.43
1882.7	4.92		5.18	—0.26
1888.7	—4.37		—4.65	—0.28

Secular variations of the magnetic declination, dip and intensity—Continued.

MILWAUKEE, WIS.—Continued.

DIP AND INTENSITY AT MILWAUKEE.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1859, Aug. 20.	73 57	0·1779	0·6435	Lieut. W. P. Smith, U. S. Lake S.
2	1873, Aug. 22.	73 43	0·1797	0·6409	Capt. A. N. Lee, "
3	1888, Aug. 25, 27.	73 48·0	0·1765	0·6327	J. B. Baylor, U. S. Coast & G. S. Near North Point light-house.

BUFFALO, N. Y.

$\varphi = 42° 52'·8$ $\lambda = 78° 53'·5$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
	1789, June 29.	4 06 W.	From a surveyor's MS., not used. 7 miles south of Buffalo.
1	1797—	0	A. Atwater. East end of Lake Erie.
2	1798—	0½ W.	A. Porter. Buffalo Reservation, lake shore.
3	1837—	1 25 W.	R. W. Haskins.
4	1839—	1 15 W.	U. S. Lake Survey, at Fort Erie.
5	1845—	1 25 W.	Sir J. H. Lefroy.
6	1859, June.	2 56 W.	Lieut. W. P. Smith, U. S. Lake S. Near South Pier.
7	1872, June 14.	3 52 W.	Capt. A. N. Lee, U. S. Lake S. At Fort Porter.
8	1873, June 4, 5.	3 58 W.	
9	1885, Sept. 17, 18, 19.	5 04·3 W.	J. B. Baylor, U. S. Coast & G. S. At Fort Porter.
10	1893, Mar.	5 20 W.	E. S. Nott, surveyor; letter of Mar., 1893.

$$D = +3°·66 + 3·47 \sin(1·4\, m - 27°·8)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1797·5	0·00		+0·26	+0·26
1798·5	+0·50		0·24	—0·26
1837·5	1·42		1·19	—0·23
1839·5	1·25		1·31	+0·06
1845·5	1·42		1·71	+0·29
1859·5	2·94		2·79	—0·15
1872·5	3·87		3·89	+0·02
1873·5	3·97		3·97	0·00
1885·7	5·07		4·98	—0·09
1893·2	+5·33		+5·54	+0·21

DIP AND INTENSITY AT BUFFALO.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1839, Aug.	74 40·8	......	......	Prof. E. Loomis.
2	1844, June 23.	74 36·5	0·1689	0·6364	Dr. J. Locke.
3	1845, Oct. 20.	74 37·8	0·1674	0·6314	Sir J. H. Lefroy.
4	1859, June 11.	74 47	0·1663	0·6337	Lieut. W. P. Smith, U. S. Lake S.
5	1872, June 13, 14.	74 43	0·1680	0·6374	Capt. A. N. Lee, U. S. Lake S. At Fort Porter.
6	1873, June 3, 6.	74 29	0·1691	0·6320	" " " " " "
7	1885, Sept. 17, 18, 19.	74 04·7	0·1692	0·6168	J. B. Baylor, U. S. Coast & G. S. At Fort Porter.

Secular variations of the magnetic declination, dip and intensity—Continued.

BUFFALO, N. Y.—Continued.

DIP AND INTENSITY AT BUFFALO—Continued.

$$\Theta = 74^\circ{\cdot}74 + 0{\cdot}010\ 1\ m - 0{\cdot}000\ 756\ m^2$$
$$H = 0{\cdot}167\ 6 - 0{\cdot}000\ 063\ m + 0{\cdot}000\ 003\ 4\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1839·6	74·68	74·55	—0·13
1844·5	74·61	·66	+0·05
1845·8	74·63	·68	+0·05
1859·4	74·78	·77	—0·01
1872·5	74·72	·58	—0·14
1873·4	74·48	·56	+0·08
1885·7	74·08	74·14	+0·06

Date.	Obs'd H.	Comp'd H.	C — O.
1844·5	0·1689	0·1681	—0·0008
1845·8	74	79	+ 05
1859·4	63	73	+ 10
1872·4	80	79	- 01
1873·4	91	80	— 11
1885·7	0·1692	0·1696	+0·0004

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	+0·79	74·24	0·1702	0·6266
1840	1·35	·56	·1684	·6325
1850	2·05	·74	74	·6360
1860	2·84	·77	71	·6362
1870	3·67	·64	75	·6323
1880	4·51	74·36	·1685	·6250
1890	5·30	73·93	·1702	·6149
1900	+6·0	73·35	0·1726	0·6024

ITHACA, N. Y.

$\varphi = 42^\circ\ 26'{\cdot}8$ $\lambda = 76^\circ\ 28'{\cdot}9$ W. of Gr.

[Cornell University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1672, June 24.	10 W.	Observer, Father Raffeix. In the country between the lakes, probably in Cayuga County. Approximate position $\varphi = 42\frac{1}{2}^\circ$, $\lambda = 76\frac{3}{4}^\circ$ W. of Gr. Raffeix, writing from Goiougouen, describes the country between the lakes at about $42\frac{1}{2}^\circ$ lat. and notes the magnetic declination as scarcely 10°. Communicated by J. H. Trumbull, April, 1876.
2	1795—	3 25 W.	Benjamin Ellicott ran the new prëemption line, longitude 76° 57′·9 W. from Gr. and in latitude 42° 27′, and found the declination 3° 25′ W. [Platting the observed declinations of the prëemption line (1795), of the Pennsylvania line (1786–87), and of the west boundary of Pennsylvania (1786), and constructing an isogonic chart for the epoch 1790, I find the reduction of Ellicott's station to Ithaca to equal about +35′, hence for 1795 declination at Ithaca, 4°·0 W. — Sch.]
3	1831, Sept.	2 51 W.	Regent's Report, Geological Survey of New York. In $\varphi = 42^\circ\ 27'$, $\lambda = 76^\circ\ 30'$ W. [See also Silliman's Journal, Vol. XXXIV, 1838, where the year 1833 is given to the observation.
4	1874, June 13.	5 25·8 W.	Dr. T. C. Hilgard, at the Fuertes Meridian, Cornell College grounds. Appendix No. 8, C. & G. S. Rept. for 1881. Assigned position $\varphi = 42^\circ\ 27'{\cdot}5$, $\lambda = 76^\circ\ 33'{\cdot}0$ W. of Gr.
5	1889, Apr. 17, 18, 19.	6 25·5 W.	J. C. Dowling and J. F. Hayford; MS. of thesis communicated by Prof. Fuertes. At Cornell University, position as in heading.
6	1890, Oct. 27, 28.	6 31·5 W.	J. B. Baylor, U. S. Coast & G. S. At Cornell University, position as above.

Secular variations of the magnetic declination, dip and intensity—Continued.

ITHACA, N. Y.—Continued.

$$D = +6^\circ.48 + 3.74 \sin (1.35m - 52^\circ.4)$$

Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°
1672·5	+10·00		+9·95	—0·05
1795·5	3·42		3·45	+0·03
1831·7	2·85		2·84	—0·01
1874·4	5·43		5·23	—0·20
1889·3	6·42		6·52	+0·12
1890·8	+ 6·53		+6·66	+0·13

DIP AND INTENSITY AT ITHACA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1874, June 13.	74 14·7	0·1689	0·6221	Dr. T. C. Hilgard.
2	1888, Oct. 9, Nov. 5.	....	0·1713	......	J. C. Dowling and J. F. Hayford. At Cornell University.
3	1889, Apr. 17, 18, 19.	73 51·7	......	......	J. C. Dowling and J. F. Hayford. At Cornell University.
4	1890, Oct. 27, 28.	73 49·5	0·1692	0·6074	J. B. Baylor, U. S. Coast & G. S. At Cornell University.

DUNKIRK, N. Y.

$\varphi = 42^\circ\ 29'.6$ $\lambda = 79^\circ\ 21'.3$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1798, Aug. 2.	0 35 E.	By a surveyor of the Holland Land Co. At Chautauqua Lake, about 15 statute miles to the southward and westward of Fredonia ($\varphi = 42^\circ\ 26'.5$, $\lambda = 79^\circ\ 21'.5$).
2	1837, June 16 to Aug. 28.	0 37·6 W.	W. L. Starke at Fredonia; mean of 4 morning and 3 evening observations.
3	1841, Aug. 12.	0 52·5 W.	Dr. A. D. Bache, at Dunkirk, in $\varphi = 42^\circ\ 29'.3$, $\lambda = 79^\circ\ 21'$. Appendix No. 19, C. S. Rept. for 1862.
4	1845—	1 07 W.	Lieut. J. H. Simpson at Dunkirk. Prof. Papers No. 24, U. S. E., Washington, D. C., 1882. In $\varphi = 42^\circ\ 30'$, $\lambda = 79^\circ\ 21'$.
5	1850, Aug.	1 20 W.	N. Y. & E. R. R. engineer, at Dunkirk.
6	1874, Aug. 8, 9, 10.	2 57 W.	E. S. Ely, surveyor; letter dated Fredonia, July 6, 1891.
7	1891—	4 12·5 W.	" " " " as above. This letter also refers to the observations of 1798, 1837 and 1850.

$$D = +2^\circ.34 + 2.89 \sin (1.40m - 19^\circ.8)$$

Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°
1798·6	—0·58		—0·55	+0·03
1837·6	+0·63		+0·59	—0·04
1841·6	+0·88		+0·83	—0·05
1845·5	+1·12		+1·07	—0·05
1850·6	+1·33		+1·40	+0·07
1874·6	+2·95		+3·07	+0·12
1891·5	+4·21		+4·13	—0·08

DIP AND INTENSITY AT DUNKIRK.

No.	Date.	Θ.	H.	F.	Reference.
		° ′			
1	1841, Aug.	74 17·2	0·1670	0·6166	Dr. A. D. Bache.

Secular variations of the magnetic declination, dip and intensity—Continued.

DETROIT, MICH.

$\varphi = 42° 20'.0 \qquad \lambda = 83° 03'.0$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1810—	2 48 E.	J. Mansfield.
2	1822—	3 13 E.	L. Lyons.
3	1828—	2 50 E.	L. Lyons.
4	1835—	2 10 E.	Geological Report.
5	1839, July.	1 34 E.	W. A. Burt, near Detroit in $\varphi = 42° 42'$, $\lambda = (?)$. Letter of C. S. Woodard dated Ypsilanti, Sept. 10, 1888.
6	1840—	2 00 E.	Geological Report.
	1840—	1 56 E.	Prof. E. Loomis.
7	1859, Apr.	0 42 E.	U. S. Lake S.
8	1865—	0 40 E.	U. S. Lake S.
9	1872, May 8–29.	0 25.2 E.	Capt. A. N. Lee, U. S. Lake S.
10	1873, May 5–17.	0 17.3 E.	Capt. A. N. Lee, U. S. Lake S.
11	1876, June 3, 6.	0 04.7 E.	Lieut. T. N. Bailey, U. S. Lake S.
12	1885, Sept. 2, 3, 4.	0 31.0 W.	J. B. Baylor, U. S. Coast & G. S. In rear of Harper Hospital.
13	1891, June 20–26.	1 00.0 W.	G. R. Putnam, U. S. Coast & G. S. At Olympic Park in $\varphi = 42° 21'.1$, $\lambda = 83° 03'.4$; result referred to mean of day.

$$D = -0°.72 + 2.42 \sin (1.40\,m - 19°.0)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1810.5	—2.80		—3.05	—0.25
1822.5	3.22		2.76	+0.46
1828.5	2.83		2.55	+0.28
1835.5	2.17		2.25	—0.08
1839.5	1.57		2.06	—0.49
1840.5	1.97		2.01	—0.04
1859.3	0.70		0.97	—0.27
1865.5	0.67		0.61	+0.06
1872.4	0.42		0.20	+0.22
1873.4	0.29		—0.14	+0.15
1876.4	—0.08		+0.03	+0.11
1885.7	+0.52		+0.53	+0.01
1891.5	+1.00		+0.80	—0.20

DIP AND INTENSITY AT DETROIT.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839, May.	73 42.6	......	......	Prof. E. Loomis.
2	1841, Aug.	73 35.7	......	......	" " "
	1841, Sept.	73 32.7	......	......	" J. N. Nicollet.
3	1842, Nov. 4.	73 28.7	......	0.6372	Lieut. C. Younghusband.
4	1843, June 12, 15.	73 32.2	0.1795	0.6331	Dr. J. Locke.
5	1845—	73 38.8	......	0.6326	Sir J. H. Lefroy.
6	1859, Apr.	73 41	0.1776	0.6321	Lieut. W. P. Smith, U. S. Lake S.
7	1860, May.	73 43	0.1782	0.6356	" " " " " "
8	1872, May 8–29.	73 35	0.1789	0.6326	Capt. A. N. Lee, " " "
9	1873, May 5–16.	73 34	0.1789	0.6324	" " " " " " "
10	1876, May and June.	73 34.1	0.1797	0.6354	Lieut. T. N. Bailey, " " "
11	1885, Sept. 2, 3, 4.	73 12.8	0.1792	0.6204	J. B. Baylor, U. S. Coast & G. S. In rear of Harper Hospital.
12	1891, June 20, 21, 22.	73 05.9	0.1803	0.6201	G. R. Putnam, U. S. Coast & G. S. At Olympic Park.

Secular variations of the magnetic declination, dip and intensity—Continued.

DETROIT, MICH.—Continued.

DIP AND INTENSITY AT DETROIT—Continued.

$$\Theta = 73^\circ{\cdot}67 + 0{\cdot}008\ 41\ m - 0{\cdot}000\ 545\ m^2$$
$$H = 0{\cdot}178\ 7 - 0{\cdot}000\ 054\ m + 0{\cdot}000\ 002\ 2\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C – O.
	°	°	°
1839·4	73·71	73·52	—0·19
1841·7	·57	·56	— ·01
1842·8	·48	·58	+ ·10
1843·4	·54	·59	+ ·05
1845·5	·65	·62	— ·03
1859·3	·68	·70	+ ·02
1860·4	·72	·70	— ·02
1872·4	·58	·58	·00
1873·4	·57	·57	·00
1876·4	·57	·51	— ·06
1885·7	·21	·28	+ ·07
1891·5	73·10	73·08	— ·02

Date.	Obs'd H.	Comp'd H.	C—O.
1843·4	0·1795	0·1792	—0·0003
1859·3	76	84	+ 8
1860·4	82	84	+ 2
1872·4	89	86	— 3
1873·4	89	87	— 2
1876·4	97	88	— 9
1885·7	0·1792	0·1796	+ 4
1891·5	0·1803	0·1803	0·0000

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	—2·49	73·28	0·1807	0·6281
1840	2·04	·53	795	331
1850	1·55	·67	87	354
1860	0·93	·70	84	356
1870	—0·34	·62	85	330
1880	+0·23	·43	791	281
1890	+0·74	73·13	801	209
1900	+1·2	72·73	0·1816	0·6117

KALAMAZOO, MICH.

$\varphi = 42^\circ\ 17'{\cdot}4$ $\lambda = 85^\circ\ 35'{\cdot}2$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1826—	5 50 E.	From General Land Office record; letter of Acting Commissioner of Dec. 13, 1879. In $\varphi = 42^\circ\ 30'$, $\lambda = 85^\circ\ 48'$, this is to the north and west of Kalamazoo, while Bronson is south and east of the same. The reduction to either place is small and covered by the observing error.
2	1834—	{ 6 45 E. / 4 52 E. }	From a map entitled "Plat of the village of Bronson, county seat of Kalamazoo County; L. Lyon, T. Bronson, J. Burdick, and T. C. Sheldon, proprietors [used mean value = —5°·81. Sch.].
3	1879, Apr.	3 13 E.	Frank Hodgeman, surveyor, Kalamazoo Weekly Telegraph, Dec. 29, 1880.
4	{ 1880, Sept. / 1880, Dec. 21. }	{ 2 45 E. / 2 46 E. }	Reference as above. / Marcus Baker, U. S. Coast & G. S.
5	1884, Aug. 22, 23.	2 47 E.	" " " " "
6	1890, July 3.	1 55 E.	" " " Geological S.; letter of July 14, 1890.
7	1893, Aug. 1.	1 43 E.	" " " " " " " Aug. 24, 1893.
8	1895, Sept. 23.	1 32 E.	" " " " " At Lake Survey astronomical post in City Park.

Secular variations of the magnetic declination, dip and intensity—Continued.

KALAMAZOO, MICH.—Continued.

$$D = -1^\circ{\cdot}63 + 4{\cdot}21 \sin(1{\cdot}4\, m - 61^\circ{\cdot}6)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C — O.
	°		°	°
1826·0	−5·83		−5·82	+0·01
1834·0	5·81		5·82	−0·01
1879·3	3·22		3·11	+0·11
1880·8	2·76		2·96	−0·20
1884·6	2·78		2·59	+0·19
1890·5	1·92		1·99	−0·07
1893·6	1·72		1·68	+0·04
1895·7	−1·53		−1·46	+0·07

DIP AND INTENSITY AT KALAMAZOO.

(No observations here.)

YPSILANTI, MICH.

$\varphi = 42^\circ\ 14'{\cdot}3$ $\lambda = 83^\circ\ 37'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1815—	4 00 E.	Government land surveyors.
2	1825—	3 16 E.	W. Brookfield.
3	1832—	2 40 E.	O. Risdon.
4	1838—	2 25 E.	" "
5	1851—	1 12 E.	
6	1855, Jan. 10.	1 00 E.	
7	1859, Feb. 26.	0 45 E.	
8	1860, June 11.	0 38 E.	
9	1863—	0 25 E.	
10	1875, Dec. 4.	0 30 W.	C. S. Woodard.
11	1878—	0 45 W.	
12	1881, Mar. 11.	1 00 W.	
13	1885, Aug. 18.	1 13 W.	
14	1887, Apr. 25.	1 25 W.	
15	1888, Aug. 23.	1 30 W. 1 40 W.	When referred to mean of day + 1°·50.
16	1893, Aug. to Dec.	2 18 W.	C. S. Woodard. Observations at several hours each day. Letter of Jan. 1, 1894.
17	1894, Jan. to Dec.	2 08 W.	C. S. Woodard. Letter of Jan. 3, 1895.
18	1895, Jan. to Dec.	2 07 W.	" " " " " Jan. 2, 1896.

$$D = -0^\circ{\cdot}76 + 3{\cdot}59 \sin(1{\cdot}35\, m - 11^\circ{\cdot}8)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C — O.	Date.	Obs'd D.	*p.*	Comp'd D.	C — O.
	°		°	°		°		°	°
1815·5	−4·00		−3·82	+0·18	1875·9	+0·50		+0·65	+0·15
1825·5	3·27		3·29	−0·02	1878·5	0·75		0·85	+0·10
1832·5	2·67		2·84	−0·17	1881·2	1·00		1·05	+0·05
1838·5	2·42		2·40	+0·02	1885·6	1·22		1·36	+0·14
1851·5	1·20		1·37	−0·17	1887·3	1·42		1·48	+0·06
1855·0	1·00		1·07	−0·07	1888·6	1·50		1·56	+0·06
1859·1	0·75		0·73	+0·02	1893·8	2·30		1·88	−0·42
1860·4	0·63		0·62	+0·01	1894·5	2·13		1·92	−0·21
1863·5	−0·42		−0·36	+0·06	1895·5	+2·12		+2·03	−0·09

DIP AND INTENSITY AT YPSILANTI.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839, May.	73 18	......	......	Prof. E. Loomis.
2	1841, Aug.	73 18·8	......	......	" " "

Secular variations of the magnetic declination, dip and intensity—Continued.

ERIE, PA.

$\varphi = 42° 07'.8$ $\lambda = 80° 05'.4$ W. of Gr.

[Court-house.]

No.	Date.	D.		References and remarks.
		° ′		
1	1786, Oct.	0 32	W.	Boundary monument on French Creek, about 10 miles SSE. of Erie.
2	1793—	0 42	E.	Report of Secretary of Internal Affairs, Pa. 1885.
3	1795—	0 43	E.	A. Ellicott. Monument corner Parade and Front streets.
4	1841, Aug.	0 30	W.	Dr. A. D. Bache. Near Reed's house.
5	1855—	1 33	W.	Report of Secretary of Internal Affairs, Pa. 1877.
6	1859, Apr.	1 34	W.	S. Low. At meridian in cemetery.
	1859, June.	1 44	W.	Lieut. W. P. Smith, U. S. Lake S. At Presque Isle Harbor.
7	1862, Aug. 6, 7.	1 33	W.	C. A. Schott, U. S. Coast S. Seventh street near Reed's house.
	1862—	1 30	W.	S. Low.
8	1867, Apr.	2 13	W.	S. Wilson. At meridian in cemetery.
9	1873, June 12, 13.	2 01	W.	Capt. A. N. Lee, U. S. Lake S.
	1873, Oct.	2 36	W.	S. Wilson. At meridian in cemetery.
10	1875, Oct. 9.	2 10	W.	A. C. Lamson.
11	1876—	2 50	W.	Report of Secretary of Internal Affairs, Pa. 1876.
12	1877, Nov.	3 00	W.	" " " " " " 1877.
13	1883, Nov. 9.	3 20	W.	Platt. Report of Secretary of Internal Affairs, Pa. 1885.
14	1885, Sept. 11, 12, 14.	3 08.2	W.	J. B. Baylor, U. S. Coast & G. S. At Marine Hospital.

$$D = +2°.17 + 2.69 \sin (1.5\, m - 27°.3)$$

Date.	Obs'd D. *p*.	Comp'd D.	C — O.	Date.	Obs'd D. *p*.	Comp'd D.	C — O.
	°	°	°		°	°	°
1786.8	+0.53	—0.11	—0.64	1867.3	+2.22	+2.11	—0.11
1793.5	—0.70	—0.32	+0.38	1873.6	2.31	2.55	+0.24
1795.5	—0.72	—0.37	+0.35	1875.8	2.17	2.70	+0.53
1841.6	+0.50	+0.45	—0.05	1876.5	2.83	2.75	—0.08
1855.5	1.55	1.29	—0.26	1877.9	3.00	2.84	—0.16
1859.4	1.65	1.56	—0.09	1883.9	3.33	3.24	—0.09
1862.6	+1.53	+1.78	+0.25	1885.7	+3.14	+3.36	+0.22

DIP AND INTENSITY AT ERIE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1841, Aug.	73 46.6	0.1748	0.6256	Dr. A. D. Bache.
2	1859, June 7.	73 56	0.1744	0.6299	Lieut. W. P. Smith, U. S. Lake S.
3	1862, Aug. 6, 7.	73 52.3	0.1734	0.6243	C. A. Schott, U. S. Coast S.
4	1873, June 11, 12.	73 46	0.1765	0.6315	Capt. A. N. Lee, U. S. Lake S.
5	1885, Sept. 11, 12, 14.	73 24.3	0.1764	0.6180	J. B. Baylor, U. S. Coast & G. S. At Marine Hospital.

$$\Theta = 73°.89 + 0.013\,85\, m - 0.000\,786\, m^2$$
$$H = 0.174\,3 - 0.000\,018\, m + 0.000\,002\,5\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	
1841.6	73.78	73.72	—0.06
1859.4	73.93	73.95	+0.02
1862.4	73.87	73.91	+0.04
1873.4	73.77	73.78	+0.01
1885.7	73.40	73.38	—0.02

Date.	Obs'd H.	Comp'd H.	C — O.
1841.6	0.1748	0.1746	—0.0002
1859.4	44	44	00
1862.4	34	45	+ 11
1873.4	65	52	— 13
1885.7	0.1764	0.1768	+0.0004

Secular variations of the magnetic declination, dip and intensity—Continued.

ERIE, PA.—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1840	+0·36	73·67	0·1747	0·6213
1850	0·94	·89	43	282
1860	1·60	·95	44	307
1870	2·30	·85	49	288
1880	2·99	·60	60	233
1890	3·62	73·19	76	141
1900	+4·2	72·62	0·1796	0·6012

CHICAGO, ILL.

$\varphi = 41° \ 50'·0 \qquad \lambda = 87° \ 36'·8$ W. of Gr.

[Observatory, Dearborn University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1823—	6 12 E.	Maj. S. H. Long, U. S. A.
2	1857, July 23.	5 46 E.	Lieut. Col. J. D. Graham.
3	1878, Sept. 2.	4 33 E.	Dr. T. E. Thorpe. Grounds of Chicago University (old site).
4	1888, Aug. 18, 20.	4 07·4 E.	J. B. Baylor, U. S. Coast & G. S. Grounds of Chicago University (old site).
5	1891, July 18, 19, 20.	3 32·3 E.	G. R. Putnam, U. S. Coast & G. S. Near water tower, $\varphi = 41° \ 53'·9$, $\lambda = 87° \ 37'·4$.

$$D = -3°·40 + 2·89 \sin (1·45\ m - 66°·2)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1823·5	—6·20		—6·20	0·00
1857·6	5·77		5·77	0·00
1878·7	4·55		4·60	—0·05
1888·6	4·12		3·91	+0·21
1891·5	—3·54		—3·70	—0·16

DIP AND INTENSITY AT CHICAGO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1841, Sept.	72 45·8	......	......	Prof. J. N. Nicollet.
	1841, Sept.	72 47·8	......	......	Prof. E. Loomis.
2	1842, Nov. 15, 16.	72 39·3	0·1893	0·6353	Lieut. C. Younghusband.
3	1878, Sept. 2.	72 39·4	0·1875	0·6291	Dr. T. E. Thorpe. Grounds of Chicago University (old site).
4	1888, Aug. 18, 20.	72 28·5	0·1863	0·6184	J. B. Baylor, U. S. Coast & G. S. Grounds of Chicago University (old site).
5	1891, July 18, 19, 20.	72 22·6	0·1874	0·6189	G. R. Putnam, U. S. Coast & G. S. Near water tower.

Secular variations of the magnetic declination, dip and intensity—Continued.

CHICAGO, ILL.—Continued.

DIP AND INTENSITY AT CHICAGO—Continued.

$\Theta = 72°.74 - 0.000\,34\,m - 0.000\,167\,m^2$

COMPUTED DECENNIAL VALUES.

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1841·7	72·78	72·73	—0·05
1842·9	·66	·73	+0·07
1878·7	·66	·59	—0·07
1888·6	·48	·48	0·00
1891·5	72·38	72·44	+0·06

Date.	D.	Θ.
	°	°
1840	—6·25	72·72
1850	6·04	·74
1860	5·67	·73
1870	5·15	·68
1880	4·52	·60
1890	3·81	·49
1900	—3·1	72·34

MICHIGAN CITY, IND.

$\varphi = 41° 43'.4$ $\lambda = 86° 54'.4$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1830—	5 35 E.	Government land surveys.
2	1857, May 7 to Dec. 31.	3 43 E.	C. S. Woodard.
3	1859, Aug. 28.	5 23 E.	Lieut. W. P. Smith, U. S. Lake Survey.
4	1871, Sept. 11.	4 02 E.	L. Foote.
5	1873, Aug. 25, 26.	3 59 E.	Capt. A. N. Lee, U. S. Lake S. North of north corner of light-house inclosure.
6	1891, July 18.	2 20·1 E.	J. B. Baylor, U. S. Coast & G. S. North of north corner of light-house inclosure.

$D = -2°.38 + 3.12 \sin(1.4\,m - 59°.9)$. An approximate expression.

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1830·5	—5·58		—5·50	+0·08
1857·7	3·72		4·74	—1·02
1859·7	5·38		4·63	+0·75
1871·7	4·03		3·91	+0·12
1873·6	3·98		3·79	+0·19
1891·5	—2·34		—2·48	—0·14

DIP AND INTENSITY AT MICHIGAN CITY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1859, Aug. 28.	73 02	0·1853	0·6358	Lieut. W. P. Smith, U. S. Lake S.
2	1873, Aug. 25, 26.	72 43	0·1886	0·6349	Capt. A. N. Lee, U. S. Lake S. North of north corner of light-house inclosure.
3	1891, July 18.	72 25·4	0·1875	0·6210	J. B. Baylor, U. S. Coast & G. S. North of north corner of light-house inclosure.

Secular variations of the magnetic declination, dip and intensity—Continued.

MICHIGAN CITY, IND.—Continued.

DIP AND INTENSITY AT MICHIGAN CITY—Continued.

$\Theta = 73°.20 - 0.019\ m$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1859·6	73·03	73·02	—0·01
1873·6	72·72	72·75	+0·03
1891·5	72·42	72·41	—0·01

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1850	—5·1	73·20
1860	4·6	73·01
1870	4·03	72·82
1880	3·34	72·63
1890	2·59	72·44
1900	—1·8	72·25

CLEVELAND, OHIO.

$\varphi = 41°\ 30'.4$ $\lambda = 81°\ 41'.5$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1796, Sept.	2 E.	A. Porter and S. Pease.
2	1830—	1 20 E.	A. Merchant.
3	1831, Aug.	1 15 E.	E. Foote.
4	1834, winter.	0 50 E.	} A. Merchant.
5	1838, "	0 35 E.	
6	1840—	0 19 E.	Prof. E. Loomis.
7	1841, May 1.	0 05 E.	J. N. Pillsbury.
8	1845—	0 39 E.	Chart of N. and NW. Lake S.
9	1859, July 5.	0 46 W.	Lieut. W. P. Smith, U. S. Lake S.
	1865, May 22.	1 12 E.	W. T. Casgrain. Not used. At east end of pier.
10	1871, Nov. 9-11.	0 33 W.	E. Goodfellow, U. S. Coast S. At Marine Hospital.
11	1872, June 17, 18.	0 45 W.	Capt. A. N. Lee, U. S. Lake S.
12	1873, June 16, 17.	0 51 W.	" " " " " " " "
13	1876, Oct. 27, 28.	1 08 W.	A. C. Lamson.
14	1880, July 9, 10, 12.	1 38·5 W.	J. B. Baylor, U. S. Coast & G. S. Grounds of City Hospital.
15	1888, July 23, 24.	2 03·7 W.	" " " " " " " " "
16	1891, May 30, 31, June 1.	2 19 W.	H. F. Reid, in City Hospital grounds, station of 1871. Record in C. & G. S. archives.

$D = +0°.77 + 2.53 \sin (1.30\ m - 21°.6)$.

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1796·7	—2·00		—1·76	+0·24	1859·5	+0·77		+0·37	—0·40
1830·5	1·33		1·08	+0·25	1871·8	0·54		1·07	+0·53
1831·6	1·25		1·03	+0·22	1872·5	0·75		1·10	+0·35
1834·1	0·83		0·93	—0·10	1873·5	0·85		1·16	+0·31
1838·1	0·58		0·76	—0·18	1876·8	1·13		1·35	+0·22
1840·5	0·32		0·64	—0·32	1880·5	1·64		1·55	—0·09
1841·3	0·09		0·60	—0·51	1888·6	2·06		1·98	—0·08
1845·5	—0·65		—0·40	+0·25	1891·4	+2·32		+2·12	—0·20

Secular variations of the magnetic declination, dip and intensity—Continued.

CLEVELAND, OHIO—Continued.

DIP AND INTENSITY AT CLEVELAND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839, May.	73 26	......	......	Prof. E. Loomis.
2	1840—	73 14·1	......	......	" " "
3	1841 { Aug. / Apr.	73 04·3 } / 73 16·3 }	......	......	" " " April obs'n at Brooklyn.
4	1842, Nov. 3.	73 03·8	0·1836	0·6301	Lieut. C. Younghusband. Near landing.
5	1843, Aug. 4.	73 08	0·1847	0·6363	Dr. J. Locke.
6	1859, July 4.	73 20	0·1824	0·6360	Lieut. W. P. Smith, U. S. Lake S. [Not used.] Near Marine and City Hospital.
7	1871, Nov. 6–14.	73 09·3	0·1844	0·6363	E. Goodfellow, U. S. Coast S. Near Marine and City Hospital.
8	1872, June 17, 18.	73 07	0·1852	0·6378	Capt. A. N. Lee, U. S. Lake S. Near Marine and City Hospital.
9	1873, June 16, 17.	73 08	0·1842	0·6350	Capt. A. N. Lee, U. S. Lake S. Near Marine and City Hospital.
10	1880, July 9, 12.	73 02·4	0·1842	0·6317	J. B. Baylor, U. S. Coast & G. S. Near Marine and City Hospital.
11	1888, July 23, 24.	72 49·9	0·1832	0·6208	J. B. Baylor, U. S. Coast & G. S. Near Marine and City Hospital.
12	1891, Apr. 6, May 26, 31, June 1.	72 39	0·183	0·614	H. F. Reid. City Hospital grounds.

$$\Theta = 73^\circ{\cdot}26 + 0{\cdot}002\,4\,m - 0{\cdot}000\,372\,m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C – O.
	°	°	°
1839·4	73·43	73·19	–0·24
1840·5	·23	·20	–0·03
1841·5	·17	·21	+0·04
1842·8	·06	·22	+0·16
1843·6	·13	·23	+0·10
1871·9	·16	·14	–0·02
1872·5	·12	·13	+0·01
1873·5	·13	73·11	–0·02
1880·5	73·04	72·99	–0·05
1888·6	72·83	72·80	–0·03
1891·4	72·65	72·72	+0·07

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1830	–1·10	73·06
1840	0·66	·20
1850	–0·16	·26
1860	+0·39	·25
1870	0·96	·16
1880	1·52	73·00
1890	2·05	72·76
1900	+2·5	72·45

OMAHA, NEBR.

$\varphi = 41^\circ\ 15'{\cdot}7$ $\lambda = 95^\circ\ 56'{\cdot}5$ W. of Gr.

[High School grounds.]

No.	Date.	D.	References and remarks.
		° ′	
1	1819, Sept. 22.	12 59 E.	Maj. S. H. Long, U. S. A. At Engineer's cantonment; reduction –12′.
2	1869, Jan. 25–27. Feb. 12, 13.	10 43 E.	E. Goodfellow, U. S. Coast S. At Coast Survey astronomic station.
3	1872, Oct. 31.	10 44 E.	Dr. T. C. Hilgard. At Coast Survey astronomic station.
4	1877, Oct. 13–18.	10 22 E.	A. Braid, U. S. Coast S. At Coast Survey astronomic station.
5	1878, Aug. 30.	10 40 E.	Dr. T. E. Thorpe. At Council Bluffs.
6	1880, Oct. 15, 17.	10 06·2 E.	} J. B. Baylor, U. S. Coast & G. S. Grounds of High School.
7	1888, Sept. 25, 26.	9 29·6 E.	}
8	{ 1891, Aug. 30, 31, Sept. 1. / 1891, Sept. 2, 3, 4.	9 23·5 E. / 9 37·8 E.	G. R. Putnam, U. S. Coast & G. S. Grounds of High School. / " " " " " " " " " New station N. of above.

Secular variations of the magnetic declination, dip and intensity—Continued.

OMAHA, NEBR.—Continued.

$$D = -9^\circ{\cdot}61 + 3{\cdot}03 \sin (1{\cdot}30\, m - 50^\circ{\cdot}9)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1819·7	—12·78	¼	—12·64	+0·14
1869·1	10·71		10·94	—0·23
1872·8	10·74		10·71	+0·03
1877·8	10·37		10·39	—0·02
1878·7	10·66		10·32	+0·34
1880·8	10·10		10·18	—0·08
1888·7	9·49		9·64	—0·15
1891·7	— 9·51		— 9·43	+0·08

DIP AND INTENSITY AT OMAHA.

No.	Date.	Θ.		H.	F.	References.	
		°	′				
1	1869, Jan. 25, Feb. 1.	71	04·5	0·1989	0·6132	E. Goodfellow, U. S. Coast S.	At U. S. C. S. astronomic station.
2	1872, Oct. 31.	71	06·1	0·1992	0·6150	Dr. T. C. Hilgard.	
3	1877, Oct. 13–20.	71	05·8	0·2032	0·6274	A. Braid, U. S. Coast S.	
4	1880, Oct. 15, 17.	71	05·9	0·2017	0·6226	J. B. Baylor, U. S. Coast & G. S.	In grounds of High School.
5	1888, Sept. 25, 26.	71	01·0	0·1996	0·6137	" " " " " " " "	
6	1891, Aug. 30, 31, Sept. 1.	70	47·1	0·2014	0·6120	G. R. Putnam, " " " " "	

BEAVER, PA.

$\varphi = 40^\circ\ 44'$ $\lambda = 80^\circ\ 20'$ W. of Gr.

No.	Date.	D.			References and remarks.
		°	′		
1	1786—	0	51	E.	A. Ellicott. Reduction to Beaver + 8′.
2	1866, Aug. 7, 8.	0	37	W.	F. H. Agnew.
3	1874, Aug. 11.	1	08	W.	F. E. Hilgard.
4	1879—	1	31	W.	Report of Secretary of Internal Affairs, Pa., for 1885. Reduction to Beaver + 5′.
5	1883, Sept. 28.	1	42	W.	County Surveyor.

$$D = +1^\circ{\cdot}41 + 2{\cdot}72 \sin (1{\cdot}40\, m - 39^\circ{\cdot}6)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1786·5	—0·72		—0·72	0·00
1866·6	+0·62		+0·64	+0·02
1874·6	1·14		1·17	+0·03
1879·5	1·60		1·49	—0·11
1883·7	+1·70		+1·77	+0·07

DIP AND INTENSITY AT BEAVER.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1839, Oct.	72	40·3	......	......	Prof. E. Loomis.
2	1874, Aug. 11.	72	31·5	0·1870	0·6228	F. E. Hilgard and W. Diehl.

Secular variations of the magnetic declination, dip and intensity—Continued.

PITTSBURG, PA.

$\varphi = 40° 27'.6$ $\lambda = 80° 00'.8$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1840, Aug. 10.	0 08 W.	Dr. A. D. Bache. At Homestead.
2	1845, May 3.	0 33 W.	Dr. J. Locke.
3	1878, Sept. 5.	2 22 W.	Dr. T. E. Thorpe. Grounds of Allegheny Observatory.
4	1884, Sept. 26.	2 41 W.	Hemmings.
5	1885, Aug. 24, 25, 26.	2 55·7 W.	J. B. Baylor, U. S. Coast & G. S. Grounds of Allegheny Observatory.
6	1887, Sept.	3 01 W.	D. Carthart's "Treatise on Plane Surveying," 1888.

$$D = +1°.85 + 2.45 \sin(1.45\, m - 28°.4)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1840·6	+0·13		+0·21	+0·08
1845·3	0·55		0·44	—0·11
1878·7	2·36		2·41	+0·05
1884·7	2·68		2·76	+0·08
1885·6	2·93		2·82	—0·11
1887·7	+3·02		+2·93	—0·09

DIP AND INTENSITY AT PITTSBURG.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1819, May 1.	78 12(?)	......	......	Maj. S. H. Long, U. S. A. Possibly misprint for 73° 12′ (Sch.).
2	1839, Sept.	72 38·9	......	......	Prof. E. Loomis.
3	1840, Aug.	72 32·1	0·1867	0·6221	Dr. A. D. Bache. At Homestead.
4	1841, Mar. 22.	72 43·5	0·1872	0·6303	Dr. J. Locke.
5	1842, Apr. 7.	72 43·2	0·1870	0·6298	" " "
6	1845, May 3.	72 46·7	0·1860	0·6282	" " "
7	1878, Sept, 5.	72 07·5	0·1904	0·6203	Dr. T. E. Thorpe. Grounds of Allegheny Observatory.
8	1885, Aug. 24, 26, 27.	72 09·4	0·1870	0·6103	J. B. Baylor, U. S. Coast & G. S. Grounds of Allegheny Observatory.

$$H = 0.188\,9 + 0.000\,213\, m - 0.000\,006\,8\, m^2$$

Date.	Obs'd H.	Comp'd H.	C—O.
1840·6	0·1867	0·1863	—0·0004
1841·2	872	65	— 07
1842·3	870	68	— 02
1845·3	860	77	+ 17
1878·7	904	94	— 10
1885·7	0·1870	0·1878	+0·0008

Secular variations of the magnetic declination, dip and intensity—Continued.

DENVER, COLO.

$\varphi = 39° 45'.3$ $\lambda = 104° 59'.5$ W. of Gr.

[Astronomic station.]

No.	Date.	D.	References and remarks.
		° ′	
1	1866, July.	15 E.	J. Prince.
2	1872, Oct. 13, 14, 19.	14 45 E.	Dr. T. C. Hilgard. On Pierce's Block.
3	1873, Aug. 14.	14 42.8 E.	*E. Smith, U. S. Coast S. At U. S. Coast S. astronomic station.
4	{ 1878, Aug. 8.	{ 14 43 E.	Dr. T. E. Thorpe. In Mrs. Craig's garden.
	{ 1878, Sept. 3, 4, 5.	{ 14 40.2 E.	J. B. Baylor, U. S. Coast & G. S. Corner of Seventeenth street and Broadway.
5	1888, Oct. 29, 30.	14 06.1 E.	J. B. Baylor, U. S. Coast & G. S. In grounds of State Capitol.

$$D = -15°.30 + 0.011\, m + 0.000\,5\, m^2$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1866.5	—15.00		—14.98	+0.02
1872.8	14.74		14.79	—0.05
1873.6	14.71		14.76	—0.05
1878.6	14.70		14.58	+0.12
1888.8	—14.10		—14.12	—0.02

DIP AND INTENSITY AT DENVER.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1872, Oct. 13, 14, 19.	67 34.4	......	......	Dr. T. C. Hilgard. On Pierce's Block.
2	1873, Aug. 13, 14, 15.	67 27.2	0.2299	0.5995	E. Smith, U. S. Coast S. Astronomic station.
3	{ 1878, Aug. 8.	{ 67 32.8	0.2298	0.6018	Dr. T. E. Thorpe. Craig's garden.
	{ 1878, Sept. 3–6.	{ 67 30.7	0.2291	0.5989	J. B. Baylor, U. S. Coast & G. S. Corner Seventeenth street and Broadway.
4	1888, Oct. 29, 30, 31.	67 27.7	0.2269	0.5921	J. B. Baylor, U. S. Coast & G. S. State Capitol grounds.

MARIETTA, OHIO.

$\varphi = 39° 25'$ $\lambda = 81° 28'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1810—	2 36 E.	J. Mansfield.
2	1823–24.	3½ E.	Boye. At Parkersburg, reduction to Marietta +5′.
3	{ 1838—	{ 1 29 E.	Prof. E. Loomis.
	{ 1838—	{ 1 36 E.	B. E. Stone.
4	1845, Apr.	2 25 E.	Henck's Field Book.
5	1850—	1 25 E.	Gillespie's Land surveying.
6	1864, Jan. 26.	1 18 E.	A. T. Mosman, U. S. Coast S., at Parkersburg. Reduction as above.
7	1881, May 30, 31.	0 07.2 W.	J. B. Baylor, U. S. Coast & G. S. Station of 1864.

Secular variations of the magnetic declination, dip and intensity—Continued.

MARIETTA, OHIO—Continued.

$D = +0^\circ{\cdot}02 + 2{\cdot}89 \sin(1{\cdot}4\, m - 40^\circ{\cdot}5)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1810·5	—2·60		—2·86	—0·26
1824·0	3·42		2·79	+0·63
1838·5	1·54	½	2·39	—0·85
1845·3	2·42		2·10	+0·32
1850·5	1·42		1·83	—0·41
1864·1	—1·21		—1·01	+0·20
1881·4	+0·20		+0·20	0·00

DIP AND INTENSITY AT MARIETTA.

No.	Date.	Θ.	H.	F.	Reference.
		° ′			
1	1845—	71 22·3	0·2006	0·6280	Dr. J. Locke.

ATHENS, OHIO.

$\varphi = 39^\circ\ 19'$ $\lambda = 82^\circ\ 02'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1796—	4 03 E.	Public surveys.
2	1806—	4 17 E.	S. B. Pruden and Fletcher, deduced value.
3	1838—	3 12 E.	S. B. Pruden.
4	1880, Dec. 3, 4.	0 40·5 E.	J. B. Baylor, U. S. Coast & G. S. West of College.
5	1890, Dec. 5.	0 05 E.	W. E. Peters, County Surveyor. Letter of Dec. 8, 1890. Observed at 8h a. m. [Reduction to mean of day —2′. Sch.]
6	1891, June 12.	0 00	Prof. W. Hoover; letter of June 13, 1891.

$D = -1^\circ{\cdot}51 + 2{\cdot}63 \sin(1{\cdot}4\, m - 24^\circ{\cdot}7)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1796·5	—4·05		—4·10	—0·05
1806·5	4·28		4·13	+0·15
1838·5	3·20		3·23	—0·03
1880·8	0·68		0·67	+0·01
1890·9	—0·05		0·09	—0·04
1891·4	0·00		—0·06	—0·06

DIP AND INTENSITY AT ATHENS.

No.	Date.	Θ.	H.	F.	Reference.
		° ′			
1	1880, Dec. 3, 4.	70 58·7	0·2024	0·6210	J. B. Baylor, U. S. Coast & G. S. West of College.

Secular variations of the magnetic declination, dip and intensity—Continued.

CINCINNATI, OHIO.

$\varphi = 39° \; 08'.4 \qquad \lambda = 84° \; 25'.3$ W. of Gr.

[Astronomic Observatory on Mount Lookout.]

No.	Date.	D.	References and remarks.
		° ′	
1	1806—	4 58 E.	Public surveys.
2	1810—	5 E.	J. Mansfield.
3	1840, Jan. 11.	4 46 E.	Dr. J. Locke.
4	1845, Apr.	4 04 E.	Dr. J. Locke.
5	1873, Oct. 31.	2 40·8 E.	G. B. Nicholson, 8 miles N. of Cincinnati. Reduction to city, 0.
6	1880, Nov. 27, 29, 30.	2 14·4 E.	J. B. Baylor, U. S. Coast and G. S. In grounds of observatory at Mount Lookout.
7	1888, July 28, 30.	1 58·0 E.	J. B. Baylor, U. S. Coast and G. S. In grounds of observatory at Mount Lookout.

$$D = -2°.59 + 2.43 \sin (1.42 \, m - 37°.9)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1806·5	—4·97		—4·99	—0·02
1810·5	5·00		5·02	—0·02
1840·0	4·77		4·51	+0·26
1845·3	4·07		4·30	—0·23
1873·8	2·68		3·29	—0·61
1880·9	2·24		2·34	—0·10
1888·6	—1·97		—1·88	+0·09

DIP AND INTENSITY AT CINCINNATI.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1838, Mar. 20.	70 28·1	......	......	Dr. J. Locke.
	1838 –	70 46	......	......	" " "
2	1840, Aug. 18, Sept. 24.	70 28·3	......	......	" " "
3	1841, May 8.	70 26·2	......	......	" " "
	1841, Oct.	70 27·7	......	......	Prof. E. Loomis. In Longworth's garden.
4	1842, Mar. 31.	70 25·4	......	......	Dr. J. Locke.
5	1843, Aug. 21.	70 25·5	......	......	" " "
6	1844, Mar. 21.	70 28	0·2097	0·6266	" " "
	1844, July 4.	70 25			" " "
7	1845, Apr. 23.	70 26	0·2097	0·6262	" " "
8	1849, June 5.	70 28·8	0·2087	0·6247	Sir J. H. Lefroy. In Longworth's garden.
9	1880, Nov. 29, 30.	70 24·7	0·2069	0·6172	J. B. Baylor, U. S. Coast & G. S. At observatory, Mount Lookout.
10	1888, July 28, 30.	70 18·7	0·2058	0·6110	J. B. Baylor, U. S. Coast & G. S. At observatory, Mount Lookout.

Dip apparently constant between 1838 and 1880.

SAINT LOUIS, MO.

$\varphi = 38° \; 38'.0 \qquad \lambda = 90° \; 12'.2$ W. of Gr.

[Washington University.]

No.	Date.	D.	References and remarks.
		° ′	
	1819, June 17.	10 48 E.	Maj. S. H. Long, U. S. A. Not used.
1	1835—	8 49 E.	Col. Nicolls.
	1838—	7 45 E.	De Ward. On city commons. Not used.
2	1855—	8 00 E.	Colton's Atlas, 1873.
	1856, Oct. 31.	6 23 E.	K. Friesach. Not used.
3	1872, June, July, Aug.	6 38 E.	Dr. T. C. Hilgard. On Compton Hill and SW. of court-house.
4	1877, June.	6 30 E.	T. Featherson.
5	1878, Aug. 14, 15.	6 34 E.	Prof. F. E. Nipher. SE. corner Garrison ave. and Dickson st.
6	1879, Sept.	6 13 E.	Prof. F. E. Nipher. Corner Garrison ave. and Glasgow place.
7	1886, Oct. 3, 4, 5, 6.	6 10·6 E.	C. H. Sinclair, U. S. Coast and G. S. Near Tower Grove Park.

Secular variations of the magnetic declination, dip and intensity—Continued.

SAINT LOUIS, MO.—Continued.

$D = -5°.91 + 3.00 \sin (1.40\,m - 51°.1)$. Uncertain.*

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1835·5	—8·82		—8·74	+0·08
1855·5	8·00		7·96	+0·04
1872·6	6·63		6·90	—0·27
1877·5	6·51		6·56	—0·05
1878·6	6·56		6·48	+0·08
1879·7	6·22		6·39	—0·17
1886·8	—6·18		—5·88	+0·30

* But confirmed by an observation in 1896.

DIP AND INTENSITY AT ST. LOUIS.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1819, June 16.	70 30	......	......	Maj. S. H. Long, U. S. A.
2	{ 1835, Aug. 1836, June.	69 10	0·2220	0·6242	Prof. J. N. Nicollet. In H. Chauteau's garden.
3	1839, Sept. 6.	69 31·4	0·2189	0·6261	Dr. J. Locke.
4	1841, Sept.	79 25·5	......	......	Prof. E. Loomis. One mile west of city.
	1841, Oct. 11.	69 27·1	......	......	Prof. J. N. Nicollet. In H. Chauteau's orchard.
5	1856, Nov. 1.	68 01(?)	0·2270	0·6062	K. Friesach.
6	1872, June and July.	69 34·4	0·2134	0·6115	Dr. T. C. Hilgard. On Compton Hill.
7	1878, May 27, 28, 30.	69 18·7	......	......	Prof. F. E. Nipher. In three localities.
	1878, July 10, Oct. 11.	....	0·2115	......	Prof. F. E. Nipher. Washington ave. and Eighteenth st.
8	1879, Sept. 3, 9.	....	0·2155	......	Prof. F. E. Nipher.
9	1886, Oct. 3-7.	69 28·5	0·2157	0·6152	C. H. Sinclair, U. S. Coast & G. S. Near Tower Grove Park.

The dip has remained nearly stationary during the last 60 years.

NASHVILLE, TENN.

$\varphi = 36°\ 08'.9 \qquad \lambda = 86°\ 48'.2$ W. of Gr.

[Vanderbilt University.]

No.	Date.	D.	References and remarks.
		° ′	
1	1829—	6 50 E.	Prof. Hamilton.
2	1835—	7 07 E.	
3	1877, Dec. 5, 6, 7.	5 14·9 E.	A. Braid, U. S. Coast S. Grounds of Vanderbilt University.
4	1888, Aug. 7, 8.	4 31·0 E.	J. B. Baylor, U. S. Coast & G. S. Grounds of Vanderbilt University.

$D = -3°.57 + 3.33 \sin (1.35\,m - 68°.5)$. Expression uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1829·5	—6·83		—6·88	—0·05
1835·5	7·12		6·90	+0·22
1877·9	5·25		5·27	—0·02
1888·6	—4·52		—4·51	+0·01

* But confirmed by an observation in 1896.

Secular variations of the magnetic declination, dip and intensity—Continued.

NASHVILLE, TENN.—Continued.

DIP AND INTENSITY AT NASHVILLE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1833, Nov.	67 05	......	......	J. N. Nicollet.
2	1877, Dec. 5, 6, 7.	67 18·9	0·2356	0·6109	A. Braid, U. S. Coast S. Grounds of Vanderbilt University.
3	1888, Aug. 7, 8.	67 03·9	0·2312	0·5932	J. B. Baylor, U. S. Coast & G. S. Grounds of Vanderbilt University.

FLORENCE, ALA.

$\varphi = 34° 47'.2$ $\lambda = 87° 41'.7$ W. of Gr.

[Astronomic station.]

No.	Date.	Θ.	References and remarks.
		° ′	
1	1818—	6 35 E.	J. H. Weakly.
2	1835—	6 28 E.	J. H. Weakly.
3	1865, Apr. 17.	5 24 E.	A. T. Mosman, U. S. Coast S. Near railway bridge.
4	1875, May 29.	5 14 E.	F. E. Hilgard. $\varphi = 34° 47'$, $\lambda = 87° 42'$.
5	1881, Sept. 5, 6.	4 37·8 E.	J. B. Baylor, U. S. Coast & G. S. Grounds of Synd'l College for Females. $\varphi = 34° 48'$, $\lambda = 87° 43'$.
6	1890, May 29, 30.	4 15·6 E.	J. B. Baylor, U. S. Coast & G. S. Locality as in 1881. College station.

$$D = -4°.25 + 2.33 \sin (1.3\, m - 52°.8)$$

Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°
1818·5	—6·58		—6·58	0·00
1835·5	6·47		6·46	+0·01
1865·3	5·40		5·51	—0·11
1875·4	5·24		5·04	+0·20
1881·7	4·63		4·72	—0·09
1890·4	—4·26		—4·26	0·00

DIP AND INTENSITY AT FLORENCE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1881, Sept. 5, 6.	65 52·1	0·2442	0·5974	J. B. Baylor, U. S. Coast & G. S. Synd'l College.
2	1890, May 29, 30.	65 30·6	0·2415	0·5826	J. B. Baylor U. S. Coast & G. S. Synd'l College.

Secular variations of the magnetic declination, dip and intensity—Continued.

MOBILE, ALA.

$\varphi = 30° 41'.4$ $\lambda = 88° 02'.5$ W. of Gr.

[Astronomic station.]

No.	Date.	D.	References and remarks.
		° ′	
	1809—	8 10 E.	J. H. Weakly. Not used.
1	1814—	6 30 E.	Kent.
2	1835—	7 12 E.	J. H. Weakly.
3	1840—	7 05 E.	Chart by E. and G. W. Blunt.
4	1843—	6 56 E.	L. M. Powell, U. S. N. At Mobile Point light.
5	1847, May 21–30.	7 04 E.	R. H. Fauntleroy, U. S. Coast S. At Fort Morgan.
6	1857, Feb. 14–18.	6 52·2 E.	E. Goodfellow, " " " " On public square.
7	1875, May 27.	6 07 E.	J. M. Poole, Summerville.
8	1883, Mar. 12.	5 17 E.	Lieut. E. S. Prime, U. S. N.

$$D = -4°.38 + 2.69 \sin(1.45\, m - 76°.4)^*$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1814·5	—6·50		—6·50	0·00
1835·5	7·20		7·05	+0·15
1840·5	7·08		7·07	+0·01
1843·5	6·93		7·06	—0·13
1847·4	7·07		7·03	+0·04
1857·1	6·87		6·84	+0·03
1875·4	6·12		6·09	+0·03
1883·2	—5·28		—5·66	—0·38

DIP AND INTENSITY AT MOBILE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	{1834, 1835} May.	61 38	0·2820	0·5935	Prof. J. N. Nicollet. Batre's garden.
2	1857, Feb. 9–25.	60 51·0	0·2836	0·5821	E. Goodfellow, U. S. Coast Survey. Public square.

PENSACOLA, FLA.

$\varphi = 30° 20'.8$ $\lambda = 87° 18'.3$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1763—	4½ E.	Plan of Pensacola.
2	1775—	4½ E.	Des Barres' Atlantic Neptune.
3	1807—	7 50 E.	} V. S. Pintado.
4	1817—	8 45 E.	}
5	1835—	6 10 E.	Navy officer.
6	1843—	6 54 E.	L. M. Powell, Comdr. U. S. N. At Navy-Yard.
7	1858, June 21.	6 47 E.	J. J. Oltmanns, U. S. Coast S. On Public Square.
8	1861, Jan. 8, 9.	6 42 E.	G. W. Dean, U. S. Coast S. At Barkley Point.
9	1880, Jan. 1.	5 20 E.	} W. H. Davison.
10	1890, Mar.	4 55 E.	}
11	1895, Mar. 21, 22, 23.	4 43·8 E.	R. L. Faris, U. S. Coast & G. S. At Navy-Yard.

*An observation in 1896 points to $D = -4°.15 + 2.95 \sin(1.42\, m - 74°.5)$ as a preferable expression.

Secular variations of the magnetic declination, dip and intensity—**Continued.**

PENSACOLA, FLA.—Continued.

$D = -4°.58 + 2.92 \sin (1.4\, m - 61°.4)$

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1763.5	−4.50		−4.45	+0.05
1775.5	4.50		5.30	−0.80
1807.5	7.83		7.09	+0.74
1817.5	8.75		7.37	+1.38
1835.5	6.17		7.47	−1.30
1843.5	6.90		7.33	−0.43
1858.5	6.79		6.80	−0.01
1861.0	6.70		6.68	+0.02
1880.0	5.33		5.53	−0.22
1890.2	4.92		4.84	+0.08
1895.2	−4.73	2	−4.48	+0.25

DIP AND INTENSITY AT PENSACOLA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1858, June 22, 23.	61 05.9	0.2825	0.5845	J. G. Oltmanns and F. H. Gerdes, U. S. Coast S. Public Square.
2	1861, Jan. 5-11.	60 38.9	0.2836	0.5786	G. W. Dean, U. S. Coast S. At Barkley Point.
3	1895, Mar. 21, 22, 23.	60 39.1	0.2685	0.5478	R. L. Faris, U. S. Coast & G. S. At Navy-Yard.

AUSTIN, TEX.

$\varphi = 30°\ 16'.4$ $\lambda = 97°\ 44'.2$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1835—	10 E.	General Land Office record.
2	1871, May 4.	9 09.7 E.	J. W. Glenn, letter to Office of May 4, 1871.
3	1872, Mar. 27, Apr. 5, 13, 15.	9 09 E.	W. Eimbeck, U. S. Coast S.
4	1878, June 20, 21, 22.	8 57.5 E.	J. B. Baylor, " " " " On Public Reservation.
5	1889, Sept.	8 20.0 E.	M. J. Doyle, General Land Office.
6	1890, Mar. 19, 20.	8 18.6 E.	J. B. Baylor, U. S. Coast & G. S.
7	1895, May 15, 16, 17.	8 07.0 E.	E. Smith, " " " " " " Grounds of the University. $\varphi = 30°\ 17'$, $= 97°\ 44'.2$.

$D = -9°.13 + 0.0466\ (t - 1873.0)$

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1835.5	−10.00	0	−10.88	(−0.88)
1871.3	9.16		9.20	−0.04
1872.3	9.15		9.16	−0.01
1878.5	8.96		8.87	+0.09
1889.7	8.33		8.35	−0.02
1890.2	8.31		8.32	−0.01
1895.4	−8.12		−8.08	+0.04

Secular variations of the magnetic declination, dip and intensity—Continued.

AUSTIN, TEX.—Continued.

DIP AND INTENSITY AT AUSTIN.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1878, June 21–25.	58 56·7	0·2891	0·5602	J. B. Baylor, U. S. Coast S. On Public Reservation.
2	1890, Mar. 19, 20.	58 51·4	0·2849	0·5509	J. B. Baylor, U. S. Coast & G. S. On Public Reservation.
3	1895, May 15, 16, 17.	58 58·8	0·2833	0·5497	E. Smith, U. S. Coast & G. S. Grounds of University.

NEW ORLEANS, LA.

$\varphi = 29^\circ\ 57'{\cdot}2$ $\lambda = 90^\circ\ 03'{\cdot}9$ W. of Gr.

[Custom-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700—	3 E.	C. & G. S. Rept. for 1888, p. 306. Deduced from observations at 17 stations.
		2½ E.	Sir E. Halley's Tabula Nautica.
2	1720—	2 E.	Laval.
3	1750—	4 36 E.	C. & G. S. Rept. for 1888, p. 308. Deduced from observations at 19 stations.
	1768—	7 50 E.	Gauld. Not used.
4	1796—	5 06 E.	A. G. Blanchard.
5	1806—	8 03 E.	Lason.
6	1840—	8 20 E.	General Land Office.
7	1856, Dec. 28.	8 00 E.	K. Friesach.
8	1858, Apr. 6, 7.	7 52 E.	G. W. Dean, U. S. Coast Survey. Basin and Canal streets.
9	1870—	7 06 E.	M. J. Thompson.
10	1872, Feb. 10–17.	6 40 E.	Dr. T. C. Hilgard. In City Park.
11	1880, Mar. 24, 25.	6 27.6 E.	J. B. Baylor, U. S. Coast & G. S. Fair Grounds station.
12	1895, July 19, 23, 24.	5 40·4 E.	G. R. Putnam, " " " " " " "

$$D = -5^\circ{\cdot}20 + 2{\cdot}98 \sin(1{\cdot}40\, m - 69^\circ{\cdot}8)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1700·0	—2·75		—2·26	+0·49	1857·0	—8·00		—7·78	+0·22
1720·5	2·00	½	2·38	—0·38	1858·3	7·86		7·73	+0·13
1750·0	4·60		3·72	+0·88	1870·5	7·10		7·16	—0·06
1796·5	5·10		6·92	—1·82	1872·1	6·66		7·07	—0·41
1806·5	8·05		7·46	+0·59	1880·2	6·46		6·58	—0·12
1840·5	—8·33		—8·16	+0·17	1895·6	—5·67		—5·51	+0·16

On plate A is given a diagram of the representation of the declination observations at this station, from which it will be seen how precarious or rather indefinite the data are upon which the adopted length of the period depends; and it would not be at all surprising if subsequent observations would demand a much longer cycle.

DIP AND INTENSITY AT NEW ORLEANS.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1834, Aug.	60 15	......	......	Prof. J. N. Nicollet.
2	1856, Dec. 18, 24.	59 30	0·2928	0·5769	K. Friesach.
3	1858, Apr. 7, 8, 10.	59 46·5	0·2909	0·5780	G. W. Dean, U. S. Coast S. Basin and Canal streets.
4	1872, Feb. 10, 15.	59 43·5	0·2750(?)	0·5459(?)	Dr. T. C. Hilgard. In City Park.
	1872, Feb. 14.	59 48·6	......	......	" " " " Fair Grounds station.
5	1880, Mar. 24, 25.	59 48·8	0·2838	0·5644	J. B. Baylor, U. S. Coast & G. S. Fair Grounds station.
6	1895, July 19, 23, 24.	59 43·2	0·2794	0·5541	G. R. Putnam, U. S. Coast & G. S. Fair Grounds station.

Secular variations of the magnetic declination, dip and intensity—Continued.

NEW ORLEANS, LA.—Continued.

DIP AND INTENSITY AT NEW ORLEANS—Continued.

$$H = 0{\cdot}294\,3 - 0{\cdot}000\,334\,m$$

Date.	Obs'd H.	Comp'd H.	C—O.
1857·0	0·2928	0·2920	—0·0008
1858·3	909	915	+ 6
1880·2	838	842	+ 4
1895·6	0·2794	0·2791	—0·0003

SAN ANTONIO, TEX.

$\varphi = 29°\ 26'{\cdot}8$ $\lambda = 98°\ 27'{\cdot}9$ W. of Gr.
$\varphi_{\prime} = 29°\ 29'{\cdot}3$ $\lambda_{\prime} = 98°\ 32'{\cdot}1$ W. of Gr.

[φ Magnetic Observatory, Military Reservation. $\varphi_{\prime}$ Magnetic Observatory, Hillside Ranch.]

No.	Date.	D.	References and remarks.
		° ′	
1	1825—	10½ E.	General Land Office record.
2	1836—	9 45 E.	
3	1874—	9 30 E.	
4	1878, June 10, 11, 12.	9 22·3 E.	J. B. Baylor, U. S. Coast S. Arsenal Grounds. $\varphi = 29°\ 25'{\cdot}4$, $\lambda = 98°\ 29'{\cdot}3$.
5	1890, Mar. to Dec.	8 53·6 E.	R. E. Halter and L. G. Schultz, U. S. Coast & G. S. Magnetic Observatory, Military Reservation.
6	1891, whole year.	8 48·7 E.	
7	1892, Jan. to Aug.	8 48·5 E.	
	1892, Sept. to Dec.	8 41·8 E.	R. E. Halter and L. G. Schultz, U. S. Coast & G. S. Magnetic Observatory, Hillside Ranch. Reduction to old site at Military Reservation —6′·4, applied.
8	1893, whole year.	8 40·2 E.	
9	1894, " "	8 38·1 E.	
10	1895, Jan. and Feb.	8 37·5 E.	

$$D = -7°{\cdot}40 + 2{\cdot}92 \sin (1{\cdot}35\,m - 84°{\cdot}8)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1825·5	—10·50		— 9·98	+0·52
1836·5	9·75		10·24	—0·49
1874·5	9·50		9·69	—0·19
1878·4	9·37		9·52	—0·15
1890·6	8·89		8·86	+0·03
1891·5	8·81		8·81	0·00
1892·5	8·75		8·74	+0·01
1893·5	8·67		8·68	—0·01
1894·5	8·63		8·62	+0·01
1895·1	— 8·62		— 8·58	+0·04

DIP AND INTENSITY AT SAN ANTONIO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1878, June 10, 13.	57 34·6	0·2964	0·5528	J. B. Baylor, U. S. Coast S. Arsenal Grounds.
2	1890, Mar. to Dec.	57 35·0	0·2927	0·5459	A. Braid and R. E. Halter, U. S. Coast & G. S. — Magnetic Observatory on Military Reservation.
3	1891, Jan. to Dec.	57 37·1	0·2927	0·5464	R. E. Halter and L. G. Schultz, U. S. Coast & G. S. — Magnetic Observatory on Military Reservation.
4	1892, Jan. to Dec.	57 {40·2, 39·9}	0·2917	0·5454	R. E. Halter and L. G. Schultz, U. S. Coast & G. S. Magnetic Observatory, Military Reservation. After July at Hillside Ranch.
5	1893, Jan. to Dec.	57 41·8	0·2916	0·5456	R. E. Halter and L. G. Schultz, U. S. Coast & G. S. — Magnetic Observatory, Hillside Ranch.
6	1894, Jan. to Dec.	57 44·8	0·2915	0·5462	Do.
7	1895, Jan. and Feb.	57 45·4	0·2914	0·5463	Do.

Secular variations of the magnetic declination, dip and intensity—Continued.

GALVESTON, TEX.

$\varphi = 29° \; 18'.2 \qquad \lambda = 94° \; 47'.5$ W. of Gr.

[Astronomic station.]

No.	Date.	D.	References and remarks.
		° ′	
1	1848, Apr. 24–28.	8 57.4 E.	R. H. Fauntleroy, U. S. Coast S. At Dollar Point in $\varphi = 29° \; 26'.0$ and $\lambda = 94° \; 53'.4$. Reduction to Galveston $+3'.3$.
2	1868, Feb. 24, 25.	8 42.9 E.	E. Goodfellow, U. S. Coast S. At Dollar Point.
3	1878, May 29, 30, 31.	8 17.3 E.	J. B. Baylor, " " " " " " "
4	1890, Mar. 29, 30.	7 32.8 E.	" " " U. S. Coast & G. S. In $\varphi = 29° \; 17'.4$, $\lambda = 94° \; 44'.2$. At Galveston.
5	1895, June 7, 8, 10.	7 19.7 E.	E. Smith, U. S. Coast & G. S. In φ 29° 17′.6, $\lambda = 94° \; 47'$. At Galveston.

$$D = -8°.33 + 0.040\,9\,(t - 1876.1) + 0.000\,732\,(t - 1876.1)^2$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1848.3	—8.90		—8.90	0.00
1868.1	8.66		8.61	+0.05
1878.4	8.23		8.23	0.00
1890.2	7.55		7.61	—0.06
1895.4	—7.33		—7.27	+0.06

DIP AND INTENSITY AT GALVESTON.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1848, Apr. 25, May 8.	57 53.3	0.3016	0.5671	R. H. Fauntleroy, U. S. Coast S. At Dollar Point.
2	1868, Feb. 24–26.	58 04.1	0.2971	0.5616	E. Goodfellow, U. S. Coast S. At Dollar Point.
3	1878, May 30–June 4.	58 21.5	0.2938	0.5602	J. B. Baylor, " " " " " " "
4	1890, Mar. 29, 30.	57 52.0	0.2901	0.5453	J. B. Baylor, U. S. Coast & G. S. At Galveston.
5	1895, June 7, 8, 10.	58 06.3	0.2885	0.5461	E. Smith, " " " " " "

$$H = 0.301\,6 - 0.000\,281\,m$$

Date.	Obs'd H.	Comp'd H.	C—O.
1848.3	0.3016	0.3019	+0.0003
1868.2	.2971	.2965	— 6
1878.4	.2938	.2936	— 2
1890.2	.2901	.2903	+ 2
1895.4	0.2885	0.2888	+0.0003

Secular variations of the magnetic declination, dip and intensity—Continued.

KEY WEST, FLA.

$\varphi = 24° 33'.5$ $\lambda = 81° 48'.5$ W. of Gr.

[Tift's Observatory.]

No.	Date.	D.	References and remarks.
		° ′	
	1700—	5 E.	Sir E. Halley's Tabula Nautica. Not used.
1	1750—	5.6 E.	C. & G. S. Rept. for 1888, p. 308. Deduced from observations at 19 stations.
2	1829, Feb.	6 25 E.	W. A. Whitehead.
3	1843—	6 02 E.	L. M. Powell, U. S. N.
4	1849, Aug. 19–21.	5 29 E.	J. E. Hilgard, U. S. Coast S. At Sand Key.
5	1860, Feb., Mar., June, Dec.	4 46.6 E.	W. P. Trowbridge and S. Walker, U. S. Coast S. At Magnetic Observatory.
6	1861, Feb., Mar., Apr.	4 44.5 E.	S. Walker, J. G. Oltmanns, and F. F. Nes, U. S. Coast Survey. At Magnetic Observatory.
7	1862, May to Dec.	4 39.9 E.	
8	1863, Jan. to Dec.	4 36.8 E.	
9	1864, Jan. to Dec.	4 33.9 E.	
10	1865, Jan. to Dec.	4 31.5 E.	
11	1866, Jan. to Apr., incl.	4 29.8 E.	
12	1879, Mar. 24, 25, 26.	3 34 E.	S. M. Ackley, Lieut. U. S. N. Grounds of Army Hospital.
13	1884, Apr. 4.	3 00 E.	C. Belknap, " " " " Vicinity of Key West, reduction°.
	1884, May 10.	2 49 E.	R. B. Peck, Lieut. U. S. N. Vicinity of Key West, reduction °.
14	1887, Feb. 1, 2, 3.	3 19.8 E.	J. B. Baylor, U. S. Coast & G. S. Grounds of Army Hospital.

$$D = -4°.31 + 2.86 \sin (1.30\, m - 23°.9)^*$$

Date.	Obs'd D.	Comp'd D.	C—O.	Date.	Obs'd D.	Comp'd D.	C—O.
	°	°	°		°	°	°
1750.0	—5.60	—5.57	+0.03	1863.5	—4.61	—4.62	—0.01
1829.1	6.42	6.54	—0.12	1864.5	4.57	4.56	+0.01
1843.5	6.03	5.84	+0.19	1865.5	4.53	4.50	+0.03
1849.6	5.48	5.49	—0.01	1866.2	4.50	4.45	+0.05
1860.7	4.78	4.81	—0.03	1879.2	3.56	3.62	—0.06
1861.2	4.74	4.77	—0.03	1884.3	2.91	3.30	—0.39
1862.7	—4.67	—4.68	—0.01	1887.1	—3.33	—3.13	+0.20

DIP AND INTENSITY AT KEY WEST.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1849, Aug. 18, 19, 22.	54 25.8	0.3116	0.5357	J. E. Hilgard, U. S. Coast S. At Sand Key. Not used.
2	1860, Feb., Mar., June, Dec.	54 37.8	0.3113	0.5378	W. P. Trowbridge and S. Walker, U. S. Coast S. At Magnetic Observatory.
3	1861, Feb., Mar., Apr.	54 36.8	0.3112	0.5372	S. Walker and J. G. Oltmanns, U. S. Coast S.
4	1862, May to Dec.	54 31.0	0.3109	0.5358	S. Walker, J. G. Oltmanns, and F. F. Nes, U. S. Coast S.
5	1863, Jan. to Dec.	54 31.2	0.3108	0.5354	S. Walker, U. S. Coast S.
6	1864, Jan. to Dec.	54 29.0	0.3107	0.5348	" " " " " "
7	1865, Jan. to Dec.	54 28.8	0.3103	0.5340	" " " " " "
8	1866, Jan. to Apr., incl.	54 28.6	0.3101	0.5334	" " " " " "
9	1879, Mar. 24, 25, May 7.	54 28.6	0.3058	0.5263	Lieut. S. M. Ackley, U. S. N. Grounds of Army Hospital.
10	1887, Feb. 2, 3, 4.	54 26.8	0.3006	0.5170	J. B. Baylor, U. S. Coast & G. S. Grounds of Army Hospital.

* Expression confirmed by an observation in 1896.

Secular variations of the magnetic declination, dip and intensity—Continued.

KEY WEST, FLA.—Continued.

DIP AND INTENSITY AT KEY WEST—Continued.

$$\Theta = 54^\circ{\cdot}60 - 0{\cdot}004\ 4\ m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1860·5	54·63	54·55	—0·08
1861·2	·61	·55	— ·06
1862·5	·52	·54	+ ·02
1863·5	·52	·54	+ ·02
1864·5	·48	·53	+ ·05
1865·5	·48	·53	+ ·05
1866·2	·48	·52	+ ·04
1879·3	·48	·47	— ·01
1887·1	54·45	54·43	—0·02

HABANA, CUBA.

$\varphi = 23^\circ\ 09'{\cdot}3$ $\lambda = 82^\circ\ 21'{\cdot}5$ W. of Gr.

[Morro light.]

No.	Date.	D.	References and remarks.
		° ′	
	1700—	6 E.	C. & G. S. Rept. for 1888, p. 306; deduced from observations at 17 stations. Not used.
1	1726—	4 24 E.	Mathews. Reduction to Habana + 10′.
2	1732, Mar. and Apr.	4 30 E.	J. Harris.
3	1750—	5½ E.	C. & G. S. Rept. for 1888, p. 308; deduced from observations at 19 stations.
4	1815—	7 E.	Ency. Brit., 7th edition.
5	1816, Aug.	5½ E.	Bentley.
6	1833—	6 50 E.	P. Barlow's isogonic chart.
7	1840—	5 40 E.	Lavallée Becquerel's Trait. de Mag^me^. Cont. to Terr. Mag., Hyd. Office, U. S. N., 1895.
8	1857, Jan. 28.	5 15 E.	K. Friesach.
9	1858—	5 45 E.	A map of Cuba.
10	1874—	4 17 E.	Benito Viñes, S. J. Conts. to Terr. Mag., Hyd. Office, U. S. N., 1895. College de Belen.
11	1879, Mar. 13, 14, 15.	3 54 E.	Lieut. S. M. Ackley, U. S. N. College de Belen.
12	1884, Apr.	2 34 E.	Lieut. C. Belknap, U. S. N.
13	1885, Nov. 5, 6, 14.	3 41·2 E.	B. Viñes. College de Belen.
14	{ 1886, Dec. 21.	3 33·5 E.	" " (—3°·58 when corrected for diurnal variation). College de Belen.
	{ 1887—	3 37 E.	B. Viñes, Conts. to Terr. Mag., Hyd. Office, U. S. N., 1895.
15	1888—	3 37 E.	" " " " " " " " "
16	{ 1889, Jan. 1.	3 33 E.	Lieut. Aubry. Annuaire pour l'an 1891, Paris, 1891. } mean —3°·56.
	{ 1889, Apr.	3 34 E.	B. Viñes. Conts. to Terr. Mag., Hyd. Office, U. S. N., 1895, College de Belen. }

$$D = -3^\circ{\cdot}72 + 2{\cdot}79 \sin (1^\circ{\cdot}05\ m - 36^\circ{\cdot}7)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1726·5	—4·57		—4·38	+0·19	1858·5	—5·75		—5·02	+0·73
1732·3	4·50		4·66	—0·16	1874·5	4·28		4·25	+0·03
1750·0	5·50		5·45	+0·05	1879·2	3·90		4·01	—0·11
1815·5	7·00		6·39	+0·61	1884·3	2·73	½	3·75	—1·02
1816·6	5·50		6·37	—0·87	1885·9	3·65		3·67	—0·02
1833·0	5·83		5·99	—0·16	1887·2	3·59		3·60	—0·01
1840·5	5·67		5·75	—0·08	1888·5	3·62		3·54	+0·08
1857·1	—5·25		—5·08	+0·17	1889·2	—3·56		—3·50	+0·06

Secular variations of the magnetic declination, dip and intensity—Continued.

HABANA, CUBA—Continued.

DIP AND INTENSITY AT HABANA.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1801, Jan.	53	22	......	......	A. von Humboldt.
2	1822—	51	55	0·3214(?)	0·5210(?)	Sir E. Sabine.
3	1857, Jan. 27, 28.	52	00	0·3191	0·5184	K. Friesach.
4	1879, Mar. 13–16.	52	18·1	0·3157	0·5164	Lieut. S. M. Ackley, U. S. N. At College de Belen.
5	1885 { Nov. 10, 12. Dec. 29, 30.	52	19·6	0·3119	0·5104	Benito Viñes, S. J. At College de Belen.
6	1886, Dec. 29, 30.	52	13·3	0·3123	0·5098	" " " " " " "
7	1889, Jan.	52	10	......	......	Lieut. Aubry. Annuaire pour l'an 1891; Paris, 1891.

KINGSTON, JAMAICA.

$\varphi = 17° 55'\cdot9$ $\lambda = 76° 50'\cdot6$ W. of Gr.

[Port Royal flagstaff.]

No.	Date.	D.			References and remarks.
		°	′		
	1660—	6½		E.	According to J. Robertson. } Not used.
	1700—	6½		E.	Mountain's Chart. } Not used.
	1700—	7		E.	Sir E. Halley's Tabula Nautica. } Not used.
1	1726, Sept. 12.	4	31	E.	Mathews. At Port Royal.
2	1732, Mar. and Apr.	6	02	E.	J. Harris. At Black River.
3	{ 1789 to 1793.	6	50	E.	} J. Leard.
	{ 1791 to 1792.	6	45	E.	} J. Leard.
4	1806 –	6	30	E.	J. Robertson.
5	{ 1819—	4	50	E.	De Mackau.
	{ 1821—	4	50	E.	De Mayne.
6	1822—	4	54	E.	Owen.
7	1832—	5	13	E.	Foster.
8	1833(?)—	4	40	E.	Map of Kingston.
	1833—	6½		E.	P. Barlow's isogonic chart. Not used.
9	1837, Oct.	4	18	E.	Milne.
10	1847, Apr.	3	40	E.	Capt. E. Barnett, R. E.
11	1857, Mar. 2	3	40	E.	K. Friesach.
	1866—	4	57	E.	Brit. Admiralty Chart { No. 446. Not used.
12	1875—	4	00	E.	Brit. Admiralty Chart { No. 456.
13	1876—	3	35	E.	Brit. Admiralty Chart { No. 762.
14	1880—	3	06	E.	Chart of curves of equal magnetic variation, Brit. Adm'y, 1880.
15	1884, Feb. 8.	2	20	E.	Lieut. R. B. Peck, U. S. N.

$$D = -3°\cdot81 + 2\cdot39 \sin(1\cdot10\, m - 10°\cdot6)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1726·7	—4·52		—5·14	—0·62	1837·8	—4·30		—4·78	—0·48
1732·2	6·04		5·34	+0·70	1847·3	3·67		4·37	—0·70
1791·8	6·78		6·11	+0·67	1857·2	3·67		3·92	—0·25
1806·5	6·50		5·85	+0·65	1875·5	4·00		3·10	+0·90
1820·0	4·83		5·46	—0·63	1876·5	3·58		3·05	+0·53
1822·5	4·90		5·37	—0·47	1880·5	3·10		2·88	+0·22
1832·5	5·22		5·00	+0·22	1884·1	—2·33		—2·73	+0·40
1833·5	—4·67		—4·96	—0·29					

Secular variations of the magnetic declination, dip and intensity—Continued.

KINGSTON, JAMAICA—Continued.

DIP AND INTENSITY AT KINGSTON.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1822—	46 55	......	......	Sir E. Sabine.
2	1834—	47 19	......	......	Capt. E. Barnett, R. E.
	1834, July 11, Aug. 1, Sept. 30, Oct. 6.	47 01·3	0·3307	0·4851	Sir E. Home.
3	1857, Feb. 25, Mar. 2.	46 32	0·3310	0·4812	K. Friesach.

BRIDGETOWN, BARBADOS.

$\varphi = 13° 05'·7$ $\lambda = 59° 37'·3$ W. of Gr.

[Rickett's Battery.]

No.	Date.	D.	References and remarks.
		° ′	
1	1700.	5⅓ E.	Sir E. Halley's Tabula Nautica.
2	1726, June 26, 28, Oct. 23.	4 24 E.	Mathews.
	1726, June 29.	3 29 E.	C. Hansteen's "Mag. der Erde." At Lambert Point.
3	1760, May 28, 31.	4 30 E.	Ross.
4	1761, May.	3 47 E.	Ross.
5	1833—	1 29 E.	Phillips.
6	1839—	1 13 E.	Milne.
7	1846—	1 27 E.	Sir R. H. Schomburgk.
8	1871—	0 35 E.	Staff Com. Parsons.
	1884, Apr. 24.	1 50 W.	Lieut. Hanford, U. S. N., reduction to Bridgetown —15′. Not used.
9	1890, May 2, 4, 8, 9.	1 12 W.	E. D. Preston, U. S. Coast & G. S. At Hastings, near the old naval hospital and the Transit of Venus station of 1882. Value reduced to mean of day.

$D = -1°·88 + 2·83 \sin (0·95\, m + 24°·6)$. Expressions very doubtful.

Date.	Ob'sd D.	p.	Comp'd D.	C — O.
	°		°	°
1700·0	—5·33		—4·38	+0·95
1726·5	3·92		4·71	—0·79
1760·4	4·50		4·34	+0·16
1761·3	3·78		4·32	—0·54
1833·5	1·48		1·44	+0·04
1839·5	1·22		1·17	+0·05
1846·5	1·45		—0·85	+0·60
1871·5	—0·58		+0·12	+0·70
1890·3	+1·20	2	+0·64	—0·56

DIP AND INTENSITY AT BRIDGETOWN.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1722¾.	44½	......	......	Capt. Othniel Beal. Recovered by Dr. L. A. Bauer. "Nature," No. 1317.
2	1835, May 11.	43 45·9	0·3066	0·4233	Sir E. Home.
3	1836, Jan. 5.	43 28·8			" " "
4	1846—	43 57	......	......	Sir R. H. Schomburgk.

Secular variations of the magnetic declination, dip and intensity—Continued.

PANAMA, NEW GRANADA.

$\varphi = 8° 57'·1$ $\lambda = 79° 32'·2$ W. of Gr.

[Cathedral.]

No.	Date.	D.	References and remarks.
		° ′	
	1700—	10 E.	C. & G. S. Rept. for 1888, p. 306, deduced from observations at 17 stations. Not used.
1	1775, Nov.	7 49 E.	Encycl. Brit., 7th edition.
2	1790, Oct. 3.	7 49 E.	Don A. Malaspina.
	1791, Dec.	7 49 E.	Encycl. Brit., 7th edition; probably the same as above. Not used.
3	1802—	8 E.	Encycl. Brit., 7th edition.
4	1822—	7 E.	Hall.
5	1837—	7 02 E.	Sir E. Belcher.
6	{ 1849—	7 15 E.	Hughes.
	{ 1849—	6 55 E.	Maj. W. H. Emory.
7	1858—	6 17 E.	K. Friesach.
8	1866, May 14.	5 56 E.	Prof. W. Harkness, U. S. N.
9	1873, Dec. 25.	6 57 E.	Logbooks of the Benicia and Richmond, U. S. N.; off Point Mala. Reduction to Panama — 38′.
10	1880—	5 24 E.	Chart of curves of equal magnetic variation. Brit. Adm.
11	1883, Feb. 22.	5 02 E.	Annales du Bureau des Longitudes, Paris, 1883.
12	1884, Mar. 20.	5 23 E.	Lieut. C. Belknap, U. S. N. Reduction to Panama inappreciable.

$$D = -5°·66 + 2·22 \sin (1·10\, m - 27°·8)$$

Date.	Obs'd D.	p.	Comp'd D.	C — O.	Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°		°		°	°
1775·8	−7·82		−7·71	+0·11	1858·5	−6·28		−6·34	−0·06
1790·8	7·82		7·83	−0·01	1866·4	5·93		6·02	−0·09
1802·5	8·00		7·79	+0·21	1873·9	6·32	½	5·71	+0·61
1822·5	7·00	½	7·49	−0·49	1880·5	5·40		5·44	−0·04
1837·5	7·03		7·09	−0·06	1883·1	5·03		5·33	−0·30
1849·5	−7·08		−6·69	+0·39	1884·2	−5·38		−5·29	+0·09

DIP AND INTENSITY AT PANAMA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1790, Oct. 3.	29 29	......	......	Don A. Malaspina.
2	1837—	31 51·9	0·3570	0·4204	Sir E. Belcher.
3	1858, Apr. 29, May 2.	32 30	0·3529	0·4184	Capt. R. W. Haig.
4	1866, May 14.	31 56	0·3511	0·4137	Prof. W. Harkness, U. S. N.

GROUP III.

Secular variations of the magnetic declination, dip and intensity.

[Western stations.]

CHAMISSO ISLAND, KOTZEBUE SOUND, ALASKA.

$\varphi = 66° 13'$ $\lambda = 161° 49'$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1728—	32 33 E.	Deduced from a discussion of 21 observations made by V. J. Bering off the coast of Kamchatka between 1725 and 1730; see C. & G. S. Rept. for 1891, Appendix No. 5.
2	{ 1826, Aug.	31 24 E.	Capt. F. W. Beechey (Narrative).
	{ 1826—	31 10 E.	Brit. Adm. Chart 593.
	1826—	28 53 E.	Capt. F. W. Beechey (Sabine's Contrib's). Not used.
3	1849—	30 26 E.	Capt. H. Kellett.
4	1880, Aug. 31.	26 49 E.	W. H. Dall and M. Baker, U. S. Coast & G. S. Chamisso Harbor.

Secular variations of the magnetic declination, dip and intensity—Continued.

CHAMISSO ISLAND, KOTZEBUE SOUND, ALASKA—Continued.

$D = -29°.88 + 4.35 \sin (1.2\,m + 2°.6)$. Expression uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1728.5	−32.55		−32.49	+0.06
1826.5	31.29		31.76	−0.47
1849.5	30.43		29.73	+0.70
1880.7	−26.82		27.12	−0.30

DIP AND INTENSITY AT CHAMISSO ISLAND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1827—	77 39	......	......	Capt. F. W. Beechey.
2	1880, Aug. 31.	77 17.4	0.1287	0.5849	W. H. Dall and M. Baker, U. S. Coast & G. S. Chamisso Harbor.

PORT CLARENCE, ALASKA.

$\varphi = 65° \; 16'$ $\lambda = 166° \; 50'$ W. of Gr.

[Point Spencer.]

No.	Date.	D.	References and remarks.
		° ′	
1	1728—	29.1 E.	Deduced from a discussion of 21 observations made by V. J. Bering off the coast of Kamchatka between 1725 and 1730; see C. & G. S. Rept. for 1891, Appendix No. 5.
2	1827—	26 55 E.	Capt. F. W. Beechey. At Port Clarence and Grantey Bay.
3	1850—	26 26 E.	Capt. H. Kellett.
4	1854—	26 00 E.	Capt. Maguire.
5	1879, July.	23 01 E.	A. Wÿkander.
6	1880, Sept. 8.	22 45 E.	W. H. Dall and M. Baker, U. S. Coast & G. S. Near Point Spencer.

$D = -26°.09 + 4.41 \sin (1.2\,m + 4°.6)$. Expression uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1728.5	−29.10	½	−28.86	+0.24
1827.5	26.91		27.77	−0.86
1850.5	26.43		25.69	+0.74
1854.5	26.00		25.32	+0.68
1879.5	23.02		23.25	−0.23
1880.7	−22.75		−23.17	−0.42

DIP AND INTENSITY AT PORT CLARENCE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1850—	75 48	......	......	Capt. R. Collinson.
2	1854—	76 30	......	......	Capt. Maguire.
3	1879, July.	76 05	0.1396	0.5804	A. Wÿkander.
4	1880, Sept. 6, 8.	76 04.0	0.1393	0.5785	W. H. Dall and M. Baker, U. S. Coast & G. S. Near Point Spencer.

Secular variations of the magnetic declination, dip and intensity—Continued.

PORT ETCHES, CONSTANTINE HARBOR, ALASKA.

$\varphi = 60° \; 20'\cdot 7 \qquad \lambda = 146° \; 37'\cdot 6$ W. of Gr.

[Astronomic station of 1874.]

No.	Date.	D. ° ′	References and remarks.
1	1778, May 19.	23 37 E.	Capt. J. Cook.
2	1787, May.	26 E.	Portlock; at Chalmers Harbor, $\varphi = 60° \; 17'$, $\lambda = 147° \; 27'$.
	1787, May and July.	26½ E.	" " Garden Cove, $\varphi = 60° \; 20'\cdot 5$, $\lambda = 146° \; 46'$.
	1787—	27 E.	J. Johnstone; at Cape Hinchinbrook, $\varphi = 60° \; 18'$, $\lambda = 147° \; 01'$. Not used.
3	1788, May 17.	25 E.	Don E. Martinez; in $\varphi = 60° \; 10'$, $\lambda = 147° \; 35'$.
4	1790—	26 28 E.	Sarycheff; at Nuchek, in $\varphi = 60° \; 18'$, $\lambda = 146° \; 32'$.
	1790, May 23.	26 E.	Fidalgo, in $\varphi = 60° \; 12'$, $\lambda = 146° \; 31'$.
	1790, July 30.	28½ E.	J. Billings. Not used.
5	1794, June.	28 30 E.	Capt. G. Vancouver; at Port Chalmers, $\varphi = 60° \; 16'$, $\lambda = 146° \; 38'$.
6	1810 (?).	28 08 E.	Sarycheff; at Nuchek, $\varphi = 60° \; 17'$, $\lambda = 147° \; 00'$.
7	1830—	31 38 E.	Chernoff; " " $\varphi = 60° \; 20'$, $\lambda = 146° \; 32'\cdot 5$.
8	1837, Aug. 27.	31 38 E.	Sir E. Belcher; near Phipps Point, $\varphi = 60° \; 21'$, $\lambda = 146° \; 41'$.
9	1874, May 31.	29 10 E.	M. Baker, U. S. Coast S. Near Phipps Point.
10	1894, June 18.	27 24 E.	Lieut. J. B. Collins, U. S. S. Mohican. Notice to Mariners of Nov. 10, 1894. At Phipps Point.

$D = -22°\cdot 40 + 9\cdot 13 \sin (1\cdot 2 \, m - 83°\cdot 6)$. Expression very uncertain.

Date.	Obs'd D. °	p.	Comp'd D. °	C − O. °
1778·4	−23·62	½	−24·06	−0·44
1787·4	26·25		25·71	+0·54
1788·4	25·00		25·90	−0·90
1790·5	26·23		26·26	−0·03
1794·5	28·50		26·94	+1·56
1810·5	28·13		29·29	−1·16
1830·5	31·63		31·13	+0·50
1837·7	31·63		31·43	+0.20
1874·4	29·17		29·81	−0·64
1894·5	−27·40	¼	−26·99	+0·41

DIP AND INTENSITY AT PORT ETCHES.

No.	Date.	Θ. ° ′	H.	F.	Reference.
1	1837—	76 02·9	0·1452	0·6022	Sir E. Belcher. Near Phipps Point.

Secular variations of the magnetic declination, dip and intensity—Continued.

PORT MULGRAVE, YAKUTAT BAY, ALASKA.

$\varphi = 59° 33'.8$ $\lambda = 139° 47'.3$ W. of Gr.

[Astronomic station, Khantaak Island.]

No.	Date.	D.	References and remarks.
		° ′	
1	{ 1778, May 6.	23 10 E.	Capt. J. Cook. At sea in $\varphi = 59° 08'$, $\lambda = 139° 41'$.
	{ 1778, May 7.	24 26 E.	" " " " south of Mount St. Elias, $\varphi = 59° 27'.5$, $\lambda = 140° 53'$.
2	1787, May.	26 E.	Capt. G. Dixon, Port Mulgrave.
3	1791, July 1.	26 40 E.	Don A. Malaspina, on shore, Bahia de Monti, in $\varphi = 59° 33'.7$, $\lambda = 139° 46'.3$.
4	1794, July.	26 E.	Capt. G. Vancouver, at Port Mulgrave.
5	1802, about.	29 E.	Russian chart. $\varphi = 59° 31'$, $\lambda = 139° 36'.5$.
6	1823—	30 30 E.	Khromchenko, at end of spit, in $\varphi = 59° 33'.6$, λ $139° 46'.5$.
7	1874, May 22.	29 58 E.	M. Baker, U. S. Coast S. At Port Mulgrave.
8	1880, June 24.	30 00 E.	" " " " & G. S. At Port Mulgrave.
	1891—	27 19 E.	I. C. Russell, Yakutat Bay. Second expedition to the Mount St. Elias Alps. Not used.
9	1892, Sept. 2, 3, 4.	29 55.8 E.	J. H. Turner, U. S. Coast & G. S. On Khantaak Island.
	1892, July, Aug., Sept.	30 43 E.	J. E. McGrath, U. S. Coast & G. S. At both ends of Malaspina Base, at Mount Hoorts, and at Ocean Cape, mean ¼ (30° 54′, 30° 42′, 30° 51′, 30° 24′) = 30° 43′. Not used.
10	1894, June.	30 43 E.	J. E. McGrath, U. S. Coast & G. S. At west end of Malaspina Base and several places west of it. Mean value. Reduction to Khantaak Island —47′.

$D = -24°.02 + 7.48 \sin (1.1\, m - 95°.0)$. A rough and doubtful representation.

Date.	Obs'd D.	*p*.	Comp'd D.	C — O.
	°		°	°
1778.3	—23.80	½	—24.81	—1.01
1787.4	26.00		26.09	—0.09
1791.5	26.67		26.65	+0.02
1794.5	26.00	¼	27.06	—1.06
1802.0	29.00		27.99	+1.01
1823.5	30.50		30.21	+0.29
1874.4	29.97		30.96	—0.99
1880.5	30.00		30.59	—0.59
1892.7	29.93	2	29.58	+0.35
1894.4	—29.93		—29.42	+0.51

DIP AND INTENSITY AT PORT MULGRAVE, YAKUTAT BAY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1791, July 1.	76 46.8	......	......	Don A. Malaspina.
2	1880, June 24.	76 17.9	0.1414	0.5970	W. H. Dall and M. Baker, U. S. Coast & G. S. Port Mulgrave.
3	1892, Sept. 2–4.	76 11.5	0.1422	0.5958	J. H. Turner, U. S. Coast & G. S. Khantaak Island.

Secular variations of the magnetic declination, dip and intensity—Continued.

ST. PAUL, KADIAK ISLAND, ALASKA.

$\varphi = 57^\circ\ 48'{\cdot}0 \qquad \lambda = 152^\circ\ 21'{\cdot}3$ W. of Gr.

[Astronomic station of 1867.]

No.	Date.	D.	References and results.
		° ′	
1	1778, May 21.	23 42 E.	Capt. J. Cook; at sea off Pye Island, in $\varphi = 59^\circ\ 30'$, $\lambda = 149^\circ\ 54'$.
	1778, June 13.	20 31 E.	" " " " " " SW. end Kadiak Island, in $\varphi = 56^\circ\ 49'$, $\lambda = 154^\circ\ 20'$. The mean position is $\varphi = 58^\circ\ 10'$, $\lambda = 152^\circ\ 07'$, and the mean declination giving the first value double weight — 22°·60.
	1779, Aug. 9.	27 E.	San Virey and Ant. Bucareli; at sea in $\varphi = 57^\circ\ 59'$, $\lambda = 152^\circ\ 07'$. Not used.
2	1790—	25½ E.	Sarycheff, chart.
	1790, July 10.	22 10 E.	Fidalgo, in $\varphi = 58^\circ\ 10'$, $\lambda = 152^\circ\ 07'$. Not used.
3	1804, Aug. 16.	26 07 E.	U. Lisiansky.
4	1808—	26 E.	Russian naval officer.
	1808—	25½ E.	
5	1818, July 19.	26½ E.	V. M. Golovnin, in front of Governor's House, in $\varphi = 57^\circ\ 47'{\cdot}2$, $\lambda = 152^\circ\ 18'{\cdot}3$.
6	1834—	28 38 E.	Murasheff, St. Paul Harbor.
7	1839, July.	26 43 E.	Sir E. Belcher, near Cape Greville in $\varphi = 57^\circ\ 20'$, $\lambda = 152^\circ\ 51'$.
8	1845 (?).	27 E.	Vasilieff, St. Paul Harbor.
9	1867, Aug. 28, 29.	26 05 E.	A. T. Mosman, U. S. Coast S., at astronomic station on bluff east of village.
10	1874, June 7.	25 22 E.	M. Baker, U. S. Coast S.
11	1880, July 9.	25 09 E.	" " & G. S., at Chagafka Cove.

$D = -22^\circ{\cdot}21 + 5^\circ{\cdot}18 \sin (1^\circ{\cdot}35\, m - 72^\circ{\cdot}5)$. Expression very uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C — O.	Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°		°		°	°
1778·4	—22·60	½	—23·18	—0·58	1839·5	—26·72		—27·38	—0·66
1790·5	25·50		24·58	+0·92	1845·5	27·00		27·29	—0·29
1804·6	26·12		25·95	+0·17	1867·7	26·08		26·09	—0·01
1808·5	25·75		26·27	—0·52	1874·4	25·37		25·51	—0·14
1818·5	26·50		26·90	—0·40	1880·5	—25·15		—24·90	+0·25
1834·5	—28·63		—27·38	+1·25					

DIP AND INTENSITY AT ST. PAUL, KADIAK ISLAND.

No.	Date.	Θ.	H.	F.	Reference.
		° ′			
1	1880, July 12.	72 34·6	0·1716	0·5730	W. H. Dall and M. Baker, U. S. Coast & G. S.

SITKA, ALASKA.

$\varphi = 57^\circ\ 02'{\cdot}9 \qquad \lambda = 135^\circ\ 20'{\cdot}4$ W. of Gr.

[Astronomic station.]

No.	Date.	D.	References and remarks.
		° ′	
	1775, Aug. 23.	22 E.	Don Bruno de Heceta. Not used.
1	1779, July 7.	23½ E.	San Virey and Ant. Bucareli.
2	1786, Aug. 6, 7.	26 46 E.	La Perouse.
3	1787, June.	24 E.	Capt. G. Dixon.
4	1791, Aug. 8, 11, 21.	27 46 E.	Capt. E. Marchand.
5	1804, Aug. 20.	26 45 E.	Capt. U. Lisiansky.
6	1818, July.	27 15 E.	Capt. V. M. Golovnin.
7	1824, Aug.	27 30 E.	Von Kotzebue.
8	1827—	28 50 E.	Capt. F. P. Lütke.
9	1829, Nov. 10.	28 19 E.	A. Erman.

Secular variations of the magnetic declination, dip and intensity—Continued.

SITKA, ALASKA—Continued.

No.	Date.	D.	References and remarks.
		° ′	
10	1837, Sept. 12–16.	27 24 E.	Sir E. Belcher.
	1839, July 15–19.	29 32 E.	
11	1842, all months but Jan., Feb., and Oct.	28 32·4 E.	
12	1843, whole year.	28 54·0 E.	
13	1844, " "	28 57·3 E.	
14	1845, " "	29 00·0 E.	Magnetic observatory on Japonski Island.*
15	1847, May to Dec.	28 58·9 E.	
16	1848, whole year.	29 04·5 E.	
17	1849, Jan., Feb., Mar.	29 03·6 E.	
18	1850, whole year.	28 50·3 E.	
	1851—	29 14 E.	Capt. R. Collinson.
19	1851, whole year.	28 53·1 E.	
20	1852, Jan. to July, Nov. and Dec.	28 48·5 E.	
21	1856—	28 58·6 E.	
22	1857, whole year.	29 07·2 E.	
23	1858, " "	29 10·5 E.	
24	1859, " "	29 06·1 E.	Magnetic observatory on Japonski Island.*
25	1860, " "	29 07·9 E.	
26	1861—	29 04·1 E.	
27	1862, whole year.	29 00·9 E.	
28	1863—	29 03·3 E.	
29	1864—	29 04·2 E.	
30	1867, Aug. 17, 18, 19, 20.	28 49 E.	A. T. Mosman, U. S. Coast S.
31	1874, May 4, 5.	28 59·5 E.	M. Baker, " " "
32	1876, Jan. 15 to Mar. 20.	28 20·5 E.	Capt. J. B. Campbell and Lieut. W. R. Quinan.
33	1879, Apr.	28 54 E.	Lieut. J. E. Craig.
34	1880, May 17, 18.	29 05 E.	M. Baker and W. H. Dall, U. S. Coast & G. S.
35	1880, Sept. 15, 16.	29 11 E.	H. E. Nichols, U. S. N.
36	1892, May 19, 20, 21.	29 32·9 E.	F. Morse, U. S. Coast & G. S. On Parade Ground, Sitka.
	1892, June 14, 15.	29 26·8 E.	" " " Japonski Island, Sitka Harbor.
	1892, Sept. 7, 8.	29 35·0 E.	J. E. McGrath, U. S. Coast & G. S. On Parade Ground.
37	1893, Aug. 15, 16, 17.	29 33·8 E.	F. Morse, " " " "
38	1894, May 22, 23, 24.	29 36·9 E.	" " " " "

* The observations at Japonski Island are supposed to have been made under the direction of Syrianow. Annales du bureau des longitudes, Vol. IV, Paris, 1890. With respect to the differential observations see note on p. 287 of C. & G. S. Report for 1888. A second periodic term (of short period) requires to be introduced and consequently the present term is to be modified as soon as the progress of the phenomenon can be better understood.

$D = -25°·48 + 3·84 \sin (1·00\, m - 116°·1) + 0·32 \sin (6·5\, m + 321°)$. An approximate expression. [N. B. The last term applied only since 1830.]

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1779·5	—23·50		—25·04	—1·54	1852·4	—28·81		—29·12	—0·31
1786·5	26·77		25·50	+1·27	1856·5	28·98		29·08	—0·10
1787·4	24·00		25·56	—1·56	1857·5	29·12		29·07	+0·05
1791·6	27·77		25·85	+1·92	1858·5	29·18		29·05	+0·13
1804·6	27·75		26·70	+1·05	1859·5	29·10		29·04	+0·06
1818·5	27·25		27·53	—0·28	1860·5	29·13		29·02	+0·11
1824·5	27·50		27·86	—0·36	1861·5	29·07		29·00	+0·07
1827·5	28·83		28·02	+0·81	1862·5	29·02		29·00	+0·02
1829·9	28·31		28·20	+0·11	1863·5	29·06		29·00	+0·06
1838·6	28·62		28·81	+0·19	1864·5	29·07		28·98	+0·09
1842·6	28·54		28·99	—0·45	1867·6	28·82		28·97	—0·15
1843·5	28·90		29·02	—0·12	1874·3	28·99		29·04	—0·05
1844·5	28·96		29·05	—0·09	1876·1	28·34		29·08	—0·74
1845·5	29·00		29·08	—0·08	1879·3	28·90		29·16	—0·26
1847·7	28·98		29·12	—0·14	1880·4	29·08		29·20	—0·12
1848·5	29·08		29·12	—0·04	1881·7	29·19		29·23	—0·04
1849·1	29·06		29·12	—0·06	1892·5	29·53		29·43	+0·10
1850·5	28·84		29·13	—0·29	1893·6	29·56		29·43	+0·13
1851·5	—28·88		—29·12	—0·24	1894·4	—29·62		—29·43	+0·19

Secular variations of the magnetic declination, dip and intensity—Continued.

SITKA, ALASKA—Continued.

DIP AND INTENSITY AT SITKA.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1786, Aug. 6, 7.	73	30(?)	......	......	La Perouse.
2	1818, July.	76	33	......	......	Capt. V. M. Golovnin.
3	1827—	75	55	......	0·6059(?)	Capt. F. P. Lütke.
4	1829·9	75	50·6	......	0·6026(?)	A. Erman.
5	1837—	75	51·5	......	......	Sir E. Belcher.
6	1839—	75	49·1	0·1479	0·6038	"
7	1842—	75	51	......	......	Magnetic observatory on Japonski Island.
8	1845, Jan.-Dec.	75	54·6	......	......	" " " "
9	1851—	76	20(?)	......	......	Capt. R. Collinson.
10	1880, May 17, 18.	75	11·7	0·1526	0·5972	W. H. Dall and M. Baker, U. S. Coast & G. S.
11	1881, Sept. 12-16.	75	16·6	0·1518	0·5976	H. E. Nichols, U. S. N. At Japonski Island.
12	1892, May 19, 20, 21.	75	04·6	0·1530	0·5942	F. Morse, U. S. Coast & G. S. On Parade Ground.
	1892, June 14, 15.	75	02·0	0·1531	0·5926	F. Morse, U. S. Coast & G. S. On Japonski Island.
	1892, Sept. 7, 8.	75	09·4	0·1527	0·5961	J. E. McGrath, U. S. Coast & G. S. On Parade Ground.
	1892, Sept. 12, 13.	75	05·6	0·1527	0·5936	J. E. McGrath, U. S. Coast & G. S. On Japonski Island.
13	1893, Aug. 15, 16, 17.	75	01·7	0·1532	0·5930	F. Morse, U. S. Coast & G. S. On Parade Ground.
14	1894, May 22, 23, 24.	75	00·5	0·1535	0·5934	F. Morse, U. S. Coast & G. S. On Parade Ground.

$$\Theta = 75°{\cdot}672 - 0{\cdot}017\,5\,m + 0{\cdot}000\,064\,2\,m^2$$
$$H = 0{\cdot}149\,0 + 0{\cdot}000\,098\,m$$
$$F = 0{\cdot}602\,90 - 0{\cdot}000\,114\,m - 0{\cdot}000\,002\,28\,m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.	Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°		°	°	°
1818·5	76·55	76·29	—0·26	1845·5	75·91	75·75	—0·16
1827·5	75·92	76·10	+0·18	1880·4	75·20	75·20	0·00
1829·9	75·84	76·05	+0·21	1881·7	75·28	75·18	—0·10
1837·5	75·86	75·90	+0·04	1892·6	75·06	75·04	—0·02
1839·5	75·82	75·86	+0·04	1893·6	74·98	75·03	+0·05
1842·5	75·85	75·80	—0·05	1894·4	74·96	75·02	+0·06

Date.	Obs'd H.	Comp'd H.	C—O.
1839·5	0·1479	0·1480	+0·0001
1880·4	0·1526	0·1520	— 6
1881·7	0·1518	0·1521	+ 3
1892·6	0·1529	0·1532	+ 3
1893·6	0·1532	0·1533	+ 1
1894·4	0·1535	0·1534	—0·0001

Date.	Obs'd F.	Comp'd F.	C—O.
1827·5	0·6059	0·6043	—0·0016
1829·9	0·6026	0·6043	+0·0017
1839·5	0·6038	0·6039	+0·0001
1880·4	0·5971	0·5973	+0·0002
1881·7	0·5976	0·5970	—0·0006
1892·6	0·5941	0·5939	—0·0002
1893·6	0·5930	0·5936	+0·0006
1894·4	0·5934	0·5933	—0·0001

Secular variations of the magnetic declination, dip and intensity—Continued.

SITKA, ALASKA—Continued.

COMPUTED DECENNIAL VALUES.

[H by means of Θ and the above values for F.]

Date.	D.	Θ.	H.	F.
	°	°		
1810	—27·0	76·48	......	......
1820	27·6	76·26	0·1435	0·6043
1830	28·0	76·05	·1457	·6043
1840	28·5	75·85	·1476	·6038
1850	29·1	75·67	·1492	·6029
1860	29·0	75·50	·1505	·6015
1870	29·1	75·35	·1516	·5997
1880	29·2	75·21	·1525	·5974
1890	29·4	75·08	·1531	·5947
1900	—29·4	74·96	0·1535	0·5915

(See diagram of secular variation of a freely suspended needle, Pl. C.)

ILIULIUK, UNALASKA ISLAND, ALASKA.

$\varphi = 53° 52'·6$ $\lambda = 166° 31'·5$ W. of Gr.

[Greek Church.]

No.	Date.	D.	References and remarks.
		° ′	
	1778, Oct. 12.	19 59 E.	Capt. J. Cook, on shore of Samganuda Harbor. Not used.
	1789—	19½ E.	J. H. Cox, at Muscle Cove. Not used.
1	1790, June 4-13.	19 35 E.	J. Billings, on Beavor Bay.
2	1792 —	19 E.	Sarycheff, at Iliuliuk.
3	1817, June.	19 24 E.	Von Kotzebue, at Iliuliuk.
4	1827, Aug. 11.	19 50 E.	Capt. F. P. Lütke.
	1829	19 54 E.	Not used.
5	1831-	19 30 E.	Vasilieff (?), at sea north of Akutan.
	1848-	19 30 E.	Russian chart. Not used.
6	1849-	20 00 E.	Tebenkoff's Atlas.
7	1867, Sept. 8, 9.	19 47 E.	A. T. Mosman, U. S. Coast S. In Captains Harbor.
8	1870-	19 45 E.	Kadin.
	1871, Nov. 11.	18 36 E.	W. H. Dall, U. S. Coast S. On Amaknak Island. Not used.
9	1873, May 26, 27.	19 07 E.	" " At Iliuliuk.
	1873, Sept. 17, 18, 19.	19 00 E.	M. Baker, " On Amaknak Island.
10	1874, Sept. 15.	18 43 E.	" "
11	1880, July 28, 29.	18 38 E.	" and W. H. Dall, U. S. Coast & G. S.
12	1883, Sept. 20, 21.	18 43 E.	R. A. Marr, U. S. Coast & G. S. Captains Harbor.
13	1889, June 28, 29.	17 46·0 E.	J. E. McGrath, " " Amaknak Island, near station of 1880.
	1889, July 28, 29.	18 12·4 E.	J. H. Turner, U. S. Coast & G. S. Amaknak Island, near station of 1880.
14	1891, July 15, 16, 17.	18 06·9 E.	J. H. Turner, U. S. Coast & G. S. Amaknak Island, near station of 1880.
15	1893, Aug. 30.	18 39 E.	N. Ludlow, Comd'r U. S. N. "Hydrographic Information."

$$D = -17°·65 + 2·26 \sin (1·3\, m - 69°·0)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1790·4	—19·58		—18·90	+0·68	1873·5	—19·06		—19·05	+0·01
1792·5	19·00		18·99	+0·01	1874·7	18·71		19·01	—0·30
1817·5	19·40		19·76	—0·36	1880·6	18·63		18·75	—0·12
1827·6	19·83		19·91	—0·08	1883·7	18·71		18·61	+0·01
1831·5	19·50		19·91	—0·41	1889·5	17·99		18·33	—0·34
1849·5	20·00		19·77	+0·23	1891·5	18·11		18·24	—0·31
1867·7	19·79		19·27	+0·52	1893·7	—18·65		18·13	+0·52
1870·5	—19·75		—19·17	+0·58					

Secular variations of the magnetic declination, dip and intensity—Continued.

ILIULIUK, UNALASKA ISLAND, ALASKA—Continued.

DIP AND INTENSITY AT ILIULIUK, UNALASKA ISLAND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1778, Oct, 12.	69 23·5	......	......	Capt. J. Cook
2	1817, June.	68 45	......	......	O. von Kotzebue.
3	1827, Aug. 11.	68 25·6	......	0·5602(?)	F. P. Lütke.
4	1829—	68 26	......	0·5750(?)	" " "
5	1849—	68 22	......	......	Tebenkoff. At Iliuliuk.
6	1880, July and Oct.	67 35·8	0·2055	0·5391	W. H. Dall and M. Baker, U. S. Coast & G. S.
7	1883, Sept, 19, 20, 21.	....	0·2022	......	R. A. Marr, U. S. Coast & G. S.
8	1889, June 28, 29.	67 06·8	0·2052	0·5277	J. H. Turner, U. S. Coast & G. S. On Amaknak Island.
9	1891, July 15, 16, 17.	67 17·2	0·2057	0·5328	J. H. Turner and H. W. Edmonds, U. S. Coast & G. S. On Amaknak Island.

$$\Theta = 68^{\circ}{\cdot}13 - 0{\cdot}017\,9\,m - 0{\cdot}000\,022\,7\,m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	°
1778·8	69·39	69·29	—0·10
1817·4	68·75	68·69	—0·06
1827·6	68·43	68·52	+0·09
1829·5	68·43	68·49	+0·06
1849·5	68·37	68·14	—0·23
1880·6	67·60	67·56	—0·04
1889·5	67·11	67·39	+0·28
1891·5	67·29	67·35	+0·06

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1770	—18·0	69·42
1780	18·4	69·27
1790	18·9	69·12
1800	19·3	68·97
1810	19·6	68·81
1820	19·8	68·65
1830	19·9	68·48
1840	19·9	68·31
1850	19·8	68·13
1860	19·5	67·95
1870	19·2	67·76
1880	18·8	67·57
1890	18·3	67·38
1900	—17·8	67·18

(See diagram of secular variation of a freely suspended needle, Pl. C.)

PETROPAVLOVSK, KAMCHATKA.

$\varphi = 53^{\circ}\ 01'$ $\lambda = 158^{\circ}\ 43'$ E. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1728—	10·1 E.	Deduced from a discussion of 21 observations made by V. J. Bering off the coast of Kamchatka between the years 1725 and 1730; see C. & G. S. Rept. for 1891, Appendix No. 5.
2	1779, June.	6 19 E.	Capt. J. King.
3	1792—	6 E.	G. Sarycheff and F. P. Lütke.
4	{ 1804, Sept.	5 20 E.	A. J. von Krusenstern, site of village.
	{ 1804, Sept.	5 39 E.	" " " on Avatcha Bay.
	1809, June 23, July 23.	7 21 E.	Capt. Hagemeister. Not used.
	1825—	4 13 E.	Sir E. Sabine's *Contributions*. Supposed the same as Beechey's value below.
5	{ 1827, July.	4 13 E.	Capt. F. W. Beechey.
	{ 1827, Sept. 30.	3 43 E.	Capt. F. P. Lütke.
	{ 1827, Sept. 30.	4 06 E.	A. Erman.
	1829—	4 04 E.	Sir E. Sabine's Contributions. Supposed to refer to Erman's value.
6	1837, Sept. 4.	3 27 E.	Du Petit Thouars.
7	1849—	2 37 E.	Capt. H. Kellett.
8	1854, July.	3 40 E.	Frigate "Aurora."
	1856, Oct.	3 24 E.	Admiralty chart. Not used.
9	1866—	1 25 E.	K. S. Staritzki. Onazevich's collection.
10	1876, June 11, 13, Sept. 15.	1 09 E.	M. L. Onazevich.
11	1890—	0 31 W.	Prof. Stellingman. } Document in U. S. Hydrog. Office, Navy Department.
12	1892—	1 10 W.	Lieut. Lachton, R.N. }

Secular variations of the magnetic declination, dip and intensity—Continued.

PETROPAVLOVSK, KAMCHATKA—Continued.

$D = -3°.43 + 5.10 \sin (0.85\, m + 11°.5)$. An uncertain expression.

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1728.5	—10.10	½	—8.53	+1.57	1849.5	—2.62		—2.45	+0.17
1779.5	6.31		7.24	—0.93	1854.5	3.67		2.08	+1.59
1792.5	6.00		6.53	—0.53	1866.5	1.42		1.23	+0.19
1804.7	5.49		5.75	—0.26	1876.6	—1.15		—0.57	+0.58
1827.6	4.07		4.10	—0.03	1890.5	+0.52	1½	+0.23	—0.29
1837.7	— 3.45		—3.34	+0.11	1892.5	+1.16	1½	+0.33	—0.83

DIP AND INTENSITY AT PETROPAVLOVSK.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1779, June and Sept.	63 05	......	......	Capt. J. King.
2	1804, Sept.	63 32	......	......	A. J. von Krusenstern.
3	{ 1827, July.	64 02	......	......	Capt. F. W. Beechey.
	{ 1827, Sept. 30.	64 07	......	......	Capt. F. P. Lütke.
4	1829, Oct. 13.	63 49	......	0.5187 (?)	A. Erman.
5	1837, Sept. 4, 5.	64 05	0.2239	0.5123	Du Petit Thouars.
6	1854, July.	64 47	......	......	Frigate "Aurora."
7	1876, June 12, Sept. 15.	64 14	......	......	M. L. Onazevich.

$\Theta = 64°.28 + 0.008\,70\, m - 0.000\,134\, m^2$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1779.5	63.08	63.00	—0.08
1804.7	63.53	63.61	+0.08
1827.6	64.07	64.02	—0.05
1829.8	63.82	64.05	+0.23
1837.7	64.08	64.15	+0.07
1854.5	64.78	64.32	—0.46
1876.6	64.23	64.40	+0.17

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1770	—7.7	62.73
1780	7.2	63.02
1790	6.7	63.28
1800	6.1	63.51
1810	5.4	63.72
1820	4.7	63.90
1830	3.9	64.05
1840	3.2	64.18
1850	2.4	64.28
1860	1.7	64.35
1870	1.0	64.40
1880	—0.4	64.42
1890	+0.2	64.41
1900	+0.7	64.38

(See diagram of secular variation of a freely suspended needle, Pl. C.)

NOOTKA, VANCOUVER ISLAND, B. C.

$\varphi = 49° 35'.5$ $\lambda = 126° 37'.5$ W. of Gr.

[Friendly Cove.]

No.	Date.	D.	References and remarks.
		° ′	
1	{ 1778, Apr. 4.	19 45 E.	Capt. J. Cook.
	{ 1778—	17 49 E.	" " " in Nootka Sound. Chart facing page 1757 of Vol. V, of Cook's Voyages. London, 1790.
2	1783.3	17 54 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
3	1786, Aug. 25, 26.	19 47 E.	La Perouse. Offshore.
	1791, Aug. 16, 17, Sept. 4.	22 30 E.	Don A. Malaspina. Not used.
4	1792, Oct.	18 22 E.	Capt. G. Vancouver.
5	1860—	23 47 E.	Capt. G. H. Richards, in Friendly Cove.
6	1863—	23 05 E.	" " " " " " "
7	1881, Sept. 27.	23 36 E.	Lieut. H. E. Nichols, U. S. N., in Friendly Cove.

Secular variations of the magnetic declination, dip and intensity—Continued.

NOOTKA, VANCOUVER ISLAND, B. C.—Continued.

$D = 21^{\circ}.25 + 2.74 \sin (1.30\, m - 152^{\circ}.0)$

Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°
1778·2	—18·78		—18·76	+0·02
1783·3	17·91		18·91	—1·00
1786·6	19·78		19·02	+0·76
1792·8	18·37		19·27	—0·90
1860·5	23·78		23·07	+0·71
1863·5	23·08		23·21	—0·13
1881·7	—23·60		—23·81	—0·21

DIP AND INTENSITY AT NOOTKA, VANCOUVER ISLAND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1778, Apr.	72 29	......	......	Capt. J. Cook. In Resolution Cove.
2	1791, Aug. 16, 17.	70 20·7	......	......	Don A. Malaspina.
3	1792, Oct.	73 56	......	......	Capt. G. Vancouver.
4	1881, Sept. 26, 27.	71 33·0	0·1883	0·5948	Lieut. H. E. Nichols, U. S. N. In Friendly Cove.

CAPE FLATTERY AND NEAH BAY, WASHINGTON.

$\varphi = 48^{\circ}\ 23'.5 \qquad \lambda = 124^{\circ}\ 44'.1$ W. of Gr.

[Light-house on Tatoosh Island.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783—	17 15 E.	Deduced from a discussion of 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1788, Aug. 15.	19 14 E.	C. Duncan.
3	1792, Apr. 30.	18 E.	Capt. G. Vancouver.
4	1841—	22 30 E.	Chart of Wilkes' Exploring Expedition.
5	1852, Aug. 17–23.	21 30 E.	G. Davidson. U. S. Coast S. At Scarboro Harbor.
6	1855, Aug. 13–18.	21 48 E.	Lieut. W. P. Trowbridge, U. S. Coast S. On Neah Bay.
7	1881, Oct. 11.	22 44 E.	H. E. Nichols, U. S. N. On Neah Bay.
8	1893·7	23 26 E.	J. J. Gilbert, U. S. Coast & G. S. Mean of observations at Waadah, —23° 26′ in $\varphi = 48^{\circ}\ 23'.1$, $\lambda = 124^{\circ}\ 35'.9$; at Classet, —23° 06′ in $\varphi = 48^{\circ}\ 23'.5$, $\lambda = 124^{\circ}\ 39'.5$, and Tatoosh, —23° 45′ in $\varphi = 48^{\circ}\ 23'.5$, $\lambda = 124^{\circ}\ 44'.0$.

$D = -19^{\circ}.88 + 3.38 \sin (1.10\, m - 149^{\circ}.4)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1783·3	—17·25		—17·58	—0·33
1788·6	19·23	¼	17·85	+1·38
1792·3	18·00		18·08	—0·08
1841·5	22·50	¼	21·10	+1·40
1852·6	21·50		21·75	—0·25
1855·6	21·80		21·91	—0·11
1881·8	22·74		22·96	—0·22
1893·7	—23·43		—23·20	+0·23

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE FLATTERY AND NEAH BAY, WASHINGTON—Continued.

DIP AND INTENSITY AT CAPE FLATTERY AND NEAH BAY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1852, Sept. 7, 8.	....	0·1923	......	G. Davidson and J. Rockwell, U. S. Coast S. In Scarboro Harbor.
2	1855, Aug. 13–22.	71 07.0	0·1972	0·6092	Lieut. W. P. Trowbridge. U. S. Coast S. Near Waadah Island, Neah Bay.
3	1881, Oct. 10, 11.	71 04·4	0·1911	0·5892	H. E. Nichols, U. S. N. Neah Bay.

PORT TOWNSEND, WASH.

$\varphi = 48^\circ\ 07'\cdot 1$ $\lambda = 122^\circ\ 45'\cdot 3$ W. of Gr.

[Marine Hospital.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783·3	17·0 E.	Deduced from 122 observations made by Spanish navigators along the coast between San Blas and Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
	1792, May.	21½ E.	Capt. G. Vancouver. Not used.
2	1841—	20 40 E.	Chart of Wilkes' Exploring Expedition.
3	1856, Aug. 17–20.	21 40 E.	G. Davidson, U. S. Coast S.
4	1857—	21 54 E.	S. Garfielde. Reduction to Port Townsend +8′.
	1859—	20 45 E.	Reference as above. Not used.
5	1862—	22 00 E.	Reference as above. At Mill.
6	1876, Feb.	21 59 E.	Capt. G. H. Burden.
7	1881, Nov. 16, 17, 18.	21 26·9 E.	J. S. Lawson, U. S. Coast & G. S.
8	1888, July 19, 20.	22 48·8 E.	E. Smith, " " " Near Marine Hospital.
9	1894, Nov. 15–21.	22 50·9 E.	J. J. Gilbert, " " " " " "

$$D = -18^\circ\cdot 80 + 3\cdot 85 \sin (1\cdot 0\, m - 140^\circ\cdot 9)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1783·3	−17·00	½	−17·02	−0·02
1841·5	20·76		20·76	−0·09
1856·6	21·66		21·56	+0·10
1857·5	21·77		21·60	+0·17
1862·5	22·00		21·82	+0·18
1876·1	21·98		22·29	−0·31
1881·9	21·45	½	22·44	−0·99
1888·5	22·81		22·56	+0·25
1894·9	−22·85		−22·63	+0·22

DIP AND INTENSITY AT PORT TOWNSEND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1792, May.	74 30	......	......	Capt. G. Vancouver. At Port Discovery.
2	1881, Nov. 17, 18.	....	0·1911	......	J. S. Lawson, U. S. Coast & G. S.
3	1888, July 19, 20.	71 07·9	0·1901	0·5880	E. Smith, U. S. Coast & G. S., Marine Hospital Grounds.
4	1894, Nov. 16–21.	71 14·8	0·1847	0·5745	J. J. Gilbert, U. S. Coast & G. S., Marine Hospital Grounds.

Secular variations of the magnetic declination, dip and intensity—Continued.

SEATTLE, WASH.

$\varphi = 47^\circ\ 36'.6$ $\lambda = 122^\circ\ 20'.1$ W. of Gr.

[Astronomic station of 1888.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783.3	16 45 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1792, May.	19 36 E.	Capt. G. Vancouver, at Restoration Point in $\varphi = 47^\circ\ 30'$, $\lambda = 122^\circ\ 14'$. Voyage of Discovery, London, 1798.
3	1841—	21 53 E.	Wilkes' Exploring Expedition. Chart of Elliott Bay No. 160, in $\varphi = 47^\circ\ 35'.7$, $\lambda = 122^\circ\ 21'.5$.
4	1855—	21 25 E.	S. Garfielde.
5	1871, Sept. 27–Oct. 3.	22 35 E.	S. R. Throckmorton, U. S. Coast S.
6	1881, Nov. 8–11.	22 02.5 E.	J. S. Lawson, " " " & G. S.
7	1888, July 9, 10, 11.	22 29.1 E.	E. Smith, " " " " " "
8	1894, May 23, 24, 25.	22 40.9 E.	G. Davidson, " " " " " " At University Block.

$$D = -19^\circ.25 + 3.24 \sin (0.90\, m - 131^\circ.3)$$

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1783.3	—16.75	¼	—18.62	—1.87
1792.4	19.60		19.08	+0.52
1841.5	21.88	½	21.38	+0.50
1855.5	21.42		21.86	—0.44
1871.8	22.59	¾	22.26	+0.33
1881.8	22.04		22.41	—0.37
1888.5	22.48		22.47	+0.01
1894.4	—22.68	1½	22.49	+0.19

DIP AND INTENSITY AT SEATTLE.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1871, Sept. 21, Oct. 4, 5.	71 08.9	0.1961	0.6068	S. R. Throckmorton, U. S. Coast S.
2	1881, Nov. 10, 11.	....	0.1944	......	J. S. Lawson, " " " & G. S.
3	1888, July 9, 10, 11.	70 52.8	0.1935	0.5908	E. Smith, U. S. Coast & G. S. University Grounds.
4	1894, May 24, 25.	....	0.1932	......	G. Davidson, U. S. Coast & G. S. University Grounds.
5	1895, Feb. 13.	70 50.3	......	......	J. J. Gilbert, U. S. Coast & G. S. University Grounds.

OLYMPIA, WASH.

$\varphi = 47^\circ\ 02'$ $\lambda = 122^\circ\ 54'$ W. of Gr.

No.	Date.	D.	References.
		° ′	
1	1783.3	16 35 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1853—	21 15 E.	S. Garfielde.
3	1856.5	20 47 E.	Sir E. Sabine, communication XIII.
4	1881, Nov. 2, 3, 4.	21 34.6 E.	J. S. Lawson, U. S. Coast & G. S.
5	1884, Dec. 13, 14, 15, 17.	22 43.3 E.	J. J. Gilbert, U. S. Coast & G. S., at Howard station in $\varphi = 47^\circ\ 03'.3$, $\lambda = 122^\circ\ 53'.4$.

Secular variations of the magnetic declination, dip and intensity—Continued.

OLYMPIA, WASH.—Continued.

$D = -18°·87 + 3·66 \sin (1·0\, m - 151°·0)$

Date.	Obs'd D.		Comp'd D.	C − O.
	°		°	°
1783·3	−16·58	½	−16·65	−0·07
1853·5	21·25		20·82	+0·43
1856·5	20·78		20·99	−0·21
1881·8	21·58		22·09	−0·51
1894·9	−22·72		−22·37	+0·35

DIP AND INTENSITY AT OLYMPIA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1881, Nov. 4	....	0·1975	......	J. S. Lawson, U. S. Coast & G. S.
2	1894, Dec. 13–17.	70 26·4	0·1976	0·5902	J. J. Gilbert, " " At Howard station.

CAPE DISAPPOINTMENT, WASHINGTON.

$\varphi = 46°\ 16'·7 \qquad \lambda = 124°\ 02'·8$ W. of Gr.

[South shore of Baker Bay.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783·3	16 23 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1786, Sept. 1, 2.	18 E.	La Perouse.
3	1792, Apr. 27.	18 E.	Capt. G. Vancouver.
4	1839—	19 11 E.	Sir E. Belcher.
	1841—	18 41·1 E.	Wilkes' Exploring Expedition, chart No. 136. In $\varphi = 46°\ 16'$ and $\lambda = 124°\ 01'·7$. Not used.
5	1842—	20 E.	Duflot de Mofras.
6	1851, July 5–9.	20 19·1 E.	G. Davidson, U. S. Coast Survey. On beach.
	1851, July 14–19.	20 45·3 E.	" " On top of cape. Not used.
7	1858—	21 E.	S. Garfielde.
8	1873, Oct. 24–27.	21 26·5 E.	W. Eimbeck, U. S. Coast S. On beach.
	1873, Oct. 19–23.	21 46·9 E.	" " On top of cape. Not used.
9	1831, Oct. 14.	21 36·0 E.	Lieut. H. E. Nichols, U. S. N. On beach.
10	1895, Feb. 24–27.	21 55·8 E.	J. J. Gilbert, U. S. Coast & G. S. Station on beach, as in 1881.

$D = -19°·39 + 2·54 \sin (1·25\, m - 158°·7)$

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1783·3	−16·39		−17·15	−0·76
1786·7	18·00		17·24	+0·76
1792·3	18·00		17·42	+0·58
1839·5	19·18		19·75	−0·57
1842·5	20·00		19·91	+0·09
1851·5	20·32		20·39	−0·07
1858·5	21·00		20·73	+0·27
1873·8	21·44		21·37	+0·07
1881·8	21·60		21·61	−0·01
1895·1	−21·93		−21·87	+0·06

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE DISAPPOINTMENT, WASHINGTON—Continued.

DIP AND INTENSITY AT CAPE DISAPPOINTMENT.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1830, Sept. and Dec.	69 30·3	......	......	D. Douglas.
2	1839—	69 26·9	......	......	Sir E. Belcher. On Baker's Bay, landing place.
3	1873, Oct. 22–20.	69 13·7	0·2092	0·5899	W. Eimbeck, U. S. Coast S. On beach.
4	1881, Oct. 13–15.	69 17·7	0·2067	0·5846	Lieut. H. E. Nichols, U. S. N. " "
5	1895, Feb. 23–26.	69 16·5	0·2064	0·5833	J. J. Gilbert, U. S. Coast & G. S. On beach.

WALLAWALLA, WASH.

$\varphi = 46° 03'·9$ $\lambda = 118° 20'·8$ W. of Gr.

[Astronomic station near court-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1853—	19 40 E.	Gov. J. J. Stevens, at Old Fort. Reduction to Wallawalla −0°·84.
2	1860—	20 30 E.	S. Garfielde.
	1860—	20 00 E.	J. Mullan, U. S. A.
3	1861—	20 30 E.	S. Garfielde, at Old Fort. Reduction to Wallawalla −0°·84.
4	1881, Sept. 24, 25, 26.	22 04·4 E.	J. S. Lawson, U. S. Coast & G. S.
	1881, Sept. 29, 30, Oct. 1–2.	19 55·7 E.	" " Near Old Fort. Reduction −0°·84.
5	1887, Sept. 16, 17, 19.	21 10·3 E.	E. Smith, U. S. Coast & G. S. Court-house block.

$D = -17°·07 + 4·25 \sin (1·3\, m - 131°·5)$. Very uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C − O.
	°		°	°
1853·0	−20·51		−20·43	+0·08
1860·5	20·25		20·82	−0·57
1861·5	21·34		20·87	+0·47
1881·7	21·42		21·32	+0·10
1887·9	−21·17		−21·28	−0·11

DIP AND INTENSITY AT WALLAWALLA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1830, July.	70 14	0·2005	0·5929	D. Douglas. Near Old Fort. Reduction to Wallawalla as indicated.
		+ 21·6	— 42	— 21	
2	1881, Sept. 25, 26.	70 46·5	0·2005	0·6089	J. S. Lawson, U. S. Coast & G. S. At town, court-house block.
3	1887, Sept. 16–20.	70 41·2	0·1984	0·5998	E. Smith, U. S. Coast & G. S. At town, court-house block.

Secular variations of the magnetic declination, dip and intensity—Continued.

VANCOUVER, WASH.

$\varphi = 45° 37'.5$ $\lambda = 122° 39'.7$ W. of Gr.

[Flagstaff at Fort Vancouver.]

No.	Date.	D.	References and remarks.
		° ′	
1	1788, Aug. 14.	14 26 E.	Gray. Reduction to Vancouver about −8′.
2	1839--	19 22 E.	Sir E. Belcher.
3	1859	21 30 E.	S. Garfielde.
4	1860—	20 05 E.	Capt. R. W. Haig.
5	1881, Oct. 26, 27.	20 53.3 E.	J. S. Lawson, U. S. Coast & G. S. South of Old Fort.
6	1895, Mar. 1, 2, 3, 4.	21 32.4 E.	J. J. Gilbert, " " " Near station of 1881. In $\varphi = 45° 37'.5$, $\lambda = 122° 39'.8$.

$$D = -17°.50 + 3.96 \sin (1.20\, m - 141°.3)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1788.6	—14.57	½	—15.23	—0.66
1839.5	19.37		19.24	+0.13
1859.5	21.50		20.54	+0.96
1860.5	20.08		20.59	—0.51
1881.8	20.89		21.36	—0.47
1895.2	—21.54		—21.46	+0.08

DIP AND INTENSITY AT VANCOUVER.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1830, Nov.	69 39.7	0.2048 (?)	0.5893 (?)	D. Douglas. At Fort Vancouver.
2	1839—	69 22.2	0.2063	0.5855	Sir E. Belcher. At Fort, garden.
3	1860, May 3.	69 17.4	0.2129	0.6020	Capt. R. W. Haig. At Fort.
4	1881, Oct. 26, 27.	....	0.2097	......	J. S. Lawson, U. S. Coast & G. S. South of Old Fort.
5	1895, Mar. 1-4.	69 17.0	0.2091	0.5911	J. J. Gilbert, U. S. Coast & G. S. South of Old Fort.

PORTLAND, OREGON.

$\varphi = 45° 31'.1$ $\lambda = 122° 40'.8$ W. of Gr.

[Custom-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783.3	16 E.	Deduced from 122 observations made by Spanish navigators between San Blas and Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1858.5	20 E.	Sir E. Sabine's contribution XIII, to Terr. Mag. Phil. Trans. Roy. Soc., 1872.
3	1870, Aug. 19, 23.	22 21 E.	G. Davidson, U. S. Coast S. In $\varphi = 45° 31'.2$, $\lambda = 122° 41'$.
4	1880, Apr. 30.	22 53 E.	W. H. Dall and M. Baker, U. S. Coast & G. S. In $\varphi = 45° 31'.5$, $\lambda = 122° 40'.5$.
5	1881, Aug. 4, 5, 6.	22 12 E.	J. S. Lawson, U. S. Coast & G. S. In $\varphi = 45° 31'.2$, $\lambda = 122° 42'.6$.
6	1886, June 17, 18, 19, 20.	22 07.8 E.	G. Davidson, " " " Station of 1881.
	1887—	22 30 E.	Surveyor-General of Oregon. Station of 1891. Communicated by W. Thiel, July 20, 1888. [Not used—Sch.]
7	1887, June 24, 25, 27.	22 00.0 E.	E. Smith, U. S. Coast & G. S. Custom-house square $\varphi = 45° 31'.1$, $\lambda = 122° 40'.8$.
8	1888, June 12, 13, 14.	21 42.5 E.	R. A. Marr, U. S. Coast & G. S. Station of 1887, custom-house square.
9	{ 1895, Feb. 20, 21, 22.	22 24.5 E.	J. J. Gilbert, U. S. Coast & G. S. Custom-house square.
	{ 1895, Mar. 6, 7, 8.	22 11.4 E.	" " " " In City Park, $\varphi = 45° 31'.4$, $\lambda = 122° 42'.2$.

Secular variations of the magnetic declination, dip and intensity—Continued.

PORTLAND, OREGON—Continued.

$D = -19^{\circ}\cdot05 + 3\cdot41 \sin(1\cdot3m - 159^{\circ}\cdot1)$. Approximate expression.

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.
	°		°	°
1783·3	—16·00		—15·94	+0·06
1858·5	20·00		20·85	—0·85
1870·6	22·35		21·57	+0·78
1880·3	22·88		22·01	+0·87
1881·6	22·20		22·06	+0·14
1886·5	22·13		22·22	—0·09
1887·5	22·00		22·25	—0·25
1888·4	21·71		22·27	—0·56
1895·2	—22·30		—22·41	—0·11

DIP AND INTENSITY AT PORTLAND.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1858, July.	69 31	......	......	D. Douglas.
2	1880, May 1.	69 35·6	0·2035	0·5837	W. H. Dall and M. Baker, U. S. Coast & G. S. West of Clarendon Hotel.
3	1881, Aug. 5, 6.	69 24·2	0·2069	0·5882	J. S. Lawson, U. S. Coast & G. S. In court-house block.
4	1886, June 17–19.	....	0·2056	......	G. Davidson, U. S. Coast & G. S. In court-house block.
5	1887, June 24–28.	69 24·1	0·2061	0·5859	E. Smith, U. S. Coast & G. S. In court-house square.
6	1888, June 12–14.	69 29·6	0·2061	0·5884	R. A. Marr, U. S. Coast & G. S. In court-house square.
7	{ 1895, Feb. 20–22.	69 31·5	0·2043	0·5840	J. J. Gilbert, U. S. Coast & G. S. In court-house square.
	{ 1895, Mar. 6–8.	68 48·7	0·2165	0·5990	J. J. Gilbert, U. S. Coast & G. S. In City Park. Apparently a disturbed locality.

SALT LAKE CITY, UTAH.

$\varphi = 40^{\circ}\ 46'\cdot1 \qquad \lambda = 111^{\circ}\ 53'\cdot8$

[Astronomic station, Temple Square.]

No.	Date.	D.	References and results.
		° ′	
1	1850—	15 34 E.	Maj. W. H. Emory.
2	1866, Aug.	16 30 E.	J. W. Fox.
3	1869, May 6–15.	16 36·4 E.	G. W. Dean and F. H. Agnew, U. S. Coast S.
4	1872—	17 01 E.	Report of Chief of Engineers. U. S. A.
5	{ 1878, Aug. 15.	16 48·1 E.	Dr. T. E. Thorpe.
	{ 1878, Oct. 26, 28, 29.	16 44·2 E.	J. B. Baylor, U. S. Coast & G. S.
6	1881, May 12, 13, 14.	16 28·4 E.	} W. Eimbeck, U. S. Coast & G. S.
7	1883, Nov. 15, 16, 17.	16 14·1 E.	} W. Eimbeck, U. S. Coast & G. S.
8	1884, Oct. 22, 23, 24.	16 13·6 E.	} W. Eimbeck, U. S. Coast & G. S.
9	1885, Nov. 5–10.	16 29·3 E.	} W. Eimbeck, U. S. Coast & G. S.
10	1887, Nov. 8–11.	16 30·6 E.	} W. Eimbeck, U. S. Coast & G. S.
11	1892, May 26–30.	16 34·7 E.	R. L. Faris, U. S. Coast & G. S., at Waddoup, $\varphi = 40^{\circ}\ 54'\cdot3$, $\lambda = 111^{\circ}\ 53'\cdot2$. Reduction to Temple Square, about +8′.
12	{ 1893, June 9–10.	16 17·0 E.	W. Eimbeck, U. S. Coast & G. S. At Temple Square station.
	{ 1893, June 6, 7, 8.	16 27·1 E.	R. L. Faris, " " " At Salt Lake University, $\varphi = 40^{\circ}\ 46'\cdot4$, $\lambda = 111^{\circ}\ 54'\cdot1$.

Secular variations of the magnetic declination, dip and intensity—Continued.

SALT LAKE CITY, UTAH—Continued.

$D = -12°.50 + 4.11 \sin (1.3\, m - 126°.4)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1850.5	—15.57	½	—15.83	—0.26	1883.9	—16.24		—16.57	—0.33
1866.6	16.50		16.47	+0.03	1884.8	16.23		16.56	—0.33
1869.4	16.61		16.53	+0.08	1885.9	16.49		16.54	—0.05
1872.5	17.02		16.58	+0.44	1887.9	16.51		16.51	0.00
1878.7	16.77		16.61	+0.16	1892.4	16.44		16.39	+0.05
1881.4	—16.47		—16.60	—0.13	1893.4	—16.45		—16.36	+0.09

DIP AND INTENSITY AT SALT LAKE CITY.

No.	Date.	Θ.	H.	F.	Referencess.
		° ′			
1	1869, May 6–19.	66 58.2	0.2326	0.5946	G. W. Dean and F. H. Agnew, U. S. Coast S. In Temple Square.
2	1878, Aug. 14, 15.	67 02.3	0.2308	0.5916	Dr. T. E. Thorpe. East of President's house.
	1878, Oct. 25–31.	67 05.9	0.2299	0.5908	J. B. Baylor, U. S. Coast & G. S. On Fourth Temple st.
3	1881, May 12–14.	67 02.1	0.2308	0.5915	W. Eimbeck and R. A. Marr, U. S. Coast & G. S. Temple block.
4	1883, Nov. 15–17.	67 01.2	0.2293	0.5873	W. Eimbeck and G. F. Bird, U. S. Coast & G. S. Temple block.
5	1884, Oct. 22–24.	67 05.2	0.2295	0.5895	W. Eimbeck and G. F. Bird, U. S. Coast & G. S. Temple block.
6	1885, Nov. 5–10.	67 01.0	0.2303	0.5895	W. Eimbeck and G. F. Bird, U. S. Coast & G. S. Temple block.
7	1887, Nov. 8–14.	67 03.4	0.2303	0.5908	W. Eimbeck and J. H. Turner, U. S. Coast & G. S. Temple blook.
8	1893, June 6–8.	67 05.2	0.2291	0.5884	R. L. Faris, U. S. Coast & G. S. University.

Between the years 1878 and 1893 the dip appears to have been nearly unchanged. The value of Θ for this period is 67° 03′.3.

$H = 0.2347 - 0.000\,134\, m$

Date.	Obs'd H.	Comp'd H.	C—O.
1869.4	0.2326	0.2321	—0.0005
1878.7	0.2303	09	+ 6
1881.4	0.2308	05	— 3
1883.9	0.2293	02	+ 9
1884.8	0.2295	0.2301	+ 6
1885.8	0.2303	0.2299	— 4
1887.8	0.2303	97	— 6
1893.4	0.2291	0.2289	—0.0002

Secular variations of the magnetic declination, dip and intensity—Continued.

CAPE MENDOCINO, CAL.

$\varphi = 40°26'\cdot3$ $\lambda = 124°\ 24'\cdot3$ W. of Gr.

[Light-house.]

No.	Date.	D.	References and remarks.
		° ′	
	1579 (?).	9 E.	Sir F. Drake. Not used.
	1693—	2	G. F. G. Carreri. Defective value, not used.
1	1783·3	14 10 E.	Deduced from 122 observations by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1786, Sept. 7, 8.	14 54 E.	La Perouse.
3	1792, Apr. 18.	16 E.	Capt. G. Vancouver. Reduction to the cape, about —0°.25
	1792, Apr. 19.	15 E.	" " " " " —0°·20
	1792, Apr. 22.	16 E.	" " " " " +0°·10
4	1794, Oct. 3.	14 E.	" " " " " +0°·12
5	1854, Apr. 25 to May 2.	17 04·5 E.	G. Davidson, U. S. Coast S. Reduction to the cape, about +0°·15.
6	1896, Apr. 7, 8, 9, 10.	18 00·5 E.	G. Davidson and F. Morse, U. S. Coast & G. S. Near the light-house.

$D = -15°\cdot25 + 2\cdot45 \sin(1\cdot10\,m - 128°\cdot0)$. Very uncertain.

Date.	Obs'd D.	p.	Comp'd D.	C—O
	°		°	°
1783·3	—14·17		—14·36	—0·19
1786·7	14·90		14·51	+0·39
1792·3	15·78		14·77	+1·01
1794·7	13·88		14·88	—1·00
1854·3	16·93		17·30	—0·37
1886·3	—18·01		—17·70	+0·31

DIP AND INTENSITY AT CAPE MENDOCINO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1886, Apr. 7–10.	64 23·7	0·2403	0·5560	G. Davidson and F. Morse, U. S. Coast & G. S. Near light-house.

SAN FRANCISCO, CAL.

$\varphi = 37°\ 47'\cdot5$ $\lambda = 122°\ 27'\cdot3$

[Presidio.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783·3	12 55 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1792, Nov. 20.	12 48 E.	Capt. G. Vancouver. On board ship.
	1816, Oct.	16 05 E.	Von Kotzebue. Not used.
3	1818, Sept. 20 (o. s.).	15 E.	V. M. Golovnin.
	1824—	16 E.	Von Kotzebue. Not used.
4	1827—	15 27 E.	Capt. F. W. Beechey.
5	1829, Dec. 6.	14 55 E.	A. Erman.
6	1830—	14 51 E.	
7	1837—	15 20 E.	Sir E. Belcher.
	1837—	15 00 E.	Du Petit Thomas.
8	1839—	15 20 E.	Sir E. Belcher.
9	1841, Oct.	15 30 E.	Duflot de Mofras.
	1842, Jan.	15 30 E.	

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN FRANCISCO, CAL.—Continued.

No.	Date.	D.	References and remarks.
		° ′	
10	1849–50.	15 41 E.	Com. Ringgold, U. S. N. On Alcatraz Island.
11	1852, Feb. 18–28.	15 27·6 E.	G. Davidson, U. S. Coast S. All observations by G. Davidson were made at Presidio of San Francisco.
	1852, Mar. 24.	15 28·8 E.	
	1852, Apr. 21.	15 27·8 E.	
	1852, May 28.	15 31·1 E.	
12	1858, June 3–8.	15 49·4 E.	K. Friesach. Dupont street, near Catholic Church.
	1858, June 10–12.	15 56·2 E.	Stockton and California streets.
13	1866, June 26.	16 25·5 E.	Prof. W. Harkness, U. S. N. On Yerba Buena Island.
14	1871, Dec. 14, 15, 16.	16 23·1 E.	All observations since 1871 at Presidio.
15	1872, Oct. 26, 27, 28.	16 25·7 E.	G. Davidson, U. S. Coast S.
16	1873, June 25, 26, 27.	16 25·4 E.	
	1873, Aug. 19–23.	16 24·0 E.	
	1873, Nov. 12–16.	16 25·4 E.	
17	1874, Jan. 10–14. 1874, Feb. 19, 20, 21.	16 26·9 E.	
18	1879, Mar. 12–15.	16 34·0 E.	G. Davidson and B. A. Colonna, U. S. Coact & G. S.
19	1880, Sept. 25–26.	16 28·3 E.	Lieut. H. E. Nichols, U. S. N.
	1880, Nov. 20.	16 39·5 E.	W. H. Dall and M. Baker, U. S. Coast & G. S.
20	1881, Mar. 30, 31, Apr. 1.	16 33·3	W. Eimbeck, " " " "
	1881, Apr. 26, 27.	16 31·9	Lieut. H. E. Nichols, U. S. N.
	1881, July 12, Nov. 1.	16 32·2	
	1881, June 22, 23, 24, Dec. 1, 2, 3.	16 18·2	J. S. Lawson, U. S. Coast & G. S.
21	1883, June 3.	16 38·6 E.	R. A. Marr, U. S. Coast & G. S.
22	1884, Sept. 5–16.	16 32·3 E.	G. Davidsón, U. S. Coast & G. S.
23	1885, Aug. 4–12.	16 33·4 E.	
24	1886, Apr. 21–24.	16 33·1 E.	
25	1887, Nov. 15–19.	16 33·9 E.	
26	1888, May 28–31.	16 33·9 E.	
27	1889, Apr. 24–29, May 1.	16 36·3 E.	
28	1890, Oct. 18–27.	16 38·3 E.	J. J. Gilbert, U. S. Coast & G. S. (G. Davidson, in charge).
29	1891, Sept. 29, 30, Oct. 1.	16 39·7 E.	F. Morse, U. S. Coast & G. S. (G. Davidson, in charge).
30	1892, Nov. 3–8.	16 40·5 E.	
31	1893, Mar. 28, 29, 30.	16 40·7 E.	
	1893, Nov. 29, Dec. 4–5.	16 42·6 E.	
32	1894, Oct. 30, 31, Nov. 1.	16 44·6 E.	
33	1896, Jan. 7, 8, 9.	16 46·2 E.	F. Morse, U. S. Coast & G. S.

$$D = -13^\circ{\cdot}73 + 2{\cdot}94 \sin(0{\cdot}95\, m - 135^\circ{\cdot}3) + 0{\cdot}056 \sin(20\, m + 87^\circ)$$

[N. B.—The second periodic term applies after 1872.]

Date.	Obs'd D.	*p.*	Comp'd D.	C—O.	Date.	Obs'd D.	*p.*	Comp'd D.	C—O.	C—O.*
	°		°	°		°		°	°	°
1783·3	—12·91		—12·81	+0·10	1874·0	—16·45		—16·45	0·00	—0·03
1792·9	12·80		13·27	—0·47	1879·2	16·57		16·53	+0·04	0·00
1818·7	15·00		14·50	+0·50	1880·8	16·56		16·56	0·00	—0·02
1827·5	15·45		14·90	+0·55	1881·5	16·48		16·56	—0·08	—0·08
1829·9	14·92		15·01	—0·09	1883·4	16·64		16·59	+0·05	+0·08
1830·5	14·85		15·03	—0·18	1884·7	16·54		16·60	—0·06	—0·01
1837·5	15·17		15·33	—0·16	1885·6	16·56		16·61	—0·05	0·00
1839·5	15·33		15·41	—0·08	1886·3	16·55		16·62	—0·07	—0·01
1841·9	15·50		15·50	0·00	1887·9	16·56		16·63	—0·07	—0·02
1850·0	15·68		15·80	—0·12	1888·4	16·57		16·63	—0·06	—0·02
1852·3	15·48		15·88	—0·40	1889·3	16·60		16·64	—0·04	—0·01
1858·4	15·88		16·07	—0·19	1890·8	16·64		16·65	—0·01	—0·01
1866·5	16·42		16·28	+0·14	1891·7	16·66		16·66	0·00	—0·02
1871·9	16·38		16·41	—0·03	1892·8	16·67		16·66	+0·01	—0·03
1872·8	16·43		16·42	+0·01	1893·6	16·69		16·66	+0·03	—0·02
1873·7	—16·41		—16·44	—0·03	1894·8	16·74		16·67	+0·07	+0·01
					1896·0	—16·77		—16·67	+0·10	+0·05

* When second periodic term is applied.

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN FRANCISCO, CAL.—Continued.

DIP AND INTENSITY AT SAN FRANCISCO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1815, Nov. 1.	62 46	......	......	Von Kotzebue.
2	1829—	....	......	0·5533 (?)	A. Erman.
3	1831, Feb.	62 58(?)	0·2534 (?)	0·5574 (?)	D. Douglas.
4	1837—	61 53·8	......	......	Sir E. Belcher.
5	1839—	62 05·8	0·2547	0·5445	" "
6	1852, Feb. 11, 12.	62 21·2	......	......	F. A. Roe and G. Davidson. At Presidio.
7	1858, June 5–13.	62 47	0·2571	0·5621	Karl Friesach. Mean value from two localities—Dupont and California streets.
8	1866, June 26.	62 22	0·2602	0·5610	Prof. W. Harkness, U. S. N. On Yerba Buena Island.
9	1873, Nov. 13–20.	62 05·1	0·2556	0·5460	G. Davidson and S. R. Throckmorton, U. S. Coast S. At Presidio.
10	1880, Apr. 12–22; Sept. 24–26; Nov. 16–19.	62 18·9	0·2542	0·5471	W. H. Dall and M. Baker, U. S. Coast & G. S. At Presidio. H. E. Nichols, U. S. N.
11	1881, Apr.–Dec.	62 26·5	0·2539	0·5488	Wm. Eimbeck, R. A. Marr, U. S. Coast & G. S., and H. E. Nichols, U. S. N. At Presidio.
12	1882, Apr. 17, 18.	62 25·5	......	......	J. S. Lawson, U. S. Coast & G. S. At Presidio.
13	1883, June 2–5	....	0·2527	......	R. A. Marr, " " " " "
14	1884, Sept. 5–24.	62 20·2	0·2529	0·5448	G. Davidson and F. Morse, U. S. Coast & G. S. At Presidio.
15	1885, Aug. 4–12.	....	0·2530	......	G. Davidson and F. Morse, U. S. Coast & G. S. At Presidio.
16	1886, Apr. 21–24.	62 16·6	0·2529	0·5437	F. Morse, U. S. Coast & G. S. At Presidio.
17	1887, Nov. 15–19.	62 25·0	0·2529	0·5462	" " " " " " "
18	1888, May 28–31.	62 23·4	0·2528	0·5454	" " " " " " "
19	1889, Apr. 24, May 1.	62 24·2	0·2526	0·5453	" " " " " " "
20	1890, Oct. 18–22.	62 28·7	0·2533	0·5482	J. J. Gilbert, " " " " "
21	1891, Sept. 29–Oct. 1.	62 30·2	0·2520	0·5458	F. Morse, " " " " "
22	1892, Nov. 3–8.	62 28·2	0·2517	0·5446	" " " " " " "
23	1893, Mar. 28–30.	62 29·5	0·2511	0·5437	" " " " " " "
24	1894, Oct. 30–Nov. 1.	62 29·0	0·2514	0·5442	" " " " " " "
25	1896, Jan. 7, 8, 9.	62 28·3	0·2522	0·5457	" " " " " " "

Omitting values of 1815 and 1831, the remaining 20 observations give:

$$\Theta = 62^{\circ}\cdot 239 + 0\cdot 011\,3\ m - 0\cdot 000\,168\ m^2$$
$$H = 0\cdot 256\,83 - 0\cdot 000\,090\,5\ m - 0\cdot 000\,005\,10\ m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C — O.
	°	°	°
1837·5	61·90	62·07	+0·17
1839·5	62·10	62·10	0·00
1852·1	62·35	62·26	−0·09
1858·4	62·78	62·32	−0·46
1866·5	62·37	62·38	+0·01
1873·9	62·08	62·41	+0·33
1880·7	62·32	62·43	+0·11
1881·5	62·44	62·43	−0·01
1882·3	62·42	62·43	−0·01
1884·7	62·34	62·43	+0·09
1886·3	62·28	62·43	+0·15
1887·9	62·42	62·42	0·00
1888·4	62·39	62·42	+0·03
1889·3	62·40	62·42	+0·02
1890·8	62·48	62·42	−0·06
1891·7	62·50	62·42	−0·08
1892·8	62·47	62·41	−0·06
1893·6	62·50	62·41	−0·09
1894·8	62·48	62·41	−0·07
1896·0	62·47	62·40	−0·07

Date.	Obs'd H.	Comp'd H.	C — O.
1831·1	0·2534	0·2533	−0·0001
1839·5	547	553	+ 6
1858·4	571	572	+ 1
1866·5	602	569	− 33
1873·9	556	561	+ 5
1880·7	542	548	+ 6
1881·5	539	546	+ 7
1883·4	527	541	+ 14
1884·7	529	538	+ 9
1885·6	530	536	+ 6
1886·3	529	534	+ 5
1887·9	529	529	0
1888·4	528	528	0
1889·3	526	525	− 1
1890·8	533	521	− 12
1891·7	520	517	− 3
1892·8	517	514	− 3
1893·6	511	511	0
1894·8	514	507	− 7
1896·0	0·2522	0·2502	−0·0020

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN FRANCISCO, CAL.—Continued.

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	−15·01	61·95	0·2530	0·5380
1840	15·43	62·11	54	460
1850	15·80	·24	68	514
1860	16·11	·34	72	540
1870	16·36	·40	66	539
1880	16·57	·43	50	510
1890	16·64	·42	0·2523	449
1900	−16·7	62·38	0·2486	0·5362

MONTEREY, CAL.

$\varphi = 36° \; 36'{\cdot}1 \qquad \lambda = 121° \; 53'{\cdot}6$ W. of Gr.

[Custom-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1783·3	12 26 E.	Deduced from 122 observations by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1786, Sept. 14, 15.	11 48 E.	La Perouse.
3	1791, Sept. 23.	10 56 E.	Don A. Malaspina.
4	1792, Dec.	12 22 E.	} Capt. G. Vancouver.
5	1794, Nov. 13.	12 22 E.	
	1818, Sept.	16½ E.	Capt. V. M. Golovnin. Not used.
	1827—	15 38 E.	Capt. F. W. Beechey. Not used.
6	1837—	14½ E.	Du Petit Thouars.
7	1839—	14½ E.	Sir E. Belcher.
8	1841—	15 E.	Duflot de Mofras.
9	1843—	14 E.	T. A. Dornin.
10	1851, Feb. 8.	14 58·3 E.	G. Davidson, U. S. Coast S. At Point Pinos.
11	1854, May 29, 30.	14 58·9 E.	Lieut. W. P. Trowbridge, U. S. Coast S. Near Barracks of Redoubt.
12	1873, Aug. 30, 31, Sept. 1.	15 55·3 E.	G. Davidson and S. R. Throckmorton, U. S. Coast S. Near astronomic station.
13	1881, Apr. 20.	15 53·9 E.	Lieut. H. E. Nichols, U. S. N. In redoubt.
14	1896, Jan. 14, 15.	16 14·6 E.	F. Morse, U. S. Coast & G. S.

$$D = -13°{\cdot}25 + 2{\cdot}83 \sin (1{\cdot}10\,m - 144°{\cdot}0)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1783·3	−12·44	¼	−11·53	+0·91	1841·5	−15·00		−14·52	+0·48
1786·7	11·80		11·69	+0.11	1843·5	14·00		14·61	−0·61
1791·7	10·93		11·92	−0·99	1851·1	14.97		14·96	+0·01
1792·9	12·37		11·98	+0·39	1854·4	14·98		15·10	−0·12
1794·9	12·37		12·07	+0·30	1873.7	15·92		15·75	+0·17
1837·5	14·50		14·32	+0·18	1881·3	15·90		16·04	−0·14
1839·5	−14·22		−14.42	−0·20	1896·0	−16·24		−16·08	+0·16

Secular variations of the magnetic declination, dip and intensity—Continued.

MONTEREY, CAL.—Continued.

DIP AND INTENSITY AT MONTEREY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1791, Sept. 23.	60 56·2 (?)	......	......	Don A. Malaspina.
2	1792, Dec.	63 00·5	......	......	Capt. G. Vancouver.
3	1794, Nov.	63 00	......	......	" " "
4	1818, Sept.	64 15 (?)	......	......	Capt. V. M. Golovnin. At the Presidio.
5	1831, Jan.	62 07·5	0·2595 (?)	0·5550 (?)	D. Douglass. Near landing place.
6	1839—	61 03·6 (?)	0·2612 (?)	0·5398 (?)	Sir E. Belcher. " " "
7	1843, Sept. 19.	61 58·9	......	......	T. H. Perry.
8	1854, May 19–25.	60 59·5	0·2675	0·5516	Lieut. W. P. Trowbridge, U. S. Coast S. At the barracks of redoubt.
9	1873, Sept. 1, 2.	61 12·5	0·2626	0·5452	S. R. Throckmorton, U. S. Coast S. At Point Pinos.
10	1881, Apr. 19, 20.	61 12·7	0·2611	0·5422	Lieut. H. E. Nichols, U. S. N. At the barracks.
11	1896, Jan. 14, 15.	61 15·9	0·2597	0·5402	F. Morse, U. S. Coast & G. S. Near station redoubt.

$$\Theta = 61°{\cdot}55 - 0{\cdot}016\,6\,m + 0{\cdot}000\,180\,m^2$$
$$H = 0{\cdot}2640 + 0{\cdot}000\,123\,m - 0{\cdot}000\,005\,2\,m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1793·0	63·01	63·08	+0·07
1794·9	63·00	63·01	+0·01
1831·0	62.12	61·93	—0·19
1843·7	61·98	61·66	—0·32
1854·4	60·99	61·48	+0·49
1873·7	61·21	61·26	+0·05
1881·3	61·21	61·21	0·00
1896·0	61·26	61·17	—0·09

Date.	Obs'd H.	Comp'd H.	C—O.
1831·0	0·2595	0·2598	+0·0003
1839·5	0·2612	0·2621	+ 09
1854·4	0·2675	0·2644	— 31
1873·7	0·2626	0·2640	+ 14
1881·3	0·2611	0·2627	+ 16
1896·0	0·2597	0·2585	—0·0012

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	—13·93	61·95	0·2594	0·5516
1840	14·45	61·73	622	536
1850	14·91	61·55	640	542
1860	15·32	61·40	647	529
1870	15·65	61·29	644	505
1880	15·89	61.21	630	461
1890	16·04	61·17	605	402
1900	—16·1	61·17	0·2570	0·5330

SANTA BARBARA, CAL.

$\varphi = 34°\ 24'{\cdot}2$ $\lambda = 119°\ 43'{\cdot}0$ W. of Gr.

[Astronomic station.]

No.	Date.	D.	References and remarks.
		° ′	
1	1714·8	7½ E.	Sauvague le Muet.
2	1783·3	11 22 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
3	1793, Nov.	10 15 E.	Capt. G. Vancouver.
4	1839—	13 28 E.	Sir E. Belcher.
5	1869, Nov. 16–19,	15 11·9 E.	S. R. Throckmorton, U. S. Coast S. (G. Davidson in charge.)
6	1881, Apr. 14.	14 51·9 E.	Lieut. H. E. Nichols, U. S. N.

Secular variations of the magnetic declination, dip and intensity—Continued.

SANTA BARBARA, CAL.—Continued.

$D = -11^\circ.52 + 3.32 \sin (1.10\, m - 123^\circ.1)$

Date.	Obs'd D.	p.	Comp'd D.	C — O.
	°		°	°
1714.8	— 7.50	¼	— 8.19	—0.67
1783.3	11.36		10.58	+0.78
1793.8	10.25		11.23	—0.98
1839.5	13.47	½	13.88	—0.41
1869.9	15.20	½	14.78	+0.42
1881.3	—14.87		—14.80	+0.07

DIP AND INTENSITY AT SANTA BARBARA.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1831, May.	60 48	0.2702	0.5539	D. Douglas.
2	1839—	58 54.1	0.2732	0.5289	Sir E. Belcher. At landing place.
3	1869, Nov. 20–25.	59 16.0	0.2751	0.5383	G. Davidson and S. R. Throckmorton, U. S. Coast S. On spur of hills.
4	1881, Apr. 13, 14.	59 19.2	0.2707	0.5305	Lieut. N. E. Nichols, U. S. N. West of Long Wharf.

$H = 0.2760 + 0.000\,139\, m - 0.000\,009\,7\, m^2$

Date.	Obs'd H.	Comp'd H.	C — O.
1831.4	0.2702	0.2700	—0.0002
1839.5	32	35	+ 3
1869.9	51	49	— 2
1881.3	0.2707	0.2708	+0.0001

SAN DIEGO, CAL.

$\varphi = 32^\circ\ 39'.8$ $\lambda = 117^\circ\ 14'.8$ W. of Gr.

[New light-house, Point Loma.]

No.	Date.	D.	References and remarks.
		° ′	
1	1714.8	6 E.	Sauvague le Muet.
2	1783.3	10 26 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
3	1792—	11 E.	Capt. G. Vancouver. Not used.
	1793—	11 E.	
4	1839—	12 20.6 E.	Sir E. Belcher.
	1841—	11 E.	Duflot de Mofras. Not used.
5	1851, Apr. 28 to May 7.	12 28.8 E.	G. Davidson, U. S. Coast S. At La Playa, Point Loma.
6	1853, Oct. 15.	12 31.7 E.	Lieut. W. P. Trowbridge, U. S. Coast S. At La Playa, near custom-house.
7	1866, June 15.	13 09.4 E.	W. Harkness, U. S. N. At La Playa.
8	1871, May 28, 29, 30.	14 46.7 E.	G. Davidson, U. S. Coast S. At New San Diego in $\varphi = 32^\circ\ 43'.1$, $\lambda = 117^\circ\ 09'.7$. Reduction to La Playa, Point Loma + 34′. [See below for 1892.]
9	1872, Nov. 19, 20, 21.	13 19.4 E.	G. Davidson and S. R. Throckmorton, U. S. Coast S. Near La Playa.
	1879—	12 55 E.	Capt. W. A. Jones. Not used.
10	1881, Jan.	13 30 E.	C. R. Gutheil, survey of the light-house reservation. Lieut. Col. Williamson, U. S. E., in charge.
	1881, Apr. 6.	13 27.6 E.	Lieut. H. E. Nichols, U. S. N.
11	1888, June 16, 17.	13 04.2 E.	Lieut. C. F. Pond, U. S. N.
12	1892, Feb. 1–5.	13 56.4 E.	G. R. Putnam, U. S. Coast & G. S. At City Park, San Diego, $\varphi = 32^\circ\ 43'.4$, $\lambda = 117^\circ\ 09'.7$.
	1892, Feb. 8, 9.	13 22.1 E.	At La Playa, Point Loma, $\varphi = 32^\circ\ 42'.2$, $\lambda = 117^\circ\ 14'.5$.

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN DIEGO, CAL.—Continued.

$$D = -10^\circ\!.30 + 3.04 \sin (1.10\, m - 117^\circ\!.6)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1714·8	— 6·00	¼	— 7·27	—1·27	1866·4	—13·15		—13·30	—0·14
1783·3	10·43	½	9·72	+0·71	1871·4	14·21		13·33	+0·88
1792·5	11·00	½	10·26	+0·74	1872·9	13·32		13·33	—0·01
1839·5	12·34		12·65	—0·31	1881·2	13·48		13·32	+0·16
1851·3	12·48		13·03	—0·55	1888·5	13·07		13·24	—0·17
1853·8	—12·53		—13·09	—0·56	1892·1	—13·37	1½	—13·18	+0·19

DIP AND INTENSITY AT SAN DIEGO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1793, Nov. and Dec.	59 13	......	......	G. Vancouver.
2	1839—	57 06·1	0·2832	0·5214	Sir E. Belcher. On tongue east side.
3	1849—	57 33	......	......	W. H. Emory, U. S. and Mex. Boundary Survey.
4	1853, Sept. and Oct.	57 38·6	0·2891	0·5402	Lieut. W. P. Trowbridge, U. S. Coast S. At La Playa.
5	1866, June 16.	57 54	0·2887	0·5433	Prof. W. Harkness, U. S. N.
6	1872, Nov. 22, 23.	57 56·8	0·2840	0·5351	S. R. Throckmorton, U. S. Coast S. At La Playa.
7	1881, Apr. 5, 6.	57 51·2	0·2814	0·5289	Lieut. H. E. Nichols, U. S. N. At La Playa.
8	1888, June 16, 17.	57 56·6	0·2932(?)	0·5524(?)	Lieut. C. F. Pond, " " " "
9	1892, Feb. 8, 9.	58 01·6	0·2785	0·5259	G. R. Putnam, U. S. Coast & G. S. — At La Playa. H at City Park 0·2795.

Omitting the observations of the dip in 1793 and of the horizontal component of the force in 1888, as defective, the above observations are represented by—

$$\Theta = 57^\circ\!.510 + 0.029\,25\, m - 0.000\,452\, m^2$$
$$H = 0.2869 + 0.000\,2\, m - 0.000\,010\,3\, m^2$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1839·5	57·10	57·15	+0·05
1849·5	57·55	57·50	—0·05
1853·8	57·64	57·61	—0·03
1866·4	57·90	57·87	—0·03
1872·9	57·95	57·94	—0·01
1881·2	57·85	57·98	+0·13
1888·5	57·94	57·97	+0·03
1892·1	58·03	57·94	—0·09

Date.	Obs'd H.	Comp'd H.	C—O.
1839·5	0·2832	0·2837	+0·0005
1853·8	91	75	— 16
1866·4	87	74	— 13
1872·9	40	61	+ 21
1881·2	0·2814	0·2831	+ 17
1892·1	0·2785	0·2771	—0·0014

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.	H.	F.
	°	°		
1830	—12·27	56·74	......	......
1840	12·67	57·17	0·2839	0·5237
1850	12·99	57·51	869	341
1860	13·21	57·76	879	397
1870	13·32	57·91	868	398
1880	13·32	57·98	836	349
1890	13·2	57·96	784	248
1900	—13	57·84	0·2711	0·5093

Secular variations of the magnetic declination, dip and intensity—**Continued.**

EL PASO AND FORT BLISS, TEX.

$\varphi = 31° 45'.5$ $\lambda = 106° 29'.1$ W. of Gr.

[Fort Bliss.]

No.	Date.	D.	References and remarks.
		° ′	
1	1852—	12 24 E.	W. H. Emory. At Frontera. $\varphi = 31° 49'$, $\lambda = 106° 29'$.
2	1855, Jan.	11 55 E.	" " " " Initial point of boundary survey, $\varphi = 31° 47'$, $\lambda = 106° 28'$.
3	1859, Jan. 20.	12 25·0 E.	J. H. Clark, Commissioner. At Frontera.
4	1878—	12 25·2 E.	Report of Chief of Engineers. At Fort Bliss.
5	1884, Apr. 8.	12 05 E.	G. Davidson, U. S. Coast & G. S. North of R. R. depot, $\varphi = 31° 45'.5$, $\lambda = 106° 27'$.
6	1888, Dec. 1, 2.	11 53·8 E.	J. B. Baylor, U. S. Coast & G. S. On U. S. reservation, $\varphi = 31° 45'.5$, $\lambda = 106° 29'.3$.
7	1892, May 4, 5, 6.	11 45·6 E.	O. B. French, U. S. Coast & G. S. Station of 1888.
8	1895, Apr. 17, 18, 19.	11 46·0 E.	E. Smith, " " " " " in City Park, $\varphi = 31° 45'.5$, $\lambda = 106° 29'.2$.

$$D = -8°.50 + 3.88 \sin(1.2\, m - 110°.1)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1852·5	—12·40		—12·21	+0·19
1855·0	11·92		12·26	—0·34
1859·1	12·42		12·33	+0·09
1878·5	12·42		12·26	+0·16
1884·3	12·08		12·12	—0·04
1888·9	11·90		11·97	—0·07
1892·2	11·76		11·84	—0·08
1895·3	—11·77		—11·70	+0·07

DIP AND INTENSITY AT EL PASO AND FORT BLISS.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1852—	59 05	......	......	W. H. Emory, U. S. and Mex. Boundary Commission. At Frontera.
2	1888, Dec. 1, 2.	58 52·3	0·2802	0·5420	J. B. Baylor, U. S. Coast & G. S. At reservation.
3	1892, May 4–6.	59 00·5	0·2808	0·5454	O. B. French, U. S. Coast & G. S. At reservation.
4	1895, Apr. 16–18.	59 03·0	0·2801	0·5446	E. Smith, U. S. Coast & G. S. In City Park.

CERROS ISLAND, LOWER CALIFORNIA, MEXICO.

$\varphi = 28° 04'$ $\lambda = 115° 12'$ W. of Gr.

[Morro Rodondo Bay.]

No.	Date.	D.	References and remarks.
		° ′	
1	1714, Oct. 17.	2 E.	Sauvague le Muet. Reduction to Cerros Island + 0°·25.
2	1783·3	8 26 E.	Deduced from 112 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
3	1839—	10 46 E.	Phil. Trans. Roy. Soc. At San Bartolome Bay. Reduction to Cerros Island — 8′.
4	1873, Feb. 17, 18.	11 45·2 E.	Wm. Eimbeck, U. S. Coast S. At Cerros Island.
	1873, Sept. 9.	12 03·5 E.	Lieut. Z. L. Tanner and E. J. Young, U. S. N. At Cerros Island.
5	1874, Dec. 28.	12 09·2 E.	Lieut. J. E. Craig and C. Seymour, U. S. N. " " "
6	1881, Mar. 9.	11 58·6 E.	Lieut. H. E. Nichols, U. S. N. " " "
7	1888 Mar. 26, 29.	11 40·5 E.	Lieut. C. F. Pond, U. S. N. In Morro Rodondo Bay.
	1888 May 31, June 1.	11 38·4 E.	

Secular variations of the magnetic declination, dip and intensity—Continued.

CERROS ISLAND, LOWER CALIFORNIA, MEXICO—Continued.

$D = -7°{\cdot}40 + 4{\cdot}61 \sin (1{\cdot}05\, m - 107°{\cdot}0)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1714·8	— 1·75	⅛	—3·09	—1·34
1783·3	8·43	½	7·64	+0·97
1839·5	10·90		11·47	—0·57
1873·4	11·90		11·96	—0·06
1875·0	12·15		11·94	+0·21
1881·2	11·98		11·83	+0·15
1888·3	—11·66		—11·63	+0·03

DIP AND INTENSITY AT CERROS ISLAND.

No.	Date.	θ.	H.	F.	References.
		° ′	°	°	
1	1873, Feb. 17.	52 30·5	0·2999	0·4927	Wm. Eimbeck, U. S. Coast S.
2	1881, Mar. 7, 8.	52 55·0	0·3045	0·5050	Lieut. H. E. Nichols, U. S. N. At Cerros Island.
3	1888, Mar. 26–29.	53 03·1	0·3122	0·5194	Lieut. C. F. Pond, U. S. N. Sebastian Viscaino Bay.
	1888, Mar. 31, June 1.	52 54·7	0·3157 (?)	0·5235 (?)	Lieut. C. F. Pond, U. S. N. Morro Rodondo Bay.

ASCENSION ISLAND, LOWER CALIFORNIA, MEXICO.

$\varphi = 27°\ 06'{\cdot}3 \qquad \lambda = 114°\ 18'{\cdot}0$ W. of Gr.

No.	Date.	D.	References and remarks.
		° ′	
1	1783·3	7 52 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
2	1839—	10 46 E.	Sir E. Belcher. At San Bartholomew in $\varphi = 27° 40'$, $\lambda = 114° 53'$; Phil. Trans. Roy. Soc., 1843, p. 140. Reduction to Ascension Island about $+0°{\cdot}25$.
3	1873, Mar. 14.	11 26·4 E.	W. Eimbeck, U. S. Coast S. In $\varphi = 27° 06'{\cdot}4$, $\lambda = 114° 18'{\cdot}2$. C. & G. S. Rept. for 1881, Appendix No. 9.
	1874, Dec. 30.	12 24·8 E.	Lieuts. J. E. Craig and C. Seymour, U. S. N. Cruise of the U. S. S. Narragansett. In $\varphi = 27° 06'{\cdot}0$, $\lambda = 114° 17'{\cdot}8$. Not used.
4	1881, Mar. 5.	11 23·0 E.	Lieut. H. E. Nichols, U. S. N. At station of 1873 in $\varphi = 27° 06'{\cdot}0$, $\lambda = 114° 18'{\cdot}4$.
5	1889, Dec. 2, 3, 4.	10 58·5 E.	Lieut. C. F. Pond, U. S. N. Hydrographic Office Publication 101, Washington, 1892. In $\varphi = 27° 06'{\cdot}5$, $\lambda = 114° 17'{\cdot}7$.

$D = -8°{\cdot}27 + 2{\cdot}99 \sin (1{\cdot}10\, m - 114°{\cdot}8)$

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1783·3	— 7·87		— 7·83	+0·04
1839·5	10·52		10·67	—0·15
1873·2	11·44		11·26	+0·18
1881·2	11·38		11·22	+0·16
1889·9	—10·98	2	—11·10	—0·12

DIP AND INTENSITY AT ASCENSION ISLAND.

No.	Date.	θ.	H.	F.	References.
		° ′			
1	1881, Mar. 4, 5.	51 43·4	0·3094	0·4995	Lieut. H. E. Nichols, U. S. N.
2	1889, Dec. 2–4.	51 53·3	0·3202 (?)	0·5188 (?)	" C. F. Pond, "

Secular variations of the magnetic declination, dip and intensity—Continued.

MAGDALENA BAY, LOWER CALIFORNIA, MEXICO.

$\varphi=24° 38'.4$ $\lambda=112° 08'.9$ W. of Gr.

[Near village on Man of War Cove.]

No.	Date.	D.	References and remarks.
		° ′	
	1625, about.	4 E.	R. Dudley's Arcano del Mare. C. & G. S. Rept. for 1888, Appendix No. 6. Not used.
1	1714, Oct. 10.	1½ E.	Sauvague le Muet.
2	1783·3	6 47 E.	Deduced from 122 observations made by Spanish navigators along the coast from San Blas to Nootka. C. & G. S. Rept. for 1888, Appendix No. 7.
3	{ 1837—	8 15 E.	Du Petit Thouars.
	{ 1837—	8 17 E.	Sir E. Sabine's Contributions.
4	1839—	9 15 E.	Sir E. Belcher.
	1841—	8 15 E.	Duflot de Mofras. (See above.) Not used.
5	1866, June 9.	10 40·5 E.	Prof. W. Harkness, U. S. N.
6	1871, Mar. and June.	11 00 E.	G. Bradford, U. S. Coast S.
7	{ 1873, Mar. 5, 6, 7.	10 36·6 E.	W. Eimbeck, "
	{ 1873, June 23.	10 30·8 E.	Lieuts. Z. L. Tanner and E. J. Young, U. S. N.
8	1881, Feb. 24.	10 29·1 E.	Lieut. H. E. Nichols, U. S. N.

$D=-6°.33+4.17 \sin(1.15\, m-119°.2.$

Date.	Obs'd D. p	Comp'd D.	C—O.
	°	°	°
1714·8	— 1·50	—2.17	—0·67
1783·3	6·78	5·19	+1·59
1837·5	8·27	9·35	—1·08
1839·5	9·25	9·46	—0·21
1866·4	10·67	10·43	+0·24
1871·3	11·00	10·49	+0·51
1873·3	10·56	10·50	+0·06
1881·1	—10·48	—10·47	+0·01

DIP AND INTENSITY AT MAGDALENA BAY.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1837—	45 39	......	......	Du Petit Thouars.
2	1839—	46 34	0·3301	0·4801	Sir E. Belcher.
3	1866, June 9.	48 32	0·3309	0·4997	Prof. W. Harkness, U. S. N.
4	1873, Mar. 6, 7.	48 09·0	0·3193	0·4786	W. Eimbeck, U. S. Coast S.
5	1881, Feb. 24.	48 18·7	0·3242	0·4875	Lieut. H. E. Nichols, U. S. N.

SAN LUCAS, LOWER CALIFORNIA, MEXICO.

$\varphi=22° 53'.3$ $\lambda=109° 54'.7$ W. of Gr.

[Bay of San Lucas.]

No.	Date.	D.	References and remarks.
		° ′	
1	1709, Jan. 12.	3 E.	Capt. W. Rogers. Reduction to Cape San Lucas +30′.
2	1714, Oct. 21.	1½ E.	Sauvague le Muet.
3	1779, Nov. 15.	6 E.	San Virey and Ant. Bucareli.
	1783·3	5·85 E.	Deduced from 122 observations by Spanish navigators. C. & G. S. Rept. for 1888, Appendix No. 7. Not used.
4	1839·5	8 38 E.	Sir E. Belcher.
5	1841·5	7 53 E.	Duflot de Mofras.
6	1873, June 9.	10 23·3 E.	Lieuts. Z. L. Tanner and E. J. Young, U. S. N. Reduction to station —7′.
7	1875, Jan. 19.	9 38·8 E.	G. C. Reiter, U. S. N.
8	1881, Feb. 20.	9 26·2 E.	Lieut. H. E. Nichols, U. S. N.

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN LUCAS, LOWER CALIFORNIA, MEXICO—Continued.

$D = -5°.94 + 3.68 \sin (1.20\, m - 116°.8)$. Approximate expression.

Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°
1709·0	—2·50	½	—2·40	+0·10
1714·8	1·50	½	2·30	—0·80
1779·9	6·00	½	4·63	+1·37
1839·5	8·63		8·78	—0·15
1841·5	7·88		8·88	—1·00
1873·3	10·50		9·62	+0·88
1875·0	9·65		9·61	+0·04
1888·1	—9·44		—9.56	—0·12

DIP AND INTENSITY AT SAN LUCAS.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1839—	45 39·3	0·3347	0·4788	Sir E. Belcher.
2	1881, Feb. 19, 20.	47 23·2	0·3275	0·4837	Lieut. H. E. Nichols, U. S. N.

SAN BLAS, MEXICO.

$\varphi = 21° 32'.4$ $\lambda = 105° 18'.4$ W. of Gr.

[Custom-house.]

No.	Date.	D.	References and remarks.
		° ′	
1	1630, about.	2½ E.	According to the isogonic system depending on data given in Dudley's "Arcano del Mare," as developed by me in the report for 1888, Appendix No. 6.
2	1686—	4 28 E.	Dampier at Cape Corrientes, 4° 28′ E. Communicated by Asst. G. Davidson, Dec. 26, 1893. Cape Corrientes is in latitude 20° 25′ and in longitude 105° 39′ (Capt. Richards's list of geographic positions, Hydrog. Office, Washington, D. C., 1883). To reduce this observation to San Blas we make use of Van Bemmelen's isogonic chart for 1680 (neither Halley's nor Hansteen's, of 1700, are here of any assistance), and the reduction appears to be nearly 1° less at San Blas than at the cape.
3	1714, Nov. 22.	0	Sauvague le Muet. Observed at Banderas Bay, where the variation was noted 0° and referred to San Blas. Banderas Bay is between Cape Corrientes and Mita Point ($\varphi = 20° 45'.8$, $\lambda = 105° 33'.6$, according to Comdr. Dewey). Reduction to San Blas, about + ¼°.
4	1788, Mar. 9.	5 E.	Don Esteban Martinez, in the Princessa. In $\varphi = 21° 30'$, and $\lambda = 105½°$ W.
5	1791, Apr. 12.	7 28 E.	Don A. Malaspina. Observed on shore.
6	1821–22.	8 40 E.	Hall.
	1828—	11 06 E.	Capt. F. W. Beechey. Not used.
7	1837—	8 34 E.	Sir Edward Belcher, on Palm Island, in $\varphi = 21° 32'$, $\lambda = 105° 16'$. Phil. Trans. Roy. Soc., 1843.
	1837—	9 09 E.	Du Petit Thouars. Sabine's Contributions to Terr. Mag. Phil. Trans. Roy. Soc., vol. 165, part 1, 1875.
8	1838—	8 47 E.	Sir Edw. Belcher, in the Sulphur. Phil. Trans. Roy. Soc., 1875.
9	1839—	9 00 E.	" " " on beach. " " " " 1843.
10	1841—	9 12 E.	Duflot de Mofras. Exploration of Oregon, Paris, 1844. In $\varphi = 21° 32'.6$, $\lambda = 105° 15'.8$.
11	1874, Feb. 23, 24, 26.	9 08·2 E.	Lieuts. Z. L. Tanner and E. J. Young. Cruise of the Narragansett, G. Dewey, comdr. In $\varphi = 21° 32'.4$, $\lambda = 105° 18'.7$.
	1874, Mar.	8 55 E.	Lieuts. C. Seymour and E. J. Young. At Mita Point. (In $\varphi = 20° 46'.1$, $\lambda = 105° 32'.2$). Not used.
12	1880, Dec. 5.	9 18·1 E.	Lieut. H. E. Nichols, U. S. N. Near custom-house and station of 1839.

Secular variations of the magnetic declination, dip and intensity—Continued.

SAN BLAS, MEXICO—Continued.

$$D = -5°.14 + 4.28 \sin (1.15\, m - 97°.9)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C — O.	Date.	Obs'd D.	*p*.	Comp'd D.	C — O.
	°		°	°		°		°	°
1630·0	—2·50	¼	—4·47	—1·97	1837·5	—8·86		—9·10	—0·24
1685·0	—3·50	⅓	1 02	+2·48	1838·5	8·79		9·13	—0·34
1714·9	+0.25	½	1·04	—1·29	1839·5	9·00		9·16	—0·16
1788·2	—5·00		5·96	—0·96	1841·5	9·20		9·21	—0·01
1791·3	—7·47		6·22	+1·25	1874·1	9·14		9·17	—0·03
1822·0	- 8·67		—8·41	+0·26	1880·9	—9·30	1½	—8·93	+0·37

DIP AND INTENSITY AT SAN BLAS.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1791, Apr. 12.	43 11·2			Don A. Malaspina.
2	1837—	46 09			Du Petit Thouars.
		45 24·3			Sir E. Belcher. On Palm Island.
3	1838—	44 36			"
4	1839—	44 32·5	0·3422	0·4801	" On beach.
5	1880, Dec. 4, 5.	46 20·8	0·3322	0·4812	Lieut. H. E. Nichols, U. S. N.

MEXICO CITY, MEXICO.

$\varphi = 19° 26'.0$ $\lambda = 99° 06'.6$ W. of Gr.

[Observatorio Nacional.]

No.	Date.	D.	References and remarks.
		° ′	
1	1769, June.	5 20 E.	Don Alzate.
	1769, Dec.	5 35 E.	
2	1775—	6 42 E.	Velasquez de Leon.
3	1803, Dec.	8 08 E.	Alex. von Humboldt.
4	1849—	8 30·2 E.	Gomez de la Cortina.
5	1850—	8 35·2 E.	Velasquez y Teran.
6	1856, Dec. 10–17.	8 46 E.	A. Sonntag.
7	1858—	8 22·3 E.	Almazan.
8	1860—	8 30 E.	Salazar Llarrequi.
9	1862—	8 20·5 E.	Diaz Covarrubias.
	1862—	8 34·8 E.	Iglesias.
10	1866—	8 08·5 E.	Ponce de Leon.
	1867—	8 09·3 E.	
11	1868—	8 10·0 E.	Fernandez y Diaz Covarrubias.
12	1879, Sept., Oct., Nov., Dec.	8 34·5 E.	V. Reyes.
13	1884, Apr. 5–19.	8 19·0 E.	Sr. Barcena and G. Davidson, U. S. Coast & G. S.
14	1893, Dec.	7 41·1 E.	Sr. Morena y Anda. Estudio sobre el magnetismo terrestre en Mexico. Mexico, 1895.
15	1894, Jan., Feb., Apr., May, Sept., Oct., Nov., and Dec.	7 43·6 E.	
16	1895, Jan. to Dec. incl.	7 45·7 E.	Sr. Manuel Morena y Anda. Boletin del observatorio astronomico Nacional de Tacubaya.

$$D = -5°.44 + 3.28 \sin (1.0\, m - 87°.9)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C — O.	Date.	Obs'd D.	*p*.	Comp'd D.	C — O.
	°		°	°		°		°	°
1769·7	—5.46		—6·11	—0·65	1862·5	—8·46		—8·62	—0·16
1775·5	6·70		6·43	+0·27	1867·0	8·15		8·54	—0·39
1804·0	8·13		7·80	+0·33	1868·5	8·17		8·51	—0·34
1849·5	8·50		8·72	—0·22	1879·8	8·58		8·22	+0·36
1850·5	8·59		8·72	—0·13	1884·3	8·32		8·08	+0·24
1856·9	8·77		8·68	+0·09	1893·9	7·68		7·72	—0·04
1858·5	8·37		8·66	—0·29	1894·5	7·73		7·69	+0·04
1860·5	—8·50		—8·64	—0·14	1895·5	—7·76		—7·65	+0·11

Secular variations of the magnetic declination, dip and intensity—Continued.

MEXICO CITY, MEXICO—Continued.

DIP AND INTENSITY AT MEXICO.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1778—	38 00	......	......	Don Alzate.
2	1799—	42 10	......	......	Alex. von Humboldt.
3	1803, Dec.	42 10	0·3085 (?)	......	" " " Value of H a rough approximation.
4	1857, Dec. 10, 17.	41 26 (?)	0·3493	......	A. Sonntag and von Mueller.
5	1879, Sept.-Dec.	44 51·7	0·3449	0·4866	V. Reyes.
6	1884, Apr. 5-19.	45 01·4	......	......	Sr. Barcena.
7	1889, Nov. to 1890, Jan.	44 06·8	......	......	Bulletin del Observatorio Nacional at Tacubaya.
8	1893, Dec.	44 16·1	0·3347	0·4674	Sr. Morena y Anda. Observatorio Nacional.
9	1894, Jan.-May and Dec.	44 16·6	0·3347	0·4676	" "
10	1895, Jan., Feb., Mar., Apr., May, Sept.	44 21·5	0·3335	0·4664	" "

VERA CRUZ, MEXICO.

$\varphi = 19° 12'·0$ $\lambda = 96 08'·8$ W. of Gr.

[Castle San Juan d'Alloa.]

No.	Date.	D.	References and remarks.
		° ′	
	1625, about.	3 W.	R. Dudley's "Arcano del Mare." Not used.
1	1726-27.	2 15 E.	J. Harris.
2	{ 1769—	6 40 E.	Ency. Brit.
	{ 1769, Mar. 15.	6 28 E.	Chappe.
3	1776—	7 30 E.	Don Ulloa.
	1815—	10 37 E.	Malony. Not used.
4	1819, Apr. 27.	9 16 E.	Wise.
5	1839—	8 22 E.	Behard.
6	1856, Aug. 7, 8.	8 17 E.	A. Sonntag.
7	1861—	8 20 E.	English Admiralty Chart.
8	1880, Feb. 10, 11, 12.	7 26·3 E.	Lieut. S. M. Ackley, U. S. N.
9	1888, Dec. 21-25.	7 12·7 E.	Ensign J. H. L. Halcombe and Lieut. C. Laird, U. S. N. Letter of R. Clover, hydrographer, U. S. N., dated Jan. 28, 1891. At Plaza Baluarte in $\varphi = 19° 12'·0$, $\lambda = 96° 07'·4$.

$$D = -5°·35 + 3°·71 \sin (1·15\, m - 69°·1)$$

Date.	Obs'd D.	*p*.	Comp'd D.	C—O.
	°		°	°
1727·0	—2·25		—3·47	—1·22
1769·4	6·57		6·51	+0·06
1776·5	7·50		7·00	+0·50
1819·3	9·27		8·94	+0·33
1839·5	8·37		9·02	—0·65
1856·6	8·28		8·61	—0·33
1861·5	8·33		8·42	—0·09
1880·1	7·44		7·45	—0·01
1888·9	—7·18		—6·88	+0·30

DIP AND INTENSITY AT VERA CRUZ.

No.	Date.	Θ.	H.	F.	References.
		° ′			
1	1856, Aug. 7, 8.	43 58	0·3473	0·4825	A. Sonntag and von Mueller. Villa von la Guaca.
2	1880, Feb. 10-12.	44 04·6	0·3408	0·4743	Lieut. S. M. Ackley, U. S. N. N. E. bastion Castle S. J. d'Ulloa.
3	1888, Dec. 21-25.	44 20	......	......	Ensign Holcombe and Lieuts. Laird and Norrig, U. S. N. On Plaza Baluarte.

Secular variations of the magnetic declination, dip and intensity—Continued.

ACAPULCO, MEXICO.

$\phi = 16° 50'.5$ $\lambda = 99° 53'.5$ W. of Gr.

[Near Fort San Diego.]

No.	Date.	D.			References and remarks.
		°	′		
	1625, about.	1½		E.	According to R. Dudley's "Arcano del Mare." Not used.
1	1744—	3		E.	Anson.
2	1791, Apr. 29.	7	44	E.	Don A. Malaspina.
3	1822—	8	40	E.	Hall.
4	1828—	9	07	E.	Capt. F. W. Beechey.
5	1837—	8	23	E.	Sir E. Belcher.
5	1838—	8	13	E.	Sir E. Belcher.
5	1838—	8	17	E.	Du Petit Thouars.
	1841—	8	17	E.	Duflot de Mofras. Not used (same value as above).
6	1866, May 30.	8	22	E.	Prof. W. Harkness, U. S. N. In cocoanut grove.
7	1874, Mar. 17.	8	38·7	E.	Lieuts. Z. L. Tanner and E. J. Young, U. S. N.
8	1880, Nov. 23, 24.	7	56·6	E.	Lieut. H. E. Nichols, U. S. N. In cocoanut grove.
9	1882, Nov. 18.	7	54	E.	W. P. Ray, U. S. N.
10	1892, Nov. 17, 18.	7	35	E.	Lieut. Louis Mottez. Annales hydrographiques, vol. 2 of 1893. East of Fort San Diego.

$$D = -4°.48 + 4.41 \sin (1.0\, m - 85°.7)$$

Date.	Obs'd D.	p.	Comp'd D.	C—O.	Date.	Obs'd D.	p.	Comp'd D.	C—O.
	°		°	°		°		°	°
1744·5	—3·00		—3·62	—0·62	1866·5	—8·37		—8·60	—0·23
1791·3	7·73		7·05	+0·68	1874·2	8·64		8·36	+0·28
1822·5	8·67		8·53	+0·14	1880·9	7·94		8·08	—0·14
1828·5	9·12		8·69	+0·43	1882·9	7·90		7·99	—0·09
1838·0	—8·29		—8·85	—0·56	1892·9	—7·58		—7·48	+0·10

DIP AND INTENSITY AT ACAPULCO.

No.	Date.	Θ.		H.	F.	References.
		°	′			
1	1791, Apr. 29.	36	07·5	......	......	Don A. Malaspina.
2	1803, Mar.	38	53	......	......	Alex. von Humboldt.
3	1838—	37	57·4	0·3647	0·4625	Sir E. Belcher.
4	1866, May 30.	39	54	0·3569	0·4652	Prof. W. Harkness, U. S. N. In cocoanut grove.
5	1880, Nov. 22–24.	40	08·5	0·3466	0·4534	Lieut. H. E. Nichols, U. S. N. In cocoanut grove.
6	1892, Nov. 17, 18.	40	25	0·3462	0·4547	Lieut. L. Mottez. East of Fort San Diego.

$$\Theta = 39°.05 + 0.033\,9\, m$$

Date.	Obs'd Θ.	Comp'd Θ.	C—O.
	°	°	°
1791·3	36·12	37·06	+0·94
1803·2	38·88	37·46	—1·42
1838·5	37·96	38·66	+0·70
1866·4	39·90	39·61	—0·29
1880·9	40·14	40·10	—0·04
1892·9	40·42	40·50	+0·08

COMPUTED DECENNIAL VALUES.

Date.	D.	Θ.
	°	°
1790	—7·0	37·02
1800	7·6	37·36
1810	8·1	37·69
1820	8·5	38·03
1830	8·7	38·37
1840	8·9	38·71
1850	8·88	39·05
1860	8·75	39·39
1870	8·50	39·73
1880	8·12	40·07
1890	7·64	40·41
1900	—7·1	40·75

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION.

Recapitulation of expressions for the secular variation of the declination.

GROUP I.

No.	Locality.	Latitude. °	′	Longitude. °	′	Expression for secular variation of the declination.* (m = year − 1850.0.)
1	St. John's, Newfoundland.	47	34.4	52	41.9	$D = +22^\circ.16 + 8^\circ.71 \sin(1^\circ.1\, m + 70^\circ.4)$
2	Quebec, Canada.	46	48.4	71	14.5	$14.66 + 3.03 \sin(1.4\, m + 4.6) + 0.61 \sin(4^\circ\, m + 0^\circ.3)$
3	Charlottetown, Prince Edward Island.	46	14	63	27	$15.50 + 7.72 \sin(1.05\, m + 58.6)$ †
4	Montreal, Canada.	45	30.5	73	34.6	$11.87 + 4.33 \sin(1.45\, m - 18.8)$
5	Eastport, Me.	44	54.4	66	59.2	$15.18 + 3.79 \sin(1.25\, m + 31.1)$
6	Bangor, Me.	44	48.2	68	46.9	$13.60 + 3.60 \sin(1.30\, m + 14.1)$
7	Halifax, Nova Scotia.	44	39.6	63	35.3	$16.18 + 4.53 \sin(1.0\, m + 46.1)$
8	Burlington, Vt.	44	28.7	73	12.0	$9.99 + 2.87 \sin(1.4\, m - 8.3)$
9	Hanover, N. H.	43	42.3	72	17.1	$9.38 + 3.75 \sin(1.4\, m - 5.9)$
10	Portland, Me.	43	38.8	70	16.6	$11.40 + 3.28 \sin(1.30\, m + 2.7)$
11	Rutland, Vt.	43	36.2	72	55.0	$9.80 + 3.44 \sin(1.42\, m - 21.3)$
12	Portsmouth, N. H.	43	04.3	70	42.5	$10.55 + 3.08 \sin(1.4\, m - 5.1)$
13	Chesterfield, N. H.	42	53.5	72	24	$8.67 + 3.22 \sin(1.45\, m - 1.9) + 0.21 \sin(9\, m + 168)$
14	Newburyport, Mass.	42	48.9	70	49.2	$10.07 + 3.02 \sin(1.35\, m - 1.0)$
15	Williamstown, Mass.	42	42.8	73	13.4	$8.84 + 3.13 \sin(1.4\, m - 14.0)$
16	Albany, N. Y.	42	39.2	73	45.8	$8.76 + 3.33 \sin(1.25\, m - 18.0)$
17	Salem, Mass.	42	31.9	70	52.5	$9.98 + 3.85 \sin(1.4\, m - 5.1)$
18	Oxford, N. Y.	42	26.5	75	40.5	$6.19 + 3.24 \sin(1.35\, m - 18.9)$
19	Cambridge, Mass.	42	22.9	71	07.7	$9.68 + 2.81 \sin(1.32\, m + 5.9)$
20	Boston, Mass.	42	21.5	71	03.9	$9.58 + 2.90 \sin(1.32\, m + 5.0)$
21	Provincetown, Mass.	42	03.1	70	11.3	$9.76 + 3.20 \sin(1.30\, m + 10.7)$
22	Providence, R. I.	41	50.2	71	23.8	$9.09 + 3.00 \sin(1.40\, m - 2.8) + 0.15 \sin(6\, m + 117)$
23	Hartford, Conn.	41	45.9	72	40.4	$8.06 + 2.98 \sin(1.35\, m - 16.1)$
24	New Haven, Conn.	41	18.5	72	55.7	$7.72 + 3.03 \sin(1.35\, m - 21.9)$
25	Nantucket, Mass.	41	17.0	70	06.0	$9.21 + 3.03 \sin(1.23\, m + 6.9)$
26	Cold Spring Harbor, N. Y.	40	52.5	73	28	$7.19 + 2.52 \sin(1.35\, m - 11.4)$
27	New York City, N. Y.	40	42.7	74	00.4	$7.04 + 2.77 \sin(1.30\, m - 18.1) + 0.14 \sin(6.3\, m + 64)$
28	South Bethlehem, Pa.	40	36.4	75	22.9	$5.27 + 3.05 \sin(1.46\, m - 34.8)$
29	Huntingdon, Pa.	40	31	78	02	$3.76 + 2.93 \sin(1.48\, m - 35.2)$
30	New Brunswick, N. J.	40	29.9	74	26.8	$5.11 + 2.94 \sin(1.30\, m + 4.2)$
31	Jamesburg, N. J.	40	21	74	27	$6.03 + 2.94 \sin(1.40\, m - 22.4)$
32	Harrisburg, Pa.	40	15.9	76	52.9	$3.12 + 2.98 \sin(1.55\, m - 4.2)$
33	Hatboro, Pa.	40	12	75	07	$5.17 + 3.16 \sin(1.54\, m - 16.7) + 0.22 \sin(4.1\, m + 157)$
34	Philadelphia, Pa.	39	56.9	75	09.0	$5.36 + 3.17 \sin(1.50\, m - 26.1) + 0.19 \sin(4.0\, m + 146)$
35	Chambersburg, Pa.	39	56	77	39	$2.79 + 3.10 \sin(1.55\, m - 30.6) + 0.20 \sin(4.6\, m + 124)$
36	West Creek, Little Egg Harbor, N. J.	39	38	74	19	$5.50 + 2.78 \sin(1.5\, m - 18.4)$
37	Baltimore, Md.	39	17.8	76	37.0	$3.38 + 2.72 \sin(1.4\, m - 22.3)$
38	Cape May, N. J.	38	56.0	74	57.6	$4.31 + 2.40 \sin(1.4\, m - 26.7)$
39	Washington, D. C.	38	53.3	77	00.6	$2.53 + 2.64 \sin(1.45\, m - 16.6)$
40	Cape Henlopen, Del.	38	46.7	75	05.0	$4.01 + 3.22 \sin(1.35\, m - 25.2)$
41	Williamsburg, Va.	37	16.2	76	42.4	$2.20 + 2.48 \sin(1.5\, m - 32.2)$
42	Cape Henry, Va.	36	55.6	76	00.4	$2.42 + 2.25 \sin(1.47\, m - 30.6)$
43	Newbern, N. C.	35	06	77	02	$+\ 0.41 + 2.53 \sin(1.45\, m - 11.6)$
44	Milledgeville, Ga.	33	04.2	83	12	$-\ 3.10 + 2.53 \sin(1.4\, m - 61.9)$
45	Charleston, S. C.	32	46.6	79	55.8	$-\ 1.82 + 2.75 \sin(1.40\, m - 12.1)$
46	Savannah, Ga.	32	04.9	81	05.5	$-\ 1.94 + 2.75 \sin(1.35\, m - 42.0)$
47	Fernandina, Fla.	30	40.3	81	27.7	$-\ 3.18 + 0.065\,(t - 1870.2)$

18[illegible] = 9° 15.2′

*A + sign indicates west declination, a — sign east declination.

† Very uncertain.

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Recapitulation of expressions for the secular variation of the declination—Continued.

GROUP II.

No.	Locality.	Latitude.	Longitude.	Expression for secular variation of the declination.* ($m =$ year $-$ 1850.0.)
		° ′	° ′	
1	York Factory, Brit. North Am.	56 59.9	92 26	$D = +\ 7^{\circ}.34 + 16^{\circ}.03 \sin (1.10\, m - 97^{\circ}.9)$
2	Fort Albany, Brit. North Am.	52 22	82 38	$+15.78 + 6.95 \sin (1.20\, m - 99.6)$
3	Duluth, Minn.	46 45.5	92 04.5	$-\ 7.70 + 2.41 \sin (1.4\, m - 120)$
4	Sault de Ste. Marie, Mich.	46 29.9	84 20.1	$+\ 1.54 + 2.70 \sin (1.45\, m - 58.5)$
5	Pierrepont Manor, N. Y.	43 44.5	76 03.0	$+\ 5.95 + 3.78 \sin (1.4\, m - 22.2)$
6	Toronto, Canada.	43 39.4	79 23.3	$+\ 3.60 + 2.82 \sin (1.4\, m - 44.7) + 0.09 \sin (9.3\, m + 136) + 0.08 \sin (19\, m + 247)$
7	Grand Haven, Mich.	43 05.2	86 12.6	$-\ 4.95 + 0.038\,0\, m + 0.001\,15\, m^2$
8	Milwaukee, Wis.	43 02.5	87 54.2	$-\ 4.12 + 3.60 \sin (1.45\, m - 64.5)$
9	Buffalo, N. Y.	42 52.8	78 53.5	$+\ 3.66 + 3.47 \sin (1.4\, m - 27.8)$
10	Ithaca, N. Y.	42 26.8	76 28.9	$+\ 6.48 + 3.74 \sin (1.35\, m - 52.4)$
11	Dunkirk, N. Y.	42 29.6	79 21.3	$+\ 2.34 + 2.89 \sin (1.40\, m - 19.8)$
12	Detroit, Mich.	42 20.0	83 03.0	$-\ 0.72 + 2.42 \sin (1.40\, m - 19.0)$
13	Kalamazoo, Mich.	42 17.4	85 35.2	$-\ 1.63 + 4.21 \sin (1.40\, m - 61.6)$
14	Ypsilanti, Mich.	42 14.3	83 37	$-\ 0.76 + 3.59 \sin (1.35\, m - 11.8)$
15	Erie, Pa.	42 07.8	80 05.4	$+\ 2.17 + 2.69 \sin (1.5\, m - 27.3)$
16	Chicago, Ill.	41 50.0	87 36.8	$-\ 3.40 + 2.89 \sin (1.45\, m - 66.2)$
17	Michigan City, Ind.	41 43.4	86 54.4	$-\ 2.38 + 3.12 \sin (1.4\, m - 59.9)$
18	Cleveland, Ohio.	41 30.4	81 41.5	$+\ 0.77 + 2.53 \sin (1.30\, m - 21.6)$
19	Omaha, Nebr.	41 15.7	95 56.5	$-\ 9.61 + 3.03 \sin (1.30\, m - 50.9)$
20	Beaver, Pa.	40 44	80 20	$+\ 1.41 + 2.72 \sin (1.40\, m - 39.6)$
21	Pittsburg, Pa.	40 27.6	80 00.8	$+\ 1.85 + 2.45 \sin (1.45\, m - 28.4)$
22	Denver, Colo.	39 45.3	104 59.5	$-15.30 + 0.011\, m + 0.000\,5\, m^2$
23	Marietta, Ohio.	39 25	81 28	$+\ 0.02 + 2.89 \sin (1.4\, m - 40.5)$
24	Athens, Ohio.	39 19	82 02	$-\ 1.51 + 2.63 \sin (1.4\, m - 24.7)$
25	Cincinnati, Ohio.	39 08.4	84 25.3	$-\ 2.59 + 2.43 \sin (1.42\, m - 37.9)$
26	St. Louis, Mo.	38 38.0	90 12.2	$-\ 5.91 + 3.00 \sin (1.40\, m - 51.1)$
27	Nashville, Tenn.	36 08.9	86 48.2	$-\ 3.57 + 3.33 \sin (1.35\, m - 68.5)$
28	Florence, Ala.	34 47.2	87 41.7	$-\ 4.25 + 2.33 \sin (1.3\, m - 52.8)$
29	Mobile, Ala.	30 41.4	88 02.5	$-\ 4.15 + 2.95 \sin (1.42\, m - 74.5)$
30	Pensacola, Fla.	30 20.8	87 18.3	$-\ 4.58 + 2.92 \sin (1.4\, m - 61.4)$
31	Austin, Tex.	30 16.4	97 44.2	$-\ 9.13 + 0.046\,6\, (t - 1873.0)$
32	New Orleans, La.	29 57.2	90 03.9	$-\ 5.20 + 2.98 \sin (1.40\, m - 69.8)$
33	San Antonio and Hill Side Range, Tex.	29 { 26.8 / 29.3 }	98 { 27.9 / 32.1 }	$-\ 7.40 + 2.92 \sin (1.35\, m - 84.8)$
34	Galveston, Tex.	29 18.2	94 47.5	$-\ 8.33 + 0.040\,9\, (t - 1876.1) + 0.000\,732\, (t - 1876.1)^2$
35	Key West, Fla.	24 33.5	81 48.5	$-\ 4.31 + 2.86 \sin (1.30\, m - 23.9)$
36	Habana, Cuba.	23 09.3	82 21.5	$-\ 3.72 + 2.79 \sin (1.05\, m - 36.7)$
37	Kingston, Jamaica.	17 55.9	76 50.6	$-\ 3.81 + 2.39 \sin (1.10\, m - 10.6)$
38	Bridgetown, Barbados.	13 05.7	59 37.3	$-\ 1.88 + 2.83 \sin (0.95\, m + 24.6)$
39	Panama, New Granada.	8 57.1	79 32.2	$-\ 5.66 + 2.22 \sin (1.10\, m - 27.8)$

* A + sign indicates west declination, a − sign east declination.

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Recapitulation of expressions for the secular variation of the declination—Continued.

GROUP III.

No.	Locality.	Latitude.		Longitude.		Expression for secular variation of the declination.* (m = year − 1850·0.)
		°	′	°	′	
1	Chamisso Id., Alaska.	66	13	161	49	$D = -29°·88 + 4°·35 \sin (1°·2\, m + 2°·6)$†
2	Port Clarence, Alaska.	65	16	166	50	$-26·09 + 4·41 \sin (1·2\, m + 4·6)$†
3	Port Etches, Constantine Hbr., Alaska.	60	20·7	146	37·6	$-22·40 + 9·13 \sin (1·2\, m - 83·6)$†
4	Port Mulgrave, Yakutat Bay, Alaska.	59	33·8	139	47·3	$-24·02 + 7·48 \sin (1·1\, m - 95·0)$†
5	St. Paul, Kadiac Id., Alaska.	57	48·0	152	21·3	$-22·21 + 5·18 \sin (1·35\, m - 72·5)$†
6	Sitka, Alaska.	57	02·9	135	20·4	$-25·48 + 3·84 \sin (1·0\, m - 116·1) + 0·32 \sin (6°·5\, m + 321°)$†
7	Iliuliuk, Unalaska Id., Alaska.	53	52·6	166	31·5	$-17·65 + 2·26 \sin (1·3\, m - 69·0)$
8	Petropavlovsk, Kamchatka.	53	01	201	17	$-3·43 + 5·10 \sin (0·85\, m + 11·5)$†
9	Nootka, Vancouver Id.	49	35·5	126	37·5	$-21·25 + 2·74 \sin (1·30\, m - 152·0)$
10	Cape Flattery and Neah Bay, Wash.	48	23·5	124	44·1	$-19·88 + 3·38 \sin (1·10\, m - 149·4)$
11	Port Townsend, Wash.	48	07·1	122	45·3	$-18·80 + 3·85 \sin (1·0 - 140·9)$
12	Seattle, Wash.	47	36·6	122	20·1	$-19·25 + 3·24 \sin (0·9\, m - 131·3)$
13	Olympia, Wash.	47	02	122	54	$-18·87 + 3·66 \sin (1·0\, m - 151·0)$
14	Cape Disappointment, Wash.	46	16·7	124	02·8	$-19·39 + 2·54 \sin (1·25\, m - 158·7)$
15	Wallawalla, Wash.	46	03·9	118	20·8	$-17·07 + 4·25 \sin (1·3\, m - 131·5)$†
16	Vancouver, Wash.	45	37·5	122	39·7	$-17·50 + 3·96 \sin (1·20\, m - 141·3)$
17	Portland, Oreg.	45	31·1	122	40·8	$-19·05 + 3·41 \sin (1·3\, m - 159·1)$†
18	Salt Lake City, Utah.	40	46·1	111	53·8	$-12·50 + 4·11 \sin (1·3\, m - 126·4)$†
19	Cape Mendocino, Cal.	40	26·3	124	24·3	$-15·25 + 2·45 \sin (1·10\, m - 128·0)$†
20	San Francisco, Cal.	37	47·5	122	27·3	$-13·73 + 2·94 \sin (0·95\, m - 135·3) + 0·056 \sin (20\, m + 87)$
21	Monterey, Cal.	36	36·1	121	53·6	$-13·25 + 2·83 \sin (1·1\, m - 144·0)$
22	Santa Barbara, Cal.	34	24·2	119	43·0	$-11·52 + 3·32 \sin (1·10\, m - 123·1)$
23	San Diego, Cal.	32	39·8	117	14·8	$-10·30 + 3·04 \sin (1·10\, m - 117·6)$
24	El Paso and Fort Bliss, Tex.	31	45·5	106	29·1	$-8·50 + 3·88 \sin (1·2\, m - 110·1)$
25	Cerros Id., Low. Cal., Mex.	28	04	115	12	$-7·40 + 4·61 \sin (1·05\, m - 107·0)$
26	Ascension Id., Low. Cal., Mex.	27	06·3	114	18·0	$-8·27 + 2·99 \sin (1·10\, m - 114·8)$
27	Magdalena Bay, Low. Cal., Mex.	24	38·4	112	08·9	$-6·33 + 4·17 \sin (1·15\, m - 119·2)$
28	San Lucas, Low. Cal., Mex.	22	53·3	109	54·7	$-5·94 + 3·68 \sin (1·20\, m - 116·8)$
26	San Blas, Mex.	21	32·4	105	18·4	$-5·14 + 4·28 \sin (1·15\, m - 97·9)$
30	Mexico City, Tacubaya Obs'y.	19	26·0	99	06·6	$-5·44 + 3·28 \sin (1·0\, m - 87·9)$
31	Vera Cruz, Mex.	19	12·0	96	08·8	$-5·35 + 3·71 \sin (1·15\, m - 69·1)$
32	Acapulco, Mex.	16	50·5	99	53·5	$-4·48 + 4·41 \sin (1·0\, m - 85·7)$

*A + sign indicates west declination, a − sign east declination.

†A rough and doubtful expression. At Sitka and Yakutat a secondary maximum is apparently in process of development; at Sitka the last periodic term applies only since 1830.

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Summary of special results.

GROUP I.—DECLINATIONS.

No.	Locality.	Year of first observation.	Number of observations.	Probable error of an observation.	Approximate epoch of last magnetic eastern elongation.	Approximate declination at late eastern elongation.	Approximate epoch of nearest or prospective western elongation.	Approximate declination at late or prospective western elongation.	Annual change in 1895.	1900.
				′		°		°	′	′
1	St. John's, Newfoundland.	1665(?)	13	±44	1704	+13·4	1868	+30·9	—5·0	—5·8
2	Quebec, Canada.	1642	41	21	1806	+12·1	1909 (?)	+17·2	—0·5(?)	—1·0(?)
3	Charlottetown, Pr. Edw. Isd.	1833(?)	17	18	1708	+ 7·8	1880	+23·2	—2·3	—3·1
4	Montreal, Canada.	1700(?)	11	31	1801	+ 7·5	....	......	+4·5	+3·9
5	Eastport, Me.	1604–12	16	20	1753	+11·4	1897	+19·0	+0·2	—0·3
6	Bangor, Me.	1805	8	15	1770	+10·0	1908	+17·2	+1·5	+0·9
7	Halifax, Nova Scotia.	1604–12	17	31	1714	+11·6	1894 (?)	+20·7	—0·1	—0·5
8	Burlington, Vt.	1793	15	16	1792	+ 7·1	1920 (?)	+12·9	+2·4	+2·0
9	Hanover, N. H.	1765	8	52	1790	+ 5·6	....	......	+3·0	+2·4
10	Portland, Me.	1700(?)	15	10	1779	+ 8·1	1917 (?)	+14·7	+2·2	+1·7
11	Rutland, Vt.	1789	7	24	1802	+ 6·4	1928 (?)	+13·2	+3·8	+3·3
12	Portsmouth, N. H.	1771	8	11	1789	+ 7·5	....	......	+2·5	+2·0
13	Chesterfield, N. H.	1812	15	13	1784	+ 5·3	....	......	+0·7	+0·5
14	Newburyport, Mass.	1750(?)	7	13	1784	+ 7·0	1918 (?)	+13·1	+2·1	+1·7
15	Williamstown, Mass.	1750(?)	6	31	1796	+ 5·7	....	......	+3·0	+2·6
16	Albany, N. Y.	1580(?)	41	18	1792	+ 5·4	1936 (?)	+12·1	+3·4	+3·1
17	Salem, Mass.	1750(?)	10	25	1789	+ 6·1	....	......	+3·0	+2·4
18	Oxford, N. Y.	1794	14	9	1797	+ 3·0	....	......	+3·4	+3·0
19	Cambridge, Mass.	1708	26	12	1777	+ 6·9	1914	+12·5	+1·6	+1·2
20	Boston, Mass.	1700	15	23	1779	+ 6·6	1915	+12·4	+1·8	+1·4
21	Provincetown, Mass.	1620(?)	9	18	1773	+ 6·6	1911	+13·0	+1·6	+1·1
22	Providence, R. I.	1717	13	10	1778 (?)	+ 6·1	....	......	+3·0	+2·0
23	Hartford, Conn.	1713	14	9	1795	+ 5·1	1929 (?)	+11·0	+3·0	+2·7
24	New Haven, Conn.	1750(?)	20	11	1800	+ 4·7	1933	+10·8	+3·3	+3·0
25	Nantucket, Mass.	1700(?)	14	15	1771	+ 6·2	1918	+12·2	+1·8	+1·4
26	Cold Spring Harbor, N. Y.	1750(?)	14	8	1792	+ 4·7	1925 (?)	+ 9·7	+2·3	+2·0
27	New York City, N. Y.	1609	29	18	1784	+ 4·4	....	......	+3·8	+3·4
28	South Bethlehem, Pa.	1742	16	11	1812	+ 2·2	....	......	+4·0	+3·7
29	Huntingdon, Pa.	1750(?)	14	7	1813	+ 0·8	....	......	+3·9	+3·5
30	New Brunswick, N. J.	1800	19	11	1778 (?)	+ 2·2	....	......	+1·8	+1·4
31	Jamesburg, N. J.	1761	7	10	1802	+ 3·1	....	......	+3·3	+2·9
32	Harrisburg, Pa.	1795	15	15	1795	+ 0·1	....	......	+2·0	+1·4
33	Hatboro, Pa.	1680(?)	18(?)	6	1797	+ 1·8	....	......	+3·3	+3·3
34	Philadelphia, Pa.	1701	18	17	1802	+ 2·1	....	......	+4·4	+2·8(?)
35	Chambersburg, Pa.	1736	45	7	1809	— 0·5	....	......	+4·8	+4·5
36	West Creek, Little Egg Harbor, N. Y.	1687	6	22	1802	+ 2·7	....	......	+2·9	+2·4
37	Baltimore, Md.	1640(?)	20	17	1802.	+ 0·7	....	......	+3·0	+2·7
38	Cape May, N. J.	1700(?)	12	6	1805	+ 1·9	....	......	+2·8	+2·6
39	Washington, D. C.	1791	40	6	1799	— 0·1	....	......	+2·7	+2·3
40	Cape Henlopen, Del.	1700(?)	8	19	1802	+ 0·8	....	......	+3·7	+3·4
41	Williamsburg Va.	1694	7	16	1811	— 0·3	....	......	+3·2	+2·9
42	Cape Henry, Va.	1700(?)	14	20	1810	+ 0·2	....	......	+2·8	+2·5
43	Newbern, N. C.	1750(?)	9	20	1796	— 2·1	....	......	+2·3	+1·9
44	Milledgeville, Ga.	1750(?)	6	18	1830 (?)	— 5·6	....	......	+3·7	+3·7
45	Charleston, S. C.	1700	16	28	1794	— 4·6	....	......	+2·5	+2·1
46	Savannah, Ga.	1750(?)	10	±23	1814	— 4·7	....	......	+3·7	+3·5
47	Fernandina, Fla.	1849	5	....	....	......	....	......	+3·9	....

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Summary of special results—Continued.

GROUP II.—DECLINATIONS.

No.	Locality.	Year of first observation.	Number of observations.	Probable error of an observation.	Approximate epoch of last magnetic eastern elongation.	Approximate declination at late eastern elongation.	Annual change in 1895.	Annual change in 1900.
				′		°	′	′
1	York Factory, Brit. North Am.	1725	7	±49	1857	− 8·7	+12·2	+13·5
2	Fort Albany, Brit. North Am.	1668	5	78	1858	+ 8·8	+ 6·1	+ 6·7
3	Duluth, Minn.	1859	5	28	1871 (?)	−10·1	+ 1·9	+ 2·3
4	Sault de Ste. Marie, Mich.	1790	10	12	1828	− 1·2	+ 4·1	+ 4·0
5	Pierrepont Manor, N. Y.	1823	13	7	1802	+ 2·2	+ 4·2	+ 3·7
6	Toronto, Canada.	1840	40	2	....	......	+ 4·4	+ 3·7
7	Grand Haven, Mich.	1825	8	10	1834	− 5·2	......	......
8	Milwaukee, Wis.	1859	5	29	1832	− 7·7	+ 5·5	+ 5·4
9	Buffalo, N. Y.	1797	10	10	1806	+ 0·2	+ 4·2	+ 3·8
10	Ithaca, N. Y.	1672	6	8	1822	+ 2·7	+ 5·2	+ 5·1
11	Dunkirk, N. Y.	1798	7	4	1800	− 0·6	+ 3·1	+ 2·7
12	Detroit, Mich.	1810	13	12	1799	− 3·1	+ 2·5	+ 2·2
13	Kalamazoo, Mich.	1826	8	9	1830	− 5·8	+ 6·2	+ 6·1
14	Ypsilanti, Mich.	1815	18	7	1792	− 4·4	+ 3·3	+ 2·9
15	Erie, Pa.	1786	14	13	1808	− 0·5	+ 3·2	+ 2·8
16	Chicago, Ill.	1823	5	8	1833	− 6·3	+ 4·4	+ 4·4
17	Michigan City, Ind.	1830	6	37	1828	− 5·5	+ 4·6	+ 4·5
18	Cleveland, Ohio.	1796	16	13	1797	− 1·8	+ 2·8	+ 2·6
19	Omaha, Nebr.	1819	8	9	1820	−12·6	+ 4·1	+ 4·0
20	Beaver, Pa.	1786	5	5	1814	− 1·3	+ 3·7	+ 3·6
21	Pittsburg, Pa.	1840	6	6	1808	− 0·6	+ 3·0	+ 2·7
22	Denver, Colo.	1866	5	4	1839	−15·4	+ 3·4	+ 3·7
23	Marietta, Ohio.	1810	7	23	1815	− 2·9	+ 3·9	+ 3·7
24	Athens, Ohio.	1796	6	5	1803	− 4·1	+ 3·0	+ 2·7
25	Cincinnati, Ohio.	1806	7	9	1813	− 5·0	+ 3·3	+ 3·2
26	St. Louis, Mo.	1835	7	9	1822	− 8·9	+ 4·3	+ 4·1
27	Nashville, Tenn.	1829	4	5	1834	− 6·9	+ 4·7	+ 4·7
28	Florence, Ala.	1818	6	7	1821	− 6·6	+ 3·2	+ 3·1
29	Mobile, Ala.	1814	8	6	1839	− 7·1	+ 4·3	+ 4·4
30	Pensacola, Fla.	1763	11	35	1830	− 7·5	+ 4·3	+ 4·3
31	Austin, Tex.	1835	7	....	....	......	+ 2·8	......
32	New Orleans, La.	1700(?)	12	22	1836	− 8·2	+ 4·3	+ 4·3
33	San Antonio and Hill Side, Tex.	1825	10	14	1846	−10·3	+ 3·8	+ 3·9
34	Galveston, Tex.	1848	5	....	....	......	+ 4·0	......
35	Key West, Fla.	1750(?)	14	5	1799	− 7·2	+ 3·2	+ 2·9
36	Habana, Cuba.	1726	16	18	1798	− 6·5	+ 3·0	+ 3·0
37	Kingston, Jamaica.	1726	15	25	1778	− 6·2	+ 2·1	+ 2·0
38	Bridgetown, Barbados.	1700(?)	9	33	1729 (?)	− 4·7	+ 1·1	+ 0·9
39	Panama, New Granada.	1775	12	±11	1793 (?)	− 7·9	+ 2·4	+ 2·3

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Summary of special results—Continued.

GROUP III.—DECLINATIONS.

No.	Locality.	Year of first observation.	Number of observations.	Probable error of an observation.	Approximate epoch of last magnetic eastern elongation.	Approximate declination at late eastern elongation.	Approximate epoch of next eastern elongation.	Approximate declination at next eastern elongation.	Annual change in 1895.	Annual change in 1900.
				′		°		°	′	′
1	Chamisso Island, Alaska.	1728(?)	4	±(?)	1773 (?)	—34	....	......	+6·9	.....
2	Port Clarence, Alaska.	1728(?)	6	40	1771 (?)	—30	....	......	+5(?)	(*)
3	Port Etches, Constantine Hbr., Alaska.	1778	10	40	1845 (?)	—31·5	....	......	+3(?)	(†)
4	Port Mulgrave, Yakutat Bay, Alaska.	1778	10	32	....	......	....	......	0(?)	.....
5	St. Paul, Kadiak Island, Alaska.	1778	11	31	1837	—27·4	....	......	+4(?)	(‡)
6	Sitka, Alaska.	1779	38	22	....	......	....	......	—2(?)	.....
7	Iliuliuk, Unalaska Isd., Alaska.	1790	15	15	1834	—19·9	....	......	+3·0	+3·1
8	Petropavlovsk, Kamchatka.	1728(?)	12	37	1731 (?)	— 8·5	....	......	+2·9	+2·7
9	Nootka, Vancouver Isd.	1778	7	35	....	......	1898	—24·0	—0·2	0·0
10	Cape Flattery and Neah Bay, Wash.	1783(?)	8	23	....	......	1904	—23·3	—0·7	—0·3
11	Port Townsend, Wash.	1783(?)	9	16	....	......	1901	—22·7	—0·4	—0·1
12	Seattle, Wash.	1783(?)	8	18	....	......	1896	—22·5	0·0	+0·2
13	Olympia, Wash.	1783(?)	5	31	....	......	1904	—22·4	—1·0	—0·7
14	Cape Disappointment, Wash.	1783(?)	10	23	....	......	1905	—21·9	—1·1	—0·7
15	Wallawalla, Wash.	1853	5	17	1882 (?)	—21·3	....	......	+1·7	.....
16	Vancouver, Wash.	1788	6	36	1893 (?)	—21·5	....	......	+0·2	+0·7
17	Portland, Oreg.	1783(?)	9	28	....	......	1903	—22·5	—0·9	—0·3
18	Salt Lake City, Utah.	1850	12	10	1878	—16·6	....	......	+2·1	+2·7
19	Cape Mendocino, Cal.	1783(?)	6	37	1886 (?)	—17·7	....	......	+0·6	.....
20	San Francisco, Cal.	1783(?)	33	10	....	......	1898	—16·7	—0·1	+0·1
21	Monterey, Cal.	1783(?)	13	19	....	......	1899	—16·1	—0·3	0·0
22	Santa Barbara, Cal.	1714	6	24	1880	—14·5	....	......	+1·1	+1·5
23	San Diego, Cal.	1714	12	23	1875	—13·3	....	......	+1·3	+1·6
24	El Paso, Tex.	1852	8	10	1867	—12·4	....	......	+2·7	+3·1
25	Cerros Island, Low. C., Mex.	1714	7	20	1866	—12·0	....	......	+2·5	+2·9
26	Ascension Isd., Low. C., Mex.	1783	5	13	1872	—11·3	....	......	+1·4	+1·7
27	Magdalena Bay, Low. C., Mex.	1714	8	31	1875	—10·5	....	......	+1·9	+2·2
28	San Lucas, Low. C., Mex.	1709	8	32	1872	— 9·6	....	......	+2·1	+2·5
29	San Blas, Mexico.	1630(?)	12	37	1857	— 9·4	....	......	+3·6	+3·9
30	Mexico City, Mexico.	1769	15	13	1848	— 8·6	....	......	+2·5	+2·7
31	Vera Cruz, Mexico.	1727	9	22	1832	— 9·1	....	......	+4·3	+4·4
32	Acapulco, Mexico.	1744	10	±20	1846	— 8·9	....	......	+3·5	+3·8

* The formula gives $a = +3'$; direct observation about $+7'$, provisionally $+5'$ may be adopted for the present.
† The formula gives $a = +10'$, but $+3'$ may be better.
‡ The formula gives $a = +7'$, but $+4'$ may be better.

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ.

[A + sign indicates west, a — sign east declination.]

GROUP I.—EASTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS.

Year (Jan. 1).	St. John's, Newfoundland.	Quebec, Canada.	Charlottetown, Pr. Edw. Id.	Montreal, Canada.	Eastport, Me.	Bangor, Me.	Halifax, N. S.	Burlington, Vt.	Hanover, N. H.	Portland, Me.	Rutland, Vt.	Portsmouth, N. H.
	°	°	°	°	°	°	°	°	°	°	°	°
1600					+19		+18					
10					19		17					
20					19		16·5					
30					18·5		15·5					
40		+17			18		15					
1650		17			17·5		14					
60	+16	17			17		13·5					
70	15	17·5			16		13					
80	14	17·5			15		12·5					
90	14	17			14·5		12					
1700	13·5	16·5		+15·5	13·7		12			+12		
10	13·5	15·5		15	13·0		11·5			11·4		
20	14	14·3		14	12·3		11·5			10·6		
30	14·5	13·3		13	11·9		12			9·9		
40	15·5	12·5		11·7	11·6		12			9·3		
1750	16·5	12·1		10·7	11·4		12·5			8·8		
60	18	12·1		9·7	11·4		13·0		+ 6·6	8·41		
70	19·5	12·2		8·8	11·6		13·7		6·1	8·18		+ 7·8
80	21	12·2		8·1	12·0		14·4		5·7	8·12	+ 6·8	7·6
90	23	12·2		7·7	12·6		15·1	+ 7·1	5·6	8·23	6·5	7·5
1800	24·5	12.1		7·5	13·2,	+10·8	15·9	7·2	5·7	8·50	6·36	7·6
10	26	12.1		7·6	14·0	11·4	16·7	7·4	6·1	8·92	6·44	7·9
20	27·5	12·3		8·0	14·8	12·1	17·4	7·78	6·6	9·46	6·71	8·3
30	28·7	12·9	+20	8·7	15·6	12·9	18·2	8·29	7·3	10·10	7·18	8·9
40	29·7	13·8	21·2	9·5	16·4	13·7	18·9	8·90	8·1	10·82	7·80	9·55
1850	30·4	14·9	22·1	10·5	17·1	14·48	19·4	9·58	9·0	11·56	8·55	10·28
55	30·6	15·5	22·4	11·0	17·5	14·87	19·7	9·93	9·45	11·92	8·96	10·66
60	30·8	16·0	22·7	11·6	17·79	15·24	19·9	10·27	9·90	12·29	9·38	11·03
65	30·9	16·5	22·9	12·1	18·08	15·59	20·1	10·62	10·36	12·64	9·80	11·40
70	30·9	16·9	23·1	12·6	18·32	15·92	20·3	10·96	10·79	12·97	10·22	11·75
1875	30·8	17·2	23·2	13·2	18·53	16·22	20·5	11·28	11·20	13·29	10·64	12·09
80	30·6	17·4	23·2	13·7	18·71	16·48	20·6	11·58	11·59	13·58	11·05	12·40
85	30·4	17·5	23·2	14·2	18·84	16·71	20·7	11·86	11·94	13·85	11·44	12·69
90	30·1	17·5	23·1	14·6	18·92	16·89	20·7	12·11	12·26	14·08	11·80	12·94
95	29·7	17·5	22·9	15·0	18·97	17·03	20·7	12·33	12·53	14·27	12·13	13·16
1900	+29·3	+17·5	+22·7	+15·4	+19·0	+17·1	+20·7	+12·5	+12·8	+14·4	+12·4	+13·3

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP I.—EASTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Chesterfield, N. H.	Newburyport, Mass.	Williamstown, Mass.	Albany, N. Y.	Salem, Mass.	Oxford, N. Y.	Cambridge, Mass.	Boston, Mass.	Provincetown, Mass.	Providence, R. I.	Hartford, Conn.	New Haven, Conn.
	°	°	°	°	°	°	°	°	°	°	°	°
1600				+10.5								
10				11								
20				11.5					+13			
30				12					13			
40				12					13			
1650				12					12.8			
60				12					12.4			
70				11.7					12.0			
80				11.3					11.4		10.2	
90				10.8					10.7		9.9	
1700				10.2			+10.3	+10.3	10.0		9.6	
10				9.5			9.6	9.6	9.3	+10.1	+9.3	
20				8.8			9.0	8.9	8.6	9.5	8.7	
30				8.1			8.4	8.3	7.9	8.7	8.0	
40				7.4			7.85	7.7	7.4	7.9	7.3	
1750		+8.0	+7.5	6.8	+7.8		7.41	7.3	7.0	7.2	6.6	+6.5
60		7.5	6.8	6.2	7.1		7.09	6.9	6.7	6.6	6.1	5.9
70		7.2	6.3	5.8	6.6		6.91	6.7	6.6	6.35	5.6	5.40
80		7.07	5.9	5.6	6.2		6.88	6.6	6.6	6.27	5.3	5.01
90		7.07	5.7	5.4	6.1	+3.0	6.99	6.73	6.8	6.22	5.1	4.77
1800		7.26	5.7	5.5	6.3	3.0	7.24	6.97	7.2	6.23	5.1	4.69
10	+5.9	7.60	5.9	5.67	6.6	3.1	7.63	7.35	7.7	6.47	5.3	4.78
20	6.2	8.07	6.3	6.02	7.2	3.4	8.12	7.84	8.2	6.95	5.58	5.04
30	6.98	8.65	6.8	6.49	7.9	3.9	8.70	8.42	8.92	7.67	6.02	5.44
40	7.97	9.31	7.4	7.07	8.7	4.46	9.32	9.06	9.63	8.49	6.59	5.97
1850	8.60	10.02	8.1	7.73	9.6	5.14	9.97	9.73	10.36	9.06	7.24	6.59
55	8.86	10.37	8.5	8.08	10.1	5.51	10.29	10.06	10.71	9.38	7.58	6.92
60	9.16	10.72	8.8	8.44	10.6	5.89	10.60	10.38	11.05	9.67	7.93	7.28
65	9.59	11.06	9.2	8.80	11.0	6.26	10.90	10.70	11.37	9.95	8.27	7.63
70	10.09	11.39	9.6	9.17	11.5	6.65	11.18	10.99	11.67	10.23	8.62	7.99
1875	10.59	11.70	10.0	9.52	11.9	7.02	11.44	11.27	11.95	10.53	8.97	8.34
80	11.01	11.99	10.3	9.87	12.30	7.38	11.68	11.53	12.20	10.85	9.29	8.69
85	11.27	12.25	10.6	10.21	12.65	7.72	11.90	11.76	12.42	11.17	9.60	9.01
90	11.38	12.48	10.9	10.52	12.97	8.05	12.08	11.96	12.60	11.48	9.89	9.33
95	11.44	12.7	11.2	10.82	13.2	8.35	12.23	12.1	12.75	11.75	10.2	9.62
1900	+11.5	+12.8	+11.4	+11.1	+13.5	+8.6	+12.4	+12.3	+12.9	+12.0	+10.4	+9.9

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP I.—EASTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Nantucket, Mass.	Cold Spring Harbor, N. Y.	New York City and vicinity (N.Y. and N.J.).	South Bethlehem, Pa.	Huntingdon, Pa.	New Brunswick, N. J.	Jamesburg, N. J.	Harrisburg, Pa.	Hatboro, Pa.	Philadelphia, Pa.	Chambersburg, Pa.	West Creek, N. J.
	°	°	°	°	°	°	°	°	°	°	°	°
1600			+8									
10			8.5									
20			9									
30			9.5									
40			9.6									
1650			9.7									
60			9.7									
70			9.7									
80		1681 = 9° 16'	9.6						+8.3			+8.3
90			9.1						8.2			8.2
1700	+ 9.1		8.5						7.9	+8.2		8.0
10	8.4		7.8						7.5	7.8		7.6
20	7.8		7.30						7.0	7.4		7.0
30	7.3		6.83						6.4	6.8	+4.45	6.4
40	6.8	+6.3	6.29	+6.1					5.7	6.2	3.83	5.66
1750	6.5	5.8	5.64	5.3	+3.9		+4.7		4.8	5.3	3.18	4.94
60	6.3	5.35	5.01	4.5	3.2		4.5		3.9	4.4	2.45	4.24
70	6.2	5.00	4.56	3.8	2.5		3.93		3.1	3.6	1.64	3.65
80	6.23	4.77	4.38	3.2	1.8		3.49		2.4	2.8	0.82	3.18
90	6.42	4.67	4.39	2.7	1.33	+2.3	3.21	+0.2	2.0	2.3	+0.12	2.86
1800	6.74	4.72	4.42	2.4	0.99	2.54	3.09	0.2	1.8	2.09	—0.35	2.73
10	7.17	4.90	4.46	2.2	0.84	2.93	3.15	0.4	2.0	2.16	—0.48	2.78
20	7.69	5.21	4.61	2.3	0.88	3.43	3.38	0.8	2.5	2.44	—0.28	3.01
30	8.29	5.63	4.98	2.5	1.11	4.02	3.77	1.4	3.0	2.91	+0.17	3.42
40	8.93	6.13	5.61	3.0	1.52	4.66	4.28	2.1	3.7	3.46	0.75	3.97
1850	9.57	6.69	6.31	3.53	2.07	5.32	4.91	2.90	4.3	4.07	1.38	4.62
55	9.89	6.99	6.62	3.86	2.40	5.66	5.25	3.31	4.6	4.39	1.70	4.97
60	10.21	7.28	6.91	4.22	2.74	5.98	5.60	3.70	5.0	4.73	2.02	5.34
65	10.51	7.58	7.16	4.59	3.10	6.29	5.96	4.09	5.3	5.08	2.35	5.70
70	10.79	7.87	7.40	4.98	3.48	6.59	6.32	4.46	5.7	5.44	2.70	6.06
1875	11.06	8.15	7.64	5.36	3.85	6.87	6.67	4.81	6.2	5.81	3.06	6.41
80	11.31	8.41	7.90	5.75	4.23	7.12	7.01	5.12	6.7	6.20	3.44	6.76
85	11.53	8.66	8.18	6.12	4.60	7.35	7.35	5.40	7.1	6.59	3.84	7.06
90	11.72	8.89	8.49	6.49	4.95	7.55	7.65	5.64	7.6	6.97	4.25	7.35
95	11.89	9.10	8.8	6.83	5.3	7.7	7.94	5.83	7.9	7.4[illegible]	4.65	7.6
1900	+12.03	+9.3	+9.1	+7.2	+5.6	+7.9	+8.2	+6.0	+8.0	+7.7	+5.03	+7.8

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP I.—EASTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Baltimore, Md.	Cape May, N. J.	Washington, D. C.	Cape Henlopen, Del.	Williamsburg, Va.	Cape Henry, Va.	Newbern, N. C.	Milledgeville, Ga.	Charleston, S. C.	Savannah, Ga.	Fernandina, Fla.
	°	°	°	°	°	°	°	°	°	°	°
1600											
10											
20											
30											
40	+5										
1650	5.5										
60	6										
70	6										
80	6.1										
90	5.9			+7	+4.7						
1700	5.5	+6		6.4	4.6	+4.6			0.c		
10	5.1	5.9		5.8	4.4	4.3			—0.5		
20	4.5	5.5		5.2	4.0	3.9			1.2		
30	3.9	4.9		4.4	3.5	3.4			1.8		
40	3.2	4.3		3.7	2.9	2.9			2.5		
1750	2.55	3.8	+1.7	2.9	2.3	2.3	—0.6	—2	3.1	—2.1	
00	1.95	3.2	1.1	2.3	1.65	1.8	1.1	2.5	3.7	2.7	
70	1.43	2.7	0.6	1.7	1.05	1.2	1.6	3	4.1	3.3	
80	1.03	2.3	+0.2	1.2	0.52	0.8	1.9	4	4.4	3.8	
90	0.77	2.1	0.0	0.9	+0.10	0.45	2.1	4.5	4.55	4.2	
1800	0.66	1.9	—0.1	0.8	—0.17	0.24	2.1	5.0	4.55	4.5	
10	0.72	1.9	0.0	0.9	—0.28	0.17	1.96	5.3	4.37	4.7	
20	0.93	2.1	+0.2	1.1	—0.22	0.25	1.66	5.6	4.05	4.7	
30	1.29	2.35	0.65	1.5	+0.01	0.47	1.23	5.63	3.59	4.5	
40	1.77	2.75	1.17	2.00	0.38	0.82	0.70	5.55	3.03	4.2	—5
1850	2.35	3.23	1.77	2.64	0.88	1.27	—0.09	5.33	2.39	3.78	4.5
55	2.67	3.50	2.10	2.99	1.16	1.53	+0.22	5.17	2.06	3.53	4.2
60	2.99	3.78	2.43	3.36	1.47	1.80	0.54	4.98	1.73	3.25	3.8
65	3.32	4.07	2.77	3.73	1.78	2.08	0.86	4.76	1.39	2.96	3.5
70	3.65	4.37	3.10	4.11	2.10	2.37	1.17	4.51	1.07	2.65	3.2
1875	3.98	4.66	3.42	4.49	2.43	2.66	1.46	4.24	0.75	2.33	2.9
80	4.30	4.94	3.72	4.86	2.75	2.94	1.74	3.96	0.45	2.01	2.5
85	4.60	5.22	4.01	5.22	3.06	3.22	2.01	3.66	—0.17	1.69	2.2
90	4.89	5.48	4.28	5.56	3.35	3.48	2.25	3.4	+0.09	1.37	1.9
95	5.15	5.73	4.51	5.9	3.6	3.7	2.4	3.0	+0.32	1.06	1.6
1900	+5.4	+6.0	+4.7	+6.2	+3.9	+4.0	+2.6	—2.7	+0.5	—0.8	—1.2

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP II.—CENTRAL SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS.

Year (Jan. 1).	York Factory, Brit. North Am.	Fort Albany, Brit. North Am.	Duluth, Minn.	Sault de Ste. Marie, Mich.	Pierrepont Manor, N. Y.	Toronto, Canada.	Grand Haven, Mich.	Milwaukee, Wis.	Buffalo, N. Y.	Ithaca, N. Y.	Dunkirk, N. Y.	Detroit, Mich.	Kalamazoo, Mich.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1650													
60		+19.5											
70		20.5								+10			
80		21.5								10			
90		22.5								10			
1700		22.5								10			
10		22.5								10			
20	+21	22.5								9			
30	20	22								9			
40	17	21								8			
1750	15	20								7			
60	12	19								6			
70	9	17.5								5			
80	6	16								4.5			
90	3	15		0.0					+0.44	4	—0.5		
1800	+ 0.1	13.5		—0.5					0.22	3.3	—0.55	—3.1	
10	— 2.5	12		0.9					0.21	2.9	—0.46	3.06	
20	4.7	11		1.1	+2.6		—5.0		0.41	2.7	—0.21	2.84	—5.72
30	6.5	10		1.16	3.05	+0.8	5.2		0.79	2.8	+0.20	2.49	5.84
40	7.8	9		1.04	3.72	1.32	5.2		1.35	3.1	0.73	2.04	5.71
1850	8.5	9	— 9.8	0.76	4.52	1.60	4.95	—7.4	2.05	3.5	1.36	1.55	5.33
55	8.6	9	9.9	0.57	4.96	1.85	4.74	7.2	2.43	3.8	1.70	1.22	5.06
60	8.6	8.8	10.02	0.34	5.41	2.17	4.45	6.9	2.84	4.1	2.05	0.93	4.74
65	8.5	8.9	10.08	—0.07	5.87	2.39	4.11	6.6	3.25	4.5	2.40	0.64	4.37
70	8.2	9.1	10.11	+0.21	6.33	2.66	3.71	6.2	3.67	4.88	2.75	0.34	3.96
1875	7.7	9.3	10.10	0.52	6.79	3.14	3.25	5.8	4.09	5.29	3.10	—0.05	3.52
80	7.2	9.6	10.06	0.84	7.23	3.62	2.73	5.4	4.51	5.71	3.43	+0.23	3.04
85	6.4	9.9	9.98	1.18	7.65	3.88	2.15	5.0	4.91	6.14	3.75	0.49	2.55
90	5.6	10.3	9.9	1.52	8.0	4.12	1.6	4.5	5.30	6.58	4.05	0.74	2.04
95	4.6	11	9.7	1.9	8.4	4.50	—1	4.1	5.66	7.0	4.32	0.96	1.53
1900	— 3.6	+11.5	— 9.5	+2.2	+8.8	+4.8	....	—3.6	+6.0	+ 7.5	+ 4.6	+1.2	—1.0

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP II.—CENTRAL SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Ypsilanti, Mich.	Erie, Pa.	Chicago, Ill.	Michigan City, Ind.	Cleveland, Ohio.	Omaha, Nebr.	Beaver, Pa.	Pittsburg, Pa.	Denver, Colo.	Marietta, Ohio.	Athens, Ohio.	Cincinnati, Ohio.	St. Louis, Mo.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1650													
60													
70													
80													
90													
1700													
10													
20													
30													
40													
1750													
60													
70													
80		+0.2					−0.4						
90		−0.2			−1.7		0.85				−4.0		
1800		0.46			1.76		1.15				4.1	−4.9	
10	−4.0	0.52			1.66	−12.6	1.30			−2.9	4.1	5.0	
20	3.60	0.39	−6.12		1.43	12.64	1.28			2.8	3.9	5.0	
30	3.01	−0.09	6.28	−5.5	1.10	12.56	1.11			2.7	3.60	4.82	−8.9
40	2.29	+0.36	6.25	5.4	0.66	12.33	0.78	+0.18		2.33	3.15	4.51	8.6
1850	1.49	0.94	6.04	5.1	−0.16	11.96	0.32	0.68		1.86	2.61	4.08	8.2
55	1.07	1.26	5.88	4.9	+0.11	11.73	−0.06	0.96		1.57	2.31	3.83	8.0
60	0.65	1.60	5.67	4.6	0.39	11.47	+0.23	1.26	−15.14	1.27	2.00	3.57	7.7
65	−0.24	1.94	5.45	4.3	0.67	11.19	0.54	1.56	15.02	0.94	1.68	3.28	7.4
70	+0.18	2.30	5.15	4.03	0.96	10.89	0.86	1.87	14.88	0.60	1.36	2.99	7.1
1875	0.59	2.65	4.84	3.69	1.25	10.56	1.19	2.18	14.71	−0.26	1.04	2.69	6.7
80	0.96	2.99	4.52	3.34	1.52	10.23	1.52	2.49	14.52	+0.10	0.73	2.39	6.4
85	1.32	3.32	4.17	2.97	1.79	9.89	1.85	2.78	14.30	0.45	0.43	2.09	6.0
90	1.65	3.62	3.81	2.59	2.05	9.56	2.18	3.06	14.06	0.79	−0.14	1.80	5.6
95	1.95	3.9	3.45	2.21	2.29	9.2	2.49	3.3	−13.8	1.1	+0.12	1.5	5.3
1900	+2.2	+4.2	−3.1	−1.8	+2.5	−8.9	+2.8	+3.5	....	+1.4	+0.4	−1.3	−5

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP II.—CENTRAL SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Nashville, Tenn.	Florence, Ala.	Mobile, Ala.	Pensacola, Fla.	Austin, Tex.	New Orleans, La.	San Antonio, Tex.	Galveston, Tex.	Key West, Fla.	Habana, Cuba.	Kingston, Jamaica.	Bridgetown, Barbados.	Panama, New Granada.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1650													
60													
70													
80													
90													
1700						—2.3							
10						2.2							
20						2.4				—4	—4.9		
30						2.7				4.5	5.3		
40						3.1				5	5.6		
1750						3.7				5.5	5.9	—4.5	
60				—4.2		4.4				5.8	6.1	4.3	
70				4.9		5.1				6.1	6.2	4.1	—7.7
80				5.6		5.8				6.3	6.2	3.8	7.8
90				6.2		6.5				6.5	6.1	3.4	7.9
1800			—5.8	6.8		7.12			—7.2	6.5	6.0	3.0	7.9
10		—6.5	6.37	7.17		7.62			7.1	6.5	5.8	2.5	7.8
20	—6.7	6.58	6.78	7.42		7.96	— 9.8		6.86	6.3	5.5	2.1	7.6
30	6.9	6.54	7.03	7.50	—11	8.15	10.1		6.50	6.08	5.1	1.6	7.35
40	6.9	6.37	7.10	7.40	10.7	8.16	10.28	—8.8	6.03	5.77	4.7	1.1	7.05
1850	6.7	6.11	6.99	7.14	10.2	8.00	10.31	8.9	5.47	5.39	4.3	0.7	6.69
55	6.5	5.93	6.89	6.95	9.97	7.85	10.26	8.87	5.17	5.18	4.0	0.5	6.50
60	6.3	5.74	6.71	6.73	9.74	7.66	10.17	8.80	4.85	4.95	3.8	0.3	6.30
65	6.1	5.53	6.51	6.47	9.50	7.44	10.04	8.69	4.53	4.72	3.6	—0.1	6.09
70	5.78	5.30	6.27	6.19	9.27	7.18	9.87	8.55	4.21	4.48	3.3	+0.1	5.88
1875	5.46	5.06	6.01	5.88	9.03	6.90	9.67	8.37	3.88	4.23	3.1	0.2	5.67
80	5.13	4.81	5.71	5.55	8.80	6.59	9.44	8.16	3.57	3.97	2.9	0.4	5.46
85	4.78	4.55	5.39	5.21	8.57	6.26	9.18	7.91	3.26	3.72	2.7	0.5	5.25
90	4.40	4.28	5.05	4.85	8.34	5.91	8.90	7.62	2.96	3.46	2.5	0.6	5.0
95	4.0	4.02	4.69	4.50	8.1	5.56	8.59	7.29	2.7	3.21	2.3	0.7	4.8
1900	—3.6	—3.8	—4.3	—4.14	— 7.9	—5.20	— 8.3	—6.9	—2.4	—3.0	—2.1	+0.8	—4.6

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP III.—WESTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS.

Year (Jan. 1).	Chamisso Island, Kotzebue Sound, Alaska.	Port Clarence, Alaska.	Port Etches, Constantine Harbor, Alaska.	Port Mulgrave, Yakutat Bay, Alaska.	St. Paul, Kadiak Island, Alaska.	Sitka, Alaska.	Iliuliuk, Unalaska Island, Alaska.	Petropavlovok, Kamchatka.	Nootka, Vancouver, Island.	Cape Flattery and Neah Bay, Wash.	Port Townsend, Wash.
	°	°	°	°	°	°	°	°	°	°	°
1630											
40											
1650											
60											
70											
80											
90											
1700											
10											
20	—32	—28						—8.5			
30	32.6	29						8.5			
40	33.3	29.6						8.5			
1750	33.7	30.1						8.3			
60	34.1	30.4						8.1			
70	34.2	30.5	—22	—24	—22.2	—24.4		7.7	—18.6		
80	34.2	30.4	24	25	23.4	25.1	—18.4	7.2	18.8	—17.4	—16.8
90	34.0	30.2	26	26.4	24.5	25.7	18.9	6.7	19.2	17.9	17.42
1800	33.5	29.8	27.8	27.7	25.5	26.4	19.27	6.1	19.6	18.5	18.06
10	33.0	29.1	29.2	28.9	26.4	27.0	19.59	5.4	20.1	19.1	18.73
20	32.3	28.4	30.3	29.9	27.0	27.6	19.80	4.7	20.7	19.7	19.40
30	31.5	27.6	31.1	30.7	27.3	28.0	19.90	3.9	21.3	20.4	20.06
40	30.6	26.7	31.5	31.2	27.4	28.5	19.89	3.2	21.9	21.0	20.67
1850	29.7	25.7	31.5	31.4	27.2	29.1	19.76	2.4	22.5	21.60	21.22
55	29.2	25.3	31.3	31.5	26.9	29.1	19.65	2.1	22.8	21.88	21.48
60	28.8	24.8	31.0	31.4	26.6	29.0	19.52	1.7	23.1	22.12	21.71
65	28.4	24.4	30.7	31.3	26.3	29.0	19.37	1.3	23.3	22.35	21.91
70	27.9	24.0	30.3	31.2	25.9	29.1	19.19	1.0	23.5	22.56	22.10
1875	27.5	23.6	29.8	30.9	25.5	29.1	18.99	0.7	23.6	22.75	22.26
80	27.2	23.2	29.1	30.6	25.0	29.2	18.78	0.4	23.8	22.90	22.40
85	26.8	22.9	28.5	30.2	24.4	29.3	18.55	—0.1	23.9	23.04	22.50
90	—26	22.6	28	—30	23.9	29.4	18.31	+0.2	24.0	23.14	22.58
95	....	—22	—27	....	—23.2	29.4	18.1	+0.5	—24.0	23.21	22.63
1900	....	....	....	....	....	—29.4	—17.8	+0.7	....	—23.3	—22.7

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued

[A + sign indicates west, a — sign east declination.]

GROUP III.—WESTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	Seattle, Wash.	Olympia, Wash.	Cape Disappointment, Wash.	Wallawalla, Wash.	Vancouver, Wash.	Portland, Oreg.	Salt Lake City, Utah.	Cape Mendocino, Cal.	San Francisco, Cal.	Monterey, Cal.	Santa Barbara, Cal.
	°	°	°	°	°	°	°	°	°	°	°
1630											
40											
1650											
60											
70											
80											
90											
1700											
10											—8
20											8.2
30											8.3
40											8.5
1750											8.9
60											9.3
70											9.8
80	—18.5	—16.5	—17.1		—14.7	—16		—14	—12.6	—11.4	10.4
90	19	17.0	17.3		15.3	16		14.5	13.1	11.8	11.0
1800	19.5	17.6	17.7		16.1	16.7		15	13.6	12.3	11.6
10	20	18.2	18.2		16.9	17.3		15.5	14.1	12.9	12.3
20	20.5	18.8	18.7		17.7	18.0		16	14.6	13.4	12.9
30	20.9	19.4	19.2		18.5	18.8		16.5	15.01	13.93	13.43
40	21.3	20.1	19.8		19.3	19.5		16.9	15.43	14.45	13.90
1850	21.7	20.65	20.31	—20.3	19.98	20.3	—15.8	17.2	15.80	14.91	14.30
55	21.85	20.91	20.56	20.6	20.28	20.6	16.08	17.3	15.96	15.13	14.46
60	21.96	21.17	20.80	20.8	20.57	21.0	16.27	17.4	16.11	15.32	14.60
65	22.11	21.41	21.02	21.0	20.81	21.3	16.43	17.5	16.25	15.49	14.70
70	22.22	21.63	21.22	21.2	21.02	21.5	16.54	17.6	16.36	15.65	14.78
1875	22.31	21.83	21.40	21.3	21.19	21.8	16.60	17.6	16.50	15.78	14.82
80	22.39	22.01	21.56	21.3	21.32	22.0	16.61	17.7	16.57	15.89	14.84
85	22.44	22.16	21.69	21.3	21.41	22.2	16.56	17.7	16.56	15.98	14.82
90	22.48	22.29	21.79	21.2	21.45	22.3	16.46	17.7	16.64	16.04	14.8
95	22.49	22.39	21.87	—21.1	21.5	22.4	16.31	—17.7	16.73	16.1	14.7
1900	—22.5	—22.5	—21.9	....	—21.4	—22.5	—16.1	....	—16.7	—16.1	—14.6

SYNOPSIS OF RESULTS OF THE SECULAR VARIATION OF THE MAGNETIC DECLINATION—Continued.

Decennial and quinquennial tabular values of the magnetic declination computed by preceding formulæ—Continued.

[A + sign indicates west, a — sign east declination.]

GROUP III.—WESTERN SUBDIVISION OF THE UNITED STATES AND ADJACENT PARTS—Continued.

Year (Jan. 1).	San Diego, Cal.	El Paso, Tex.	Cerros Island, Low. Cal., Mex.	Ascension Island, Low. Cal., Mex.	Magdalena Bay, Low. Cal., Mex.	San Lucas, Low. Cal., Mex.	San Blas, Mexico.	Mexico City, Mexico.	Vera Cruz, Mexico.	Acapulco, Mexico.
	°	°	°	°	°	°	°	°	°	°
1630							—4·4			
40							3·6			
1650							2·9			
60							2·2			
70							1·6			
80							1·2			
90							1·0			
1700						—2·6	0·9			
10	— 7		— 3		— 2	2·4	0·9			
20	7·3		3·3		2·2	2·3	1·2		—3·0	
30	7·5		3·7		2·3	2·3	1·6		3·7	
40	7·7		4·3		2·5	2·5	2·1		4·4	—3·3
1750	8·1		5·0		3·0	2·9	2·8		5·1	4·0
60	8·5		5·7		3·5	3·4	3·6	—5·4	5·8	4·8
70	9·0		6·5		4·2	4·0	4·4	6·0	6·6	5·6
80	9·5		7·4	— 7·7	4·9	4·6	5·3	6·6	7·2	6·3
90	10·1		8·2	8·2	5·7	5·4	6·1	7·1	7·8	7·0
1800	10·7		9·0	8·8	6·6	6·2	6·9	7·5	8·3	7·6
10	11·26		9·8	9·35	7·4	6·9	7·66	7·9	8·7	8·1
20	11·79		10·5	9·86	8·2	7·6	8·30	8·2	9·0	8·5
30	12·27		11·0	10·32	8·9	8·26	8·81	8·5	9·1	8·7
40	12·67		11·5	10·69	9·5	8·81	9·18	8·6	9·0	8·9
1850	12·99	—12·14	11·81	10·98	9·97	9·23	9·38	8·62	8·82	8·88
55	13·11	12·26	11·91	11·09	10·15	9·38	9·42	8·59	8·66	8·83
60	13·21	12·34	11·98	11·17	10·30	9·50	9·41	8·55	8·48	8·75
65	13·28	12·38	12·01	11·23	10·41	9·56	9·36	8·48	8·27	8·64
70	13·32	12·38	12·00	11·26	10·47	9·62	9·27	8·39	8·02	8·50
1875	13·34	12·32	11·95	11·26	10·50	9·61	9·14	8·26	7·75	8·33
80	13·32	12·23	11·86	11·23	10·48	9·57	8·97	8·13	7·46	8·12
85	13·28	12·10	11·74	11·18	10·42	9·49	8·76	7·96	7·14	7·89
90	13·2	11·93	11·58	11·09	10·3	9·37	8·5	7·77	6·80	7·64
95	13·1	11·72	11·4	11·0	10·2	9·2	8·2	7·66	6·4	7·36
1900	—13	—11·5	—11·2	—10·8	—10	—9	—8	—7·4	—6·1	—7·1

Collection of results of the secular variation of the magnectic dip and intensity.

RESULTS FOR SECULAR VARIATION AND ANNUAL CHANGE OF THE DIP.

[Collection of preceding expressions and deductions.]

Name of station.	Time range (between years).	Dip expressed as a function of time. (m = year — 1850·0)	Approximate annual change (1895). + increase. — decrease.	Approximate epoch. Max. dip.
GROUP I.				
St. John's, N. F.	1881–1883	....	(?)′	....
Quebec, Can.	1842–1879	....	—1·6	....
Charlottetown, Prin. Edw. Isd.	....	....	....	....
Montreal, Can.	1833–1879	$\Theta = 77^{\circ}.08 - 0.011\,1\,m - 0.000\,382\,m^2$	—2·7	1836
Eastport, Me.	1860–1895	$\Theta = 76^{\circ}.31 - 0.039\,2\,m + 0.000\,053\,m^2$	—2·1	....
Bangor, Me.	1841–1895	$\Theta = 76^{\circ}.23 - 0.005\,2\,m - 0.000\,497\,m^2$	—3·0	1845
Halifax, N. S.	1834–1881	$\Theta = 74^{\circ}.94 - 0.016\,1\,m$	—1·0	....
Burlington, Vt.	1845–1890	$\Theta = 75^{\circ}.78 - 0.019\,1\,m$	—1·2	....
Hanover, N. H.	1873–1890	....	—1·8	....
Portland, Me.	1845–1895	$\Theta = 75^{\circ}.21 + 0.001\,1\,m - 0.000\,548\,m^2$	—2·9	1850
Rutland, Vt.	1859–1890	$\Theta = 75^{\circ}.70 - 0.031\,0\,m$	—1·8	....
Portsmouth, N. H.	1850–1890	$\Theta = 75^{\circ}.12 - 0.024\,0\,m$	—1·4	....
Chesterfield, N. H.	1874–1890	....	—1·9	....
Newburyport, Mass.	1850–1887	....	—1·9	....
Williamstown, Mass.	1876	....	....	....
Albany, N. Y.	1833–1890	$\Theta = 74^{\circ}.91 + 0.003\,7\,m - 0.000\,653\,m$	—3·3	1853
Salem, Mass.	1855–1887	....	—2·3	....
Oxford, N. Y.	1874–1885	....	—1·8	....
Cambridge, Mass.	1780–1895	$\Theta = 71^{\circ}.22 + 3^{\circ}.28 \sin (1.5\,m + 76^{\circ}.3)$	—4·2	1858
Boston, Mass.	1722–1890	$\Theta = 71^{\circ}.23 + 3^{\circ}.10 \sin (1.5\,m + 79.2)$	—4·1	1857
Provincetown, Mass.	1860–1895	....	—1·9	....
Providence, R. I.	1834–1895	$\Theta = 74^{\circ}.11 - 0.001\,4\,m - 0.000\,614\,m^2$	—3·4	1851
Hartford, Conn.	1839–1890	$\Theta = 73^{\circ}.94 - 0.010\,9\,m - 0.000\,250\,m^2$	—2·0	1828
New Haven, Conn.	1839–1895	$\Theta = 73^{\circ}.55 + 0.003\,5\,m - 0.000\,642\,m^2$	—3·2	1853
Nantucket, Mass.	1843–1895	$\Theta = 73^{\circ}.80 + 0.002\,8\,m - 0.000\,633\,m^2$	—3·2	1852
Cold Spring Harbor, N. Y.	1844–1865	....	(?)	....
New York City, N. Y.	1822–1895	$\Theta = 72^{\circ}.73 - 0.009\,8\,m - 0.000\,160\,m^2$	—1·4	....
South Bethlehem, Pa.	1841–1874	....	(?)	....
Huntingdon, Pa.	1840	....	....	....
New Brunswick, N. J.	1844–1895	....	(?)	....
Jamesburg, N. J.	....	....	....	....
Harrisburg, Pa.	1840–1895	$\Theta = 72^{\circ}.48 + 0.006\,7\,m - 0.000\,563\,m^2$	—2·6	1856
Hatboro, Pa.	....	....	....	....
Philadelphia, Pa.	1834–1895	$\Theta = 72^{\circ}.13 + 0.010\,1\,m - 0.000\,743\,m^2$	—3·4	1857
Chambersburg, Pa.	1842	....	....	....
West Creek, L. Egg Hbr. N. J.	1846–1860	....	....	....
Baltimore, Md.	1834–1895	$\Theta = 71^{\circ}.74 + 0.014\,5\,m - 0.000\,752\,m^2$	—3·2	1860
Cape May, N. J.	1846–1891	....	—2·1	....
Washington, D. C.	1838–1895	$\Theta = 71^{\circ}.36 - 0.002\,27\,m - 0.000\,540\,m^2$	—3·0	1884
Cape Henlopen, Del.	1846–1885	....	1·2	....
Williamsburg, Va.	1874–1887	....	—2·4	....
Cape Henry, Va.	1856–1895	$\Theta = 70^{\circ}.04 - 0.035\,9\,m$	—2·2	....
Newbern, N. C.	1874–1887	....	—2·2	....
Milledgeville, Ga.	1887	....	....	....
Charleston, S. C.	1849–1895	$\Theta = 64^{\circ}.53 - 0.012\,1\,m$	—0·7(?)	
Savannah, Ga.	1852–1895	$\Theta = 63^{\circ}.63 + 0.021\,1\,m - 0.000\,682\,m^2$	—2·5	1865
Fernandina, Fla.	1857–1879	....	....	....
GROUP II.				
York Factory, B. N. A.	1843–1884	....	(?)	....
Fort Albany, B. N. A.	1775	....	....	....
Duluth, Minn.	1859–1891	....	(?)	....
Sault de Ste Marie, Mich.	1841–1891	$\Theta = 77^{\circ}.63 + 0.011\,68\,m - 0.000\,653\,m^2$	—2·8	1859
Pierrepont Manor, N. Y.	1874	....	....	....
Toronto, Can.	1843–1895	$\Theta = 75^{\circ}.34 + 0.008\,784\,m - 0.000\,589\,m^2$	—2·6	1858
Grand Haven, Mich.	1859–1891	$\Theta = 74^{\circ}.37 - 0.017\,8\,m$	—1·1(?)	....
Milwaukee, Wis.	1859–1888	....	(?)	....
Buffalo, N. Y.	1839–1885	$\Theta = 74^{\circ}.74 + 0.010\,1\,m - 0.000\,756\,m^2$	—3·5	1857
Ithaca, N. Y.	1874–1890	....	—1·5(?)	....
Dunkirk, N. Y.	1841	....	....	....

Collection of results of the secular variation of the magnetic dip and intensity—Continued.

RESULTS FOR SECULAR VARIATION AND ANNUAL CHANGE OF THE DIP—Continued.

Name of station.	Time range (between years).	Dip expressed as a function of time. (m = year − 1850·0)	Approximate annual change (1895). + increase. − decrease.	Approximate epoch. Max. dip.
GROUP II—continued.				
Detroit, Mich.	1839–1891	$\Theta = 73°\cdot67 + 0\cdot008\ 41\ m - 0\cdot000\ 545\ m^2$	−2·4	1858
Kalamazoo, Mich.	....	....	......	....
Ypsilanti, Mich.	1839–1841	....	......	....
Erie, Pa.	1841–1885	$\Theta = 73°\cdot89 + 0\cdot013\ 85\ m - 0\cdot000\ 786\ m^2$	−3·4	1859
Chicago, Ill.	1841–1891	$\Theta = 72°\cdot74 - 0\cdot000\ 34\ m - 0\cdot000\ 167\ m^2$	−0·9	1850
Michigan City, Ind.	1859–1891	$\Theta = 73°\cdot20 - 0\cdot019\ m$	−1·1	....
Cleveland, Ohio.	1839–1891	$\Theta = 73°\cdot26 + 0\cdot002\ 4\ m - 0\cdot000\ 372\ m^2$	−1·9	1853
Omaha, Nebr.	1869–1891	....	−0·8	1877(?(
Beaver, Pa.	1839–1874	....	......	....
Pittsburg, Pa.	1819–1885	....	......	....
Denver, Colo.	1872–1888	....	−0·3(?)	....
Marietta, Ohio.	1845	....	......	....
Athens, Ohio.	1880	....	......	....
Cincinnati, Ohio.	1838–1888	....	−0·7(?)	....
St. Louis, Mo.	1819–1886	Θ Nearly stationary since 1836	0·0	....
Nashville, Tenn.	1833–1888	....	−1·4	....
Florence, Ala.	1881–1890	....	−2·4	....
Mobile, Ala.	1834–1857	....	......	....
Pensacola, Fla.	1858–1895	....	−0·4(?)	....
Austin, Tex.	1878–1895	....	+0·4(?)	....
New Orleans, La.	1834–1895	....	0·0	....
San Antonio, Tex.	1878–1895	....	+0·2	....
Galveston, Tex.	1848–1895	....	+2·9	....
Key West, Fla.	1849–1887	$\Theta = 54°\cdot60 - 0\cdot004\ 4\ m$	−0·3	....
Habana, Cuba.	1801–1889	....	−0·8	....
Kingston, Jamaica.	1822–1857	....	......	....
Bridgetown, Barbados.	1722–1846	....	......	....
Panama, New Granada.	1790–1866	....	......	....
GROUP III.				
Chamisso Island, Alaska.	1827–1880	....	......	....
Port Clarence, Alaska.	1850–1880	....	(?)	....
Port Etches, Constantine Harbor.	1837	....	......	....
Port Mulgrave, Yakutat Bay.	1791 1892	....	−0·5(?)	....
St. Paul, Kadiak Island.	1880	....	......	....
Sitka, Alaska.	1818–1894	$\Theta = 75°\cdot67 - 0\cdot017\ 5\ m + 0\cdot000\ 064\ m^2$	−0·7	....
Iliuliuk, Unalaska Island.	1778–1891	$\Theta = 68°\cdot13 - 0\cdot017\ 9\ m - 0\cdot000\ 023\ m^2$	−1·2	....
Petropavlovsk, Kamchatka.	1779–1876	$\Theta = 64°\cdot28 + 0\cdot008\ 7\ m - 0\cdot000\ 134\ m^2$	−0·2	1882
Nootka, Vancouver Island.	1778–1881		(?)	
Cape Flattery, Wash.	1855–1881	....	0·0(?)	....
Port Townsend, Wash.	1792–1894	....	+1·0(?)	....
Seattle, Wash.	1871–1895	....	−0·3(?)	....
Olympia, Wash.	1894	....	......	....
Cape Disappointment, Wash.	1830–1895	....	0·0(?)	....
Wallawalla, Wash.	1830–1887	....	−0·8(?)	....
Vancouver, Wash.	1830–1895	....	0·0(?)	....
Portland, Oreg.	1858–1895	....	+0·7(?)	....
Salt Lake City, Utah.	1869–1893	....	0·0(?)	....
Mendocino City, Cal.	1886	....	......	....
San Francisco, Cal.	1815–1896	$\Theta = 62°\cdot24 + 0\cdot011\ 3\ m - 0\cdot000\ 168\ m^2$	−0·2	1884
Monterey, Cal.	1791–1896	$\Theta = 61°\cdot55 - 0\cdot016\ 6\ m + 0\cdot000\ 180\ m^2$	0·0	1896
Santa Barbara, Cal.	1831–1881	....	+0·6(?)	....
San Diego, Cal.	1793–1892	$\Theta = 57°\cdot51 + 0\cdot029\ 2\ m - 0\cdot000\ 452\ m^2$	−0·7(?)	....
El Paso, Tex.	1852–1895	....	+1·6	....
Cerros Island, Low. Cal.	1873–1888	....	+1·6(?)	....
Ascension Island, Low. Cal.	1881–1889	....	+1·2	....
Magdalena Bay, Low. Cal.	1837–1881	....	+0·8(?)	....
San Lucas, Low. Cal.	1839–1881	....	+2·5(?)	....
San Blas, Mex.	1791–1880	....	+2·5(?)	....
Mexico City, Mex.	1778–1895	....	......	....
Vera Cruz, Mex.	1856–1888	....	+0·5	....
Acapulco, Mex.	1791–1892	$\Theta = 39°\cdot05 + 0\cdot033\ 9\ m$	+2·0	....

The preceding table of results for the secular variation of the dip at stations in the eastern, central, and western parts of the United States exhibits, as a broad feature, over a large area, a slowly diminishing dip at the present time. This region is roughly defined by a spherical quadrilateral with angles in Nova Scotia, Cuba, Bay of Monterey, and Strait of Juan de Fuca. The average annual decrease within this area is, at 36 stations of Group I to which Key West and Habana were added 2′·2; at 16 stations of Group II but exclusive of New Orleans and other stations to the south 1′·7, and at 9 stations of Group III the motion may be said to have begun but recently, thus making it difficult to be certain of it. On the other hand, south of the line from Cuba to Monterey the dip everywhere (within our limits of research) is found to be increasing, its annual rate from 10 stations being 1′·3; this includes the area of Lower California and of Mexico as far south as Acapulco. This band of demarcation of diminishing and increasing dip in its secular change is marked on accompanying chart, as near as can be done with our imperfect data. It will be noted that already in 1885 (Appendix No. 6, Report for 1885) this feature had been made out, although based upon much less secure ground and in part conjectural; in fact, the reversal in the secular motion over the Eastern States from a previous increase to a decrease which took place about 1859 (as then made out) was the main cause of obscuration at the earlier time of investigation; nothing could be inferred as to changes in the dip at western stations. According to our table the dip reached a maximum value about the year 1851 ± 6 years in the eastern part of the United States and about the year 1859 ± 5 in the Central States. At San Francisco and Monterey the year 1890 is indicated. This later occurrence of the epoch of maximum dip as we proceed from east to west is in exact accord with the known westward sweep over the country of the secular change phases of the magnetic declination. The band of stationary dip at this time is slowly shifting its position to the southward.

RESULTS FOR SECULAR VARIATION AND ANNUAL CHANGE OF THE HORIZONTAL COMPONENT OF THE MAGNETIC FORCE.

[Collection of preceding expressions and deductions.]

Name of station.	Time range (between years).	Horizontal component H (m = year—1850·0)	Approximate annual change $\frac{a}{H}$ + increasing. — decreasing.	Approximate epoch of minimum H.
GROUP I.				
St. John's, N. F.	1881–1883	....	....	....
Quebec, Can.	1842–1879	....	+0·0018	....
Charlottetown, Pr. Edw. Isd.	....	....	....	....
Montreal, Can.	1842–1879	$H=0{\cdot}1402+0{\cdot}000\,015\,m+0{\cdot}000\,007\,3\,m^2$	+0·0043	1849
Eastport, Me.	1860–1895	$H=0{\cdot}1502+0{\cdot}000\,183\,m+0{\cdot}000\,000\,6\,m^2$	+0·0015	....
Bangor, Me.	1857–1895	$H=0{\cdot}1472+0{\cdot}000\,117\,m+0{\cdot}000\,001\,5\,m^2$	+0·0017	1812 (?)
Halifax, N. S.	1834–1881	$H=0{\cdot}1518+0{\cdot}000\,130\,m+0{\cdot}000\,002\,9\,m^2$	+0·0022	1827
Burlington, Vt.	1845–1890	$H=0{\cdot}1569+0{\cdot}000\,078\,m$	+0·0005	....
Hanover, N. H.	1873–1890	....	+0·0005	....
Portland, Me.	1845–1895	$H=0{\cdot}1585-0{\cdot}000\,017\,m+0{\cdot}000\,004\,0\,m^2$	+0·0020	1852
Rutland, Vt.	1859–1890	....	+0·0011	....
Portsmouth, N. H.	1850–1890	....	+0·0009	....
Chesterfield, N. H.	1874–1890	....	+0·0007	....
Newburyport, Mass.	1850–1887	....	+0·0007	....
Williamstown, Mass.	1876	....	....	....
Albany, N. Y.	1835–1890	$H=0{\cdot}1652+0{\cdot}000\,033\,m+0{\cdot}000\,001\,0\,m^2$	+0·0008	1834
Salem, Mass.	1849–1887	....	+0·0004	....
Oxford, N. Y.	1874–1885	....	(?)	....
Cambridge, Mass.	1842–1895	$H=0{\cdot}1661-0{\cdot}000\,090\,m+0{\cdot}000\,005\,8\,m^2$	+0·0024	1858
Boston, Mass.	1839–1890	$H=0{\cdot}1660-0{\cdot}000\,121\,m+0{\cdot}000\,007\,4\,m^2$	+0·0032	1858
Provincetown, Mass.	1860–1895	....	+0·0009	....
Providence, R. I.	1835–1895	$H=0{\cdot}1686-0{\cdot}000\,198\,m+0{\cdot}000\,009\,5\,m^2$	+0.0037	1860
Hartford, Conn.	1859–1890	....	+0·0003	....
New Haven, Conn.	1839–1895	$H=0{\cdot}1731-0{\cdot}000\,151\,m+0{\cdot}000\,008\,2\,m^2$	+0·0032	1859 !
Nantucket, Mass.	1846–1895	$H=0{\cdot}1680+0{\cdot}000\,281\,m-0{\cdot}000\,001\,2\,m^2$	+0·0010	....

RESULTS FOR SECULAR VARIATION AND ANNUAL CHANGE OF THE HORIZONTAL COMPONENT OF THE MAGNETIC FORCE—Continued.

Name of station.	Time range (between years).	Horizontal component H (m = year — 1850·0)	Approximate annual change $\frac{a}{H}$ + increasing. — decreasing.	Approximate epoch of minimum H.
GROUP I—continued.				
Cold Spring Harbor, N. Y.	1844–1865	......	......	....
New York City, N. Y.	1822–1895	$H=0{\cdot}1847+0{\cdot}000\,024\,m+0{\cdot}000\,000\,5\,m^2$	+0·0004	1826 (?)
South Bethlehem, Pa.	1841–1874	......	......	....
Huntingdon, Pa.	1840	......	......	....
New Brunswick, N. J.	1844–1895	......	+0·0003	....
Jamesburg, N. J.	......	......	......	....
Harrisburg, Pa.	1840–1895	......	+0·0005 (?)	....
Hatboro, Pa.	......	......	......	....
Philadelphia, Pa.	1835–1895	$H\ 0{\cdot}1918-0{\cdot}000\,022\,m+0{\cdot}000\,002\,0\,m^2$	+0·0008	1855
Chambersburg, Pa.	1842	......	......	....
West Creek, Lit. Egg Hbr., N. J.	1846–1860	......	......	....
Baltimore, Md.	1832–1895	$H=0{\cdot}1952-0{\cdot}000\,027\,m+0{\cdot}000\,000\,72\,m^2$	+0·0002	1869
Cape May, N. J.	1846–1891	$H=0{\cdot}1951-0{\cdot}000\,073\,m+0{\cdot}000\,004\,66\,m^2$	+0·0018	1858
Washington, D. C.	1842–1895	$H=0{\cdot}1979+0.000\,123\,m-0{\cdot}000\,000\,717\,m^2$	+0·0002	....
Cape Henlopen, Del.	1846–1885	......	+0·0000 (?)	....
Williamsburg, Va.	1874–1887	......	(?)	....
Cape Henry, Va.	1856–1895	......	+0·0014 (?)	....
Newbern, N. C.	1874–1887	......	(?)	....
Milledgeville, Ga.	1887	......	......	....
Charleston, S. C.	1833–1895	......	—0·0010 (?)	....
Savannah, Ga.	1852–1895	......	—0·0004 (?)	....
Fernandina, Fla.	1857–1879	......	......	....
GROUP II.				
York Factory, Brt. North Am.	1843–1884	......	......	....
Fort Albany, Brt. North Am.	......	......	......	....
Duluth, Minn.	1859–1891	......	—0·0003 (?)	....
Sault de Ste. Marie, Mich.	1843–1891	......	+0·0013 (?)	....
Pierrepont Manor, N. Y.	1874–1884	......	(?)	....
Toronto, Can.	1842–1895	$H\ 0{\cdot}1623-0{\cdot}000\,154\,m+0{\cdot}000\,006\,m^2$	+0·0022	1863
Grand Haven, Mich.	1859–1891	......	0·0000	....
Milwaukee, Wis.	1859–1888	......	—0·0012 (?)	....
Buffalo, N. Y.	1844–1885	$H=0{\cdot}1676-0{\cdot}000\,063\,m+0{\cdot}000\,003\,4\,m^2$	+0·0014	1859
Ithaca, N. Y.	1874–1890	......	(?)	....
Dunkirk, N. Y.	1841	......	......	....
Detroit, Mich.	1843–1891	$H=0{\cdot}1787-0{\cdot}000\,054\,m+0{\cdot}000\,002\,2\,m^2$	+0·0008	1862
Kalamazoo, Mich.	......	......	......	....
Ypsilanti, Mich.	......	......	......	....
Erie, Pa.	1841–1885	$H=0{\cdot}1743-0{\cdot}000\,018\,m+0{\cdot}000\,002\,5\,m^2$	+0·0011	1854
Chicago, Ill.	1842–1891	......	—0·0020 (?)	....
Michigan City, Ind.	1859–1891	......	—0·0007 (?)	....
Cleveland, Ohio.	1842–1891	......	(?)	....
Omaha, Nebr.	1869–1891	......	(?)	....
Beaver, Pa.	1874	......	......	....
Pittsburg, Pa.	1840–1885	$H=0{\cdot}1889+0{\cdot}000\,213\,m-0{\cdot}000\,006\,8\,m^2$	—0·0022	1865
Denver, Colo.	1873–1888	......	—0·0011	....
Marietta, Ohio.	......	......	......	....
Athens, Ohio.	1880	......	......	....
Cincinnati, Ohio.	1844–1888	......	—0·0007	....
St. Louis, Mo.	1835–1886	......	(?)	....
Nashville, Tenn.	1877–1888	......	—0·0017	....
Florence, Ala.	1881–1890	......	—0·0012	....
Mobile, Ala.	1834–1857	......	......	....
Pensacola, Fla.	1858–1895	......	—0·0015	....
Austin, Tex.	1878–1895	......	—0·0012	....
New Orleans, La.	1856–1895	$H=0{\cdot}2943-0{\cdot}000\,334\,m$	—0·0012	....
San Antonio, Tex.	1878–1895	......	—0·0009	....
Galveston, Tex.	1848–1895	$H=0{\cdot}3016-0{\cdot}000\,281\,m$	—0·0010	....
Key West, Fla.	1849–1887	......	—0·0009	....

RESULTS FOR SECULAR VARIATION AND ANNUAL CHANGE OF THE HORIZONTAL COMPONENT OF THE MAGNETIC FORCE—Continued.

Name of station.	Time range (between years.)	Horizontal component H (m = year − 1850·0)	Approximate annual change $\frac{a}{H}$ + increasing. − decreasing.	Approximate epoch of maximum. H.
GROUP II—continued.				
Habana, Cuba.	1822–1886	....	−0·0007	....
Kingston, Jamaica.	1834–1857	....	......	....
Bridgetown, Barbados.	1835–1836	....	......	....
Panama, New Granada.	1837–1866	....	−0.0006 (?)	....
GROUP III.				
Chamisso Island, Alaska.	1880	....	......	....
Port Clarence, Alaska.	1879–1880	....	......	....
Port Etches, Constantine Hbr.	1837	....	......	....
Port Mulgrave, Yakutat Bay.	1880–1892	....	+0·0005	....
St. Paul, Kadiak Island.	1880	....	......	....
Sitka, Alaska.	1839–1894	$H = 0{\cdot}1490 + 0{\cdot}000\,098\,m$	+0·0007	....
Iliuliuk, Unalaska.	1880–1891	....	+0·0009	....
Petropavlovsk, Kamchatka.	1837	....	......	....
Nootka, Vancouver Id.	1881	....	......	....
Cape Flattery, Wash.	1852–1881	....	−0·0001	....
Port Townsend, Wash.	1881–1894	....	−0·0033	....
Seattle, Wash.	1871–1894	....	−0·0006	....
Olympia, Wash.	1881–1894	....	(?)	....
Cape Disappointment, Wash.	1873–1895	....	−0·0004	....
Wallawalla, Wash.	1830–1887	....	−0·0002	....
Vancouver, Wash.	1830–1895	....	−0·0002	....
Portland, Oreg.	1880–1895	....	−0·0009	....
Salt Lake City, Utah.	1869–1893	$H = 0{\cdot}2347 - 0{\cdot}000\,134\,m$	−0·0006	....
Mendocino City, Cal.	1886	....	......	....
San Francisco, Cal.	1831–1896	$H = 0{\cdot}2568 + 0{\cdot}000\,090\,m - 0{\cdot}000\,005\,m^2$	−0·0015	1861
Monterey, Cal.	1831–1896	$H = 0{\cdot}2640 + 0{\cdot}000\,123\,m - 0{\cdot}000\,005\,m^2$	−0·0014	1862
Santa Barbara, Cal.	1831–1881	$H = 0{\cdot}2760 + 0{\cdot}000\,139\,m - 0{\cdot}000\,010\,m^2$	−0·0028	1857
San Diego, Cal.	1839–1892	$H = 0{\cdot}2870 + 0{\cdot}000\,173\,m - 0{\cdot}000\,010\,m^2$	−0·0025	1859
El Paso, Tex.	1888–1895	....	(?)	....
Cerros Id., Low. Cal.	1873–1888	....	(?)	....
Ascension Id., Low. Cal.	1881–1889	....	(?)	....
Magdalena Bay, Low. Cal.	1839–1881	....	(?)	....
San Lucas, Low. Cal.	1839–1881	....	(?)	....
San Blas, Mex.	1839–1880	....	(?)	....
Mexico City, Mex.	1857–1895	....	−0·0014	....
Vera Cruz, Mex.	1856–1880	....	−0·0008 (?)	....
Acapulco, Mex.	1838–1892	....	−0·0008	....

A glance at the preceding table of the secular change of the horizontal component of the force about the period 1895 shows an annual *increase* only for the northeastern part of the United States and for an undefined space about Sitka, Yakutat, and Unalaska, Alaska. At all other stations the value of H appears to be on the *decrease*, and this conclusion holds probably for the whole of Mexico and as far south as Panama. It would seem that the band of no annual change of H as given on the 1885 chart was placed too far south; at any rate the present investigation, with the aid of slightly better means, makes it cross Lake Erie and the coast at Cape Fear (see accompanying chart).

Within the region of present increasing H its value has lately passed through a minimum, for which epoch 12 stations indicate the year 1852; the annual change, or $a / H = +0{\cdot}0014$ is derived from 29 stations. Over the vast region to the west of the band of no change the annual change is about $-0{\cdot}0013$ (as deduced from 39 stations).

In case the annual change of the total force or of its vertical component should be desired, the change in terms of the force can readily be had from the expressions:

$$\frac{dF}{F} = \frac{dH}{H} + \tan\theta\, d\theta \quad \text{and} \quad \frac{dV}{V} = \frac{dH}{H} + \frac{d\theta}{\sin\theta\cos\theta}$$

THE SECULAR VARIATION IN THE DIRECTION OF A FREELY SUSPENDED MAGNETIC NEEDLE.

While in the former investigations of the secular variation in the direction of the magnetic force, we treated the changes in the declination and in the dip separately, there is a decided advantage in studying and representing graphically their combined effect, as already remarked in a preceding part of this paper. For this purpose, tables of decennial values of D and θ were introduced for all stations where the respective observations were sufficiently numerous and accurate and extended over a sufficient length of time to make the results available for further study or for graphical representation.

In Group I there are 23 such stations, in Group II only 10, and in Group III there are but 7 stations at which the direction of the secular motion can be more or less distinctly recognized. From these stations I have selected 18 representative ones for which the secular traces were constructed as shown on accompanying Plates B and C. The diagrams are all on the same scale, viz, one centimetre to the meridional degree and the plane of representation is that plane which is tangent at the point on the spherical surface where it is intersected by the average direction of the magnetic needle, as produced. The radius of curvature of the parallels is given by the convergence of the meridians, the length of a degree on any parallel being equal to a meridional degree times the cosine of the dip.

Notwithstanding the identity of the scale of representation the secular traces appear under several distinct aspects. All the stations of Group I (eastern part of the United States) agree in the direction of the motion, viz, from left to right or clockwise, which is supposed to be the normal direction for the whole globe, and they all have a general likeness or resemblance to our most complete trace, namely, that for Cambridge. The few stations of the central group also conform to this type with an apparent broadening of the trace, as at St. Louis and New Orleans. In the third or western group we meet with apparently abnormal traces. Thus at San Francisco, Sitka, Unalaska, and probably also at Cape Disappointment the direction of the motion is apparently inverted; whether this be a real exception to the general rule time only can reveal. Irregularities such as are exhibited at San Diego and probably also at Sitka may prepare us to admit the existence of small loops obscuring the general law of clockwise motion. At Petropavlovsk we have a type common at stations on the Eastern Continent, also in the Southern Hemisphere, which approximates more toward a circular trace; the same type may also be noted at Acapulco, Mexico, the only one of our American stations showing it well developed.

It would be rather presumptuous at this time to attempt a closer scrutiny of these secular traces. They are yet far too limited in extent and in some cases even doubtfully developed, yet they invite further research by opening new lines for investigation.

Respecting the secular variation of the total intensity (F) it is entirely too early to inquire with any advantage into the circumstances of the case, but it may be mentioned that for the Cambridge trace a maximum value of the intensity occurs within the lower apsis.

Certain results of the investigation of the secular variation laid down on the accompanying chart, already referred to, are self-explanatory. With reference to the agonic lines it may be remarked that the conjectural position for the year 1500 falls outside of the limits of the chart; the agonic for the year 1600, though ill defined, yet must have passed across Mexico or near to it, according to the preliminary isogonic charts constructed for 1580 and 1610 by W. van Bemmelen, "De Isogonen in de XVIde en XVIIde Eeuw, Utrecht, 1893," and the chart showing the isogonic lines for the epoch of the Arcano del Mare, Florence, 1646, as given in Appendix No. 6, Coast and Geodetic Survey Report for 1888; the line for the year 1700 is taken from the discussion in the preceding edition of this paper, corrected so as to pass through Charleston, S. C.,* and extended seaward according to Halley; the position for the year 1800, when the agonic line had attained its highest northeasterly position on the Atlantic Coast, is taken from the same paper. If the motion during the present century continues we may expect to see the agonic line enter Florida and possibly retrace its course across the peninsula.

COMPUTING DIVISION, *March 7, 1896.*

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*At this place the compass needle pointed due north about the years 1700 and 1888; during the interval of 188 years the declination was east, or the agonic line remained to the north of the place.

U.S. COAST AND GEODETIC SURVEY

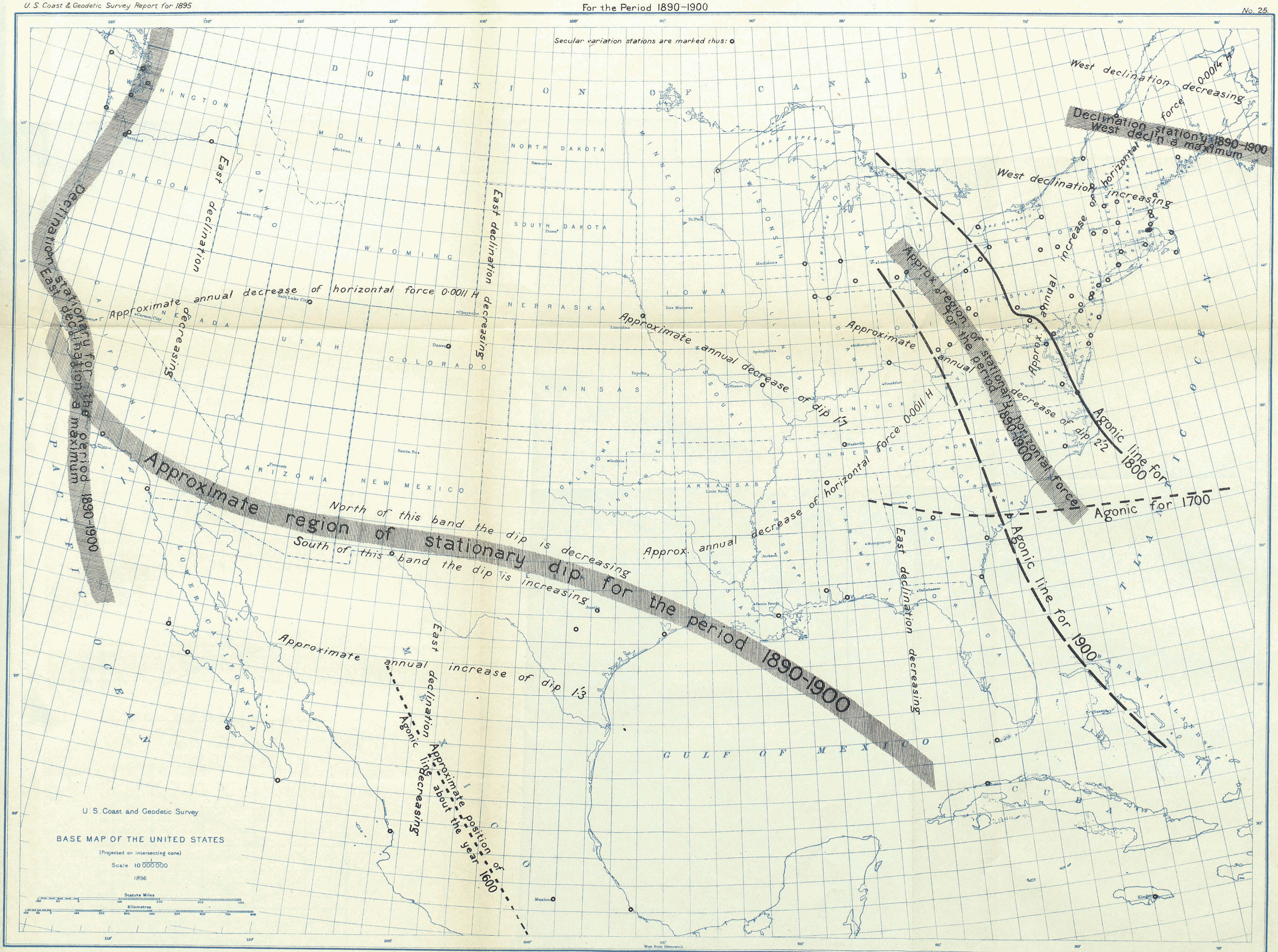
W. W. Duffield, Superintendent.

CHART ILLUSTRATING THE SECULAR VARIATION OF THE MAGNETIC DECLINATION DIP AND INTENSITY IN THE UNITED STATES

For the Period 1890-1900

U. S. Coast & Geodetic Survey Report for 1895

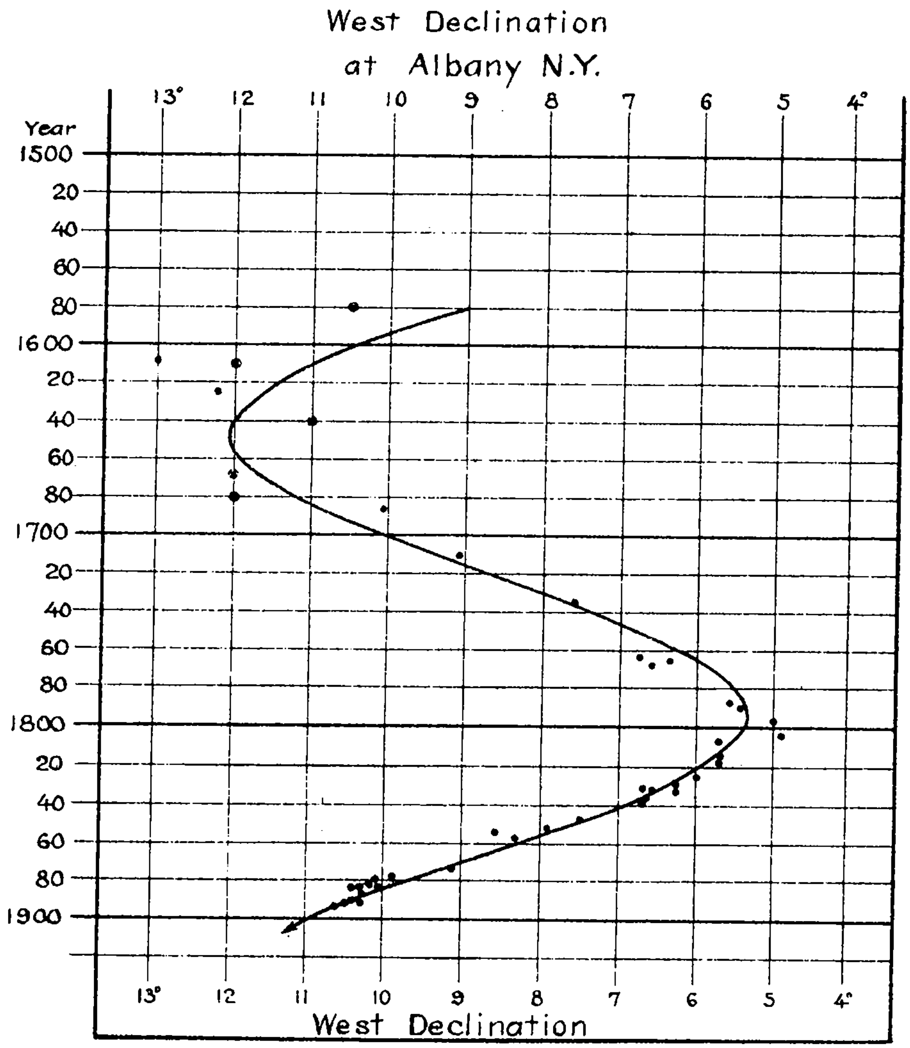
No. 25.

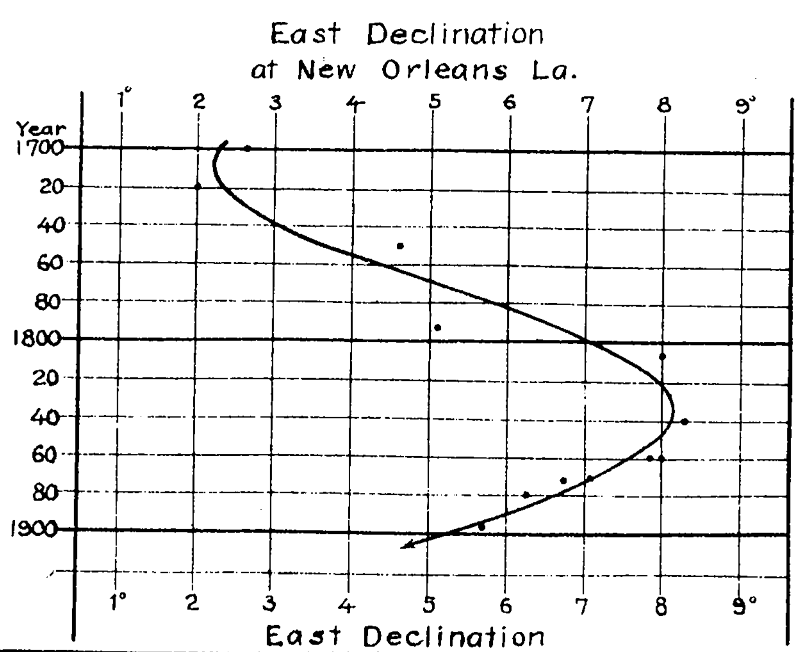


Computing Division, C. and G. S.

March, 1896

C. A. Schott, Asst.





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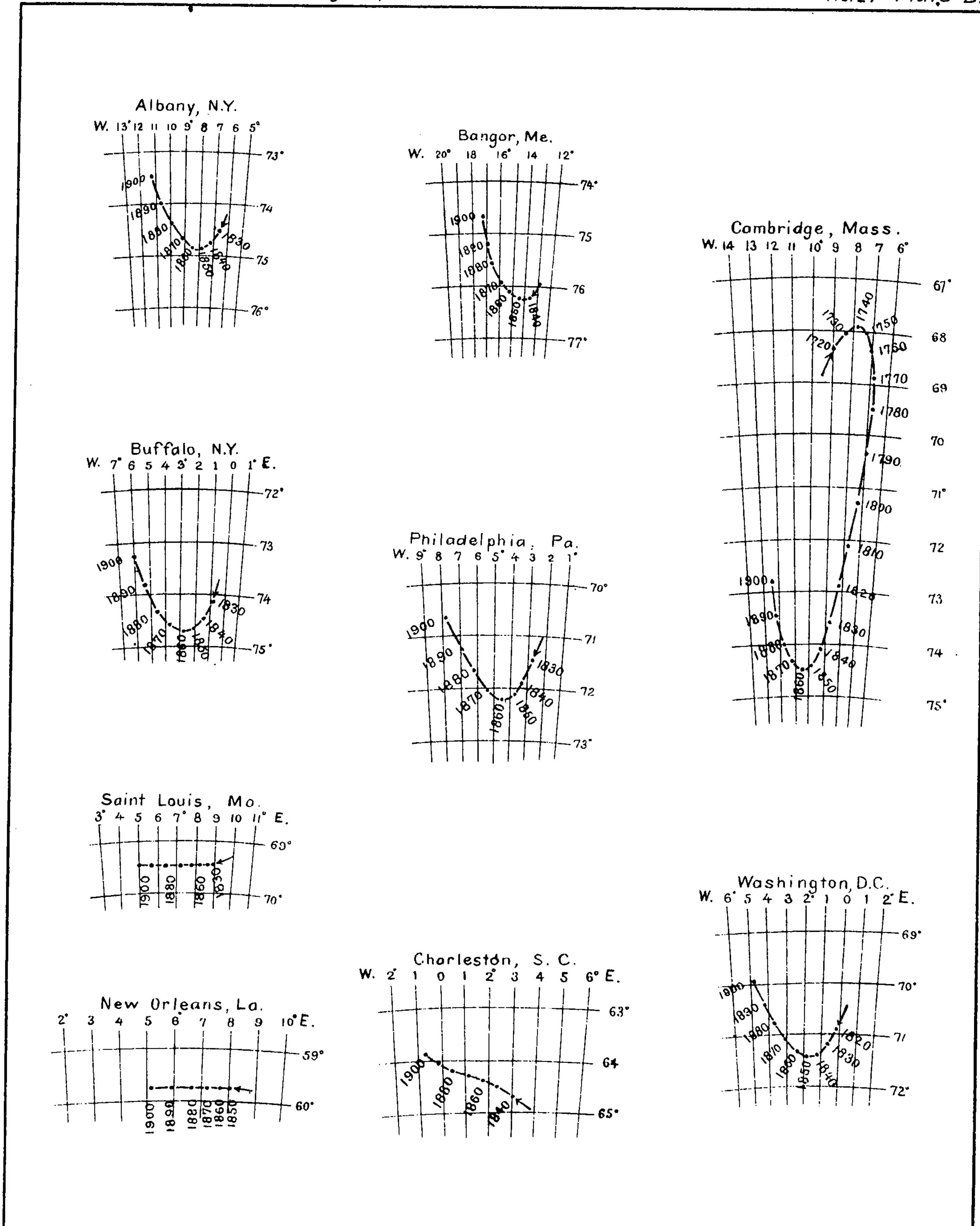

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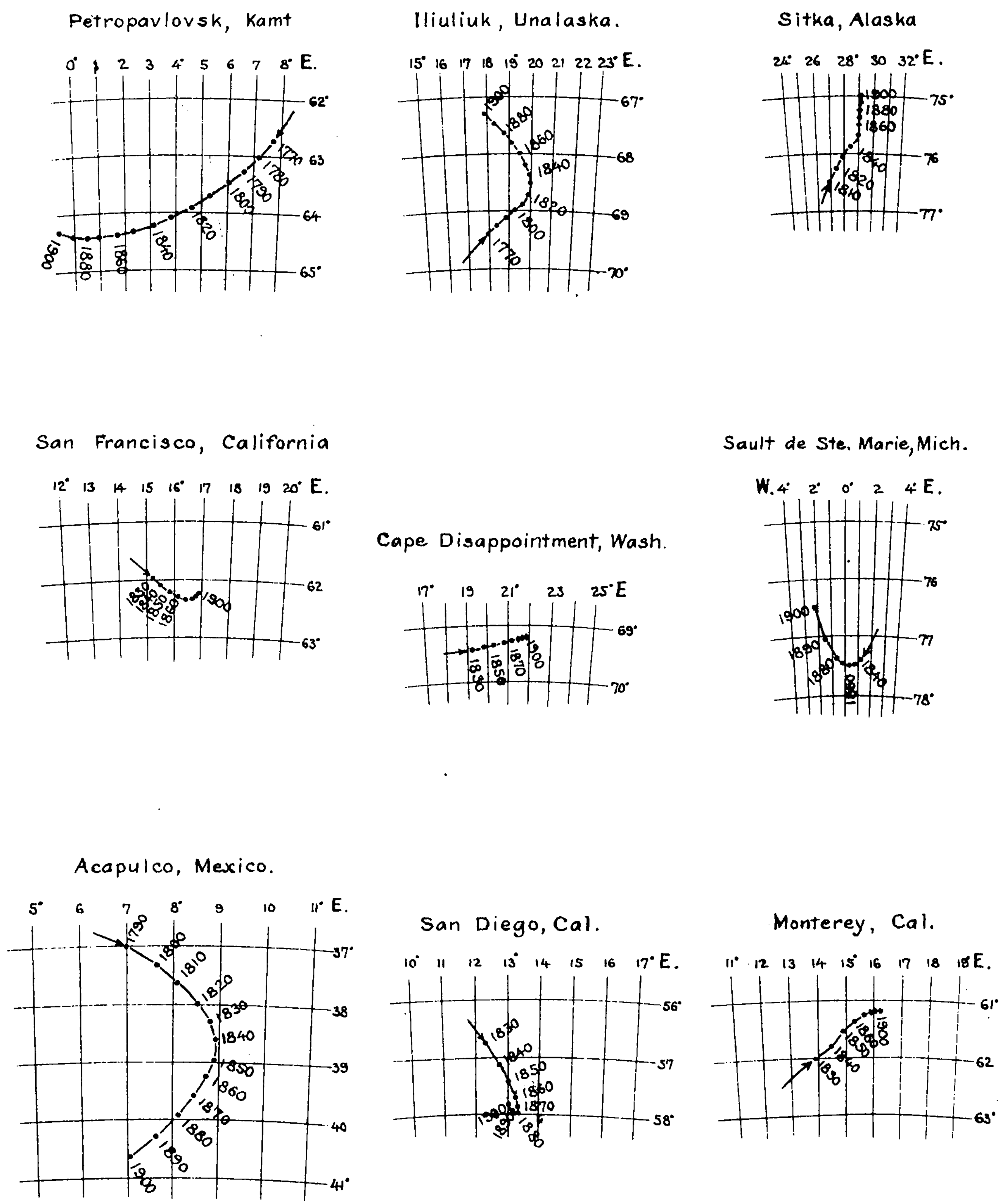

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APPENDIX No. 2—1895.

ABSTRACT OF RESULTING LATITUDES OF SOME PROMINENT STATIONS IN ALASKA AND ADJACENT PARTS, AS ASTRONOMICALLY DETERMINED DURING 1889-1895.

Reported by C. A. SCHOTT, Assistant.

1. CAMP DAVIDSON, YUKON RIVER.

(J. E. McGrath, observer. November, 1889, and April and May, 1891.)

The station is located on the right bank of the Yukon River a few miles above its intersection with the boundary, and is identical with one previously established by the Canadian surveyor, W. Ogilvie.

The observations of 1889 were made with meridian telescope No. 16; value of one division of level 1″·86 and of one turn of micrometer 67″·50 as determined from observations of Polaris at eastern elongation on October 10. In the absence of a computation by the observer the office computation by H. F. Flynn was carefully scrutinized. The mean places of stars are due to H. Farquhar; the apparent places were computed independently by C. H. Kummell and J. Pawling. Twenty-one pairs of stars were observed and the average number of observations of each is less than 3. The measures are comparatively rough, yet of sufficient accuracy for the purpose intended. Probable error of a single observation ±1″·3 and of final result ±0″·3 The individual values are as follows:

No. of pairs of stars.	Stars from B. A. C.			*n*.	Weight.	Latitude.		
						°	′	″
1	7621	and	7658	2	1·1	64	40	51·89
2	7686		7778	1	·6			52·57
3	7799		7896	1	·6			51·93
4	7967		8068	2	1·2			52·45
5	8124		8162	3	1·8			48·37
6	8188		8204	3	1·8			51·04
7	8238		8252	2	1·2			47·88
8	86		180	2	1·2			51·80
9	219		320	3	1·8			50·93
10	416		438	4	2·4			51·22
11	605		705	3	1·7			52·67
12	863		955	4	2·4			48·22
13	1062		1137	3	1·8			52·85
14	1211		1282	3	1·7			49·94
15	1382		1428	3	1·8			50·54
16	1448		1477	3	1·8			48·21
17	2083		2107	1	·6			56·13
18	2223		2157	3	1·8			52·01
19	2410		6650	4	2·4			50·95
20	2722		2792	4	2·3			53·80
21	7124		2937	3	1·8			52·34
				57		64	40	51·09

Weighted mean 64° 40′ 51″·08 ± 0″·28

The observations of 1891 were made with an 8-inch (20 cm.) Gambey vertical circle No. 57, with 4 verniers reading to the nearest 5″. Polaris was observed direct and reflected in mercury, and altogether 116 sets were obtained in 10 nights, as shown in the following table of results as computed by Mr. D. L. Hazard:

Date.	No. of sets circle R.	No. of sets circle L.	Mean latitude from sets with— Circle R.	Mean latitude from sets with— Circle L.	R − L.	Mean latitude ϕ	Δ
1891.			″	″	″	° ′ ″	″
Apr. 4	11	0	59·2	....	....	64 40 57·4	−4·8
" 5	10	0	57·9	....	....	56·2	−3·6
" 25	6	6	56·7	49·7	+7·0	53·2	−0·6
May 1	6	6	54·7	50·8	+3·9	52·8	−0·2
" 2	6	6	53·9	47·9	+6·0	50·9	+1·7
" 3	6	6	55·5	49·6	+5·9	52·6	0·0
" 4	6	6	53·7	49·5	+4·2	51·6	+1·0
" 5	6	6	52·0	54·5	−2·5	53·2	−0·6
" 7	6	6	53·2	50·2	+3·0	51·7	+0·9
" 9	5	6	50·7	50·2	+0·5	50·4	+2·2
			Weighted mean		+3·5	64 40 52·6	±0·5

Resulting latitude:

From observations of Polaris with vertical circle — 64° 40′ 52″·6 ±0″·5

From micrometric differences of stars N. and S. of zenith by meridian telescope — 51″·1 ±0″·3

Weighted mean $\varphi = 64° \ 40′ \ 51″·5 \pm 0″·3$

For the 4th and 5th of April the results are reduced to mean of Circle R and L by application of half of the mean difference 3″·5 with weight ½ to each result.

2. CAMP COLONNA, PORCUPINE RIVER.

(J. H. Turner, observer. March and April, 1890.)

The station is located on the north bank of the Porcupine River, a short distance above its intersection with the boundary, and at an elevation of 98 feet above the river.

The observations were made with meridian telescope No. 13. Focal length 66 cm., aperture 5·3 cm., magnifying power with diagonal eyepiece about 72. One division of latitude level was found to equal 2″·36±0″·01, as determined by Subassistant Turner at Camp Colonna, October 30, 1889, at the temperature −10°·9 C. The value of one turn of the micrometer was found from observations of α Ursæ Minoris at eastern elongation, 1890, July 5, 6, 8, viz: 77″·609±0″·007, the separate results being very consistent. Local time was obtained by means of the same instrument and kept by sidereal chronometer Hutton No. 223.

What we have of field computation is by the observer who brought out only a few latitude results; the office computation is by Mr. H. F. Flynn aided by two computers for the apparent places of stars. The mean places are due to Mr. H. Farquhar.

Numbers of pairs of stars observed 24, average number of observations upon a pair 4; the probable error of an observation for latitude is $e_0 = \pm 1″·03$, a very large value,* and it is supposed due to the difficulty of operating at very low temperatures. The micrometer, as well as the level values, as given above, were found to satisfy the latitude work very well. The probable error of the resulting latitude is but ±0″·14.

* On account of which the probable error of a star's place (in declination) could not be made out.

Recapitulation of results for latitude, Camp Colonna, Porcupine River, Alaska.

Pairs of stars. B. A. C.			n.	w.*	Latitude.			Δ.
					°	′	″	″
2819	and	2852	3	2·6	67	25	05·59	−0·48
2943		3049	1	0·9			03·90	+1·21
3087		3099	3	2·6			04·37	+0·74
7493		3366	3	2·4			05·83	−0·72
3496		3514	2	1·7			04·25	+0·86
3531		3645	2	1·7			04·52	+0·59
8026		3856	4	2·8			05·03	+0·08
3864		3914	5	4·0			02·79	+2·32
4033		[1028]	6	3·8			05·09	+0·02
4143		4216	6	4·4			04·70	+0·41
154		[1076]	4	2·9			06·35	−1·24
†262		4433	5	4·0			05·43	−0·32
†262		4467	4	2·7			03·82	+1·29
4484		4527†	4	3·2			05·87	−0·76
4493		4527†	1	0·9			06·21	−1·10
4540		4614	5	3·6			04·70	+0·41
4696		4732	5	3·8			05·35	−0·24
777		4864	4	3·2			04·94	+0·17
908		4961	5	3·2			05·87	−0·76
5079		[1270]	4	2·7			03·37	+1·74
5122		1061†	5	4·2			05·27	−0·16
5130		1061†	5	4·0			05·86	−0·75
5348		5462	5	4·0			06·57	−1·46
5502		5592	5	3·3			06·16	−1·05
			Indiscriminate mean		67	25	05·11	
			Weighted mean		67	25	05·11	±0·14

* For probable error of a star's place the value ± 0″·2 was used in the computation for the weight *w*.
† N. B.—For the combination, two-thirds of the tabular weights are to be used.

3. ST. MICHAEL.

(J. H. Turner, observer. March, April, and May, 1891.)

The observatory was located east of the main administration building, about 40 feet distant, and at an elevation of 16 feet above mean high-water level. In the vicinity of the observatory was the post flagstaff.

The observations were made with meridian telescope No. 13. For instrumental constants see report on the latitude of Camp Colonna, Porcupine River, by the same instrument and observer. The level value, as determined on October 13, 1890, was 1 div.$=2''\cdot676\pm0''\cdot016$ at 5° C. It is considerably different from the one determined at the camp, and it is probable that a different level vial was used, particularly since the latitude results agree with the 1890 value. There is no satisfactory determination of the micrometer value at this station, hence the Camp Colonna value (77″·609) had to be used in the first instance. It was afterwards corrected from the latitude observations themselves and found to be, 1 turn$=77''\cdot717$. The chronometer correction was given by the observer.

The observer left but few computed results. The office computation was made by Mr. H. F. Flynn. The mean places of stars had been previously made out by Mr. H. Farquhar and the apparent places were computed by Mr. Kummell and Mr. Pawling. Number of observations, 106; of pairs, 27; of nights, 7. Probable error of an observation for latitude $e_0=\pm0''\cdot90$ and of final result $\pm0''\cdot09$.

Recapitulation of results for latitude at St. Michael, Alaska.

Pairs of stars. B. A. C.			n	w	Latitude.	Δ
					° ′ ″	″
7005	and	2789*	2	0·59	63 28 42·07	−0·56
7005		2833*	3	0·88	41·87	− ·36
2852		2892	2	0·60	41·42	+ ·09
2909		2930	3	0·85	41·41	+ ·10
7299		3133	4	1·15	41·02	+ ·49
7438		3246	4	1·14	42·30	− ·79
3283		3358	5	1·41	41·09	+ ·42
3402		3514	5	1·37	40·93	+ ·58
3612		3645*	4	1·14	41·63	− ·12
3645		3664*	4	1·14	41·26	+ ·25
3864		3918	4	1·16	41·73	− ·22
3990		8314	4	1·15	42·39	− ·88
[1028]		4148	4	1·09	40·81	+ ·70
4195		154	4	1·19	42·80	−1·29
4346		[2006]	4	0·93	41·61	− ·10
393		4513*	3	0·72	40·92	+ ·59
393		4526*	5	0·83	41·13	+ ·38
[1147]		4568	6	1·67	41·09	+ ·42
[1167]		4696	6	1·69	41·18	+ ·33
4949		4967*	4	1·18	42·13	− ·62
4967		4989*	4	0·99	43·24	−1·73
[1270]		5147	4	1·11	41·03	+ ·48
[1211]		5302	3	0·88	41·56	− ·05
5348		5406	3	0·89	41·98	− ·47
5574		[2388]*	4	0·32	39·73	+1·78
5575		[2388]*	4	0·32	39·21	+2·30
5705		5776	4	1·00	41·03	+ ·48
		Weighted mean latitude			63 28 41·51	±0·09

* Two-thirds of tabular weights used.

4. SITKA.

(F. Morse, observer. May and June, 1892.)

The observatory was located between the Presbyterian Church and the governor's residence, upon an outcropping ledge. It is 1″·06 north of the station of 1867–1869 upon the parade ground.

The observations were made with the Würdemann meridian telescope No. 1. For design of this instrument see Appendix No. 8, Report for 1867. Aperture 7 cm. (2¾ inches), focal distance 0·79 m. (31 inches), magnifying power about 60. The value of one division of the latitude level is stated in the record as 0″·95, but without giving authority or reference. The latitude observations, however, do not indicate any decided change in the value. Observations for value of micrometer were made May 28, June 3 and 4 on α Ursæ Minoris about eastern elongation, with the following results: 64″·312, 64″·352, 64″·334 mean = 64″·333 and when corrected for refraction 64″·307. The inequality of the screw was also investigated for whole turns and for fractional parts and corrections were applied accordingly.

The field computation was made by the observer, the office computation by Mr. H. Farquhar.

Number of pairs of stars observed 19, number of observations used 65; probable error of an observation for latitude $e_0 = \pm$ 0″·74; the probable error of a star's place could not be deduced in consequence of the large value of e_0.

Recapitulation of results for latitude of Sitka, Alaska.

Pairs of stars C. & G. S. Cat.			n	w	Latitude.			Δ
					°	′	″	″
1213	and	1233	2	0·9	57	02	53·44	−0·52
1234		1237	2	.6			52·36	+ ·56
1246		1249	3	1·1			53·92	−1·00
1258		1259	4	1·6			52·60	+ ·32
1274		1293	3	1·3			52·91	+ ·01
1318		1319	4	1·7			53·87	− ·95
1328		1336	4	1·7			53·99	−1·07
1338		1343	4	1·5			52·93	− ·01
1348		1361	4	1·6			52·89	+ ·03
1377		1382	4	1·6			52·80	+ ·12
1384		1392	4	1·7			52·66	+ ·26
1407		1420	4	1·4			52·15	+ ·77
1423		1439	4	1·6			52·76	+ ·16
1456		1466	3	1·2			52·90	+ ·02
1470		1475	4	1·8			52·68	+ ·24
1503		1511	3	1·3			52·53	+ ·39
1518		1539	3	1·3			52·90	+ ·02
1562 }		1594	{ 3	·9			52·23	+ ·69
1575 }			{ 3	·9			53·00	− ·08
				Mean	57	02	52·92	
				Weighted mean	57	02	52·94	±0·08

5. FORT WRANGELL.

(G. R. Putnam, observer. May and June, 1893.)

The station is located on the southern edge of the United States reservation at Fort Wrangell, about 15 feet from the high-water line and 10 feet above the highest water, on the northern shore of Etolin Harbor. It was located as nearly as possible on the site of the station of 1882 and not far from the station of 1869. It is marked by a brick pier 26 by 17 inches with a granite capstone 4 inches thick. The pier stands about 40 inches above ground and the reference mark is a hole drilled in the center of the capstone. This point is also the longitude station of 1893.

The observations were made with the Würdemann meridian telescope No. 13. Focal length 66 cm. (26 inches), aperture 5·3 cm. (2⅛ inches), magnifying power about 72 with diagonal eyepiece. The level values were determined at Fort Wrangell by the observer June 14, 1893, viz, 1 div. of striding level$=1''\cdot752$ and of latitude level $2''\cdot574$, temperature 14°·0 C. Two sets of observations for value of micrometer were made, viz:

May 23, 1893.	α Urs. Min. about E. elong.	1 turn $= 77''\cdot702$	$t=$ 8° C.
June 5, "	" " " " " "	1 " $= 77''\cdot748$	$t=$ 10° C.

The latitude observations themselves demanded $77''\cdot756$.

Time was observed with the same instrument and kept by sidereal chronometer Negus No. 1771.

The field computation is by the observer, the office computation by Mr. H. Farquhar. The number of pairs of stars observed was 26 and of observations 69; the probable error of an observation for latitude $e_0=\pm0''\cdot38$, and the probable error of a star's place (in declination) $e_{\frac{**}{2}}=\pm0''\cdot35$; both are satisfactory values. With a few exceptions the stars are from the Greenwich 10-year catalogue, 1889.

Recapitulation of results for latitude at Fort Wrangell, southeast Alaska.

Pairs of stars. B. A. C.		n	w	Latitude.	Δ
				° ′ ″	
[1147]	and 4596	2	9	56 28 17.30	
[1147]	4699	2	8	16·48	
4725	**G. 2125	2	6	16·11	
4726	**G. 2125	2	6	15·98	
4742	**G. 2125	2	6	16·00	
784	4849	2	9	16·00	
4897	4936	1	7	16·33	
4958	4978	2	10	16·92	
5079	*5168	3	8	15·97	
5094	*5168	3	8	15·88	
[1301]	5287	3	9	16·01	Max.
5343	5336	3	11	17·39	—0·93
5385	5462	3	11	15·72	
5411	5511	3	11	16·92	
G. 2351	5560	3	10	16·98	
*5599	5643	3	9	17·01	
*5599	5752	3	8	17·03	
5763	G. 2419	3	11	16·80	
*5811	5847	3	9	16·75	
*5811	5886	3	9	16·81	
50+2412	5978	3	10	16·89	Min.
**[1483]	G. 2473	3	4	14·24	+2·22
**[1483]	6062	3	6	15·23	
**[1483]	6068	3	5	15·07	
*6114	[1529]	3	9	16·19	
*6114	[1523]	3	8	16·94	
		Weighted mean		56 28 16·46	±0″·09

6. TAKU INLET.

(O. B. French, observer. May, June, and July, 1893.)

The station was located on the north end of the north island in the group of three, on the southeast side of Taku Inlet. It is on the highest point about 25 feet above high tide. The instrument was mounted upon a brick pier, built upon a foundation of solid clay and capped by a rectangular granite stone (1½ by 2 feet and 4 inches thick).

The observations were made with meridian telescope No. 9, one of the small instruments. It has a focal length of 65 cm. (25½ inches), aperture 5·2 cm. (2 inches), magnifying power 43 diameters. The glass diaphragm has 5 equidistant lines, the central one with 4 side lines and the second and fourth with 2 side lines. The value of the level was found to be 1 div. $=1''·81$ at $9°·8$ C. from observations made by E. G. Fischer at the Survey Office, March 18, 1893. After May 25 the numbering of the level was changed from "center" to "end to end." Observations were made for value of the new micrometer on July 8, 1893, on δ Ursæ Min. about upper culmination and on α Ursæ Min. about eastern elongation, whence the values: 1 turn $=80''·574$ from δ Ursæ Min. and $80''·574$ from α Ursæ Min., but notwithstanding this perfect accord and the certainty of the value, the latitude observations themselves unmistakably demand a higher value, viz, $80''·701$. This anomaly is supposed to be due to shifting (readjusting) of focus. Time was obtained with the same instrument and kept by sidereal chronometer Hutton No. 202.

Owing to the unfavorable state of the weather the observations extend over a long period. The stars were taken, for the most part, from the last Greenwich 10-year catalogue and the observations were spread over unusually large zenith distances,* there being several pairs with $\zeta=56°$. It would appear that there is no specific difference in the results for φ depending on ζ and the observer's supposition of different refractions for the north and south stars is not justified by the very limited experience. Number of pairs of stars observed 33, of observations 107; probable

*Northern stars with $\zeta>31° 34'$ are sub polo.

error of an observation for latitude $e_0 = \pm 0''\cdot55$ (a fair value for this size of instrument) and probable error of a star's place in declination $= \pm\ 0''\cdot38$.

In the following table of results the relative weights depend on the number of observations on a pair and upon the probable error of the star places; doublets have special weights. The probable error of the result is as small as that of any first-class latitude.

Recapitulation of results for latitude at Taku, Alaska.

Pairs of stars from B. A. C.		ζ	n	w	Latitude with obs'd mic. value.			With corr'd value.	Δ
		°			°	′	″	″	″
990 and	5047	56	2	6	58	26	15·60	15·51	+0·11
1001	5095	56	2	6			16·25	16·04	−0·42
5147	[1289]	6	3	7			15·86	15·54	+0·08
1137	5214	51	3	8			15·11	15·65	−0·03
1211	5367*	41	2	4			16·10	15·95	−0·33
5367*	1276	41	2	4			14·93	15·25	+0·37
G. 2326	5461	9	3	6			14·80	15·28	+0·34
5496	5592	21	3	8			15·14	15·28	+0·34
1428	5587	46	3	8			15·42	15·48	+0·14
5617	5705	19	3	9			15·00	15·16	+0·46
1510	5802	48	5	11			17·09	17·29	−1·67
1549	5841	48	5	13			17·01	16·18	−0·56
5919	1751*	56	5	8			16·75	15·94	−0·32
1751*	6020	56	5	8			16·52	15·87	−0·25
6062	6114*	18	5	9			15·92	15·63	−0·01
6068	6114*	18	5	9			16·11	15·75	−0·13
6147	6281	28	5	13			15·90	15·10	+0·52
6320	6237	29	5	11			15·21	15·43	+0·19
6268	6375*	19	2	4			16·52	16·42	−0·80
6375*	G. 2644	19	2	4			14·82	15·45	+0·17
6404	6478*	17	2	4			14·92	15·61	+0·01
6478	6473	17	3	6			15·49	15·79	−0·17
6493	6563	18	2	6			16·32	14·76	+0·86
Ll. 36249	6612	9	3	9			15·58	14·87	+0·75
6662	6697	7	3	9			15·72	15·34	+0·28
6744	2521	41	3	9			15·59	16·11	−0·49
6808	6830	11	3	8			15·14	15·56	+0·06
6856	6905	6	3	9			15·06	15·63	−0·01
7005	7022	19	3	9			17·56	16·36	−0·74
7073	7178	22	3	9			16·42	15·64	−0·02
7230	7204	25	3	8			14·98	15·14	+0·48
7255	3087*	54	3	5			14·94	15·10	+0·52
7276	3087*	54	3	6			14·44	15·28	+0·34
		Means			58	26	15·70	15·62	
		Weighted mean			58	26		15·64	±0·06

7. BURROUGHS BAY.

(W. H. Edmonds, observer. July, August, and September, 1893.)

The station is located near the head of Burroughs Bay, on a slight knoll on the hillside, about 70 feet above the wharves of the Burroughs Bay Cannery building and about 100 feet above mean low water, in a spot quite clear of the surrounding forest. The station is marked by a brick pier, set in cement and furnished with a stone cap. It rests upon solid rock.

The observations were made with meridian telescope No. 7. It was changed in 1870–71 from a transit into a time and latitude instrument. Focal length 66 cm., aperture 5·4 cm., magnifying power with diagonal eyepiece 67; it is supplied with a glass diaphragm. Value of striding level* 1 div.$=2''\cdot04$ from observations by E. G. Fischer, November 3, 1890, and of latitude level 1 div.$=2''\cdot30$. The value of the micrometer was determined from observations of Polaris about

* The observer mistook this for the latitude level.

eastern elongation on August 16, 1893, viz, 1 turn=78″·287; this is in accord with previous values by other observers. Time was obtained with the same instrument and kept by sidereal chronometer Hutton No. 223.

The observations extend over a long time and are irregularly scattered and unequal in number of nights for the pairs of stars in consequence of the cloudy state of the sky. Between May and July 20 no latitude work was possible, and not till the middle of August was a fair night available, though clouds were present at all dates. Number of pairs of stars observed 42, number of observations 191 (of which 3 were rejected); probable error of an observation for latitude $e_0 = \pm 0{\cdot}61$ (an ordinary value with this instrument), and of a star's place in declination $e_{\frac{**}{2}} = \pm 0''{\cdot}63$, a somewhat doubtful value.

In the following table of results the relative weights depend on the number of observations of the pair and upon the probable errors of the star places; doublets have special weights.

Recapitulation of results for latitude at Burroughs Bay, Alaska.

Pairs of stars from— C. & G. S. Cat.		Pairs of stars from— B. A. Cat.		*n*	*w*	Latitude.	Δ
						° ′ ″	″
1493 and	1498	6047 and	6068	1	8	56 02 09·68	+1·87
1530	1548	6162	6243	1	8	07·71	+3·84
1556	1560	6268	6302	1	8	11·35	+0·20
1566	1580	6348	6395	2	11	10·85	+0·70
	1601	6419	6463	3	12	10·24	+1·31
1623	1628		6520	4	12	10·86	+0·69
1646	1664	6581	6650	4	13	11·44	+0·11
1694	1702	6735	6745	4	13	11·38	+0·17
1728	1741	6824	6852	6	14	11·39	+0·16
1765		6912	6999*	1	8	11·78	−0·23
	1785	6999*	6968	1	8	12·26	−0·71
1793	1796	7005	6998	5	13	11·13	+0·42
1806	1813		7085	7	13	12·18	−0·63
1820		7094	2930	6	13	14·60	−3·05
1852	1862	7211	7233	6	14	10·99	+0·56
1877	1899	7277	7363	7	14	12·21	−0·66
	1907	7381	7399	6	14	11·64	−0·09
1903	1931	7377	7468	2	11	11·05	+0·50
1932	1940	7465	7510	6	13	10·76	+0·79
1948	1954	7542	7560	7	14	10·95	+0·60
1968	1979	7598	7658	8	14	12·26	−0·71
1996	2003	7708	7746	8	14	11·01	+0·54
2016*		7789*	7825	1	8	12·31	−0·76
2016*	2038	7789*	7855	6	14	11·86	−0·31
2036	2041	7850	7876	1	8	13·72	−2·17
2043	2045	7880	7896	6	13	11·47	+0·08
2057	2073	7923	7990	7	14	12·37	−0·82
2087	2110	8023	8106	7	14	11·80	−0·25
2130	2145	8195		6	6	12·19	−0·64
2162	2167	8310	8322	6	14	10·69	+0·86
2177	6		16	6	13	11·55	0·00
15	23	46	79	6	13	11·91	−0·36
32	51	126	180	5	13	11·73	−0·18
56	61	201	218	3	12	12·91	−1·36
74	87	253		6	13	10·48	+1·07
103		339	391	5	13	12·20	−0·65
123	128	412	432	5	13	10·53	+1·02
137	156	482	558	5	13	11·88	−0·33
170	179	595	628	5	13	11·95	−0·40
1189	209	4733	745	2	11	12·69	−1·14
218	229	777	821	2	11	11·91	−0·36
241	266	863	948	2	11	11·38	+0·17
					Indiscriminate mean	56 02 11·55	
					Weighted mean	56 02 11·57	±0·10

8. ANCHORAGE POINT, CHILKAT INLET.

(J. F. Hayford, observer. June and July, 1894.)

The station is located just to the southward of Pyramid Harbor, Chilkat Inlet, and is marked by a brick pier, laid in cement, standing on a concrete bed and having a granite capstone marked U. S. C. & G. S. 1894. A copper bolt in the center of the capstone and one in the center of the concrete foundation mark the station point.

The observations were made with meridian telescope No. 9. Diameter of objective 5 cm., focal length 64 cm., magnifying power about 50. One division of latitude level $=1''\cdot81$ as determined at the office in March, 1893. The value of 1 turn of the micrometer was found from observations of Polaris near eastern elongation, July 7, 1894, viz, $80''\cdot60$ with a small inequality for parts of a turn. Observing chronometer Bond No. 380 (sidereal).

The field computation was made by the observer, the office computation by H. Farquhar. Number of pairs of stars observed 14, of nights of observation 10, and number of observations 28. Probable error of observation $e_0 = \pm 0''\cdot36$ and of a star's place (in declination) $e_{\frac{**}{2}} = \pm 0''\cdot29$.

The weights to each result for latitude are substantially uniform.

Recapitulation of results for latitude at Anchorage Point, Alaska.

Pairs of stars B. A. C.		Latitude.			Δ
		°	′	″	″
5168 and	5191	59	10	19·14	+0·30
5234	1211			18·92	+0·52
5511	5552			19·37	+0·07
5514	5596			19·16	+0·28
5574	5628			19·66	—0·22
5780	5788			18·55	+0·89
5840	5950			18·74	+0·70
5990	6048			19·58	—0·14
6281	6178			18·97	+0·47
6245	2095			19·76	—0·32
2326	6589			20·18	—0·74
6551	6662			20·48	—1·04
6623	6662			19·54	—0·10
6783	2590			20·18	—0·74
	Mean	59	10	19·44	±0·10

9. LION POINT, PORTLAND CANAL.

(P. A. Welker, observer. May, June, and July, 1895.)

The station was located near the head of Portland Canal on a prominent rocky knoll, near the extreme end of Lion Point, about 20 metres back from high-water mark and 7 metres above mean high water. The station is marked by a brick pier, capped with a granite block with the letters U. S. C. & G. S., 1895, cut into the top surface. A copper bolt set in the center of the capstone marks the station.

The observations were made with meridian telescope No. 13. Focal length 65 cm., aperture 5·2 cm., magnifying power about 55. Value of one division of latitude level$=2''\cdot23$, as determined by E. G. Fischer, March 18, 1893. Five sets of observations for value of micrometer were made, but these showed consistently that the screw was very irregular; thus the value for 1 turn$=77''\cdot783$ between turns 0 and 24, and $78''\cdot417$ between turns 24 and 30. The latitude observations demanded the values $77''\cdot697$ and $78''\cdot331$, respectively. The field computation is by the observer, aided by

Mr. O. B. French. The office reduction is by Mr. H. F. Flynn, assisted by Mr. C. H. Kummell in the reduction of apparent places of stars. Number of pairs of stars observed 19; average number of observations upon a pair 4·8; the probable error of an observation for latitude is $e_0 = \pm 0''.39$.

Recapitulation of results for latitude at Lion Point, B. C.

Pairs of stars. B. A. C.		n	w	Latitude.	Δ
				° ′ ″	″
4607 and	[1167]	5	7	55 52 52·92	+0·13
4646	[1179]	4	7	53·02	+0·03
(1498)	4845	5	4	53·88	−0·83
(1499)	4845	5	4	53·40	−0·35
4874	4937	5	7	53·48	−0·43
5022	(2477)	5	7	53·08	−0·03
5147	5177	5	7	53·22	−0·17
5259	5343	5	7	52·99	+0·06
5514	5523	4	6	53·27	−0·22
5545	5552	5	8	54·16	−1·11
5568	5628	5	7	53·39	−0·34
5705	5747	5	7	52·47	+0·58
(1742)	(2402)	4	3	53·43	−0·38
(1743)	(2402)	4	3	52·61	+0·44
5927	(544)	5	6	52·50	+0·55
[1483]	[1489]	5	6	52·70	+0·35
(3245)	6375	5	7	52·01	+1·04
6410	6470	5	6	52·66	+0·39
[1623]	6520	5	7	53·16	−0·11
Indiscriminate mean				55 52 53·05	

Weighted mean after micrometer correction, } 55° 52′ 53″·07 ±0″·08 (adopted).

10. PORT SIMPSON.

[O. B. French, observer. May and June, 1895.)

The station is located on the west side of the hill just east of the town of Port Simpson, B. C., and is a little north of east and distant about 300 metres from the Hudson Bay Company's store. The point is marked by a brick pier about 3 feet high, capped by a granite block 17 by 24 by 4 inches, marked on its upper surface U. S. C. & G. S. 1895.

The observations were made with meridian telescope No. 9. Focal length 65 cm., aperture 5·2 cm., magnifying power 43 diameters. Value of 1 division of latitude level = 1″·81 as determined by E. G. Fischer, at the office, March 18, 1893. The value of the new micrometer screw, supplied in the spring of 1893, was found as follows:

Date.	Star.	Position.	Value of one turn.
1895.			″
May 30.	δ Urs. Min.	U. C.	80·662
May 30.	λ Urs. Min.	U. C.	·677
June 25.	β Urs. Min.	W. E.	·666
June 25.	α Urs. Min.	E. E.	·695

Mean value 80″·675 adopted. The observations prove the screw to be fairly regular. A set of observations on June 13 was rejected by the observer on account of imperfect focus.

Time observations were made with meridian telescope No. 2, and sidereal chronometer Frodsham No. 3462 was used.

The field computation is by O. B. French, the office reduction by H. F. Flynn. Number of pairs of stars observed 21, number of observations for latitude 76. The probable error of an observation for latitude $e_0 = \pm 0''.46$, and probable error of a star's place (in declination) $= \pm 0''.13$, an extremely small value. The estimated a priori value of the mean place was $\pm 0''.17$.

Recapitulation of results for latitude at Port Simpson, B. C.

Pairs of stars.		B. A. C.	n	w	Latitude.			Δ
					°	′	″	″
4276	and	4287	1	4	54	33	33·43	+0·90
[1086]		4342	1	4			33·53	+ ·80
4350		4392	1	4			33·82	+ ·51
(720)		4451	1	3			33·77	+ ·56
(720)		(2400)	1	3			34·11	+ ·22
4540		4555	4	12			34·40	— ·07
4568		4649	5	15			34·25	+ ·08
4696		4699	5	17			34·06	+ ·27
4732		4758	3	10			34·28	+ ·05
(777)		4870	4	13			34·31	+ ·02
4907		4918	4	13			33·46	+ ·87
4967		4980	4	15			34·40	— ·07
5079		(2651)	4	14			34·01	+ ·32
5094		(2653)	4	15			34·45	— ·12
[1288]		[1293]	4	8			34·21	+ ·12
5237		5244	5	13			34·72	— ·39
5316		5348	5	16			34·65	— ·32
5459		5461	5	10			33·66	+ ·67
(1669)		5535	5	9			34·52	— ·19
5611		5604	5	15			35·26	— ·93
5705		5731	5	17			34·89	— ·56
		Indiscriminate mean			54	33	34·20	
		Weighted mean			54	33	34·33	±0·07

which last value is proposed for adoption. This value supersedes the older determination by a hydrographic party and the results given in the Coast Pilots of Alaska.

11. MARY ISLAND.

(E. F. Dickins, observer. June and July, 1895.)

The station is located S. 40° W. by compass, and distant 69·2 feet from the west corner of the United States custom-house. It is marked by a brick pier with its base about 3 feet below the surface of the ground and surmounted by a granite capstone marked U. S. C. & G. S. 1895.

The observations were made with meridian telescope No. 1. Value of 1 division of level $1''.90$, as determined at the office; 1 turn of micrometer$=65''.962$, as determined on 3 nights from observations of Polaris about western elongation. Time was obtained in connection with the longitude work.

The office computation was made by H. F. Flynn and revised by L. Pike. The star places were determined with the usual care, but the observing error (due to unfavorable circumstances) is large and did not permit the probable error of a star's place to be deduced from the observations. The weights to the individual results will depend therefore simply on the number of observations. The probable error of an observation for latitude is $\pm 0''.95$.

Recapitulation of results for latitude, Mary Island, Alaska.

Pairs of stars. B. A. C.			*n*	*w*	Latitude.			Δ
					°	′	″	″
5033	and	5058	2	2·0	55	05	32·50	+0·70
5079		5084	2	2·0			33·10	+0·10
5098		5205	3	3·0			34·94	−1·74
5237		5302	1	1·0			31·65	+1·55
5343		5432*	2	1·3			33·42	−0·22
5432*		5462	6	4·0			32·15	+1·05
5479		5511	7	7·0			33·77	−0·57
5541		5592	4	4·0			32·55	+0·65
5568		5601*	6	4·0			34·18	−0·98
5601*		5706	7	4·7			32·96	+0·24
5785		5801	5	5·0			34·15	−0·95
5853		5917	3	3·0			31·39	+1·85
5950**		5950**	6	3·0			32·33	+0·87
5978		6056	6	6·0			32·65	+0·55
6114		[1513]	7	7·0			32·86	+0·34
6147		6206	7	7·0			32·53	+0·67
[1536]		6243	5	5·0			33·50	−0·30
6258		6289	1	1·0			33·02	+0·18
6368**		6368**	1	0·5			33.26	−0·06
6395		[1590]	5	5·0			34·67	−1·47
6419		6477*	4	2·7			33·88	−0·68
6452		6477*	4	2·7			34·26	−1·06
6500		6530	4	4·0			32·77	+0·43
6551		6583*	4	2·7			33·78	−0·58
6583*		6623	4	2·7			33·65	−0·45
				Mean	55	05	33·20	

	°	′	″	″
Weighted mean	55	05	33·22	± 0·12
Reduction to station "Custom"				+0·22
Latitude of station "Custom"	55	05	33·44	± 0·12

APPENDIX No. 3—1895.

ABSTRACT OF RESULTING LONGITUDES OF SOME PROMINENT STATIONS IN ALASKA AND ADJACENT PARTS, AS ASTRONOMICALLY DETERMINED DURING 1889–1895.

Reported by C. A. SCHOTT, Assistant.

1. CAMP DAVIDSON, YUKON RIVER.

(J. E. McGrath, observer. 1889–1891.)

[For description of station and instrument see report on the latitude observations.]

The observations for longitude comprise 2 occultations in January, 1891; a transit of Mercury, May, 1891; a solar eclipse, June, 1891; and a series of moon culminations between November, 1889, and April, 1891. The occultations and the eclipse were computed by myself and checked by D. L. Hazard, since no computation had been made by the observer. The moon culminations were reduced by D. L. Hazard and checked as far as required. The corrections to the lunar ephemerides were taken from the Greenwich observations, and corresponding observations made at San Francisco, Cal., in connection with the moon culminations were utilized. Transits of Mercury are phenomena not favorable for exact longitude determinations, and as but one phase (first interior contact) was observed, no use has been made of the observation nor of the 12 photographs secured while the planet was in transitu. We have for the longitude λ of Camp Davidson, Yukon River.

	h.	m.	s.	
From Immersion of 30 Piscium, Jan. 14, 1891.*	9	23	35·5	W. of Gr.
From Immersion of 33 Piscium, Jan. 14, 1891.			37·2	
From first and last contact, solar eclipse, June 6, 1891.			32·2	
Weighted mean (the last result having weight ½), with a probable error of about ± 1ˢ.	9	23	35·5	W. of Gr.

A rough computation for longitude from moon culminations was made by the observer; the office reduction is by D. L. Hazard. The moon was observed on 23 days, on 19 of which satisfactory results were obtained. The results marked with an asterisk in the following table were obtained by comparing the Camp Davidson observations with the Greenwich ephemeris corrected by interpolation; in all other cases there were corresponding observations either at San Francisco or at Greenwich, or at both places. The weights assigned to the mean value for each day depend upon whether there were corresponding observations at one or both stations and whether one or both limbs were observed.

* On this day the temperature of the air was noted —51°·5 F. or —46°·4C.

Summary of results for longitude of Camp Davidson, Alaska, from observations of moon culminations.

$9^h\ 22^m$ + tabular quantity.

Date.	From corresponding observations— At Greenwich. ☾ I.	☾ II.	At San Francisco. ☾ I.	☾ II.	Means. ☾ I.	☾ II.	Mean referred to ½ (I & II).	Weights.
1889.	*s.*	*s.*	*s.*	*s.*	*s.*	*s.*	*s.*	
Nov. 3.	[65·7]	Rejected.			Time?			
" 10.		35·7*				35·7	35·5	1·0
1890.								
Mar. 8.		40·9				40·9	40·7	1·4
" 27.	30·6*		28·9		29·8		30·0	1·8
" 28.	37·6				37·6		37·8	1·4
" 29.	42·9		44·3		43·6		43·8	2·0
" 30.	35·3		39·8		37·5		37·7	2·0
Apr. 2.	34·7				34·7		34·9	1·4
" 6.		35·7*				35·6	35·5	1·0
" 7.		40·6		43·3		42·0	41·8	2·0
Aug. 29.	32·7	32·9			32·8	32·9	32·9	2·0
" 30.		49·1				49·1	48·9	1·4
Nov. 24.	[50·3]	[57·0]	Rejected.		Time?			
" 27.		38·1*		39·4		38·8	38·6	1·8
1891.								
Jan. 24.	[59·0]	[62·3]	Rejected.	[64·9]	Time?			
Feb. 25.		[59·9]	Rejected.	[64·2]	Time?			
" 27.		30·5				30·5	30·3	1·4
" 28.		34·4*				34·4	34·2	1·0
Mar. 24.	37·3*	37·3*	37·8	38·5	37·5	37·9	37·7	2·5
" 25.	43·0*	42·1*			43·0	42·1	42·5	1·4
Apr. 20.	42·2				42·2		42·4	1·4
" 21.	36·6*	34·0*			36·6	34·0	35·3	1·4
" 23.	44·6	48·2			44·6	48·2	46·4	2·0
Means	37·9	38·4	37·7	40·4	38·2	38·6	38·3	

$\Sigma p = 30{\cdot}3$ and weighted mean $38''{\cdot}5$, hence the resulting longitude from the moon culminations $9^h\ 23^m\ 38^s{\cdot}5 \pm 0{\cdot}675 \sqrt{\frac{[pvv]}{[p]\ (n-1)}} = \pm\ 0^s{\cdot}8$, and it should be noted that the separate results from the two limbs of the moon show no decided specific difference.

COMBINATION OF THE RESULTS FOR LONGITUDE FROM OCCULTATIONS AND AN ECLIPSE, AND FROM MOON CULMINATIONS.

The probable error $\pm\ 1^s$ assigned to the former result is too weak for use in combination, hence we give the weight 2 to each occultation result and the weight 1 to the eclipse result, hence we have:

	h.	m.	s.		
λ from occultations and eclipse	9	23	35·5	weight	5
λ from moon culminations			38·5	"	30
Resulting longitude of Camp Davidson	9	23	38·1±0^s·7 or		
	140°	54′	31″·5±10″·5		

The triangulation of the Yukon River in the vicinity where it is traversed by the international boundary line will depend upon the astronomic latitude and longitude. An azimuth was observed at the camp station, "Bluff △." In the latitude of the astronomic station 1′ of the arc of parallel equals 795·7 metres, and 1″ equals 13·26 metres, hence the transit house is 4356·4 metres, equal to 2·707 statute miles, east of the one hundred and forty-first meridian.

2. CAMP COLONNA, PORCUPINE RIVER.*

(J. H. Turner, observer. 1889–1890.)

[For description of station and instrument see report on the observations for latitude.]

The longitude of this station rests wholly upon 13 moon culminations and 1 occultation. For its *approximate* location close to the boundary, the longitude of Fort Yukon, 210 miles distant, as

* Also longitude of Old Rampart house, on the Porcupine, and longitude of Fort Yukon.

determined in 1869 by Capt. C. W. Raymond, was made use of. In consequence of cloudy and foggy weather no chronometric connection was made between the two places on the ascent of the river in 1889, but it succeeded on the descent in the following year.

On October 4, 1889, meridian telescope No. 13 was mounted in the observatory, a wooden structure 10 feet square. It is in latitude 67° 25′ 05″·11 ±0″·14, and is therefore within the Arctic Circle and 52′·2 north of it.

Although the number of astronomic observations for longitude is small, owing to fog during the winter, clouds during the summer, and the continuous twilight about the beginning of May, rendering observations of stars difficult, we may conclude with the observer that sufficient data have been obtained to make the determination of the boundary satisfactory for all practical purposes. Faint stars, such as many of the moon culminations stars, could only be observed with difficulty, or not at all, and the probable error of a time determination by a single star which in middle latitudes would be nearly ±0s·04, rises to ±0s·08 within the Arctic Circle.

Corresponding observations of moon culminations were made at San Francisco, Cal., by F. Morse and J. J. Gilbert between December 28, 1889, and March 30, 1891, as proposed by Assistant G. Davidson. At this place, also, the observers compared for personal equation, both for star and moon transits, with the following results: August 14–20, 1891. Morse–Turner =+0s·06 for stars and −0s·07 for moon.

The transit observations at the camp were reduced by Assistant A. T. Mosman (temporarily assigned to the computing division), and completed and revised by Mr. D. L. Hazard. Special attention was paid to the rate of the chronometer about the time of the moon culminations, since the rate at those times was found different from the corresponding daily rate; in fact, the rates at times were excessive, due to extremely low temperatures, the minimum stated being −42°·8 C. (or −45° F.).*

The transits at San Francisco were reduced by Mr. Hazard; the moon culminations and the occultation at the camp were computed by myself and checked by Mr. Hazard. Corresponding observations of the moon were found at San Francisco, at Washington, D. C., and at Greenwich, England, but on three nights the lunar ephemeris had to be corrected from Greenwich observations made close to these dates.

Recapitulation of results for longitude at Camp Colonna, Porcupine River, Alaska, from observations of moon culminations between November, 1889, and April, 1890.

Date.	Corresponding observations at—	Longitude $9^h\ 23^m$ + from ☾ I.		Longitude $9^h\ 23^m$ + from ☾ II.	Δ (II − I).	$\lambda = 9^h\ 23^m$ + from I + 9s.	$\lambda = 9^h\ 23^m$ + from I & II.	Weight p	v
		s.	s.	s.	s.	s.	s.		s.
1889, Nov. 6.	Washington.	38·8	39·8	[52·8]	+ 14·0		45·8	½	− 11·1
" 6.	Greenwich.	40·8		[54·7]	+ 13·9		47·8	½	− 9·1
" 9.	"	[36·4]		71·5	+ 35·1		54·0	1	− 2·9
" 30.	"	37·7				46·7		½	− 10·2
Dec. 2.	Washington.	39·8	38·9						
" 2.	Greenwich.	38·0				47·9		½	− 9·0
" 8.	Ephemeris corrected.	[52·6]		69·0	+ 16·4		60·8	1	+ 3·9
" 9.	"	[45·6]		71·1	+ 25·5		58·4	1	+ 1·5
" 27.	Washington.	35·3	36·5						
" 27.	Greenwich.	37·7				45·5		½	− 11·4
" 28.	San Francisco.	40·8	42·0						
" 28.	Washington.	44·4				51·0		½	− 5·9
" 28.	Greenwich.	42·1							
" 29.	"	52·7				61·7		½	+ 4·8
1890, Jan. 29.	"	48·0				57·0		½	+ 0·1
Mar. 2.	"	49·1				58·1		½	+ 1·2
" 7.	Ephemeris corrected.	[60·3]		67·2	+ 6·9		63·8	1	+ 6·9
Apr. 3.	San Francisco.	47·4	49·6			56·4		¼	− 0·5
" 3.	Greenwich.	51·9		[66·6]	+ 14·7		59·2	¾	+ 2·3
				Means	+ 18·1	53·0	55·7		

* March 8, 1890, the lowest temperature recorded was −44°·7 C. (or −48°·5 F.).

Where v = difference from $56^s.9$, see further on.

Values inclosed in brackets are obtained from the moon's defective (in illumination) limb, as corrected. The result of December 28 from corresponding observation at San Francisco has been given double weight on account of the known personal equation. On April 3 the observation at the camp was by H. W. Edmonds.

There is the usual systematic difference in the results from observations of ☾ I and ☾ II, only large in the present case, viz, $18^s.1$; half of this amount divided by 27 would measure the irradiation by which ☾ I is observed too early and ☾ II too late; it is one-third of a second nearly.

The results in column headed λ have slightly different weights depending on the rate of change of the moon's right ascension, for which we may take from the ephemeris the variation in one minute; in the present case the weighted means were the same as the indiscriminate tabular means;* nor was it necessary to refer to another refinement in relative weights namely, those depending on an unequal number of observed threads in the transits. The weights, marked p however, are important, since the results of the first row headed I + 9^s depend only on one-half of the number of observed transits of the moon as compared with the results in column I & II, hence the respective weights $\frac{1}{2}$ and 1; exceptions are the two days of November 6 and April 3, when the sum of the two weights must equal unity for each date.

From $\Sigma p\lambda = 526.3$ and $\Sigma p = 9.5$ we have the weighted mean value for the longitude of the observatory $9^h\ 23^m\ 55^s.4$ as far as this depends on the observed moon culminations. Forming $\Sigma pv^2 = 367.5$ and putting $n = 13$ we get the probable error of a single determination for longitude from moon culminations $0.675\sqrt{\frac{\Sigma pv^2}{n-1}} = \pm 3^s.7$, a fair value since in middle latitude $\pm 3^s$ is noted as an ordinary result.

We have next to combine with the preceding result that deduced from the occultation of η Geminorum on November 10, 1889, both immersion and emersion being observed. With a revised chronometer correction and a corrected lunar ephemeris from Greenwich observations we get the resulting longitude from the immersion $9^h\ 24^m\ 05^s.9$ and from the emersion $9^h\ 24^m\ 01^s.4$, mean $9^h\ 24^m\ 03^s.6$.†

Results from occultations being of superior value in comparison with moon culminations the weight 2 has been assigned to it in connection with tabular weights p. We then have for our *final value*, from

$\Sigma p\lambda = 653.7$ and $\Sigma p = 11.5$	$\lambda = 9^h\ 23^m\ 56^s.9$	or $140°\ 59'\ 13''.5$
with a probable error, $0.675\sqrt{\frac{[pv^2]}{[p]\,(n-1)}}$	± 1.2	± 17.7

The observer's preliminary adopted longitude of the camp was $9^h\ 23^m\ 56^s$ and on his topographical map (No. 2066) he locates approximately the meridian of 141° west and marked the same on the ground 625 metres west of his observatory.

In latitude 67° 25′ 05″ one minute of longitude equals 714.5 metres and 1″ equals 11.9083 metres; the difference between 141° 00′ 00″.0 and 140° 59′ 13″.5 being 46″.5, which equals 554 metres (nearly), shows that Assistant Turner's approximate boundary line is 625—554 or 71 metres farther to the west than the position resulting from the present investigation. On the scale of his map ($\frac{1}{5000}$) the boundary line should therefore be shifted to the east by 14.3 mm. (about 0.56 of an inch). The probable error of this position $\pm 17''.7$, equals ± 214 metres, or between one-seventh and one-eighth of a statute mile.

The observatory was 98 feet above the river, its altitude above the sea I estimate at 650 feet, viz: Altitude of Fort Yukon as determined by Captain Raymond, U. S. E., in 1869, 412 feet; distance of Fort Yukon from the sea 966 statute miles, slope stated 5 inches per mile. Supposing the Porcupine's slope to be 8 inches per mile, the difference in height for 210 miles equals 140 feet, hence for altitude of river at camp 552 feet and of observatory 650 feet; also its distance from the

* The extreme values of the weights being 1.94 and 2.16.

† The observer's approximate results were $9^h\ 24^m\ 07^s.2$ and $9^h\ 23^m\ 55^s.4$; that given above is from my own reduction and a check reduction by Mr. Hazard.

mouth of the Yukon 1176 statute miles. An altitude of 650 feet has but a slight effect on the computed longitude from the occultation.

The topographic survey of the region about Camp Colonna depends on triangulation with a base 953 metres in length measured on the ice; the angles were measured with an 8-inch theodolite.* The reconnoissance to the north in March and April, 1890, during which the Arctic Ocean was reached, was not productive of astronomic determinations for position in consequence of the breaking down of the two chronometers. The reconnoissance to the south intended to make a junction with the work of Assistant McGrath's party on the Yukon, engaged in locating the boundary there, failed on account of the flooded condition of the country due to the melting of the snow.

Camp Colonna was abandoned on July 15, 1890, and the party arrived at St. Michael, Alaska, on August 30, 1890, where it was forced to winter for want of transportation southward. The flying topographic survey of the Porcupine between Camp Colonna and Fort Yukon showed a fair accord with the longitude assigned to the fort by Captain Raymond in 1869,† the position assigned by him is $\varphi=66^\circ\,33'\,47''$ $\lambda=145^\circ\,17'\,47''$. The latter value depends on two moon culminations and one contact of a solar eclipse, but two other values were rejected. The position of the Old Rampart house on the Porcupine, about 33 miles down the river from the camp, was satisfactorily determined by Turner, as well as the difference of longitude between the camp and Fort Yukon. Taking the mean of the stationary rates ‡ of his six chronometers, viz, from 9 days at the camp and 3 days at the Old Rampart house, the difference of longitude is found as follows:

			m.	s.	
From M. T. chronometer		1713	2	42·0	mean $2^m\,41^s{\cdot}4$
"	"	1911		42·2	
"	"	301		42·2	
" Sid.	"	215		39·5	
"	"	1739		40·1	
"	"	223		42·6	

and the longitude of the Old Rampart house becomes $9^h\,23^m\,56^s{\cdot}9+2^m\,41^s{\cdot}4=9^h\,26^m\,38^s{\cdot}3$, or $141^\circ\,39'\,34''{\cdot}5$. Its latitude is $67^\circ\,09'\,42''\pm9''$.

Similarly taking the mean stationary rates ‡ as determined at the Old Rampart house (3 days) and at Fort Yukon (3 days), but rejecting the results by two chronometers as running wild, we have for the difference of longitude of these two places:

			m.	s.	
From M. T. chronometer		1713	14	31·1	mean $14^m\,36^s{\cdot}8$
"	"	1911		34·7	
"	"	301		39·2	
" Sid.	"	223		42·0	

and the longitude of Fort Yukon becomes

$$9^h\,26^m\,38^s{\cdot}3+14^m\,36^s{\cdot}8=9^h\,41^m\,15^s{\cdot}1 \text{ or } 145^\circ\,18'\,46''{\cdot}5$$

Longitude of Fort Yukon according to Capt. C. W. Raymond, U. S. A., in 1869	$9^h\,41^m\,11^s{\cdot}1$ or $145^\circ\,17'\,47''$
and longitude of same according to Assistant J. E. McGrath, June, 1891	$9^h\,41^m\,08^s{\cdot}1$ or $145^\circ\,17'\,01''{\cdot}5$
Mean position adopted	$9^h\,41^m\,11^s{\cdot}4$ or $145^\circ\,17'\,51''$

which value should now be used on the charts of the Yukon in preference to the older determination.

* Measures were made on June 1, 1890, at midnight, with the sun about two diameters above the horizon.

† Report of a reconnoissance of the Yukon River, Alaska, July to September, 1869, by Capt. C. W. Raymond U. S. E., Washington, D. C., 1871.

‡ Rates worked out by Mr. Flynn.

3. ST. MICHAEL.

(J. H. Turner, observer. October, 1890, to March, 1891.)

[For description of station and instrument see report on the latitude observations.]

At this station, between October, 1890, and March, 1891, there were observed 26 moon culminations, including ☾I and ☾II, and 5 occultations, *all* immersions. They were computed by Mr. D. L. Hazard* and the computation of the culminations was checked by Mr. H. F. Flynn. The observations of the occultations were independently computed by Mr. Flynn; this was necessary as no computation by Mr. Turner could be found. The individual results are given in the following table, the treatment being the same as in the case of the longitude of Camp Colonna.

Observations marked † depend on Greenwich ephemeris corrected; * rejected as outside the limit of tolerance. Seconds without mark in columns Greenwich and San Francisco depend on corresponding observations at these places. The column headed "Resulting values" contains the results reduced to ½ (☾I & ☾II). Respecting weights the following plan was adopted:

$p = 1$ to result from 1 limb observed at St. Michael combined with corrected lunar ephemeris; $p = 1{\cdot}4$ same with corresponding observation at Greenwich; $p = 1{\cdot}8$ same with corresponding observation at San Francisco; $p = 2$ same when observed at all stations; $p = 3$ when both limbs were observed at St. Michael together with corresponding observations at the other two stations.

Recapitulation of results for longitude at St. Michael, Alaska.

$10^h\ 46^m$ + tabular quantities.

Date	Greenwich ☾I.	Greenwich ☾II.	San Francisco ☾I.	San Francisco ☾II.	Means ☾I.	Means ☾II.	Resulting values.	Weights p
1890.	*s.*	*s.*	*s.*	*s.*	*s.*	*s.*	*s.*	
Oct. 24.	64·6†				64·6		67·6	1·0
" 25.	64·7	75·7	58·4	69·4	61·6	72.6	67·1	3·0
Nov. 23.	61·4†		60·9		61·1		64·1	1·8
" 24.	62·7				62·7		65·7	1·4
" 25.	66·7	68·2	65·4	66·9	66·0	67·6	66·8	3·0
" 26.	[77·3]*	75·0	[76·9]*	74·6		74·8	71·8	2·0
Dec. 17.	[74·8]*							
" 19.	67·7†		57·3		61·6		64·6	1·8
" 21.	64·1		59·7		61·9		64·9	2·0
" 22.	59·0†		55·1		56·7		59·7	1·8
" 23.	61·8†		58·9		60·1		63·1	1·8
" 29.		61·1†				61·1	58·1	1·0
" 31.		62·7†				62·7	59·7	1·0
1891.								
Jan. 2.		60·0†				60·0	57·0	1·0
" 4.		61·2		63·4		62·3	59·3	1·4
" 14.	58·2				58·2		61·2	1·4
" 16.	61·1				61·1		64·1	1·4
" 17.	58·9		58·2		58·6		61·6	2·0
" 18.	56·3		50·0		53·2		56·2	2·0
" 19.	63·1†		58·6		60·5		63·5	1·8
" 24.	62·6	65·1	63·6	66·1	63·1	65·6	64·4	3·0
" 25.		64·8		67·3		66·0	63·0	2·0
Feb. 17.	60·8				60·8		63·8	1·4
" 20.	63·8†		64·1		64·0		67·0	1·8
Mar. 18.	61·0		63·8		62·4		65·4	2·0
" 19.	61·3				61·3		64·3	1·4
			Weighted means		61·0	67·0	63·8	
			Difference		6ˢ·0			

The weighted mean $\lambda = 10^h\ 48^m\ 03^s{\cdot}8 \pm 0{\cdot}675 \sqrt{\frac{[pvv]}{[p](n-1)}}$ or $\pm 0^s{\cdot}5$

* Some of the transit reductions are due to Assistant Mosman.

The results from the occultations are as follows:

Date.	Star.	Longitude.
		s.
1890, Oct. 24.	33 Piscium.	10^h 48^m 07·3
1891, Jan. 14.	30 "	05·0
" " 14.	33 "	05·5
" " 14.	17 B. A. C.	09·8
" " 17.	38 Arietis.	07·9
		Mean $10^h\ 48^m\ 07^s{\cdot}1 \pm 0^s{\cdot}6$?

These values depend on corrected lunar ephemeris, and in connection with the results from the culminations each has the relative weight 2 assigned to it.

Combined with preceding result the final longitude of St. Michael becomes

$$10^h\ 48^m\ 04^s{\cdot}4 \pm 0^s{\cdot}4 \text{ or } 162^\circ\ 01'\ 06'' \pm 6''$$

4. ANCHORAGE POINT, CHILKAT INLET.

(May to August, 1894.)

[For description of station and instrument see report on the latitude observations.]

The longitude of this station was determined in 1894 by a series of chronometer transportations between it and Sitka. The office computation was made by Mr. D. L. Hazard.* The transit observations at Sitka (station of 1892) were made by Assistant F. Morse between May 12 and August 18, 1894. From May 12 to 20, meridian telescope No. 7 was used, and for the rest of the observations meridian telescope No. 16 (focal length 78 cm., aperture 6·6 cm., magnifying power ? 1 div. of striding level $2''{\cdot}109$, pivot inequality $p=+0^s{\cdot}030$ for illumination W.). Observing chronometer Hutton No. 194 (sid.). Auxiliary chronometers Negus No. 1589 (sid.) and Fletcher No. 1713 (M. T.) were kept rated by daily comparisons with No. 194. Accurate local time for any date was thus secured.

At Anchorage Point the observations for time were made by J. F. Hayford (J. F. Pratt, chief of party) between May 15 and August 12, 1894. Meridian telescope No. 9 was used. Focal length 64 cm., aperture 5 cm., magnifying power 43; one division of striding level $1''{\cdot}92$. Observing chronometer Bond No. 380 (sid.). Auxiliary chronometers Frodsham No. 4969 (M. T.), Frodsham No. 2490 (M. T.), Hutton No. 207 (sid.), and Frodsham No. 2637 (sid.) were kept rated by means of daily comparisons.

The comparison of the local times at the two stations was effected by the transportation of 9 chronometers on board the C. & G. S. steamer *Hassler*, Lieut. G. B. Harber, U. S. N., in command, making 7½ round trips between these places. Daily comparisons of the chronometers were made by J. Page (under the direction of Assistant Morse). On arrival and departure of the steamer at each place the observing chronometer was brought on board and compared with the traveling chronometers.

Two results were obtained, the first depending on the traveling rates from the round trips starting from Chilkat, the second depending on the traveling rates from the round trips starting from Sitka. As there were 7½ round trips the last half trip was omitted in obtaining the first result and the first half trip in the second case. Weights to the results depend on the variations in the rates of the chronometers, on the duration of the trip, the interval between the comparisons of the observing and traveling chronometers and the time elapsed since the last time determination being included in the actual traveling time. There are no observations for difference of personal equation of the two observers.

* The field computation is by Assistant F. Morse.

The results by the individual chronometers and trips are as follows:

1894. *Difference of longitude between Sitka and Anchorage Point, Chilkat Inlet, Alaska.*

SUMMARY OF RESULTS FROM SEVEN ROUND TRIPS, STARTING FROM ANCHORAGE POINT, CHILKAT INLET.

Chronometers, M. T. or Sid.		1st	2d	3d	4th	5th	6th	7th	Means. Δ λ	Weights.
		m. s.	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	
M. T.	231	0 28·03	0 26·36	0 28·36	0 28·19	0 28·45	0 28·19	0 28·18	0 27·97	3
	1507	28·44	29·06	29·18	28·26	28·27	28·20	28·54	28·56	4
	1510	28·57	29·25	29·00	28·52	28·63	28·06	28·58	28·66	7
	196	28·59	29·09	29·54	28·59	28·43	28·51	28·92	28·81	3
	1542	28·11	28·11	28·66	28·23	28·47	28·38	28·37	28·33	22
	1728	28·66	28·94	29·16	28·63	28·58	28·43	28·59	28·71	6
	208	27·95	27·40	28·21	28·19	28·42	28·42	28·09	28·10	6
	2167	28·21	28·56	28·90	28·55	28·68	28·27	28·64	28·54	17
Sid.	387	28·20	28·44	28·91	27·93	28·41	27·93	28·59	28·34	6
Mean		0 28·31	0 28·36	0 28·88	0 28·34	0 28·48	0 28·27	0 28·50	0 28·45	
Weighted mean		28·25	28·38	28·82	28·35	28·52	28·28	28·49	28·44	
Weight *p*		3	1	2	2	2	1	2		

Weighted mean $0^h\ 0^m\ 28^s{\cdot}44 \pm 0^s{\cdot}05$

SUMMARY OF RESULTS FROM SEVEN ROUND TRIPS, STARTING FROM SITKA.

Chronometers, M. T. or Sid.		1st	2d	3d	4th	5th	6th	7th	Means, Δ λ	Weights.
		m. s.	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	*m. s.*	
M. T.	231	0 28·87	0 28·78	0 28·74	0 28·39	0 28·37	0 28·71	0 28·11	0 28·57	3
	1507	27·69	29·08	29·11	27·76	28·78	27·93	28·64	28·43	4
	1510	28·37	28·88	28·82	27·91	28·83	28·10	28·58	28·50	7
	196	28·59	29·07	28·95	27·66	28·03	29·56	29·20	28·72	3
	1542	28·93	28·57	28·59	28·22	28·50	28·50	28·32	28·52	22
	1728	27·59	28·90	28·75	27·99	29·01	28·09	28·75	28·44	6
	208	27·71	28·03	28·52	28·58	27·88	28·76	27·65	28·16	6
	2167	28·24	28·71	28·80	28·27	28·77	28·31	28·49	28·51	17
Sid.	387	28·68	28·80	28·43	27·69	28·97	27·98	28·73	28·47	6
Mean		0 28·30	0 28·76	0 28·75	0 28·05	0 28·57	0 28·44	0 28·50	0 28·48	
Weighted mean		28·41	28·69	28·70	28·13	28·61	28·38	28·44	28·48	
Weight *p*		1	2	2	2	2	2	2		

Weighted mean $0^h\ 0^m\ 28^s{\cdot}48 \pm 0^s{\cdot}05$

	h. m. s. s.
Final mean $\Delta\lambda$	$= +0\ 00\ 28{\cdot}46 \pm 0{\cdot}05$
Longitude of Sitka, transit of 1892–93	$9\ 01\ 21{\cdot}48 \pm 0{\cdot}13$ ‡
Longitude of Anchorage Point *	$9\ 01\ 49{\cdot}94 \pm 0{\cdot}14$
or	$135^\circ\ 27'\ 29''{\cdot}10 \pm 2''{\cdot}10$

This result will be used for the triangulation of the Chilkat Inlet and adjacent region.

In connection with the transit observations at Anchorage Point the meridian mark was made use of to provide the triangulation with a good azimuth.

5. PORT SIMPSON, B. C., AND LION POINT, PORTLAND CANAL, B. C.

[For description of stations and instruments see report on the latitude observations.]

The longitudes of Port Simpson and Lion Point were determined in 1895 by a series of chronometer transportations, the first named place being made to depend on the telegraphic longitude of Seattle, Wash., viz: $8^h\ 09^m\ 20^s{\cdot}32 \pm 0^s{\cdot}08$.

At Seattle the station is in the grounds of the State University. The time observations were

* In 1867 and 1869 Assistant Davidson visited this place and his longitude of Pyramid Island (center of inlet) is given in Dall and Baker's Pacific Coast Pilot, Coast and Geodetic Survey, Washington, D. C., 1883 as $9^h\ 01^m\ 48^s{\cdot}3$ W.

‡ C. & G. S. Report for 1894, pt. 2, p. 83.

made by Assistant F. Morse with meridian telescope No. 16, between April 23 and July 7, 1895. Observing chronometer Hutton No. 194 (sidereal) was used also as a "hack" for comparison with chronometers transported on board the *City of Topeka*. Mean time chronometer Fletcher No. 1713 and sidereal chronometer Negus No. 1825 were kept rated by means of comparisons with the observing chronometer. The field reduction is by the observer, the office reduction by Mr. D. L. Hazard; only those sets of transits were computed which immediately precede or follow a comparison with the *City of Topeka* chronometers.

At Port Simpson the observations for time were made by Mr. O. B. French with meridian telescope No. 2. Sidereal chronometer Frodsham No. 3462 was used in observing transits, also as a "hack." Sidereal chronometer No. 3477 and mean time chronometer No. 2171 were kept rated by means of comparisons.

The observations comprise the period May 6 to July 9, 1895. The field computation was made by the observer, aided by C. C. Yates, the office computation by D. L. Hazard.

At Lion Point the transit observations were made by Assistant P. A. Welker with meridian telescope No. 13, between May 14 and July 27, 1895. Sidereal chronometer Negus No. 1823 was used as observing chronometer as well as "hack." Sidereal chronometer No. 3479 and mean time chronometer No. 1718 were kept rated.

For the determination of the longitude of Port Simpson 9 chronometers were transported on the steamer *City of Topeka* for 4 round trips, and for the determination of the longitude of Lion Point 5 chronometers were transported on the C. & G. S. steamer *Fuca* for 6½ round trips. Assistant F. A. Young accompanied the chronometers to and from Port Simpson and made daily comparisons on board the *Topeka*. The average duration of a trip between Seattle and Port Simpson was about three days, and between Port Simpson and Lion Point about three-fourths of a day.

In computing at the office the differences of longitude the plan adopted for previous chronometric differences of longitude in Alaska was followed. (See report on the longitude of Anchorage Point, 1894.)

There were no observations for personal equation. In the case of the determination of Lion Point, the work begins there and the results are combined as before, except that when Port Simpson is taken as a starting point the first (half) trip is neglected and when Lion Point is taken as the starting point the last (half) trip is not used.

Difference of longitude of Seattle and Port Simpson.

SUMMARY OF RESULTS OF FOUR ROUND TRIPS STARTING FROM SEATTLE.

Chronometers.		1st	2d	3d	4th	Means, Δ λ	Weights.
		m. s.	m. s.	m. s.	m. s.	m. s.	
M. T.	1707	32 23·63	32 22·69	32 22·75	32 22·29	32 22·84	20
"	229	25·76	23·42	22·56	23·33	23·77	1
"	2535	22·59	22·78	23.04	22·76	22·79	25
"	1542	22·90	22·42	21 75	22·29	22·34	26
"	231	23·16	23·02	21·71	21·97	22·46	10
Sid.	220	22·22	22·60	21·96	22·49	22·32	87
"	1840	21·85	22·81	23·22	23·14	22·76	5
"	1589	22·99	22·44	21·41	22·26	22·28	11
"	1838	22·81	22·74	21·84	22·51	22·47	22
Mean		32 23·10	32 22·77	32 22·25	32 22·56	32 22·67	207
Weighted mean		22·64	22·64	22·12	22·46	22·47	
p		4	4	2	4		

Weighted mean $32^m\ 22^s{\cdot}51 \pm 0^s{\cdot}07$

Differences of longitude of Seattle and Port Simpson—Continued.

SUMMARY OF RESULTS OF FOUR ROUND TRIPS STARTING FROM PORT SIMPSON.

Chronometers.		1st	2d	3d	4th	Means, Δ λ	Weights.
		m. s.	m. s.	m. s.	m. s.	m. s.	
M. T.	1707	32 22·73	32 22·38	32 22·82	32 23·52	32 22·86	20
"	229	23·07	22·02	21·80	28·58	23·87	1
"	2535	22·31	22·39	22·75	23·70	22·79	25
"	1542	22·55	21·97	22·03	22·92	22·37	26
"	231	22·78	22·06	21·80	23·40	22·51	10
Sid.	220	22·57	22·25	22·39	22·07	22·32	87
"	1840	23·08	23·21	23·91	20·66	22·72	5
"	1589	22·57	21·84	21·61	23·24	22·32	11
"	1838	22·49	22·22	22·01	23·30	22·50	22
Mean		32 22·68	32 22·26	32 22·35	32 23·49	32 22·70	207
Weighted mean		22·57	22·24	22·36	22·77	22·48	
p		4	3	3	4		

Weighted mean $32^m\ 22^s{\cdot}51 \pm 0^s{\cdot}08$

Hence Port Simpson west of Seattle $0^h\ 32^m\ 22^s{\cdot}51 \pm 0^s{\cdot}08$

Difference of longitude of Port Simpson and Lion Point.

SUMMARY OF RESULTS FROM SIX ROUND TRIPS STARTING FROM PORT SIMPSON.

Chronometers.		1st	2d	3d	4th	5th	6th	Mean, Δ λ	Weight.
		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	
M. T.	1507	1 37·75	1 37·69	1 38·13	1 38·22	1 38·20	1 38·64	1 38·10	8
"	1510	37·90	37·82	38·14	38·34	38·24	38·60	38·17	10
"	297	38·10	38·36	37·89	37·89	39·04	38·28	38·26	3
"	557	38·13	37·93	37·62	38·08	38·17	38·40	38·06	10
Sid.	387	37·57	37·35	38·04	38·24	38·08	38·69	38·00	5
Means		1 37·89	1 37·83	1 37·96	1 38·15	1 38·35	1 38·52	1 38·12	36
Weighted means		37·90	37·82	37·96	38·19	38·26	38·54	38·11	
p		21	16	20	23	12	8		

Weighted mean $1^m\ 38^s{\cdot}06 \pm 0^s{\cdot}06$.

SUMMARY OF RESULTS FROM SIX ROUND TRIPS SARTING FROM LION POINT.

Chronometers.		1st	2d	3d	4th	5th	6th	Mean, Δ λ	Weight.
		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	
M. T.	1507	1 37·57	1 37·73	1 38·01	1 38·11	1 38·26	1 38·44	1 38·02	8
"	1510	37·59	37·83	38·13	38·14	38·35	38·48	38·09	10
"	297	38·94	37·79	38·27	37·18	38·60	37·80	38·10	3
"	557	38·04	37·86	38·17	37·50	38·51	38·18	38·04	10
Sid.	387	37·62	37·53	37·85	38·06	38·24	38·38	37·95	5
Means		1 37·95	1 37·75	1 38·09	1 37·80	1 38·39	1 38·26	1 38·04	36
Weighted means		37·83	37·77	38·09	37·86	38·38	38·32	38·04	
p		21	15	26	19	11	8		

Weighted mean $1^m\ 37^s{\cdot}99 \pm 0^s{\cdot}06$.

Hence Lion Point east of Port Simpson $1^m\ 38^s{\cdot}03 \pm 0^s{\cdot}06$

RESULTING LONGITUDE OF PORT SIMPSON (1895) AND OF LION POINT.

Allowing $\pm 0^s.10$ for personal equation we get the final longitudes as follows:

$$\text{Port Simpson } \lambda = 8^h\ 09^m\ 20^s.32 + 0^h\ 32^m\ 22^s.51 = 8^h\ 41^m\ 42^s.83 \text{ W. of G.}$$
$$\pm .08 \qquad \pm .13 \qquad \pm .15$$

In my report of December 27, 1893, I gave the longitude of the 1892 station at Port Simpson resulting from a single trip (time determinations by Lieutenant Poundstone, U. S. N.) as $8^h\ 41^m\ 44^s.19 \pm 0^s.40$; referred to the 1895 station this becomes $8^h\ 41^m\ 43^s.38 \pm 0^s.40$, hence by combination with regard to probable errors, we have finally

$$\lambda \text{ Port Simpson (1895 station on hill) } 8^h\ 41^m\ 42^s.90 = 130^\circ\ 25'\ 43''.50 \text{ W. of G.}$$
$$\pm 0.15 \qquad \pm 2.25$$

$$\text{Subtracting } \Delta\lambda = 1^m\ 38^s.03 \pm 0^s.06 \text{ we get}$$
$$\lambda \text{ Lion Point} \quad 8^h\ 40^m\ 04^s.87 = 130^\circ\ 01'\ 13''.05$$
$$\pm 0.16 \qquad \pm 2.40$$

6. PORT SIMPSON, B. C., AND MARY ISLAND, REVILLAGIGEDO CHANNEL, ALASKA.

[For description of station Port Simpson and of instruments see report on the latitude observations.]

The longitude of Mary Island depends on chronometer transportations between Port Simpson and Mary Island, and the same chronometers and methods of observing and computing were employed as in the case of the Port Simpson longitude.

Time observations at Mary Island.—The astronomic station occupied in 1895, May to July, was 69·2 feet from the southwest corner of the custom-house and bearing S. 40° W. from it, and is marked by a brick pier upon which meridian telescope No. 1 was mounted for time observations. The transits were observed by E. F. Dickins, assistant, and noted by sidereal chronometer Hutton No. 207, which was compared with mean time chronometer Frodsham No. 4969 and sidereal chronometer Bond No. 380. The field reduction is by the observer and C. C. Yates and the office reduction and computation for difference of longitude is by D. L. Hazard.

Chronometer transportations.—Nine chronometers were carried on board the steamer *City of Topeka* and four round trips were made between Port Simpson and Mary Island. The passage from one to the other place consumed about a quarter of a day. The method of reduction being that previously explained, we have the following table of results:

Difference of longitude of Port Simpson and Mary Island.

SUMMARY OF RESULTS OF FOUR ROUND TRIPS, STARTING FROM PORT SIMPSON.

Chronometers.		1st trip.	2d trip.	3d trip.	4th trip.	Mean, Δ λ	Weights.
		m. s.	m. s.	m. s.	m. s.	m. s.	
M. T.	1707	3 10·48	3 10·92	3 10·85	3 10·57	3 10·70	20
"	229	10·98	11·07	11·00	10·58	·91	1
"	2535	10·55	10·99	10·94	10·72	·80	25
"	1542	10·65	10·97	10·85	10·58	·76	26
"	231	10·66	11·01	10·80	10·58	·76	10
Sid.	220	10·51	10·95	10·93	10·52	·73	87
"	1840	10·31	10·87	10·87	10·44	·62	5
"	1589	10·62	10·92	10·91	10·55	·75	11
"	1838	10·65	10·90	10 88	10·52	·74	22
Mean		3 10·60	3 10·96	3 10·89	3 10·56	3 10·75	207
Weighted mean		10·55	10·95	10·90	10·56	10·74	
p		1	6	1·5	6		

Weighted mean $3^m\ 10^s.76 \pm 0^s.07$

Difference of longitude of Port Simpson and Mary Island—Continued.

SUMMARY OF RESULTS OF FOUR ROUND TRIPS, STARTING FROM MARY ISLAND.

Chronometers.		1st trip.	2d trip.	3d trip.	4th trip.	Mean, $\Delta\lambda$	Weights.
		m. s.	*m. s.*	*m. s.*	*m. s.*	*m. s.*	
M. T.	1707	3 10·72	3 10·85	3 10·72	3 10·50	3 10·70	20
"	229	10·93	11·02	10·55	10·95	·86	1
"	2535	10·74	10·97	10·72	10·81	·81	25
"	1542	10·75	10·97	10·63	10·57	·73	26
"	231	10·72	10·99	10·60	10·67	·74	10
Sid.	220	10·72	11·01	10·68	10·32	·68	87
"	1840	10·70	10·88	10·73	09·99	·58	5
"	1589	10·72	10·98	10·63	10·51	·71	11
"	1838	10·70	10·96	10·63	10·49	·70	22
Mean		3 10·74	3 10·96	3 10·65	3 10·53	3 10·72	207
Weighted mean		10·72	10·97	10·67	10·47	10·71	
p		6	2	3	1		

Weighted mean $3^m\ 10^s{\cdot}73 \pm 0^s{\cdot}05$

Hence Mary Island west of Port Simpson	$3^m\ 10^s{\cdot}74 \pm 0^s{\cdot}06$
Longitude of Port Simpson (transit of 1895)	$8^h\ 41^m\ 42^s{\cdot}90 \pm 0^s{\cdot}15$
Longitude of Mary Island, W. of G.	$8^h\ 44^m\ 53^s{\cdot}64 \pm 0^s{\cdot}16$
or	$131^\circ\ 13'\ 24''{\cdot}60 \pm 2''{\cdot}40$

APPENDIX No. 4—1895.

OBSERVATIONS OF THE TRANSIT OF MERCURY ON NOVEMBER 10, 1894, MADE AT THE COAST AND GEODETIC SURVEY OFFICE, WASHINGTON, D. C.

Report by CHAS. A. SCHOTT.
O. H. TITTMANN.
E. D. PRESTON.
EDWIN SMITH.
G. R. PUTNAM.
E. G. FISCHER.

STATION.

In lot adjacent to and south of the United States Coast and Geodetic Survey Office on Capitol Hill, Washington, D. C. Position by triangulation, latitude 38° 53′ 12″ north, longitude 77° 00′ 24″ or $5^h\ 08^m\ 01^s.6$ west of Greenwich.

INSTRUMENTS.

The following table gives a description of the instrument used by each observer:

Observer.	Instrument.	Aperture.	Focal length.	Magnifying power.
		cm.	*cm.*	
C. A. Schott.	Equatorial by Dolland.	10·2	183	40
O. H. Tittmann.	Zenith telescope No. 5.	9·0	124	90
E. D. Preston.	Reconnoitering telescope No. 30.	9·0	98	90
Edwin Smith.	Zenith telescope No. 4.	7·9	118	99
G. R. Putnam.	Reconnoitering telescope No. 4.	5·7	94	40
E. G. Fischer.	Reconnoitering telescope No. 59.	6·2	75	38

TIMEPIECE AND CORRECTIONS.

Mean time chronometer Molyneux No. 1718 was used by all the observers, the seconds being counted aloud by persons not observing. The corrections to this chronometer on seventy-fifth meridian time were as follows:

Nov. 10 — $10^h\ 31^m$ (75th mer. time) fast $0^h\ 00^m\ 00^s.32$ (before 1st contact).
Nov. 10 — 11 07 (" " ") " 0 00 00 ·28 (after 2d contact).

These corrections are derived from comparisons with sidereal chronometers Negus 1823 and Negus 1824, the corrections to which were determined by star transit observations, in the small observatory near the office, by G. R. Putnam. Molyneux No. 1718 was also compared with the noon signals from the Naval Observatory, received, telegraphically, as follows:

Nov. 8, 1894—No. 1718 is fast	0^h	00^m	$00^s.2$
Nov. 9, 1894— "	"	"	"			00.3
Nov 10, 1894— "	"	"	"			00.6

which agrees well with the above. The error being so small no correction is applied to the transit of Mercury observations.

Observed time of contacts (chronometer time).

Observer.	1st contact.	2d contact.	3d contact.	4th contact.
	h. m. s.	*h. m. s.*		
C. A. Schott.	10 57 09	10 58 25	Lost by clouds.	Lost by clouds.
O. H. Tittmann.	10 57 00	10 58 26		
E. D. Preston.	Not obs'd.	10 58 18		
Edwin Smith.	10 57 00	10 58 23		
G. R. Putnam.	10 57 00	10 58 25		
E. G. Fischer.	10 56 43	10 58 18		

REMARKS BY OBSERVERS.

C. A. Schott.—Instrument by Dolland, London, mounted equatorially, but very unsteady. Little value is attached to observation of the external contact, supposed to be about 15^s too late, sun's limb very unsteady, and wind shaking telescope. The time of the interior contact is that of the first streak of light flashing around the eastern limb of the planet; it closed up again and reopened, perhaps in half a second. Third and fourth contact lost by a cloud; two and a half minutes before third contact a heavy cloud rolled up before the sun, hiding it for about 6 minutes.

O. H. Tittmann.—First contact, the planet was quite perceptibly on the sun's limb. Second contact, time of rupture of black drop.

E. D. Preston.—Second contact, last dark band $10^h\ 58^m\ 11^s$, first light $10^h\ 58^m\ 26^s$, mean $10^h\ 58^m\ 18^s$.

Edwin Smith.—Edge of sun, fair. First contact late, planet well on. Second contact uncertain; it may be anywhere between 10^s and 35^s.

APPENDIX No. 5—1895.

REPORT ON THE CHANGES IN THE DEPTHS ON THE BAR AT THE ENTRANCE TO NANTUCKET INNER HARBOR, MASSACHUSETTS, BETWEEN THE YEARS 1888 AND 1893.

By H. L. MARINDIN, Assistant.

The harbor of Nantucket is to be classed among the harbors of refuge, and it is only as such that the General Government can entertain the project of any improvement for obtaining deeper water over the bar.

The following statistics, kindly furnished by the collector of the port, Mr. Joseph W. Clapp, exhibit the value of the imports and exports for the year 1893:

Port of Nantucket—Table of statistics for 1893.

Name of article.	Value of—		Total.	Tonnage.
	Exports.	Imports.		
Tobacco		$39 500		
Rice		960		
Grain and forage		28 000		900
Vegetables	$1 000	10 000	$11 000	
Live stock and produce		9 000		
Lumber		15 300		
Coal and minerals		42 500		7 000
Fresh fish and shellfish	12 500	3 000	15 500	
Fertilizers		20 000		
Machinery		20 000		
General merchandise	500	120 000	120 500	
Gain in navigation during year:				
1 sailing packet				16
1 new catboat				7
Means of transportation:				
1 steamer running as mail packet				460
Number of passengers carried (estimated) ... 12 000				
Number of excursionists ... 4 000				
Number of licensed vessels (5 tons and upward) ... 19				
Average draft of vessels ... feet .. 5 to 8				
Number of unlicensed vessels ... 40				
Number of enrolled vessels (250 tons each) .. 3				
Number of fishing vessels ... 1				

It will be seen from the foregoing statistics that this alone would not warrant the expenditure of any large sum of money by the General Government in the improvement of harbor and bar, but, as this harbor is the only available refuge between Vineyard Haven on the west and Provincetown Harbor on the east, where a vessel in distress could find shelter during a northerly gale, which is the prevailing direction from which come the great winter storms, and lying as it does in the midst of dangerous shoals, it would seem that the Government is justified in pushing works of improvement at this port.

Roughly speaking, about 30 000 vessels pass through Nantucket Sound yearly, the majority of which draw less than 15 feet of water. The greater number of vessels wrecked on the island are wrecked on the north side where this harbor would be accessible to those in distress, provided the depth of water over the bar were sufficient; therefore, the project of improvement by jetties contemplated the creation of a channel with 12 to 14 feet depth at mean low water, which would thus accommodate the greater number of vessels passing through the sound. It was with this end in view that in 1880–1885 the plan of improvement by jetties was suggested and adopted by the United States Engineers.

At that date the bar was a formidable obstruction over 1 mile in width, with 6 feet of water at mean low tide. This depth had obtained for many years without material change, and it would seem to have been the measure of the scouring forces of the tide as it filled and drained the inner basin.

The plan adopted promised an increase of depth on the bar to 12 or 14 feet, but at the date of our recent survey this promise had not been fulfilled, doubtless because the jetties remain unfinished, and have deteriorated, as all such incomplete works do on the seaboard.

The west jetty, which was begun in 1881, was completed to its present length in 1884; up to that time, however, no effect, either favorable or unfavorable, could be traced to this work.

During the following year, in 1885, it was recommended that an eastern jetty be constructed. The work was pushed for a number of years, with some interruptions from lack of funds, and in 1889 the depth of water was found to have increased to 7½ feet on the shoalest part of the bar.

In order to form a more intelligent understanding of the results indicated in this report it seemed advisable to present as an introduction the foregoing retrospect in the history of the projected improvements of the bar and channels, obtained chiefly from the inspection of the numerous reports of the United States Engineers since 1880.

To fully discuss the physical hydrographic changes due to the action of the jetties, it is necessary to have in hand a series of observations of the currents on the bar and in the channels, both before the location of the jetties and since their construction; these are wanting, however, so we are compelled to limit our inquiry to the comparison of the depths and the shift of channels during that period.

The plane of reference for the soundings of 1888 could not be recovered, owing to the destruction of the part of the wharf on which the bench mark was established, but as this plane was obtained from observations of the tide during one lunar month, and that for the soundings of 1893–94 was based on observations for a somewhat longer period, it does not seem unreasonable to accept the two as sufficiently identical, especially as the mean range of the tide agreed remarkably well in both instances.

The plane of reference for this comparison is found to be 4.3 feet below the bench mark of 1854 on Commercial Wharf; this height is still 0.5 foot higher than that which the bench mark of 1854 gives as the mean low-water plane from the tidal observations made during that year. This difference can not as yet be explained by the sinking of the wharf on which the bench is established, because we find no change in the difference in height between the Commercial Wharf bench and the inland bench mark at "Palmers Rock," the height of which was obtained by a line of levels in 1854 and again by two lines of levels in 1894. The solution of the question might lie in a repetition of the tidal observations of 1854 under as nearly similar conditions as could be obtained, but the cost of making the observations precludes the employment of this mode of solution.

DISCUSSION OF THE ACCOMPANYING DIAGRAMS 1 TO 4 AND TABLES 1 TO 6.

The four accompanying diagrams and tables of cross sections fully illustrate the changes. The location of the cross sections was determined by finding full lines of soundings on the survey of 1888 coinciding with similar lines in location and direction on the survey of 1893, and in order to recover the position of these sections at any future time, we have given the geographical position of the origin and end of the section.

The location of the sections and their comparisons are shown in diagrams 1 and 2. In each case the mean depth and mean difference is noted. This mean difference, however, does not indicate the important material change where a channel over a bar is concerned, which is the least depth of channel way, but it indicates the general change over the entire width, and should not be confounded with the other.

The cross section on AB, at the inner end of the bar, indicates a general shoaling, heavy on the flats at Coatue Point, and again heavy in the deep hole near the Brant Point shore.

The next cross section on AC shows the shoaling and deepening as nearly balanced, with a mean increase of depth of 0·1 foot. The next section on AD again indicates the same as the preceding.

The next section on EF, lying fairly within the action of the jetties, is more important as indicating any effect from them. The mean difference here shows an increase of depth of 0·9 foot.

Section on GH lies without the mouths of the jetties; the mean depth also indicates an improvement of 0·4 foot.

We now come to Table 6, which gives the comparison of depths along the channel lines for 1888 and 1893. These two lines are not identical in position, the one for 1888 lying west of the channel line for 1893, but their comparison is admissible, and shows an amelioration of 0·6 foot over the distance covered. Again, it must not be inferred that this increase measures the value of the improvement over the bar. Such is not the case, since the least depth on the bar is the criterion, but it shows, as stated before, the general tendency along the line under consideration. Thus we find that while the longitudinal section over the bar, from deep water inside to deep water outside, shows an increase of depth of 0·6 foot, yet the shoalest depth in channel has remained stationery at 7½ feet at mean low tide—the same as observed in 1888–89.

This shoalest depth is found in two places in the channel way over the bar, one directly east of the outer end of the west jetty, and the other on a line joining the outer ends of the east and west jetties, but somewhat nearer the east jetty.

As stated before, these two channel lines do not coincide, the one for 1888 being to the westward of that for 1893. This shift of position to the eastward (see Diagram No. 1) is also indicated by the retreat of the 6-foot contour to the eastward off the outer end of the west jetty, thus widening the channel for this depth (6 feet) from 1 050 feet in 1888 to 1 843 feet in 1893.

Diagram No. 3 exhibits the respective areas of shoaling and deepening and those where no change has appeared. Out of a total area of 594 acres covered by the diagram shoaling has occurred over 266 acres and deepening over 296 acres, while 32 acres show no change in depth. This at first does not appear very favorable, since the area shoaled is but little less than the area deepened; but it will be observed that the bulk of the shoaling has occurred in the dead angle formed by the west jetty and the Brant Point shore, and also extensively on the flats off Coatue Point and in the false channel, while the deepening has obtained in the vicinity of the channel, with the exception of the northern end of the channel, which shows a slight decrease in depth.

Upon examining closely Diagram No. 4 it will be noted that a number of shoal spots are found dotted over the bar. These spots are called "hogs' backs" by the local boatmen, and are found in close proximity to the channel, if not directly in it. They have 5 and 6 feet of water over them at mean low tide, while the surrounding depth is from 1 to 3 feet greater, and are covered with a rank growth of seaweed, which protects them effectually from erosion by the tidal currents. It is reasonable to infer that should these "hogs' backs" be once removed by the dredge their reappearance would be prevented by the tidal currents, thus ridding the navigation of the bar of one of its serious obstructions.

A recapitulation of the results determined by this comparison may be summed up in the following:

1. It is shown that the location and construction of the jetties, even to their incomplete stage, has had a favorable effect in increasing the navigable depth over the bar.

2. The shoalest depth on the bar now remains stationary at 7½ feet at mean low tide—the same as it was in 1888–89.

3. The action of the jetties is at present negative, i. e., they merely serve the purpose of maintaining the present depth.

4. The results, however, warrant the contention that the completion of the project of improvement recommended and adopted by the United States Engineers in 1885 would lead to beneficial results in further increasing the navigable depth over this bar.

NANTUCKET HARBOR BAR.

TABLE 1.—*Section AB—From Coatue Point to Brant Point.*

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	0·0	—0·4	....	0·4	Position of origin.
100	8·2	7·1	....	1·1	Lat. 41° 17′ 45″·54.
200	9·5	6·6	....	2·9	Long. 70° 05′ 10″·02.
300	9·5	5·6	....	3·9	
400	9·5	4·1	....	5·4	
500	9·5	2·2	....	7·3	
600	5·4	1·6	....	3·8	
700	2·5	2·4	....	0·1	
800	2·5	3·1	0·6	....	
900	1·5	2·6	1·1	....	
1 000	2·5	2·6	0·1	....	
1 100	2·5	2·4	....	0·1	
1 200	2·5	2·1	....	0·4	
1 300	4·2	1·6	....	3·6	
1 400	4·5	1·8	....	2·7	
1 500	4·5	1·6	....	2·9	
1 600	6·0	5·6	....	0·4	
1 700	9·2	7·2	....	2·0	
1 800	12·0	11·1	....	0·9	
1 900	15·0	13·1	....	1·9	
2 000	18·5	17·6	....	0·9	
2 100	20·7	27·6	6·9	....	
2 200	29·0	28·6	....	0·4	End of section.
2 300	22·6	19·4	....	3·2	Lat. 41° 17′ 25″·47.
2 400	14·6	5·6	....	9·0	Long. 70° 05′ 29″·61.
2 470	0·0	2·4	....	2·4	Shore line—1888.
2 500	....	0·0	....	....	" " 1893.
Means	9·0	7·3	....	1·7	

TABLE 2.—*Section AC—From Coatue Point to Brant Point.*

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	0·0	0·0	0·0	0·0	Position of origin.
100	8·0	5·6	....	2·4	Lat. 41° 17′ 45″.54.
200	8·5	7·6	....	0·9	Long. 70° 05′ 10″·02.
300	7·8	5·1	....	2·7	
400	7·5	6·6	....	0·9	
500	6·5	3·6	....	2·9	
600	3·5	2·9	....	0·6	
700	6·0	2·0	....	4·0	
800	3·5	3·1	....	0·4	
900	3·5	4·6	1·1	....	
1 000	2·5	5·6	3·1	....	
1 100	2·5	4·1	1·6	....	
1 200	2·5	2·6	0·1	....	
1 300	2·5	2·3	....	0·2	
1 400	3·5	2·1	....	1·4	
1 500	3·5	1·8	....	1·7	
1 600	4·0	3·6	....	0·4	
1 700	4·5	4·3	....	0·2	
1 800	2·5	5·6	3·1	....	
1 900	2·5	6·3	3·8	....	
2 000	1·5	7·6	6·1	....	
2 100	6·5	9·6	3·1	....	
2 200	10·5	11·6	1·1	....	
2 300	11·5	12·3	0·8	....	

NANTUCKET HARBOR BAR—Continued.

TABLE 2.—*Section AC—From Coatue Point to Brant Point*—Continued.

Distance.	Depth at mean low water. 1888.	1893.	Differences. Deepened.	Shoaled.	Remarks.
Feet.	*Feet*	*Feet.*	*Feet.*	*Feet.*	
2 400	11·5	12·1	0·6	....	
2 500	12·0	11·8	....	0·2	
2 600	13·5	12·1	....	1·4	
2 700	13·5	11·9	....	1·6	
2 800	13·5	12·2	....	1·3	
2 900	13·2	12·9	....	0·3	
3 000	12·5	12·8	0·3	....	
3 100	12·0	12·3	0·3	....	
3 200	5·2	5·6	0·4	....	
3 300	3·7	3·6	....	0·1	
3 400	3·5	3·3	....	0·2	
3 500	3·2	1·3	....	1·9	End of section.
3 600	1·7	1·3	....	0·4	Lat. 41° 17′ 33″·87.
3 700	1·4	0·8	....	0·6	Long. 70° 05′ 59″.24.
3 782	1·3	0·0	....	1·3	Shore line in 1893.
3 800	1·2	—0·2	....	1·4	
3 810	1·0	—0·4	....	1·4	
3 900	0·0	....	....	....	Shore line in 1888.
Means	6·1	6·2	0·1	....	

TABLE 3.—*Section on AD—From Coatue Point to West Jetty.*

Distance.	Depth at mean low water. 1888.	1893.	Differences. Deepened.	Shoaled.	Remarks.
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	....	0·0	....	....	Shore line in 1893.
25	0·0	....	....	....	Shore line in 1888.
100	6·6	5·8	....	0·4	Position of origin.
200	9·0	9·0	0·0	0·0	Lat. 41° 17′ 45″·54.
300	9·5	8·6	....	0·9	Long. 70° 05′ 10″·02.
400	8·4	7·4	....	1·0	
500	8·0	6·6	....	1·4	
600	2·4	5·4	3·0	....	
700	5·2	5·6	0·4	....	
800	5·7	3·4	....	2·3	
900	4·3	4·9	0·6	....	
1 000	3·7	5·2	1·5	....	
1 100	3·0	5·6	2·6	....	
1 200	2·5	3·2	0·7	....	
1 300	1·5	2·6	1·1	....	
1 400	1·0	2·7	1·7	....	
1 500	4·4	2·8	....	1·6	
1 600	5·7	2·6	....	3·1	
1 700	5·7	2·8	....	2·9	
1 800	4·2	2·8	....	1·4	
1 900	3·7	2·8	....	0·9	
2 000	3·0	3·3	0·3	....	
2 100	6·0	4·7	....	1·3	
2 200	7·4	5·5	....	1·9	
2 300	5·8	7·4	1·6	....	
2 400	5·9	10·2	4·3	....	
2 500	8·0	11·6	3·6	....	
2 600	8·4	9·8	1·4	....	
2 700	6·8	8·6	1·8	....	
2 800	7·5	7·6	0·1	....	
2 900	7·7	7·6	....	0·1	
3 000	6·8	7·9	1·1	....	
3 100	6·5	7·6	1·1	....	

NANTUCKET HARBOR BAR—Continued.

TABLE 3.—*Section on AD—From Coatue Point to West Jetty*—Continued.

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
3 200	7·2	6·1	....	1·1	
3 300	7·7	6·0	....	1·7	
3 400	8·0	7·8	....	0·2	
3 500	8·7	8·1	....	0·6	
3 600	10·3	8·6	....	1·7	
3 700	11·6	7·6	....	4·0	
3 800	11·7	9·6	....	2·1	
3 900	11·0	10·6	....	0·4	
4 000	9·2	9·8	0·6	....	
4 100	9·7	11·3	1·6	....	
4 200	9·0	10·6	1·6	....	
4 300	7·2	10·2	3·0	....	
4 400	5·8	7·8	2·0	....	
4 500	6·0	6·6	0·6	....	
4 600	5·7	6·6	0·9	....	
4 700	5·7	6·2	0·5	....	
4 800	5·1	5·6	0·5	....	
4 900	5·5	5·6	0·1	....	
5 000	4·8	5·4	0·6	....	End of section.
5 100	3·1	3·6	0·5	....	Lat. 41° 17′ 45″·41.
5 200	1·0	1·6	0·6	....	Long. 70° 06′ 18″·92.
5 260	0·0	—0·4	....	0·4	At West Jetty.
Means	6·3	6·3	0·0	0·0	

TABLE 4.—*Section on EF—From Coatue Flats to West Jetty.*

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	4·2	4·3	0·1	....	Position of origin.
100	4·2	5·2	1·0	....	Lat. 41° 17′ 58″·97.
200	6·0	6·0	0·0	0·0	Long. 70° 05′ 39″·55.
300	6·2	7·0	0·8	....	
400	6·9	8·1	1·2	....	
500	7·2	8·4	1·2	....	
600	8·0	8·8	0·8	....	
700	7·2	8·7	1·5	....	
800	7·2	8·6	1·4	....	
900	7·2	8·4	1·2	....	
1 000	8·2	8·3	0·1	....	
1 100	9·2	9·0	....	0·2	
1 200	8·2	8·6	0·4	....	
1 300	7·8	8·0	0·2	....	
1 400	7·2	7·4	0·2	....	
1 500	6·2	6·8	0·6	....	
1 600	5·7	6·3	0·6	....	
1 700	6·0	5·6	....	0·4	
1 800	5·2	5·6	0·4	....	
1 900	5·2	6·1	0·9	....	
2 000	6·0	6·6	0·6	....	
2 100	6·2	6·9	0·7	....	
2 200	7·0	7·1	0·1	....	
2 300	6·0	6·1	0·1	....	
2 400	6·2	5·8	....	0·4	End of section.
2 500	6·2	7·3	1·1	....	Lat. 41° 17′ 59″·58.
2 600	6·2	8·1	1·9	....	Long. 70° 06′ 15″·05.
2 718	2·0	0·6	....	1·4	At West Jetty.
Means	6·5	7·4	0·9	....	

NANTUCKET HARBOR BAR—Continued.

TABLE 5.—*Section on GH—From Coatue Flats to end of West Jetty.*

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	7·0	5·1	....	1·9	Position of origin.
100	7·0	5·4	....	1·6	Lat. 41° 18′ 15″·62.
200	7·0	5·6	....	1·4	Long. 70° 05′ 36″·90.
300	7·0	5·9	....	1·1	
400	8·0	6·2	....	1·8	
500	8·0	6·6	....	1·4	
600	6·0	6·8	0·8	....	
700	6·0	7·0	1·0	....	
800	6·0	7·3	1·3	....	
900	6·0	7·8	1·8	....	
1 000	6·0	8·3	2·3	....	
1 100	5·5	8·8	3·3	....	
1 200	5·7	8·4	2·7	....	
1 300	6·0	7·9	1·9	....	
1 400	7·0	7·3	0·3	....	
1 500	7·5	7·8	0·3	....	
1 600	6·2	8·1	1·9	....	
1 700	6·2	8·6	2·4	....	
1 800	8·0	9·1	1·1	....	
1 900	8·0	8·8	0·8	....	
2 000	8·0	8·4	0·4	....	
2 100	8·5	7·3	....	1·2	End of section.
2 200	9·0	8·1	....	0·9	Lat. 41° 18′ 16″·34.
2 300	8·0	3·6	....	4·4	Long. 70° 06′ 10″·49.
2 360	0·0	—0·4	....	0·4	Outer end of West Jetty.
Means	7·0	7·4	0.4	....	

TABLE 6.—*Section on IK—Along channel lines from Harbor to Bell Buoy.*

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
0	18·0	17·6	....	0·4	Position of origin.
100	16·0	12·8	....	3·2	Lat. 41° 17′ 34″·45.
200	14·0	13·4	....	0·6	Long. 70° 05′ 38″.52.
300	13·6	13·0	....	0·6	
400	13·2	12·3	....	0·9	
500	11·0	11·6	0·6	....	
600	9·2	10·6	1·4	....	
700	9·5	10·2	0·7	....	
800	9·8	10·1	0·3	....	
900	9·8	10·2	0·4	....	
1 000	9·4	10·5	1·1	....	
1 100	9·0	10·8	1·8	....	
1 200	8·5	11·1	2·6	....	
1 300	8·0	11·7	3·7	....	
1 400	7·8	12·3	4·5	....	
1 500	7·5	11·6	4·1	....	
1 600	7·3	11·6	4·3	....	
1 700	7·0	11·1	4·1	....	
1 800	7·3	10·6	3·3	....	
1 900	7·5	10·8	3·3	....	
2 000	7·0	9·8	2·8	....	
2 100	7·4	10·6	3·2	....	
2 200	7·9	9·3	1·4	....	
2 300	8·3	9·6	1·3	....	
2 400	8·8	9·0	0·2	....	

NANTUCKET HARBOR BAR—Continued.

TABLE 6.—*Section on IK—Along channel lines from Harbor to Bell Buoy*—Continued.

Distance.	Depth at mean low water.		Differences.		Remarks.
	1888.	1893.	Deepened.	Shoaled.	
Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
2 500	9·2	8·9	....	0·3	
2 600	9·0	8·8	....	0·2	
2 700	8·8	8·6	....	0·2	
2 800	8·5	8·1	....	0·4	
2 900	8·2	8·0	....	0·2	
3 000	7·8	7·8	0·0	0·0	
3 100	7·5	7·8	0·3		
3 200	7·7	7·7	0·0	0·0	
3 300	7·8	7·6	....	0·2	
3 400	8·0	7·7	....	0·3	
3 500	7·6	7·9	0·3	....	
3 600	7·2	8·1	0·9	....	
3 700	7·0	8·3	1·3	....	
3 800	7·0	8·6	1·6	....	
3 900	7·0	8·6	1·6	....	
4 000	7·3	8·6	1·3	....	
4 100	8·0	8·3	0·3	....	
4 200	7·8	8·1	0·3	....	
4 300	7·6	8·1	0·5	....	
4 400	7·6	8·1	0·5	....	
4 500	7·8	8·1	0·3	....	
4 600	7·9	8·1	0·2	....	
4 700	8·0	7·6	....	0·4	
4 800	8·0	7·7	....	0·3	
4 900	8·2	7·8	....	0·4	
5 000	8·4	8·8	0·4	....	
5 100	9·0	9·1	0·1	....	
5 200	7·8	8·6	0·8	....	
5 300	7·3	8·6	1·3	....	
5 400	7·8	8·1	0·3	....	
5 500	8·3	7·8	....	0·5	
5 600	8·5	8·6	0·1	....	
5 700	8·4	8·3	....	0·1	
5 800	8·3	8·1	....	0·2	
5 900	9·2	8·8	....	0·4	
6 000	10·0	9·3	....	0·7	
6 100	10·0	9·2	....	0·8	
6 200	10·8	9·1	....	1·7	
6 300	11·6	10·8	....	0·8	
6 400	12·2	11·1	....	1·1	
6 500	12·4	11·3	....	1·1	
6 600	12·7	12·3	....	0·4	
6 700	12·9	12·6	....	0·3	
6 800	13·1	12·1	....	1·0	
6 900	13·3	11·8	....	1·5	
7 000	13·5	13·6	0·1	....	
7 100	13·9	14·6	0·7	....	
7 200	14·3	15·8	1·5	....	
7 300	14·6	15·1	0·5	....	
7 400	15·0	15·1	0·1	....	End of section.
7 500	15·5	15·3	....	0·2	Lat. 41° 18′ 46″·52.
7 600	15·9	15·8	....	0·1	Long. 70° 05′ 54″·67.
7 700	13·3	16·1	2·8	....	At Bell Buoy. 1893.
Means	9·6	10·2	0·6	....	

Mean low-water plane of reference 4·3 feet below Mitchell's bench mark of 1854 on Commercial Wharf, Nantucket.

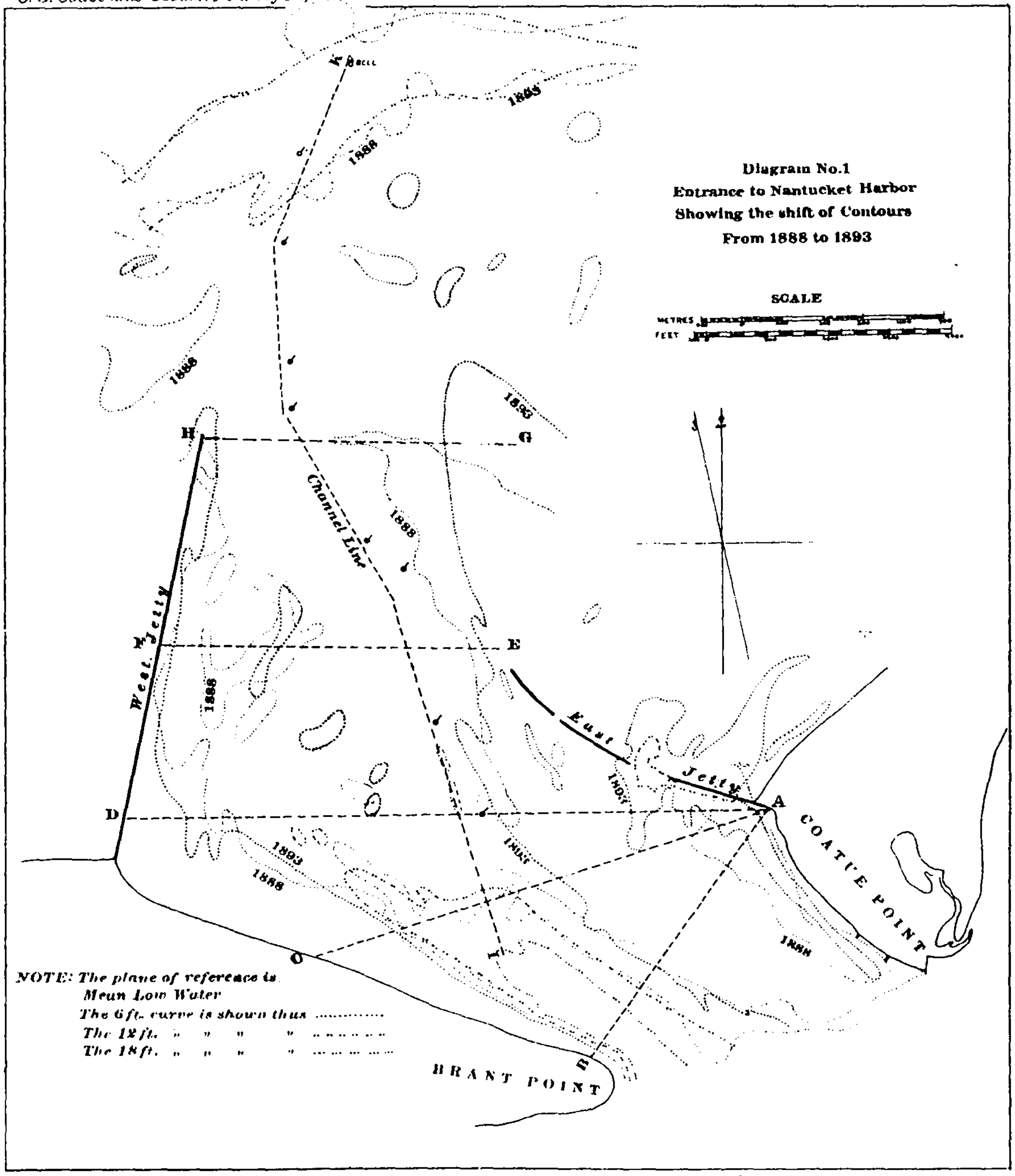


Diagram No.1
Entrance to Nantucket Harbor
Showing the shift of Contours
From 1888 to 1893
SCALE
METRES
FEET
Channel Line
West Jetty
East Jetty
COATUE POINT
BRANT POINT
1888
1893
H
G
F
E
D
A
C
B
K
NOTE: The plane of reference is
Mean Low Water
The 6 ft. curve is shown thus
The 12 ft. " " " "
The 18 ft. " " " "

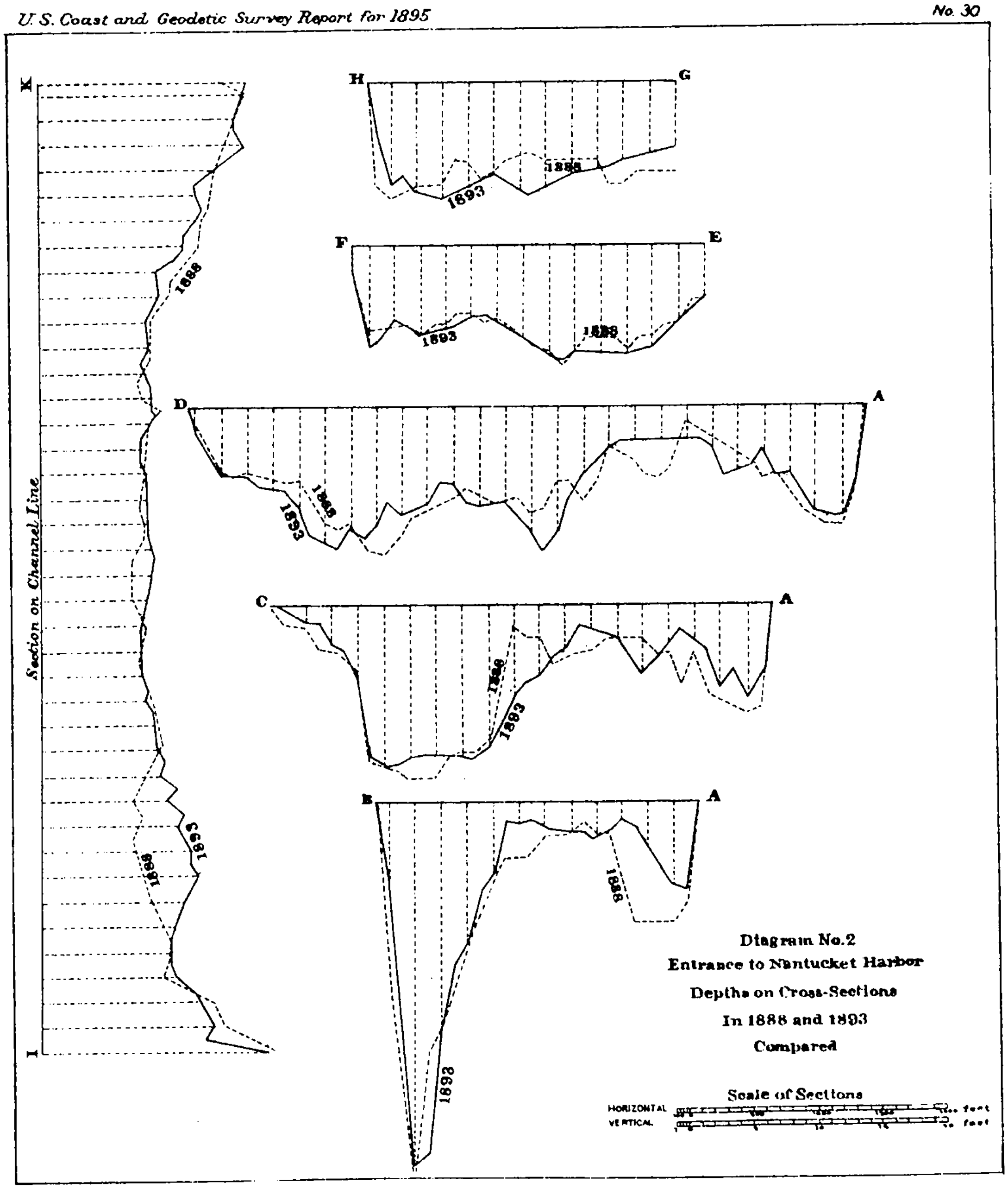
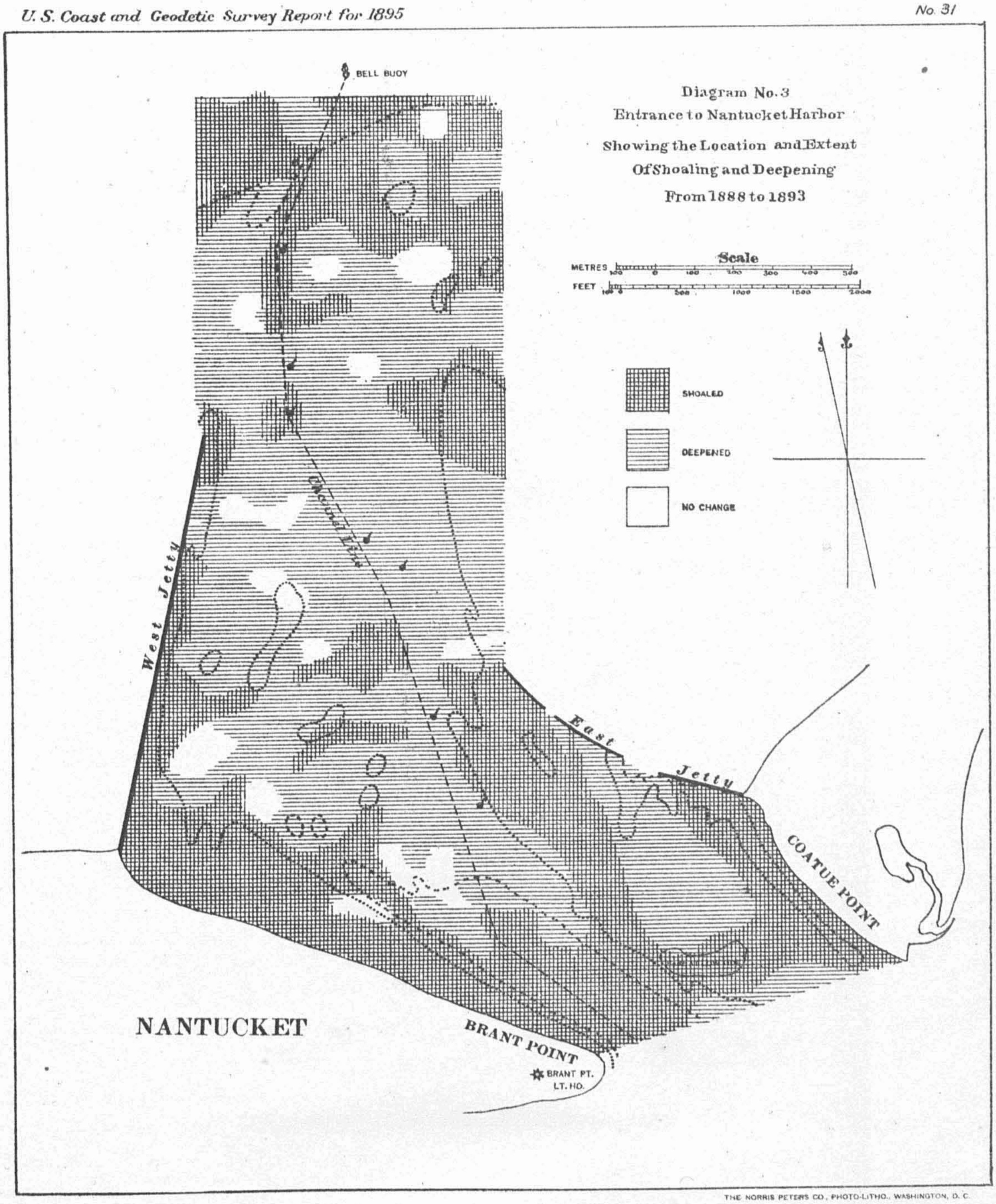


Diagram No. 2
Entrance to Nantucket Harbor
Depths on Cross-Sections
In 1888 and 1893
Compared



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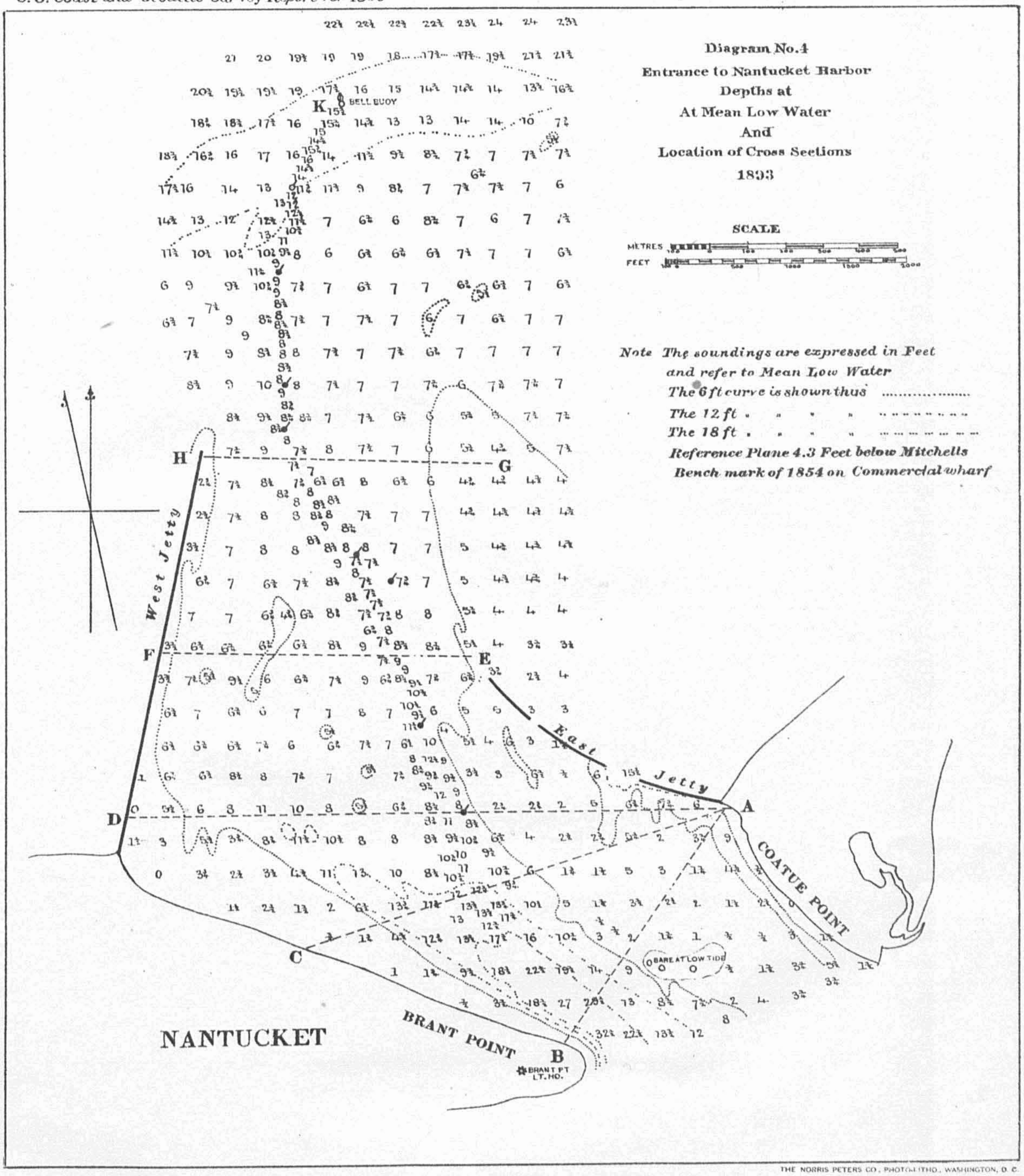

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APPENDIX No. 6.—1895.

NOTES ON THE SPECIFIC GRAVITY OF THE WATERS OF THE GULF OF MEXICO AND THE GULF STREAM.

By A. LINDENKOHL.

The sketch which accompanies this report and shows the specific gravity of the surface waters of the Gulf of Mexico and Gulf Stream is based on observations of temperature and density taken on board of the steamer *Blake* by Lieut. Commander C. D. Sigsbee between 1874 and 1878 while engaged upon the survey of the Gulf of Mexico, and those by Lieut. Commander J. R. Bartlett between 1878 and 1882 during an examination of the Gulf Stream and its approaches.

In conformity with the usage of the Challenger reports and the practice of the United States Fish Commission the specific gravity is given for a normal temperature of the sea water at 60°, taking the specific gravity of distilled water at the temperature of 39°·2 its maximum density, as unit.

It may be proper to remark that in the absence of sufficient data no attempt has been made to reduce the observations to an annual mean; but it is believed that very few abnormal observations have been recorded, that the ordinary changes of gravity are comprised within narrow limits, and that the sketch represents fairly well the average condition of things.

The specific gravity of the sea water is the result of the combined action of a number of physical factors, among the most prominent of which may be mentioned the winds, tides, ocean currents, evaporation, and precipitation. Each one of these factors exerts its influence in a peculiar way, and in order to determine in the final result the component part of each factor it becomes necessary to determine the absolute individual effect of each one.

WINDS.

The Gulf of Mexico lies fairly within the path of the northeast trades, and these may be considered as its predominating winds. But they do not blow with that steadiness and constancy of force and direction which are the characteristics of the trade winds in the open ocean; during the winter months they come from a nearly northern direction and during the summer months they veer from the north of east to the south of east. Maury in his Sailing Directions* attributes this deflection to rarification caused by the lands of northern Texas and the arid plains. It is generally held that in the middle of summer when the northeast trades, following the declination of the sun, attain their highest northern limit of about 35° latitude, the more powerful southeast trades cross the equator and reach the Gulf of Mexico through the Caribbean Sea.

The prevalence of northerly winds during the winter and southerly winds during the summer months must produce a derangement of level, an accumulation of water in the southern part of the Gulf during winter and a similar one in the northern part during summer. According to information collected by Lieutenant Pillsbury † there is a difference of about 0·7 foot between the

*Eighth edition, p. 986.

†U. S. C. and G. Survey Report for 1890, Appendix 10, p. 600.

mean levels of October and January in the northeastern part of the Gulf. The high level in October can not be attributed to excessive precipitation for the reason that this month is the driest one of the year along the northern coast of the Gulf. We shall see further on that this direct result of the mechanical action of the winds is quite insignificant when compared with the effect of their physical action on the waters of the Gulf by inciting a powerful evaporation.

EVAPORATION.

The Monthly Weather Review, published by the United States Signal Service, furnishes in the September number of 1888 estimates of evaporation for several stations on the Gulf: 51·6 inches annually for Key West, 48·8 for Pensacola, 45·4 for New Orleans, and 46 for Galveston. The average mean temperature of these four places is 70° or about the same as the mean annual temperature of the Gulf, hence the mean of the above figures which is 48 inches might be taken as the measure of annual evaporation of the Gulf as far as it is dependent upon temperatures. The evaporation from salt water, however, is less than that from fresh water and for this reason we might feel justified to assign a lower rate to the Gulf but for the counter effect of the winds. The figures of the Signal Service refer to the evaporation from the surface of ponds, rivers, reservoirs, and lakes near the signal stations. These surfaces are always to a greater or less extent protected against the action of the winds, besides the winds generally blow with greater force off-shore than on land. For these reasons we may expect an increased evaporation from the surface of the Gulf beyond that of its shores as far as it is influenced by the strength of the wind. Experiments with a Piche evaporator made by Prof. T. Russell* seem to indicate that at a velocity of the wind of 5 miles an hour, the evaporation is 2·2 times as great as in quiet air, at 10 miles 3·8 times, and at 15 miles 4·9 times. Colonel Abert,† who had given the matter of evaporation considerable study in connection with the planning of an extension of the Chesapeake and Ohio Canal to Baltimore, deduced the ratio between the evaporation in a laboratory and that of a canal to be as 1 to 1·44 and assumed 80·64 inches as the total amount of yearly evaporation in the latitude of the proposed canal. Captain Shufeldt in his Tehuantepec Canal Survey found the mean daily evaporation to be 0·016 foot on the isthmus, leaving the rainy days out of account. Assuming that the rainy season on the isthmus does not extend to any considerable distance into the Gulf and applying this daily rate to the whole year, we obtain an evaporation equal to 70 inches annually. From these various statements we conclude that an addition of 50 per cent to the amount of evaporation as deduced from the observation of the Signal Service on account of increased action of the winds might not be excessive, but in order to be within safe limits we will make the allowance but 25 per cent and assume the yearly evaporation for the whole Gulf to average 60 inches. With this condition and taking the area of the Gulf to contain 595 000 square miles‡ we find the mean amount of daily evaporation to be 1·54 cubic miles or 6·42 cubic kilometres.

PRECIPITATION.

The region bordering on the northern shore of the Gulf is noted for the great amount of rainfall which in the vicinity of New Orleans and Pensacola amounts to more than 60 inches per year and which within the limits of the United States is only exceeded by that on the Pacific Coast in Washington, Oregon, and northern California. There are rainy days in every month of the year, but the "rainy season" sets in with the summer months and lasts until October, which is the driest month of the year.

The central part of the Gulf is bordered on the southeast by the dry region of Yucatan and on the west by the arid zone of southern Texas and northern Mexico, hence it is concluded that here a very active evaporation will be going on nearly all the time and that there will be a very scant amount of precipitation.

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*Monthly Weather Review, September, 1888, p. 935: Average temperature during time of observations 83°·7 and relative humidity 50 per cent.

†Report in reference to the canal to connect the Chesapeake Canal with the city of Baltimore, by J. J. Abert, Colonel Topographical Engineers, 1838. Government Printing Office, 1874.

‡American Journal of Science, vol. 28, 1884, p. 320.

The climate of the coast region along the southern part of the Gulf is of a typical tropic character. The rainy season generally commences about the 10th of June and continues to November, and after this throughout the winter perhaps half the northers are accompanied with rain, and nearly all of them with cloudy weather.*

The mean yearly amount of rain for Vera Cruz is stated to be 179·4 inches.

If we extend the lines of equal evaporation from the positions which they occupy on the border of the Gulf, in conformity with the maps of the Weather Bureau and Schott's tables, across the Gulf according to the best of our judgment and compute the mean annual rainfall to be 32·7 inches, which is equivalent to 0·84 cubic miles or 3·51 cubic kilometres per day for the whole Gulf, we find that the precipitation is about equal to 55 per cent of the evaporation.

RIVER DISCHARGES INTO THE GULF.

The Mississippi River, which drains more than one-half of the area of the United States, constitutes the most important tributary of the Gulf of Mexico. Humphreys and Abbott in 1861 † estimated the annual discharge of the Mississippi at 19 400 000 000 000 cubic feet, which, expressed in a more convenient shape, amounts to about 0·36 cubic mile or 1·51 cubic kilometres per day. The Annual Report of the Chief Signal Officer for 1889 gives in Appendix 14 the total discharge of the Mississippi, including the Atchafalaya River, for the years 1881 and 1882 at respectively 154·54 and 202·71 cubic miles.

Taking the mean of these two statements, we find the outflow to amount to 0·49 cubic mile or 2·04 cubic kilometres per day. If we omit the arid regions of Texas, Mexico, and Yucatan from the area of the hydrographic basin of the Gulf, we find that the Mississippi River system occupies nearly three-fourths of this basin and that the drainage area of all the remaining rivers is equal to only about 40 per cent of that of the Mississippi. In the absence of discharge measurements of the numerous rivers which empty into the Gulf we may assume for the purpose of obtaining an approximate estimate that the discharges are proportional to the drainage area and upon that supposition obtain 0·196 cubic mile (0·816 cubic kilometre) for the mean daily discharge of these rivers. This added to the figures for the Mississippi gives a total daily gain to the waters of the Gulf by the discharge of rivers of 0·68 cubic mile or 2·86 cubic kilometres.

Recapitulating, we find that the Gulf loses on an average 1·54 cubic miles of water per day by evaporation and receives back in the same space of time 0·84 cubic mile by precipitation and 0·68 by river discharges, making a total of 1·52 cubic miles and showing an apparent loss of 0·02 cubic mile a day.

I do not claim for these figures such a degree of accuracy as would determine the existence and the amount of an excess of evaporation, but they are believed to be sufficiently close to show that precipitation and river discharges very nearly hold the balance to evaporation.

SPECIFIC GRAVITIES OF THE GULF OF MEXICO.

By computation I find the mean surface density of the Gulf to be 1·0277. This is 0·0006 more than Dr. Buchan in the Challenger reports allows to the eastern part of the Gulf. I have noticed that very generally the Challenger results give lower figures than those of the *Blake*. The observations on the *Blake* were made with Hilgard salinometers, and at this late date it is impossible to determine whether errors in graduation existed and had anything to do with these differences. The density observations of water from greater depths do not furnish very satisfactory results, probably for the reason that the hydrometer readings generally were taken while the water was in a state of transition from a low to a high temperature and that the temperature readings on account of the slow action of the thermometers can not be considered simultaneous with the corresponding hydrometer readings. The resulting densities of the bottom waters frequently are excessive, for the reason that the fall of the lead had stirred up the mud of the bottom and that some solid matter had found its way into the water cup.

It is assumed, however, that the vertical distribution of specific gravity in the Gulf conforms in general to the laws which govern that distribution in the open ocean, as they have been developed

* Tehuantepec Canal Survey, Capt. R. W. Shufeldt, 1872. Government Printing Office.

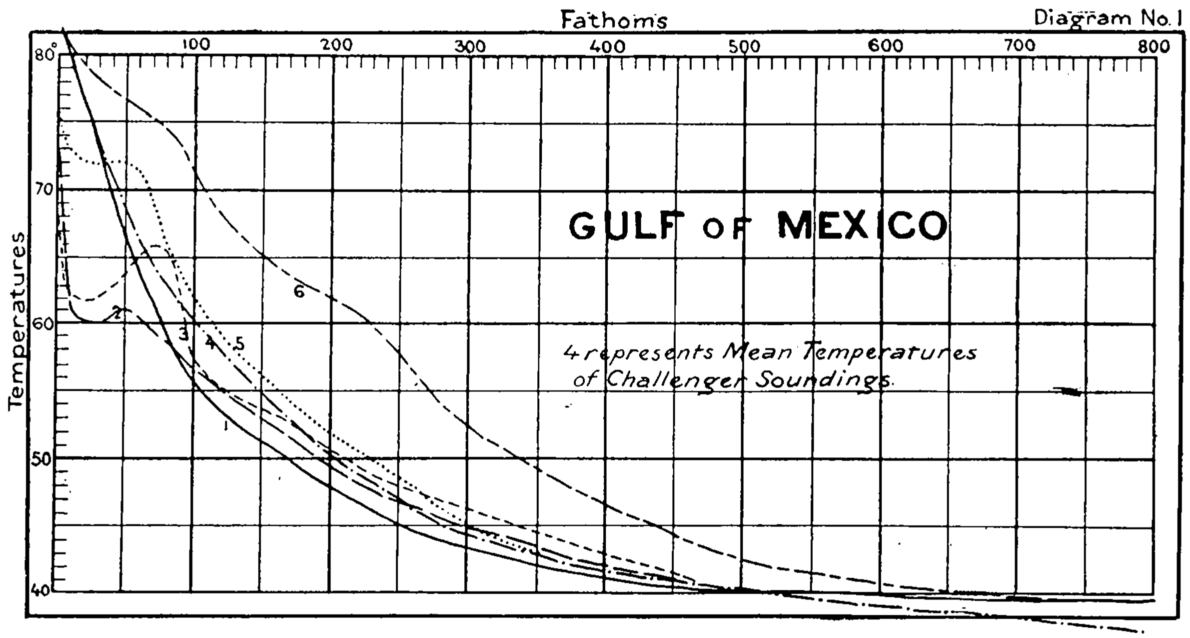
† Physics and Hydraulics of the Mississippi River, Phila., 1861.

by Mr. J. L. Buchanan, the chemist of the Challenger Expedition,* and accordingly I believe that there is a gradual diminution of specific gravity from the surface to the depth where the lowest temperature, 39½°, is reached, between 700 and 800 fathoms, and that from this depth to the bottom a gradual though very small increase takes place.

SPECIFIC GRAVITIES IN THE WESTERN PART OF THE GULF.

There is considerable difference in the behavior of fresh water which finds its way into the southwestern part of the Gulf from that which enters the northern part. It assimilates more readily with the sea water; by reason of its high temperature it remains at the surface and absorbs a sufficient quantity of salt to obtain the relatively high specific gravity of 1·028. In consequence of the constant drain of salt and heat which the waters below the surface experience, they show remarkably low gravities and temperatures.

The accompanying diagram shows by line 1 the temperature curve for a position in the southwest part of the Gulf, chosen at random, by line 3 that for a position in the northwest part, by line 6 one for the position in the southeast part, and finally by line 4 the mean temperature of



the sea at the different depths, taken from the report of Dr. Buchan on Oceanic circulation in one of the latest published Challenger volumes. It will be noticed that the temperatures in the southwest part of the Gulf are from 4° to 2° below the mean temperatures of the sea between the depths of 100 to 400 fathoms, that within this range they are a few degrees below those of the northwest part. But all these temperatures—those in the western part of the Gulf and the mean sea temperatures—are greatly surpassed by those in the eastern part of the Gulf. The difference commences at the surface, increases with the depth until at 250 fathoms it amounts to about 18°, thence it decreases until at about the depth of 700 fathoms the minimum temperature of 39½° is reached throughout the Gulf.

The fresh water which enters the northern part of the Gulf preserves its autonomy for a much longer time and greater distance from the coast than that in the southwest part. It also floats on the surface, but this is on account of its lightness or poverty of salt and rather in spite of its temperature. In its progress toward the middle of the Gulf it constantly receives accessions to its temperature and salinity from the supply of the Gulf at its greatest depths until the maximum of heat and saltness are transferred to the surface. In the accompanying diagram the blue and the

*On the distribution of salt in the ocean, as indicated by the specific gravity of its waters. Journal R. Geog. Soc., 1877.

dotted curves, which refer to positions in the northwest and northeast part of the Gulf respectively, are types of a peculiar shape which is frequently met with in the northern part of the Gulf, and which, according to the observations made by the Fish Commission and the Coast Survey at the suggestion of Professor Libbey, is normal for the left bank or cold wall of the Gulf Stream from Long Island to Nantucket. These curves show the existence of a layer of light and cold water on the surface, reaching to the depth of between 50 and 100 fathoms and the maximum of density below the cold layer. The temperature curve, given by a broken line, indicates the shape which is peculiar to the vertical distribution of heat at a greater distance from the coast or in the central part of the Gulf. The peculiar feature of a region of low temperatures less than 45° at the depth of 250 fathoms, which is shown on Sketch B to stretch through the middle of the western Gulf from the southern end to about halfway between the Mississippi Delta and Yucatan, is no doubt to be attributed to the continuous transfer of heat toward the surface.

Concerning the vertical distribution of salinity we infer from the temperature curves that in the central and southern parts of the Gulf it decreases from the surface downward until in the western part the limit of about 1·027 and in the eastern part the limit of about 1·028 is reached. In the northern part of the Gulf, leaving the immediate coast region out of consideration, the maximum of gravity is generally found at a depth of from 25 to 100 fathoms, thence the usual decrease with increasing depth to the limit of 1·027 or from the maximum below the surface downward until at about the depth of 800 fathoms the minimum temperature of 39½° is reached. From this depth to the bottom the temperature remains constant, but it is supposed that a slight increase of gravity takes place, similar to that which has been found to exist in the ocean.

The persistence with which the salt water follows up the tracks of the fresh water to its very sources, as is shown by the existence of water of the respectable density of 1·0177 very close to the northern shore of the Gulf and under the very mouth of the Mississippi, can not be attributed solely to energy of force generated by difference of temperature and density between the waters of the Gulf and the fresh river or rain water. We have abundant proof of the fact, which has also repeatedly been mathematically demonstrated, that such differences can only produce a very sluggish motion.* But we recognize in this energy the aggressiveness of the tidal flood current which works along the bottom of the sea and attacks the currents it meets from the flanks and bottom with increasing persistence until they are completely reversed. It is safe to assume that but for the tide in connection with the shoal bottoms along the northern shore of the Gulf, we would not find such high specific gravities as from 1·021 to 1·0267 in the bays along this shore.

TRACK OF THE MISSISSIPPI RIVER WATER IN THE GULF.

It will be noticed by an inspection of Sketch A showing the specific gravities that the fresh water which is carried into the Gulf by the Mississippi does not continue the course of its initial direction on entering the Gulf, but is deflected to the westward to such an extent that it finally reaches the middle of the western half of the Gulf, instead of making its way straight from the Passes to the Strait of Florida according to the popular supposition. This deflection to the right is quite in accordance with the observations of the engineers engaged upon the jetties of the South Pass who report a decided inclination of the sediment of the river toward deposition on the west side of the Pass. Three different explanations may be advanced to account for this fact. The rotation of the earth has the same effect upon a current of water flowing from a higher to a lower latitude that it has on an atmospheric current under similar conditions, as the trade winds, for instance, and deflect it to the right. This deflection, however, can be but very slight, owing to the smallness of the changes of the arcs of parallel in the latitude of the northern part of the Gulf; it might possibly be an auxiliary cause, but could not be the principal one. The deflection might possibly be ascribed to the effect of the prevailing winds. Although the winds throughout the year have an easterly tendency, they are far from showing the constancy and steadiness which would be necessary to produce the uniformity and consistency in the deflection shown to exist by the observations. It certainly must have happened during the time of observations that there was a lull or even a reversal of the wind, but the observations fail to show a disposition of the

* Handbuch der Oceanographie, Boguslawski and Krümmel, vol. 2, p. 286 et seq.

water to file off to the left. We shall see later on that the Strait of Yucatan throws a volume of water into the Gulf sufficient to raise its level 5¾ feet in twenty-four hours; we have also reason to believe that this current generally has the control over the eastern part of the Gulf and also tries to gain that over the western part by pushing a large volume of water along the Yucatan banks. Under these conditions the western or northwestern part of the Gulf presents itself as the most inviting field for the entrance of the Mississippi, the more so for the reason that the excess of evaporation over precipitation will have a constant tendency to create a depression in the central part of the western Gulf.

SPECIFIC GRAVITIES IN THE EASTERN PART OF THE GULF.

We have seen that the waters of the Gulf constantly gain in heat and salt on their way to the middle of the Gulf. From here they may sometimes be turned back by the winds and currents, but in general they proceed in an easterly direction against the trade winds toward the Strait of Florida. This motion "against the wind" produces a very active evaporation by which the specific gravity of the surface waters is soon increased beyond the limit of their ability to keep afloat. Descending, they carry down with them a greater amount of salt and heat than could reach remote depths in any other way, either by radiation or transmission by contact. Sketch B, which gives the isothermals at the depth of 250 fathoms, shows that the highest temperatures above 60° are to be found at that depth in that part of the Gulf which lies to the northward of the Strait of Yucatan and to the westward of the Strait of Florida. It is in this locality then that we assume the process of a descending warm current to be going on with the greatest precision and intensity. A careful study of the distribution of temperature at the different depths of the ocean, a study which can be made by any one by consulting the isothermal charts of the last issued volume of the Challenger Expedition, shows that whenever by excessive evaporation the temperature and specific gravity of a part of the ocean or dependency of the ocean, like the Red Sea, is raised considerably above that of the ocean, a system of circulation is found to exist by which a transition of temperatures and densities is effected, which circulation proceeds from the greater depths toward the surface and reaches out laterally to great distances, as in the case of the Mediterranean and Red Seas, more than half way across the Atlantic and Indian oceans, respectively. At this same depth of 250 fathoms where we find temperatures of above 60° in the eastern Gulf, we find temperatures as low as 44° in the western part and 47° in the Caribbean. Hence it is assumed that two systems of undercurrents have their origin in the eastern Gulf; one proceeding westward and supplying the western part of the Gulf with heat and salt and the other passing through Yucatan Channel into the Caribbean freighted with a supply of salt to the diluted waters of this sea. The lowest temperature found to exist in the Florida and Old Bahama channels at the depth of 250 fathoms is 58° or only a few degrees less than that in the eastern Gulf and in the Atlantic off the Bahama Islands. There apparently exists no necessity for any undercurrents between the Atlantic and Gulf, and it is a significant fact that the depth in the shoalest part of the passages to the Gulf is not more than sufficient to accommodate existing surface currents. We are prepared to look for a high specific gravity at these depths in the southeastern Gulf corresponding to the high temperatures. The observations give 1·0280; this is fully 0·001 more than the Challenger Expedition gives for the North Atlantic at corresponding latitudes and depths, but for reasons already stated I can not assume full responsibility for these figures.

SPECIFIC GRAVITIES OFF THE CAMPECHE AND FLORIDA BANKS.

If a body of warm water at any depth below the surface loses part of its heat and salt by contact with colder water, the increase of its density by shrinkage in consequence of loss of heat always exceeds the decrease by loss of salt. The warm water thus becoming heavier sinks to greater dephts. If it then happens that the warm water touches bottom, as is the case at the foot of the slopes of the two great banks of the Gulf, the Campeche and Florida banks, and can sink no further, it finds relief of its excess in weight by another process, which it is believed can best be explained with the assistance of the subjoined table:

Density of standard sea water at different temperatures.

(T)	Density of standard sea water.	ΔD for 1°	$\Delta^2 D$	ΔP	$\Delta^2 P$
80°	1·02300	17·2		23·2	
			0·9		1·1
75°	1·02383	16·3		22·1	
			1·0		1·4
70°	1·02461	15·3		20·7	
			1·0		1·6
65°	1·02533	14·3		19·1	
			1·4		1·7
60°	1·02600	1·29		17·4	
			1·5		2·0
55°	1·02658	12·4		15·4	
			1·6		2·2
50°	1·02710	9·8		13·2	
			1·8		2·3
45°	1·02752	8·0		10·9	
			1·9		2·6
40°	1·02785	6·1		8·3	

The first column gives temperatures decreasing 5° successively, arranged in the order in which they follow with descending depth. The second column contains the corresponding densities of standard sea water which has the density of 1·026 at 60° F. These densities have been obtained by interpolation from those given by Professor Dittmar in the first volume of the Challenger reports. The third column gives the increase of density corresponding to the decrease of temperature of 1° for each temperature. The fourth column gives the successive differences of these increases. The fifth and sixth columns furnish the equivalents of salinity to the figures of the third and fourth columns respectively. All figures in the last four columns represent thousandths or have been multiplied by 1 000.

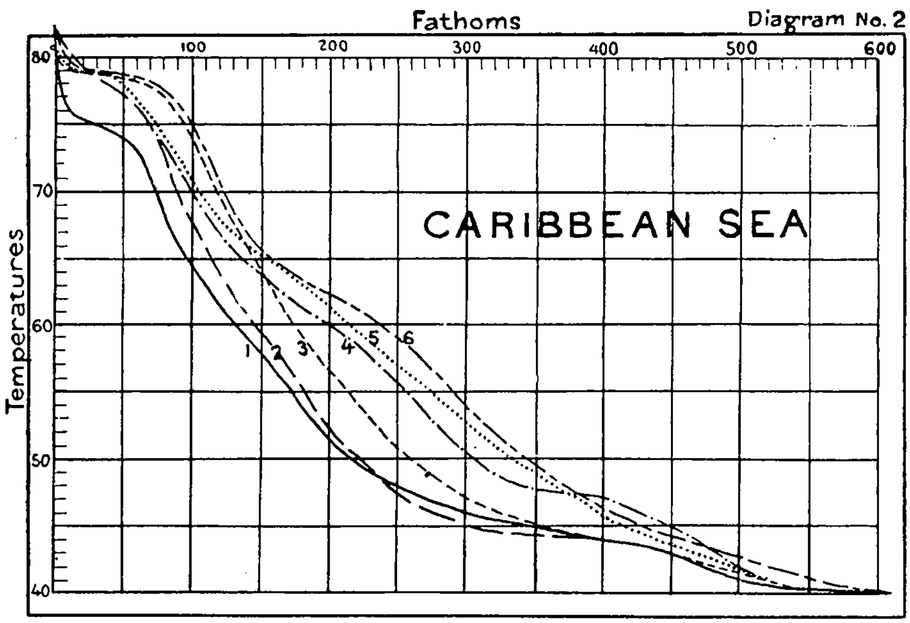
It will be noticed that the rate of expansion of sea water or the coefficient of expansion grows larger with increase of temperature, but that the equivalent of salinity is proportional to the density ($P=\frac{(S\,15°{\cdot}56-1)}{4°}\,1353$).

Now, if I suppose 1° of heat to be transferred from the lowest layer to the next one above, from 40° to 45°, the conditions of equilibrium require that with this transfer of heat 2·6 per mille more salt than constitutes an equivalent should be transferred from the lowest layer. By this operation the salinity of the lowest layer will therefore be reduced by 2·6 per mille and its density by 1·9 per mille. This decrease of density serves as an effect for the increase by the transmission of heat to adjoining colder water. Assuming the contact of warmer and colder water to extend from the bottom to the surface there will be a tendency toward increased density through the entire depth of the warm water, and in consequence a shifting of heat and salt at every depth to a higher level with the effect of neutralizing this tendency. That a motion similar to the one described really takes place on the edges of shoals where warm and cold waters meet is shown by the low temperatures at the greater depths, and the accumulation of heat and salt at the surface off the Campeche, Florida, and Bahama banks, but above all in the Gulf Stream off the continental shelf, as will be referred to again later on.

It yet remains to be mentioned that the change of temperature with depth is not by steps, but continuous, and if we assume density or the equivalent of salinity either to be a function of temperature ($D=fT$) and the change of temperature to be infinitesimal instead of 1°, the figures of the third column, which represents $\frac{\Delta F}{\Delta T}$ will become $\frac{dfT}{dT}$; those of the fourth, $\frac{\Delta^2 D}{\Delta T^2}$, will become $\frac{d^2fT}{dT^2}$. In short, the first differential coefficient will measure the quantity of salt in motion and the second differential coefficient the quantity of salt which is neutralized by this motion.

THE YUCATAN CHANNEL.

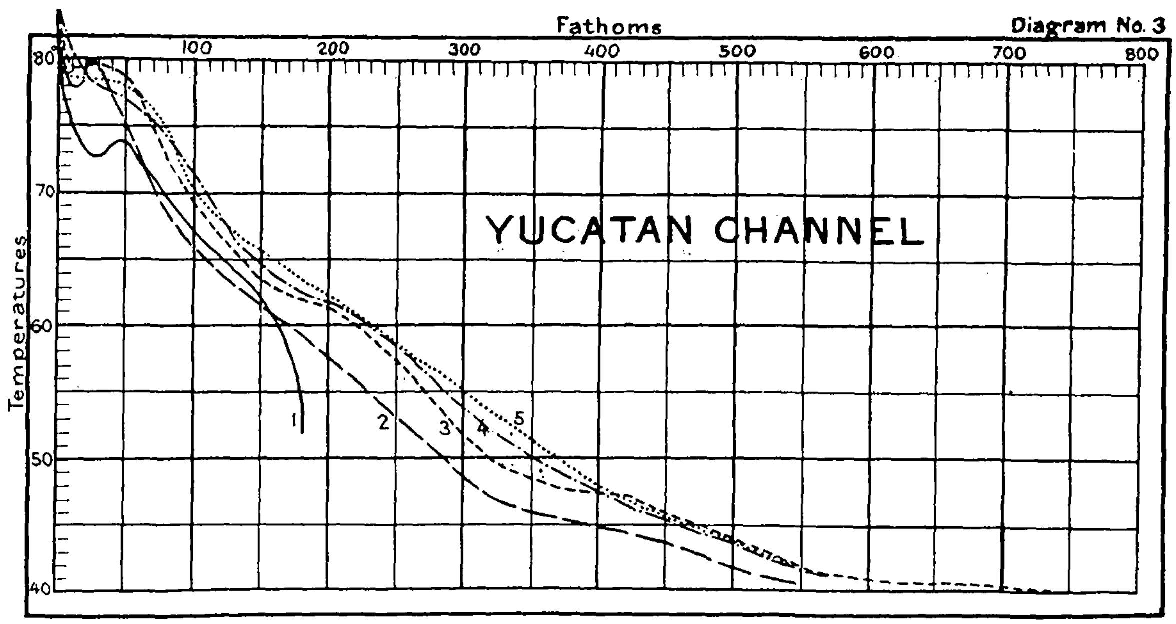
The current which passes from the Caribbean Sea to the Gulf of Mexico through the Yucatan Channel is the strongest one met with by the *Blake* within the Gulf Stream region during a period of over seventeen years' engagement in surveys and explorations. It occupies nearly the entire width of the passage between Cape Catouche and Cape San Antonio, but develops its greatest strength from 2·5 to 5 miles on the western edge, close to the slope by which the Campeche banks descend to the basin of the Gulf. According to the serial current observations taken by Lieutenant Pillsbury in 1887 at 11 stations and to the depth of 130 fathoms, the velocity decreases rapidly with increasing depth and may be assumed as zero at the depth of about 200 fathoms. A calculation of the volume of water which passes through this channel in twenty-four hours, based upon these observations, gives the enormous quantity of 652 cubic miles or 2 717 cubic kilometres, which is sufficient to raise the level of the whole Gulf 5¾ feet within the same length of time. From the observations which were taken by the same officer in the same year across the Strait of Florida, about 10 miles to the westward of Havana, we compute the volume of the water which passes through the Strait of Florida to the Atlantic within twenty-four hours at about 432 cubic miles or 1 800 cubic kilometres. Hence it appears that only about 66 per cent of the quantity of water



which enters the Gulf through the Yucatan Channel is carried off by the Gulf Stream. Making all possible allowances for water which may pass from the Gulf to the strait, by the passages around Florida Keys, for the existence of abnormal conditions during the time of observations, and for errors of observation and computation, we find this deficit of 34 per cent can not be very materially reduced, certainly not below 25 per cent. Wherever heretofore the question of difference of volume between the waters passing through the Yucatan Channel and the Gulf Stream has been raised, it has been done vaguely, and answered just as vaguely by the assertion that evaporation would carry off any possible excess. When we reflect that the Yucatan Channel current develops sufficient strength to raise the level of the whole Gulf 5¾ feet within one day, and that we do not expect evaporation to accomplish more than to depress the level about one-sixth of an inch during the same length of time, we see that evaporation is utterly powerless to neutralize the effect of the Yucatan Channel current, and we have no option left but to assume that the bulk of the volume of water which finds no escape through the Gulf Stream returns to the Caribbean Sea by an undercurrent similar to that which has been proved by Dr. Carpenter to exist in the Strait of Gibraltar and passes from the Mediterranean to the Atlantic.

Under the supposition that the difference of level between the Caribbean and the Gulf, which produces the current in the connecting channel, was solely caused by the winds, there would be no necessity for an undercurrent, but if we assume this difference of level to be entirely due to the differences of temperature and density between the waters of the two seas, there would be an absolute necessity for an undercurrent by which a body of water of very nearly the volume of the surface current would be returned to the Caribbean. (The volume of the subcurrent would be less by not quite 1 per cent, on account of the difference of temperature density, compression by pressure, and unequal absorption of gases.) From the ratio of the two currents, the Yucatan Channel current and the Gulf Stream, as it has been established by the observations cited, we conclude that the difference of level between the Caribbean and Gulf is mainly due to the winds, but that the current which passes from the first to the latter is greatly strengthened by the differences in temperature and salinity, and finally that, provided that the winds did not affect the level of the Caribbean, there still would be a surface current into the Gulf, though greatly reduced in strength, just as there is one from the Atlantic to the Mediterranean.

There are only density observations of surface water available for the Caribbean, and an examination of the temperature curves affords the only clew to the vertical distribution of heat and salt in that sea. We notice in the central part of the northwestern Caribbean a deep surface stratum

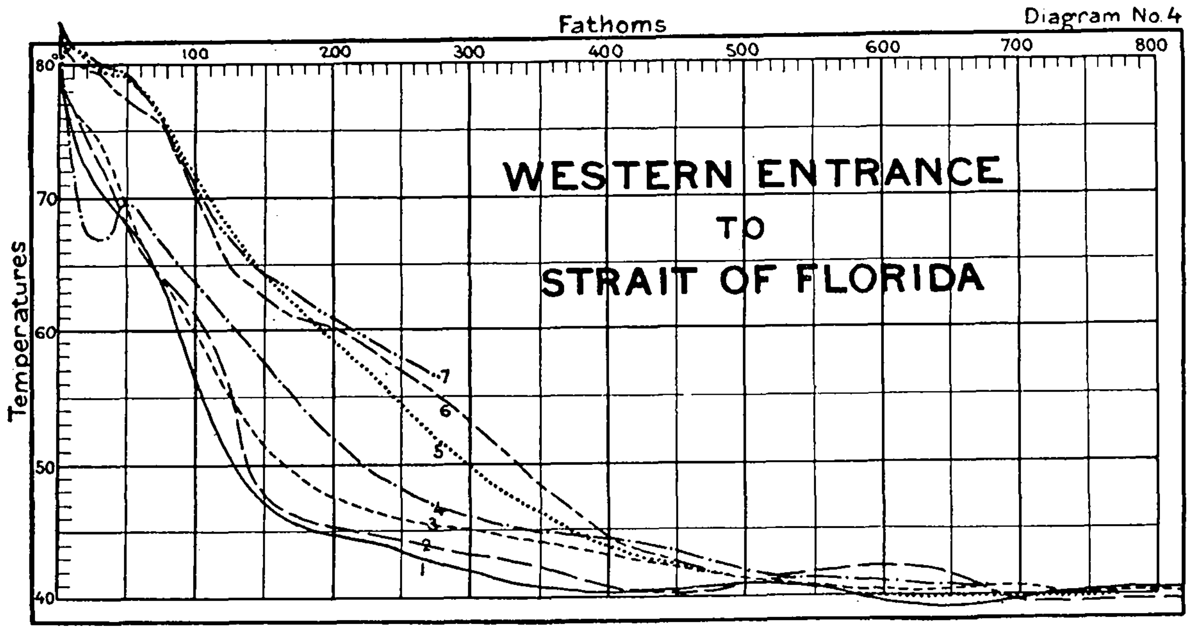


of warm water, water of an even temperature of 78° to 80°, reaching to the depth of 50 to 75 fathoms; beyond these depths the usual decline of heat takes place. From this arrangement of temperatures we conclude that the maximum density is not to be looked for at the surface, but at a depth of between 50 and 75 fathoms, and that from these depths downward the decrease is similar to that which in the central and southwestern Gulf commences at the surface. In the vicinity of the coast of the Central American Main, high temperatures are confined to the surface; at a depth of 10 fathoms there is already a decrease of 5°, and the difference in the temperature between the waters near the coast and those farther off increases with the depth until at 250 fathoms it reaches 12°, indicating a difference in specific gravity of about 0·0015. From this depth onward the difference decreases until at a depth of 600 fathoms the temperature is uniformly found to be 40°. This disposition of the temperatures shows that the waters of the northwestern Caribbean are subjected to a heavy dilution which proceeds from the direction of the mainland and reaches downward to the depth of 600 fathoms. By examining the temperature curves of the Yucatan Channel we see that the thick stratum of warm surface water has disappeared, that during its progress to this channel a sufficient amount of salt and heat have been transferred to the surface to displace the maximum of density from the depth of 75 fathoms to the surface. There is yet a considerable body of cold water on the Yucatan side of the channel, but a gain of 6° temperature at the depth of 250 fathoms is to be recorded.

This disposition of temperatures in the Caribbean Sea is entirely in accordance with the views expressed concerning the existence of an undercurrent from the Gulf of Mexico. It is supposed that the warm and slightly saline water of the Gulf passes in a southwesterly direction through the Yucatan Channel, and becoming heavier from the loss of heat, and in spite of the loss of salt, sinks down consecutively to greater depths, and that the liberated heat and salt by a system of successive transfers find their way back to the Gulf with the surface current.

CURRENTS IN THE GULF OF MEXICO.

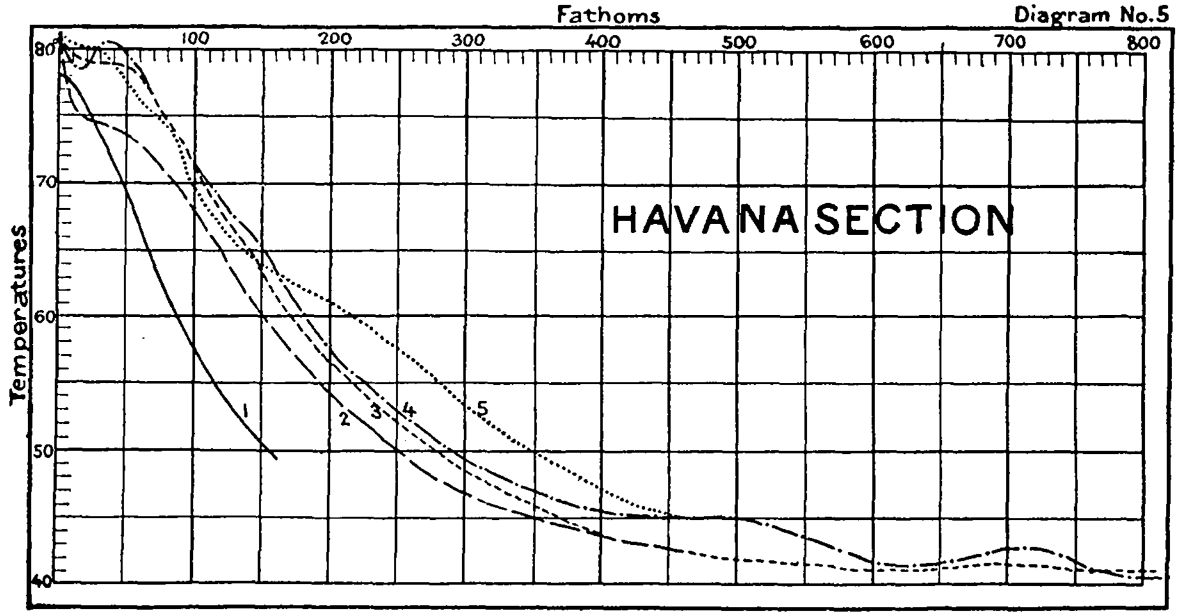
The current of the Yucatan Channel, by spreading and thinning out, soon loses its strength after leaving the strait At a distance of 100 miles its velocity is reduced to 1½ miles. The only place at a greater distance where it continues to show considerable vitality is at the northeastern edge of the Campeche bank, about 250 miles to the northward of Cape Catoche, where velocities



of 2½ miles have been recorded. These observations presumably indicate a strong effort of the current to reach the western Gulf by the shortest route.

The current observations made by Lieutenant Vreeland in the years 1889-1891 for the purpose of tracing the connection of the Yucatan Channel current with the Gulf Stream and to follow up the course of the first-named current through the Gulf, have been productive of rather more negative than positive results. It was found that at the entrance to the Strait of Florida, the current was generally from the direction of the Gulf, but sometimes it headed from the Yucatan Channel. By occupying twelve different stations between the Campeche banks and the Mississippi Delta, it was ascertained that farther west no permanent conditions existed, but that the currents were very irregular and sometimes completely reversed. I have carefully gone over Lieutenant Vreeland's observations and do not find any apparent inconsistencies that could not be easily explained. The Gulf of Mexico serves as a sort of a receiving reservoir for the waters which pass through the Yucatan Channel. When the current of the channel works with full energy it spreads in every direction between the Campeche bank and the north shore of Cuba. It invades the Florida Strait, but does not devote any special attention to it. Its main object appears to be to gain control of the whole Gulf by moving against its center with the greatest force that can be concentrated. When these conditions prevail the current is supposed to hold the waters of the whole Gulf in check and raise their level several feet above that of the Atlantic. At such times the waters of the Gulf Stream consist for the smaller part of those directly transferred from the Yucatan Channel, but more essentially of those which are forced into the Strait of Florida by the hydrostatic pressure from the Gulf. But we have seen that the current of the Yucatan Channel does not always work at high pressure, that it is very changeable, and sometimes falls off as much as 50 per cent. Whenever this is the case the pent-up waters of the Gulf are everywhere set into motion toward the Strait of Florida, and not only force the Yucatan stream through these straits but follow it up to the Yucatan passage, attack it in its eastern flank, which is the weakest part, and actually force part of it back into the Caribbean Sea. This is no doubt the cause of the persistent southerly current which Lieutenant Pillsbury has noticed to exist near Cape San Antonio.* Now we can also understand why to the westward of the Florida Bank we should at times find a strong current from the southward, indicating a powerful action of the Caribbean current, and again at another time a still stronger current from the northward, caused by waters which in consequence of reaction of the Gulf are on their way to the Strait of Florida.

Summing up we find that the time-honored theory, according to which the Gulf Stream has its origin in the Yucatan Channel, but makes the detour of the entire border of the Gulf before entering the Strait of Florida, has to be abandoned. But we also find that the theory which superseded the one just mentioned, and according to which the Gulf Stream made directly from the Yucatan Channel to the Strait of Florida, is not substantiated by facts. Another theory makes the mouths of the Mississippi the fountain head of the Gulf Stream; this theory is, as far as I can see, even much wider of the mark than any other that has been suggested.



The Gulf Stream as an appreciable and permanent current, or the Gulf Stream proper, commences, as has been shown by Lieutenant Pillsbury, at the extreme western entrance to the Strait of Florida.

THE GULF STREAM IN THE STRAIT OF FLORIDA.

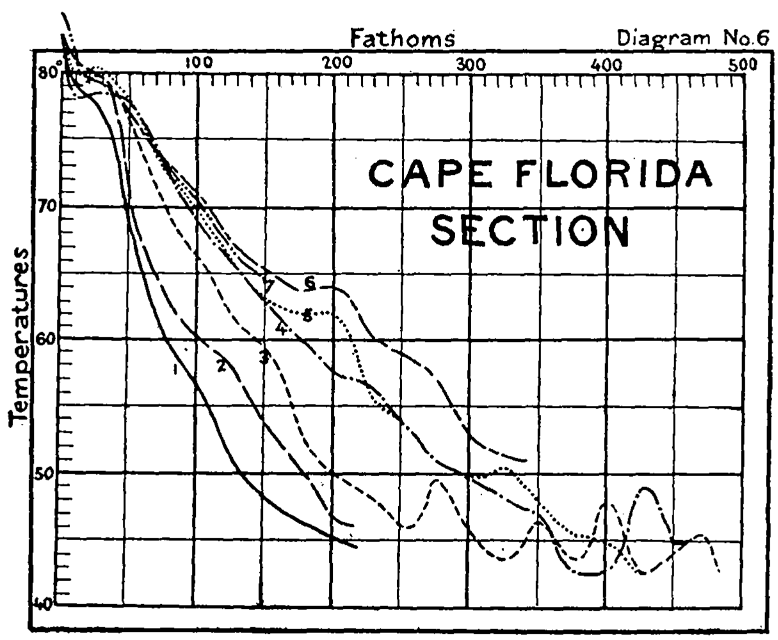
According to the observations by Lieutenants Pillsbury and Vreeland the Gulf Stream is a weak current, less than 2 miles per hour at the commencement of its career, and hugs the Florida banks quite closely. During the first 100 miles of its progress it shifts over to the southern side of the strait, practically retreats from the Florida banks, but makes considerable gain in strength; mean surface velocity, about 2½ miles.

The temperature curves for the western entrance of the strait show that the cold water which

* Appendix No. 10, U. S. C. & G. Survey, Report for 1890, p. 534.

descends from the Florida banks reaches halfway across the strait and that the warm water is all concentrated near the Cuban shore. At the depth of 150 fathoms we find differences of 17° between the temperature of the cold water in the northern and warm water in the southern half of the strait, which is a much greater difference than any noted in the Caribbean Sea.

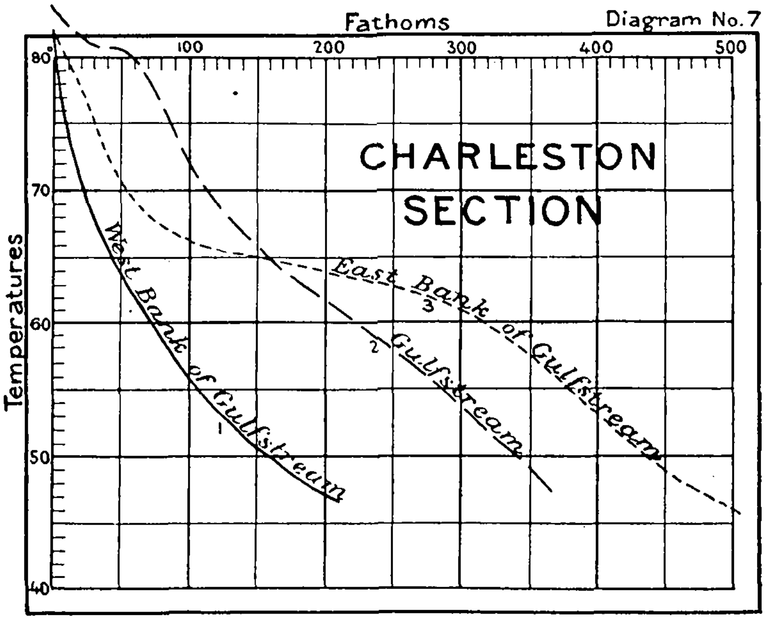
In consequence of these differences a lively exchange of temperatures must go on in the greater depths, and in conformity with this supposition we find already in the Havana cross section the extremely cold water confined to the vicinity of the Florida Reefs, and only a few degrees difference at any depth between the water about the middle of the strait and the accumulation of warm water of the Cuban coast, excepting the water directly under the surface to 80 fathoms depth, where there still exist differences of about 5°. The current observations, which were carried on to a depth of 130 fathoms, indicate a much greater depth of the Gulf Stream opposite Habana than was conceded to the current on the Yucatan Channel, as much as 500 fathoms against 200. From the distribution of temperatures in the vicinity of the Florida Strait it is inferred, as has already been stated, that there are no marked undercurrents in existence in this strait. The feeble undercurrent flowing in a westerly direction, which the current observations appear to indicate to the northward of the Gulf Stream, is probably of tidal origin. The flood current is sup-



posed to cross the reefs from the direction of the strait, and the ebb current to pass over the reefs from the Gulf. The ever-changing strength and direction of the tidal current, in connection with the varying strength of the Gulf Stream and the uncertainties of the winds, will produce all kinds of currents, which it will be difficult to analyze. But here on the very threshold of the Gulf Stream we find a condition of things which is calculated to upset all our preconceived opinions of the Gulf Stream based on the popular belief, as it finds expression not merely in the text-books of geography, but also in the most respectable works of physical geography. Almost everything connected with the Gulf Stream has been a matter of controversy, and if there existed any one property or qualification of this stream upon which all opinions agreed it was this, that it carried such an immense amount of heat over from the Gulf of Mexico toward the shores of Europe as to very materially ameliorate the climate of the whole of western Europe. Now, instead of finding the Gulf Stream well equipped on starting on its long journey with an inexhaustible supply of salt and heat, we find that it actually does not start out with so much of these commodities as can be picked up anywhere in the Atlantic between Bermuda and the West Indies, or Southern States; moreover, it carries the best part of its supplies on its surface, where by diffusion and dilution they are liable to be soon dissipated. In consequence we are not greatly surprised to find that the

Gulf Stream's stock of trade, heat and salt, has nearly given out by the time it reaches Cape Florida.

The cold water in the western half of the strait opposite Cape Florida reaches nearly to the surface, and at the depth of 250 fathoms, with temperatures ranging from 46° to 54°, stretches nearly across the entire width of the strait. The specific gravity, in consequence of the afflux of cold water, has gone down below 1·0280. Luckily for the Gulf Stream succor is at hand. A stream of warm and highly saline water, which has been moving up from the Old Bahama Channel through the Santarem Channel close to the great Bahama Bank, is ready to join the Gulf Stream and restore the temperature and specific gravity of its eastern edge, near the Bemini Islands, fully up to the Habana standard. The strongest current or the axis of the Gulf Stream is quite close to Cape Florida (about 15 miles away), over a depth of about 250 fathoms, with a bottom temperature of 34°. Here is about the nearest approach to land and the least depth of water and the strongest current of from 3 to 4½ miles in the course of the Gulf Stream. According to a diagram (No. 51) which accompanies Lieutenant Pillsbury's report on the Gulf Stream (Report of 1891, Appendix 10) the Gulf Stream current nearly everywhere in the Cape Florida section reaches within a short distance of the bottom, and with its eastern flank at a depth of 350 fathoms and with a velocity



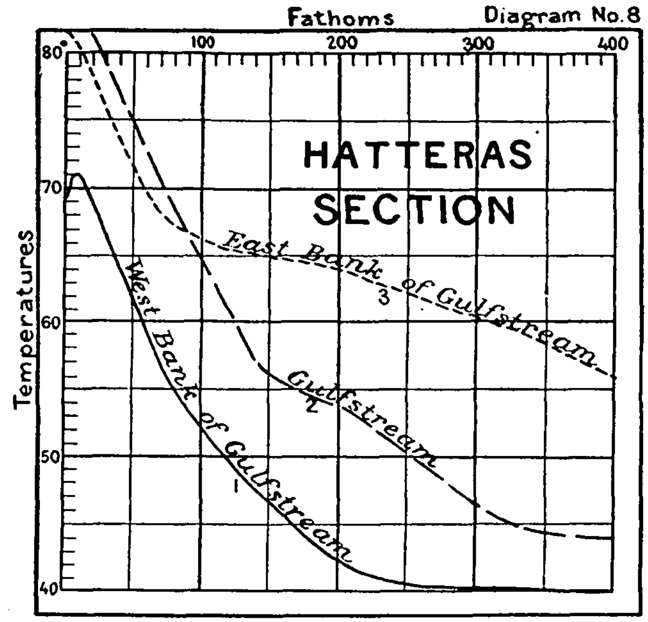
of about 1½ miles apparently scrapes the bottom. The temperature curves display an irregularity near the bottom of the strait which at these depths is something very unusual, and reveals a strange state of commotion. This state is supposed to be produced by an encounter between the cold waters which have descended from the Florida reefs with the warm water moving up from the Santarem Channel. We infer from these curves that the strength of the Florida current, which enables it to undermine the Gulf Stream and spread low temperatures halfway across the strait, has departed, and that henceforth this office must be attended to by currents which come from a more northern latitude and move along the Atlantic border of the United States.

THE GULF STREAM BETWEEN CAPES FLORIDA AND HATTERAS.

The temperature curves given for the Charleston and Cape Hatteras section show certain peculiarities which are common to all sections of the Gulf Stream examined by the Coast Survey, including those in the Florida Strait and also the Yucatan Channel. They are also noticeable in the Challenger cross sections of the Gulf Stream from the Bermudas to New York and from Halifax to the Bermudas. These peculiarities include the existence of a body of very cold and light water to the left of the Gulf Stream. The Gulf Stream itself generally is several degrees warmer at the surface than the adjoining water of the ocean, but the great heat of the Gulf Stream is confined to a superficial stratum; below the depth of 150 fathoms it is actually a great deal colder than the ocean to its right. Sketch B shows the temperature of the belt of cold water which skirts the Atlantic coast of the Southern States to be about 45° at the depth of 250 fathoms. At the same depth we find the ocean all the way to the Bermudas to be possessed of the very uniform temperatures of from 60° to 65°. The isothermal of 60° is found to be about 40 miles to the eastward of that of 45° and within this distance of 40 miles the transition of temperatures from 60° to 45° is effected.

In conformity with the views expressed when speaking of the specific gravity of the water off the Florida and Campeche banks the transition of temperatures has a tendency to increase the density of the warm water.

The preservation of density implies the liberation of part of the salt and heat. The heat and salt set free will rise vertically until they reach the surface. This process is assumed to be going on along the whole length of the continental slope from Canaveral to Hatteras throughout the whole breadth of 40 miles in which the transition of temperature is accomplished, and to produce,



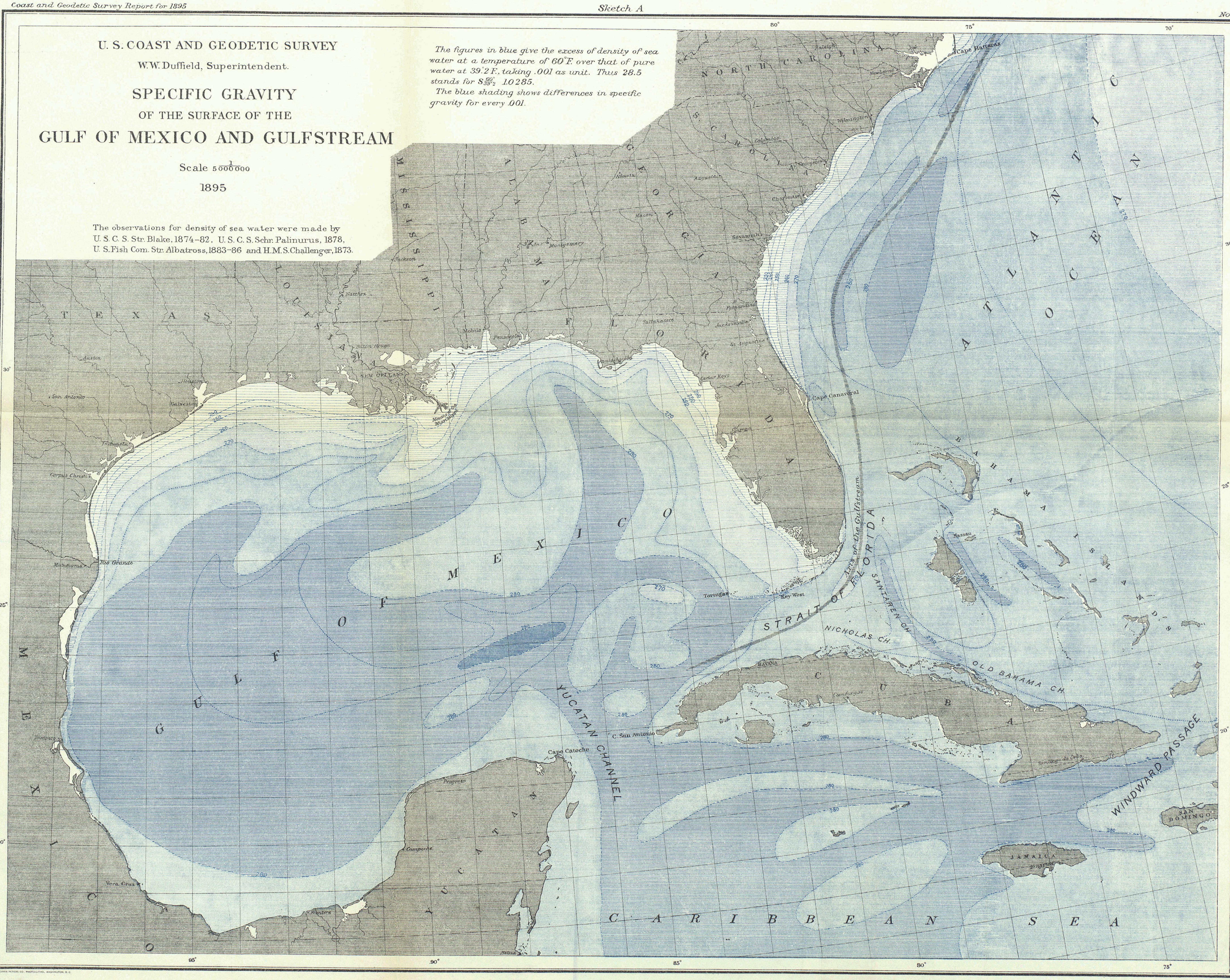
by accumulation of salt and heat on the surface of the ocean, the phenomenon known as the Gulf Stream.

The theory upon which the warmth of the waters of the middle North Atlantic between the depths of 100 and 600 fathoms generally is accounted for is no doubt correct. A very active evaporation, produced by the dry and steady trade winds, causes the surface waters to sink and carry down a great amount of heat and salt, in the manner already described for the eastern part of the Gulf, with the difference, however, that in the Gulf the process is restricted to a very small area, while on the Atlantic it takes place over the wide expanse of the sea.

It has been mentioned that the Gulf Stream as a carrier of heat and salt receives a very timely addition to its stock when opposite Cape Florida, but far more abundant supplies have been accumulating near the northern entrance to the Strait of Florida waiting for the arrival of the Gulf Stream. We can do no better than quote from the report of Lieutenant Pillsbury, already frequently referred to, to account for the presence of these warm and highly saline waters to the northward of the Florida Strait: "There is another body of water to the northward of the West India Islands, which, driven by the trade winds, is moving to the westward. This is a slow current, but when it joins the Gulf Stream proper off the southern coast of the United States it materially adds to the latter on its way to the northern seas." From Cape Canaveral to Cape

Hatteras the Gulf Stream maintains its high temperature and specific gravity; if the observations can be relied upon, we have in the vicinity of Cape Hatteras and Cape Fear gravities of above 1·028. It is certainly surprising that within 40 miles of Cape Hatteras and so far away from the regions where according to the best published charts we would naturally look for a maximum of specific gravity, we should find waters of such density as is nowhere else met with in the open ocean, and which only finds its equal in the Red Sea and the eastern part of the Mediterranean. But how does it happen that the Gulf Stream near Cape Hatteras, at such a great distance from its source, at the comparatively high latitude of 35°, and in the close vicinity of the cold current, which sometimes is called "the Labrador" and again "the cold wall," should have a temperature and density exceeding that of the adjoining ocean? We have seen that the stock of salt and heat, with which the Gulf Stream started on its journey, almost gave out before reaching Florida Cape, and that upon entering the open ocean the Gulf Stream draws its supply from the waters it meets. Now, as surely as a stream can not rise above its source, the Gulf Stream could not be warmer and salter than the ocean if it had not an independent source of supply. According to the explanation which we have advanced above, this source of supply is in the lower depths of the Gulf Stream, and the acquisition is made by vertical instead of horizontal circulation.

This might be the proper place to make some inquiry about the effect of the distribution of salt and heat as we find it in the Gulf Stream upon its level, and about the effect of difference of level upon the Gulf Stream current. These, however, are matters which require careful study and more careful and comprehensive observations than are at present available. For the purposes of the subject in hand it was quite sufficient to accept the existence of the Gulf Stream current, as it is revealed by examination, as a physical fact, and to confine ourselves to a study of its relation to the temperatures and specific gravities of the waters of the Atlantic.



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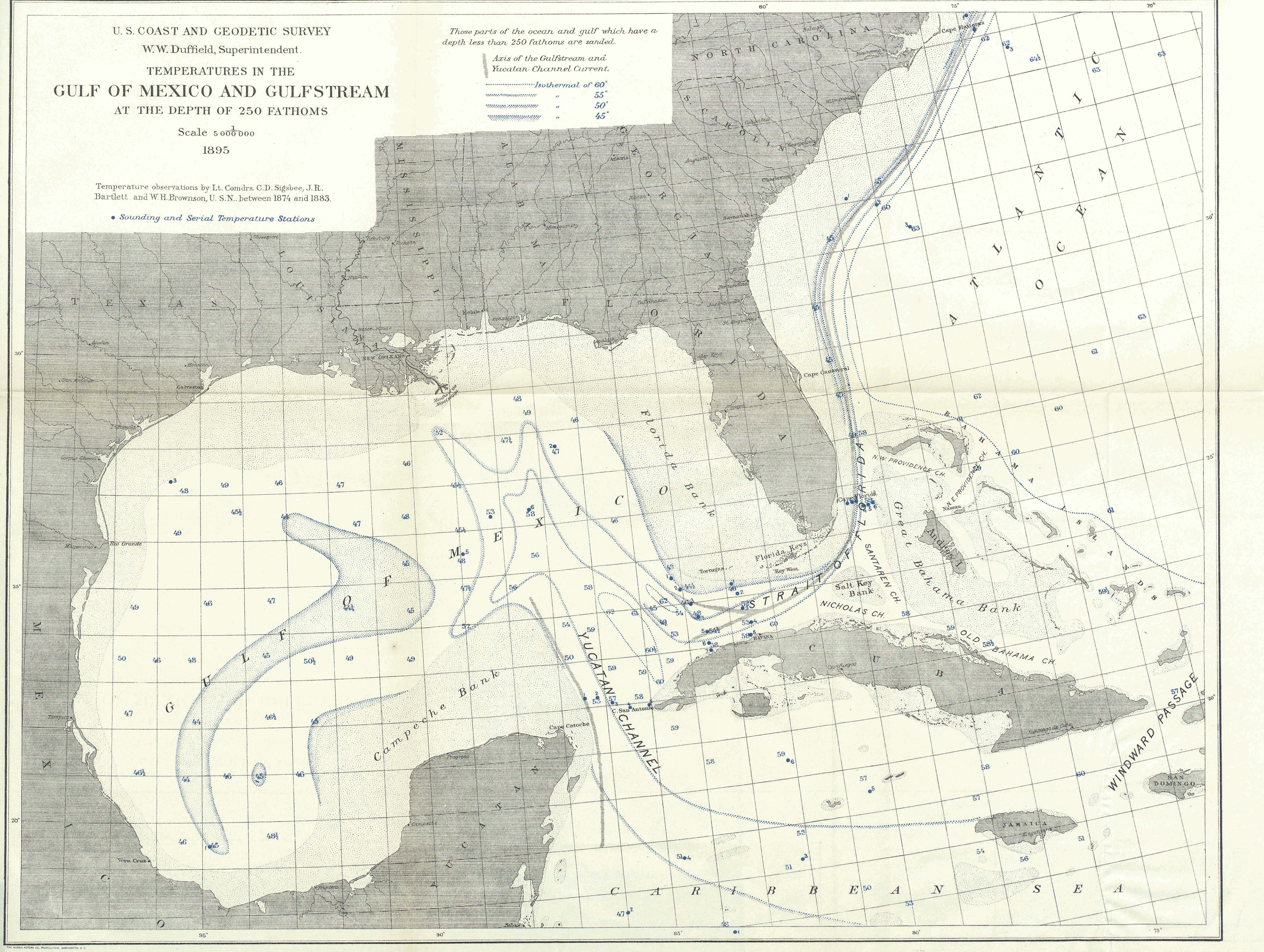

U. S. COAST AND GEODETIC SURVEY
W. W. Duffield, Superintendent.
TEMPERATURES IN THE
GULF OF MEXICO AND GULFSTREAM
AT THE DEPTH OF 250 FATHOMS
Scale $\frac{1}{5000000}$
1895
Temperature observations by Lt. Comdrs. C.D. Sigsbee, J.R. Bartlett and W.H. Brownson, U. S. N., between 1874 and 1883.
Sounding and Serial Temperature Stations
Those parts of the ocean and gulf which have a depth less than 250 fathoms are sanded.
Axis of the Gulfstream and Yucatan Channel Current.
Isothermal of 60°
" 55°
" 50°
" 45°
GULF OF MEXICO
ATLANTIC OCEAN
CARIBBEAN SEA
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
S. CAROLINA
NORTH CAROLINA
MEXICO
YUCATAN
CUBA
BAHAMA ISLANDS
JAMAICA
SAN DOMINGO
YUCATAN CHANNEL
STRAIT OF FLORIDA
WINDWARD PASSAGE
Florida Bank
Campeche Bank
Great Bahama Bank
Salt Key Bank
Florida Keys
NICHOLAS CH.
SANTAREN CH.
OLD BAHAMA CH.
N.W. PROVIDENCE CH.
N.E. PROVIDENCE CH.
Andros I.
Cape Hatteras
Cape Canaveral
Cape Florida
Cape Catoche
Cape San Antonio
Key West
Tortugas
Havana
New Orleans
Mobile
Galveston
Vera Cruz
Savannah
Charleston
Atlanta
Nassau
Rio Grande

APPENDIX No. 7—1895.

GRAPHIC METHOD OF REDUCING STARS FROM MEAN TO APPARENT PLACES.

By E. D. PRESTON, Assistant.

The reduction of stars from their mean places at the beginning of the year, as given in the catalogue, to their apparent places at any given time, as found by observation, forms a very considerable part of the astronomical calculations made in the Coast and Geodetic Survey Office. This work is especially heavy in our latitude computations, and the labor has been accentuated in recent years by the attention given to the subject of latitude variation.

There are several ways of abridging the numerical calculations, depending on the relation between the number of stars observed and the number of nights on which observations are made. For example, if many stars are observed on two or three consecutive nights, differential formulæ may be applied by means of which, the position having been obtained on any one date, that on succeeding dates may be found in about one-third the time required to get the first one. This method is given in Appendix No. 13, Coast and Geodetic Survey Report for 1888. When, however, observations are continued for a long time on the same stars, a condition that necessarily follows in researches on the variations of latitude, the reductions can be very much facilitated by a method employed in Appendix No. 2, Report for 1892. This method, which consists in applying Bessel's numbers by differences, enables the computer to obtain succeeding dates in about one-fourth the time required by the usual way. There are many cases, however, that do not fall strictly within the foregoing categories, and to meet these the present graphical method has been devised. Its advantages are rapidity and ease of application. No numerical work being necessary, the fatigue attending such operations is entirely avoided. The accuracy of the method can be increased to any desirable extent by enlarging the scale. That adopted in the following description will, however, meet all the requirements of our present instruments and methods of observation. This method was originally devised to shorten the work in the latitude computations, and has, therefore, been used only for declinations, but following the same principles, its application to right ascensions is also easily made.

GENERAL DESCRIPTION.

Three general diagrams are given. The first shows the lines necessary for all the stars and is the regular working sheet. The second and third are intended to show the construction for star No. 1381. (Catalogue of Stars for Observations of Latitude. Appendix No. 7, Report for 1876.)

In Pl. I we have a graphic representation of the day numbers *A*, *B*, *C*, *D*. The dimensions given refer only to the scale used in actual work and not to the printed sheets, which have necessarily been reduced for convenience of publication.

On a quadrant drawn with a radius of 20 inches, Pl. I, spaces are laid off equal to half degrees, corresponding to two minutes of right ascension. This scale enables one to indicate declinations to the nearest tenth of a degree and right ascensions to the nearest half minute with the greatest facility. With the exercise of a little care, on a slightly increased scale, the error in platting the former need not be more than a minute or two of arc, and the latter may be platted with a corresponding accuracy in time. Roughly speaking, the uncertainty of laying down the two functions may be stated as about six seconds for the right ascensions and one and one-half minutes for the declinations. With the above-stated dimensions the trigonometrical functions may be read off to three places, and the multiplication, by the graphical method, of these functions by the day numbers can be accomplished so that the greatest error will be only a few hundredths of a second of arc, which is abundantly sufficient for the reduction of star places for the ordinary latitude observations with the zenith telescope.

Concentric with the quadrant having a radius of 20 inches another is drawn with a radius of 20·05 inches. This is for the purpose of finding 20·05 cos α. On the two radii bounding the quadrants are laid off spaces of tenths of an inch. The entire radius is, therefore, divided into 200 parts, which enables us to read to the two thousandth part of it. Through these points of division lines are drawn parallel to the radii, the result being that the entire surface is divided into small squares.

The divisions of the quadrant are numbered for declination in the center, and for right ascension on either side. The degrees of declination are not indicated again on Pls. II and III, as these are only intended to illustrate the method by application to a special case. The trigonometrical functions for the declination are used, however, on these sheets as they would appear on Pl. I.

The hours for the last argument are so chosen that the lines representing the star numbers a, b, c, d will fall horizontally. This facilitates their multiplication with the day numbers A, B, C, D, which are all platted vertically. On the margin is indicated the space in which the right ascensions must be sought for the different star numbers a, b, c, d. A negative sign before the hours indicates that the trigonometrical function is to be taken in this sense.

The quantities A, B, C, D are platted on the largest scale possible with the accompanying quadrant. This necessitates a slight change in the values of A, and they are laid down on a scale ten times their real value. For example, the value on June 9 is 0·507 and is platted as 5·07.

B may range from $+9''$ to $-9''$, so the marginal numbers are used and the correct value of this quantity multiplied by any of the trigonometrical functions will be given by reading the result from the scale at the left.

C and D range from about $+20''$ to $-20''$. They are platted so that the radial value would be 20. Since they are both symmetrical with reference to the horizontal line passing through the center, all values are platted above the horizontal radius and negative values, in all day numbers, are made apparent by using a right line in which dots are made for each individual day.

The scale of dates is laid off in the middle of the sheet and the value of the day numbers at a specified time may be found at the intersection of the corresponding curve, with the vertical line through the given date. By means of the horizontal lines the values of A, B, C, D may be transferred visually to the margin.

For example, on June 9 we have the values

$$A = +5{\cdot}07 \qquad B = -8{\cdot}35 \qquad C = -3{\cdot}57 \qquad D = -20{\cdot}07$$

Referring now to Pl. II, we shall show the construction of the quantities

$$\begin{aligned} a'\ A &= 20{\cdot}05 \cos \alpha \times A \\ b'\ B &= -\sin \alpha \times B \\ c'\ C &= (\tan \omega \cos \delta - \sin \alpha \sin \delta) \times C \\ d'\ D &= \cos \alpha \sin \delta \times D \end{aligned}$$

It should be borne in mind, however, that in actual practice the method is very much shorter than would appear from the lines drawn in Pl. II.

For example, in finding the value of $a'\ A$ when we have once located the position of the right ascension $16^{h}\ 33^{m}{\cdot}5$ on the quadrant, it is seen by mere inspection that the quantity 20·05 cos α is equal to $-7{\cdot}38$. In fact, it is not necessary to know the numerical value of this quantity, since it is to be multiplied by A, and it is only the final product that we care to determine. A fine thread being attached at the center O and the other end being held by the hand at J, the intersection of this thread with the vertical line through the point of right ascension (G) gives at once the value of $a'A$ or $-3{\cdot}74$. No lines are actually drawn, but the final products are found by projecting selected points, with the eye, either horizontally or vertically until they meet the line of the thread. This visual projection is rendered easy and accurate by the small spaces into which the sheet is divided.

Moreover, on the regular working sheet both the quadrants indicating right ascensions and declinations and the curves for the day numbers are drawn. The diagrams are separated for illustration and to avoid confusion in the construction lines which, in the regular work, are never drawn. For the sake of comparison, the logarithmic computation employing Bessel's numbers is here given for the apparent declination of star No. 1381.

STAR NO. 1381.

Catalogue of stars for observations of latitude, Appendix No. 7, Report for 1876.

REDUCTION FROM MEAN TO APPARENT DECLINATION.

		Log.	No.
$\alpha = 16^h\ 33^m\ 41^s = 248^\circ\ 25'$		$\sin\alpha = 9{\cdot}9684_n$	$-0{\cdot}930$
$\delta =$	$53^\circ\ 7'$	$\cos\alpha = 9{\cdot}5657_n$	$-0{\cdot}368$
		$\sin\delta = 9{\cdot}9030$	$+0{\cdot}800$
		$\cos\delta = 9{\cdot}7783$	$+0{\cdot}600$

To find $a'\ b'\ c'\ d'$

Terms.	a' $20{\cdot}05_2\cos\alpha$	b' $-\sin\alpha$	c' $\tan\omega\cos\delta - \sin\alpha\sin\delta$		d' $\cos\alpha\sin\delta$
Computation.	*Logs.*	*Logs.*	*Logs.*	*Logs.*	*Logs.*
	$1{\cdot}3022$		$9{\cdot}6373$	$9{\cdot}9684_n$	$9{\cdot}5657_n$
	$9{\cdot}5657_n$		$9{\cdot}7783$	$9{\cdot}9030$	$9{\cdot}9030$
			$9{\cdot}4156$	$9{\cdot}8714_n$	
			$+0{\cdot}2604$	$0{\cdot}7437$	
			$+1{\cdot}004$		
Logs. $a'\ b'\ c'\ d'$	$0{\cdot}8679_n$	$9{\cdot}9684$	$0{\cdot}0017$		$9{\cdot}4687_n$
" $A\ B\ C\ D$	$9{\cdot}7055$	$0{\cdot}9215_n$	$0{\cdot}5521_n$		$1{\cdot}3026_n$
	$0{\cdot}5733_n$	$0{\cdot}8899_n$	$0{\cdot}5538_n$		$0{\cdot}7713$
Nos. $a'A\ b'B\ c'C\ d'D$	$-3{\cdot}74$	$-7{\cdot}76$	$-3{\cdot}58$		$+5{\cdot}91$
For June 9:					
Nos. $a'\ b'\ c'\ d'$	$-7{\cdot}38$	$+0{\cdot}930$	$+1{\cdot}004$		$-0{\cdot}294$
" $A\ B\ C\ D$	$+0{\cdot}508$	$-8{\cdot}35$	$-3{\cdot}57$		$-20{\cdot}07$

GRAPHIC DETERMINATIONS.

REDUCTIONS IN DECLINATION.

Proceeding now to determine the quantities $a'A\ b'B\ c'C\ d'D$ for star No. 1381, we shall indicate data and final results by full lines; construction lines are dotted; partial results which are intermediate between the data and the results, such as the values of $\tan\omega\cos\delta$, $\sin\alpha\sin\delta$, etc., are shown in broken lines. The reduction is made from the mean place on January 0, 1895, to its apparent place on June 9, 1895.

The position of the star is (taking the nearest half minute in α)

$$\text{Right ascension} = \alpha = 16^h\ 33^m{\cdot}5$$
$$\text{Declination} = \delta = 53^\circ\ 7'$$

FIRST TERM.

To get $a'A = 20''{\cdot}05\ \cos\alpha \times A$. (See Pl. II.)

We seek the value of α in the quadrant marked (a and d) and read at once the value of $20{\cdot}05 \cos\alpha$ or FG on the outer one of the arcs. The negative sign before 16 indicates that the cosine of the right ascension is minus. This quantity, which is $-7{\cdot}38$, is to be multiplied by the value of A on June 9. On this date we see by inspection from Pl. I that A equals $+0{\cdot}507 \times 10$ or the line

HI. In order to multiply the two lines FG and HI, I is projected to J. The point J is the intersection of a horizontal line through I and a vertical line at a distance of 10 units from the origin O. The point of intersection of the vertical through G and the line JO determines the length of the line KL, which is equal to FG multiplied by HI or $20{\cdot}05 \cos \alpha \times A$, therefore,

$$a'A = -3{\cdot}74 \text{ (agreeing with the logarithmic computation previously given).}$$

This follows from the proportion

$$hJ : hO :: LK : LO$$
$$\text{or } HI : 10 :: LK : FG$$
$$\text{Hence } LK = \frac{HI \times FG}{10}$$

which gives LK in correct units, since the value of A or 0·507 was platted on a scale ten times its true value.

When a number of stars are to be reduced for the same date the point J applies to all, and the values of $a'A$ for the separate stars are the vertical lines included between the axis of abscissas and the line JO. The lines are, of course, vertically under the points on the arc corresponding to the stars' right ascension.

For the sake of uniformity in the process of multiplication, the day numbers A, B, C, D are always projected to the vertical scale at the right when finding the products $a'A$, $b'B$, $c'C$, $d'D$. It is evident that the same result would ensue by projecting the star numbers a' b' c' d' to the horizontal scale at the top, drawing the radial line and measuring the intercept obtained by projecting the day numbers to the left. For example, if G is projected to m'' and $m''O$ is drawn, it will intersect the line JI prolonged in K'', giving $L''K'' = -3{\cdot}74$ as before. The algebraic proportions may be written out similarly to those above. If G is projected to m' and the line $m'O$ is drawn, it will intersect the line $J'I'$ prolonged, in K' giving $L'K' = -3{\cdot}74$ as before. In the figure the lines Gm' and $m'O$ are not drawn to avoid confusion with lines already drawn. Without writing out the proportions it is quite evident that in the triangle $L'K'O$ the line $L'K'$ is $\frac{7{\cdot}38}{20}$ of $L'O$, so that it is equal to $\frac{7{\cdot}38}{20}$ of $(2 \times 5{\cdot}05)$. Likewise in the triangle $L''K''O$ the line $L''K''$ is $\frac{7{\cdot}38}{10}$ of $L''O$ and is therefore $\frac{7{\cdot}38}{10}$ of 5·05, both of these being equivalent to the first construction, viz, $7{\cdot}38 \times 0{\cdot}505$.

To avoid extrapolation, in cases where the value of $20{\cdot}05 \cos \alpha$ is represented by a line longer than ten units A, may be platted on a scale twice as large as that just used, which would make the point I fall at I'. I' is then to be projected to J' and the value of $a'A$ is as before $-3{\cdot}74$. If A is platted on this scale nearly every value of $20{\cdot}05 \cos \alpha$ will be shorter than the horizontal distance between O and the point to which I' is projected, or J', and the values of $a'A$ will be vertical lines lying between J' and the center, so that the only extrapolation resorted to is that for values of a' between 20·00 and 20·05. But no sensible error would be introduced by following the first construction.

The scale at the left or right gives the result in correct units. This follows from the proportion

$$H'J' : H'O :: LK : LO$$
$$\text{or } HI' : H'O :: LK : FG \text{ as previously given.}$$

$$\text{Hence} \qquad LK = \frac{\mathrm{HI'} \times \mathrm{FG}}{\mathrm{H'O}} = \frac{(0{\cdot}505 \times 20)}{20} \quad (-7{\cdot}38) = -0{\cdot}505 \times 7{\cdot}38$$

SECOND TERM.

To get $\qquad b'B = -\sin \alpha \times B.$ (See Pl. II.)

We now use the inner quadrant or the one described with a radius of 20.

Find the right ascension in the quadrant marked (b and c). The sine for radius 20 is equal to MN or $-0{\cdot}930 \times 20$. The value of B, on June 9 is HP or $-8{\cdot}35$. Project P to Q. The intersection of the vertical line through N with the line OQ gives the point R and the distance RS read from the scale gives 7·76, which is the value of $\sin \alpha \times B$.

In actual work the thread being held at Q and the point N being selected by inspection, the position of R and its value on the scale are read off instantly without either drawing lines or writing figures. This advantage, of course, applies to all determinations by this method.

We have the proportion

$$H'Q : H'O :: SR : SO$$
$$\text{or} \quad HP : H'O :: SR : MN$$

Hence $$SR = \frac{\mathrm{HP} \times \mathrm{MN}}{\mathrm{H'O}} = \frac{(-8{\cdot}35)\ (-0{\cdot}930 \times 20)}{20} = +\ 7{\cdot}76$$

The value of $b'B$ is then $-7{\cdot}76$.

As in the case of $a'A$ all reductions for stars on June 9 have one point in common (here Q) and the values of $\sin \alpha \times B$ will appear as vertical lines included between the line QO and the axis of X.

In giving the values of the trigonometrical functions, the factor 20 is always written, as that is the number of units in the radius. The natural value of the function is, of course, the first factor.

THIRD TERM.

To find

$$c'C = (\tan \omega \cos \delta - \sin \alpha \sin \delta) \times C$$
$$\omega = 23^\circ\ 27' = \text{obliquity of ecliptic}$$
$$\tan \omega = 0{\cdot}434$$

We first find the second term of the parenthesis. By the same construction as was used for $b'B$ the sine of α is $-0{\cdot}930 \times 20 = MN$. The sine of δ is TV or $+0{\cdot}800 \times 20$. These quantities must be multiplied in such a way that the product is a horizontal line, viz, by projecting N to U and noting the point where the line UO intersects the horizontal line through V. The line XY is equal to $-14{\cdot}88$ or $-0{\cdot}744 \times 20$. We therefore have for the second term of the parenthesis on the actual scale

$$\sin \alpha \sin \delta = -0{\cdot}744 \times 20 = -14{\cdot}88$$

This follows from the proportion

$$qU : qO :: XY : XO$$
$$\text{or} \quad MN : qO :: XY : TV$$

Hence $$XY = \frac{MN \times TV}{qO} = \frac{\sin \alpha \sin \delta}{qO} = \frac{(-0{\cdot}930 \times 20)\ (0{\cdot}800 \times 20)}{20}$$
$$= -0{\cdot}744 \times 20 = -14{\cdot}88$$

We now find the first term of $c' = \tan \omega \cos \delta$.

The cosine of δ is XV or $+\ 0{\cdot}600 \times 20 = 12{\cdot}00$.

Project V to W. Draw OW. Where this intersects the horizontal line through Z determines the distance ZE which is

$$\tan \omega \cos \delta \text{ or } +\ 0{\cdot}260 \times 20 = +\ 5{\cdot}20$$

the sum of the two terms of c' is therefore $(5{\cdot}20 + 14{\cdot}88)$ or $1{\cdot}004 \times 20 = 20{\cdot}08$. The distance ZO is twenty times the natural tangent of the obliquity of the ecliptic and the line through Z is drawn once for all, as it is common to all the stars. In order to have the two terms of c' on the same scale, Z is taken at a distance from the axis of X of $20 \times 0{\cdot}434 = 8{\cdot}68$, so that we have the proportion

$$qW : qO :: ZE : ZO$$
$$\text{or} \quad XV : qO :: ZE : \tan \omega \times 20$$

Hence $$ZE = \frac{XV \times \tan \omega \times 20}{qO} = \frac{(0{\cdot}600 \times 20)}{20}\ (\tan \omega \times 20)$$
$$= 0{\cdot}600 \times 0{\cdot}434 \times 20 = 0{\cdot}260 \times 20$$

The value of ZE is laid off on the prolongation of XY, giving the point A where

$$XA = XY + YA = (0{\cdot}260 + 0{\cdot}744) \times 20 = +\ 1{\cdot}004 \times 20$$

the first term of the value $c'C$ being positive and the second term negative, their difference is $+\ 20{\cdot}08$.

This is to be multiplied by the value of C on June 9, which is $-3{\cdot}57$. Project B to C. Draw CO. Where the vertical line through A meets CO prolonged gives the point D and the line DD' is the product $c'C$ or

$$(\tan \omega \cos \delta - \sin \alpha \sin \delta) \times C \text{ or } -3{\cdot}59$$

we have

$$H'C : H'O :: D'D : D'O$$
$$\text{or } HB : H'O :: D'D : XA$$

Hence

$$D'D = \frac{HB \times XA}{H'O} = -\frac{3{\cdot}57\ (1{\cdot}004 \times 20)}{20} = -3{\cdot}58$$

If $\sin \alpha \sin \delta$ is positive, the value of ZE is laid off to the left of Y, the construction being otherwise the same.

FOURTH TERM.

To find

$$d'D = \cos \alpha \sin \delta \times D$$

Seeking the right ascension in the quadrant marked (a and d) we find $\cos \alpha$ for radius 20 to be fg or $-0{\cdot}368 \times 20$. This must not be confounded with $-0{\cdot}369 \times 20$, which is on the same scale the value of $20{\cdot}05 \cos \alpha$, and which is measured on the outer circle. The sine of δ is TV, or $0{\cdot}800 \times 20$. Project g to m. Where the line mO intersects the line XV, already drawn, determines the point n. Xn is then the value of $\cos \alpha \sin \delta$, or

$$-0{\cdot}294 \times 20 = -5{\cdot}88$$

We have

$$qm : qO :: Xn : XO$$
$$\text{or } fg : qO :: Xn : TV$$

Hence

$$Xn = \frac{fg \times TV}{qO} = \frac{(-0{\cdot}368 \times 20)\ (+0{\cdot}800 \times 20)}{20} = -0{\cdot}368 \times 16{\cdot}00 = -5{\cdot}88$$

The line Xn is now to be multiplied by $-20{\cdot}07$, the value of D, on June 9, which we find equal to the line Hp. Project p to a. Draw aO. The intersection of aO with a vertical line through n gives the point t and we have rt equal to $\cos \alpha \sin \delta \times D$, or to $+5{\cdot}90$.

We have

$$H'a : H'O :: rt : rO$$
$$\text{or } Hp : H'O :: rt : Xn$$

Hence

$$rt = \frac{Hp \times Xn}{H'O} = \frac{(-20{\cdot}07\ (-0{\cdot}294 \times 20)}{20} = +5{\cdot}90 = d'D$$
$$= \cos \alpha \sin \delta \times D$$

The slight discrepancies between the results of the logarithmic computation and those of the graphic method may either come from the uncertainties in reading the scale in the latter case or from excessive use of decimals in the former. For example, the logarithm of D in the computation is 1·3026. These are the figures given in the ephemeris, and to 4 places they correspond to the number 20·07. But in the actual work they have the effect of a quantity slightly greater, and the combination of several logarithms under these conditions may give a result differing entirely in the last place from that obtained by the use of the natural numbers to a corresponding degree of accuracy.

REDUCTIONS IN RIGHT ASCENSION.

(Pl. III.)

In the reductions for right ascension the curves for the day numbers A, B, C, D are used as already plotted, and the star numbers are so constructed that the lines representing a, b, c, d fall horizontally.

This may be readily effected since they all depend on at least three quantities, and these may be multiplied in such a way as to give the resulting line either desired direction.

The inner quadrant, already drawn, holds good for the right ascensions as already used for declinations. In seeking the trigonometrical functions of δ, however, the degrees count in the opposite direction; to facilitate this each degree has its complement written opposite.

In finding the values of a and b it is necessary to use the value of tan δ. This is obtained, where the declination is less than 45°, from the horizontal line at a distance of 10 units from the origin. A line drawn from the given degree to the point O intersects it at a vertical distance from the origin equal to ten times the natural tangent of the angle. This construction gives us three units in the value. We may now proceed to the final result by using this value, or two units may be employed and the construction carried forward on the scale used for arcs beyond 45°. Both these methods will be indicated later.

In order to compare results the usual logarithmic computation is now given.

STAR NO. 1381.

Catalogue of stars for observations of latitude, Appendix No. 7, Report for 1876.

REDUCTION FROM MEAN TO APPARENT RIGHT ASCENSION.

		Log.	No.
$\alpha = 16^h\ 33^m\ 41^s = 248°\ 25'$	sin α =	$9{\cdot}9684_n$ =	$-0{\cdot}930$
$\delta = 53°\ 7'$	cos α =	$9{\cdot}5657_n$ =	$-0{\cdot}368$
	tan δ =	$0{\cdot}1247$ =	$+1{\cdot}33$
	sec δ =	$0{\cdot}2217$ =	$+1{\cdot}67$

Terms.	a $3^s{\cdot}073 + 1{\cdot}337 \times \sin\alpha\tan\delta$	b $\frac{1}{15}\cos\alpha\tan\delta$	c $\frac{1}{15}\cos\alpha\sec\delta$	d $\frac{1}{15}\sin\alpha\sec\delta$
Log. 1·337.	0·1261			
" sin α.	$9{\cdot}9684_n$			
" tan δ.	0·1247			
Sum logs.	$0{\cdot}2192_n$			
No.	−1·656			
No.	3·073	8·8239	8·8239	8·8239
Sum.	1·417	$9{\cdot}5657_n$	$9{\cdot}5657_n$	$9{\cdot}9684_n$
		0·1247	0·2217	0·2217
Logs. $a\ b\ c\ d$	0·1514	$8{\cdot}5143_n$	$8{\cdot}6113_n$	$9{\cdot}0140_n$
" $A\ B\ C\ D$	9·7055	$0{\cdot}9215_n$	$0{\cdot}5521_n$	$1{\cdot}3026_n$
" $aA\ bB\ cC\ dD$	9·8569	$9{\cdot}4358_n$	9·1634	0·3166
Nos. " " " "	+0·719	+0·273	+0·146	+ 2·073
" $A\ B\ C\ D$	+0·507	−8·35	−3·57	− 20·07

CONSTRUCTION OF AUXILIARY LINES.

In order to find the tangents from 0° to 45° the line jp is used. These values may be reduced either graphically or mentally. For values of the declination between 45° and 87°, the tangents are read from the lines $t\ t'\ t''\ t'''$ and t^{v}, of Pl. I. The method of construction enables us to find the values for every minute of arc. The curve t applies to declinations from 45° to 50°; t' extends from 50° to 60°, etc. The units in the degrees are given by the vertical scale, and each small square represents vertically 6 minutes of arc. The tangents are the horizontal lines included between the axis of ordinates and the respective curve; e. g., the tangent of 68° is 2·48, the tangent of 85° is 11·43, etc.

The secants which are necessary in finding the values of c and d are obtained from the curves $S'\ S''\ S'''$, etc. In order to facilitate their multiplication by sin α and cos α the curves are drawn so that the secants are vertical lines and count from the axis of abscissas. From 45° on they are found in a similar manner to the tangents, but below 45° the curve S is used, which gives three places with sufficient accuracy. Referring to the case before cited, where the tangent of an angle less than 45° is to be employed, let us suppose where $\delta = 25°$. The tangent, by the construction already indicated, would be found (Pl. III) on the line jp at p' where $jp' = 0{\cdot}466$.

If we only desire two places, instead of reading the value from the line jp, it may be read from the horizontal line at a distance of 1 unit from the axis of abscissas and we get 0·47. This being on the same scale as the tangents beyond 45°, the subsequent proceeding is in every way similar. Should three places be desirable, project p' to p''; then $p''\,p'''=10\times\sin\alpha\tan\delta=4{\cdot}33$ and the true value of $1{\cdot}337\sin\alpha\tan\delta$ required in the construction of aA will be found by projecting p'' to the axis of ordinates and thus determining the line $p^{iv}p^{v}=0{\cdot}58$, jk' being made$=jo\times1{\cdot}034$. The same result, by an analogous construction, follows by taking both $\tan\delta$ and the factor 1·337 in their true proportion. This is not shown in the figure to avoid a multiplicity of lines and letters. It may be added, however, that inasmuch as the trigonometrical function by which $\tan\delta$ is multiplied can never exceed unity, two places are sufficient for small values of δ and especially in view of the fact that in the quantity aA we have the factor A which is small, and in bB the quantity 15 appears in the denominator, both tending to reduce the number of necessary places.

FIRST TERM.

To find $aA=(3^{s}{\cdot}073+1^{s}{\cdot}337\sin\alpha\tan\delta)\times A$. (See Pl. III.)

The tangent of 53° 7′ is the line $cd=1{\cdot}33$. In order to verify this value, reference must be had to Pl. I; but in the regular work the determinations are made on the same sheet on which the curves are drawn. The sine of $16^{h}\,33^{m}{\cdot}5$ is $ab=-0{\cdot}930\times20$. Project b to f and draw fo. The vertical line gh at a distance from the axis of ordinates equal to cd and included between the line fo and the axis of abscissas is the product of $\sin\alpha\tan\delta$ or 1·24.

This follows from the proposition

$$ef : eo :: gh : go$$
$$\text{or } ab : eo :: gh : cd$$
$$\therefore \sin\alpha\tan\delta=gh=\frac{ab\times cd}{eo}=-\frac{0{\cdot}930\times20\times1{\cdot}33}{20}=-1{\cdot}24$$

Draw ko so that $jk=1{\cdot}337$ times jo. The horizontal line lm passing through the point h and included between the axis of ordinates and the line ko is therefore equal to the quantity $1{\cdot}337\sin\alpha\tan\delta$ or $-1{\cdot}66$. This follows from the fact that in the triangle jok each abscissa is 1·337 times the corresponding ordinate. The total value of the quantity within the parenthesis or a is therefore $3{\cdot}07-1{\cdot}66$ or $+1{\cdot}41$.

This quantity is to be multiplied by the value of A on June 9 or 0·507. The necessary lines for the multiplication of this quantity by any factor have already been drawn in the case of the declinations and in actual work their application to the right ascensions is directly made without new construction. The method is as follows:

The value of A projected to the line pn gives the point q and a vertical line rs included between qo and the axis of abscissas and at a distance from the origin equal to 1·41 gives the value of aA or $+0{\cdot}71$.

We therefore have

$$aA=(3^{s}{\cdot}073+1^{s}{\cdot}337\sin\alpha\tan\delta)\times A=+0^{s}{\cdot}71$$

SECOND TERM.

To find $bB=\frac{1}{15}\cos\alpha\tan\delta\times B$. (See Pl. III.)

The cosine of α is the line $uv=-0{\cdot}368\times20$.

The tangent of δ is $cd=og=1{\cdot}33$.

Project v to v' and draw $v'o$.

The intersection of this line with the vertical through d gives the point s'. We then have $gs'=\cos\alpha\tan\delta=-0{\cdot}49$.

Draw ox so that $jx=\frac{10}{15}\times jo$. The intersection of a horizontal line through s' with the line xo gives the point s'' and $s''y=\frac{10}{15}\cos\alpha\tan\delta=-0{\cdot}33$. The value of B on June 9 is $-8{\cdot}35$. This distance laid off on the line pn or, which is the same thing, the ordinate for June 9 being projected to the vertical at a distance of 10 units from the origin gives the point Z. The intersection of a vertical line through s'' with the line Zo gives the point Z' and the distance

$$Z'Z'' = \frac{1}{15} \cos \alpha \tan \delta \times B = +0{\cdot}27$$

The object in laying off $jx = \frac{10}{15} jo$ is to secure one more decimal place in the value of b. The correct value in the final result is obtained in the multiplication by B since the construction gives us $\frac{835}{1\,000}$ of $\frac{10}{15} \cos \alpha \tan \delta$.

The line xo is used in the construction of cC and dD, as well as bB.

Introducing the factor $\frac{10}{15}$ serves the double purpose of giving one more decimal place, thus increasing the accuracy, and also of restoring the final result to the correct scale after multiplying by B.

THIRD TERM.

To find $$cC = \frac{1}{15} \cos \alpha \sec \delta \times C. \quad \text{(See Pl. III.)}$$

The secant of the declination is the line $AB = \sec 53^\circ\ 7' = +1{\cdot}67$. For verification see Pl. I. The intersection of a horizontal line through B with the line xo already drawn gives $A'B'$ which is

$$\frac{10}{15} \sec \delta = 1{\cdot}11$$

$$\cos \alpha = -0{\cdot}368 \text{ as before}$$

Project B' to B''

The intersection of a horizontal line through v with the line $B''o$ gives the distance $A'' = \frac{10}{15} \cos \alpha \sec \delta = -0{\cdot}408$.

The value of C on June 9 is $-3{\cdot}57$.

The intersection of a vertical line through the extremity of A'' with the line $V''o$ determines the line p, which is equal to $+0{\cdot}15$.

Hence $$P = \frac{1}{15} \cos \alpha \sec \delta \times C = +0{\cdot}15$$

As in the case of bB, the true value of the last result is given by multiplying finally by 0·357 instead of 3·57; this corrects for the artifice employed of magnifying the first partial result, viz, $\frac{1}{15} \sec \delta$ in order to secure one more decimal place. In the case of cC, since both $\cos \alpha$ and $\sec \delta$ are vertical lines, the latter is multiplied by $\frac{10}{15}$ in order to change its direction and thus facilitate its multiplication by $\cos \alpha$.

FOURTH TERM.

To find $$dD = \frac{1}{15} \sin \alpha \sec \delta \times D. \quad \text{(See Pl. II.)}$$

As in the previous case, we have $\frac{10}{15} \sec \delta = A'B' = 1{\cdot}11$ and by previous construction $\sin \alpha = a\,b = -0{\cdot}930 \times 20$.

The intersection of a horizontal line through b with the line $B''o$ gives the line MN, by which we have

$$M\,N = \frac{10}{15} \sin \alpha \sec \delta = -1{\cdot}03$$

The value of D on June 9 is $-20{\cdot}07$.

This value is projected to a vertical line at a distance of 10 units from the axis of ordinates, thus correcting for the factor 10 introduced in the value MN.

A vertical line through N intersects the line $N'o$ at a distance $M'p'=2{\cdot}07$ from the axis of abscissas and we have finally

$$M'p' = \frac{1}{15} \sin \alpha \sec \delta \times D = +2{\cdot}07$$

Attention may be called, in conclusion, to the striking manner in which the principal characteristics of the values A, B, C, D are brought out in the graphical representations. By reference to Pl. I it will be noticed that both A and B have two large maxima and minima during the year. In addition to this each curve is marked by a number of smaller maxima and minima. C and D, being dependent on the cosine and sine of the sun's longitude, present but one maximum and one minimum.

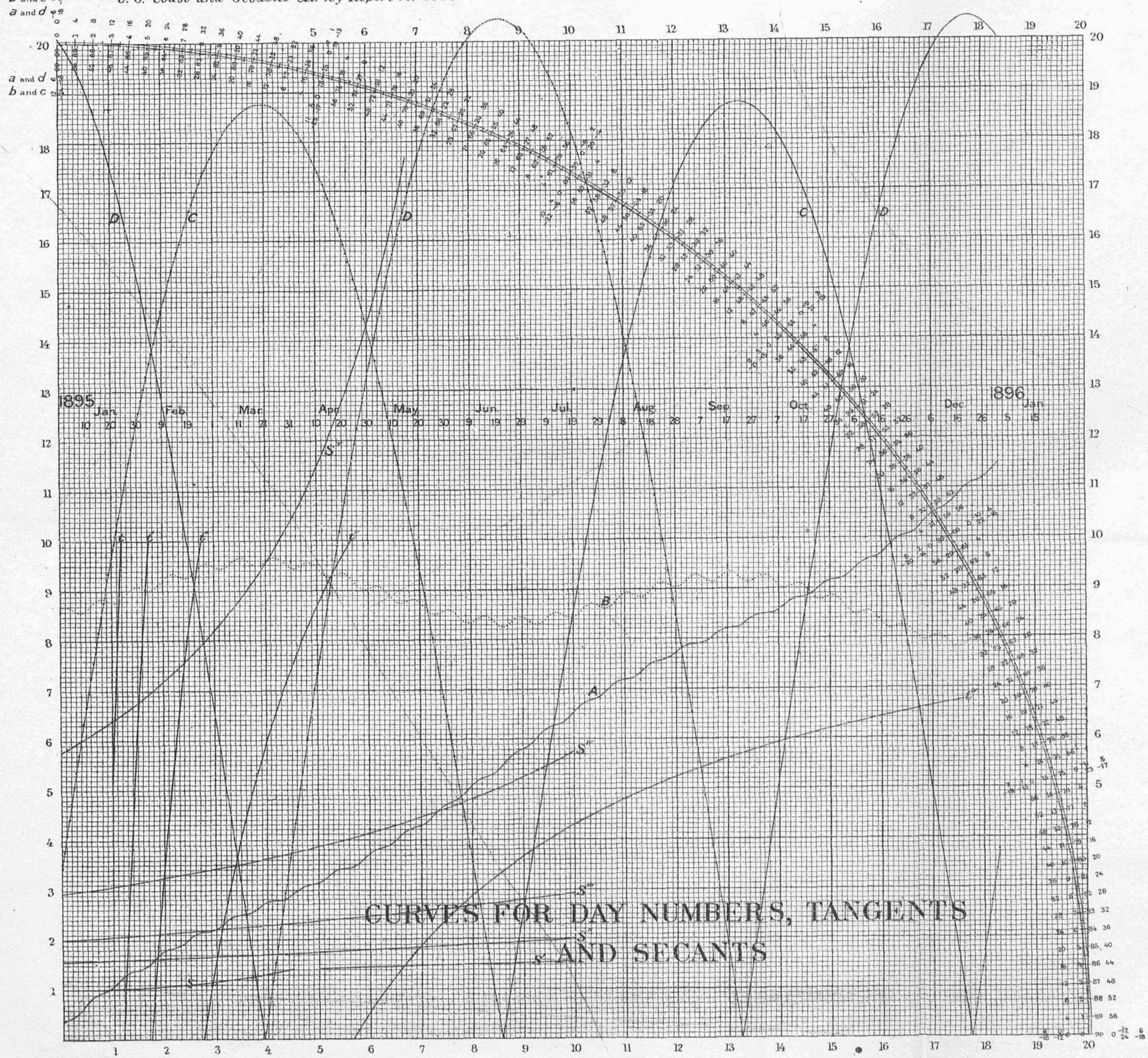
The general increase of A is the result of the term depending on the sine of the longitude of the moon's ascending node, combined with the value of t, which increases much more rapidly than the sine term decreases. The term depending on twice this function, being of the opposite sign, would tend to diminish this effect; but as it is only about 1 per cent of the first term its influence is barely perceptible.

The general decline of B, negatively, is caused by the cosine of the function mentioned, and is seen to be about three-fourths of one second as the formula requires. As, in the case of A, the function depending on the double angle modifies this to some extent.

The two major maxima and minima in both A and B are produced by the terms depending on twice the sun's true longitude, the double angle accounting for the four appearances of the extreme values. It will be noticed that the range in A is about 0·05 and in B about 1″, as demanded by the formula. In this connection it should be remembered that A is platted on a scale ten times its true value.

The minor maxima and minima in A and B show the effect of the term depending on the moon's mean longitude.

The range for A is about one-half as much as that for B. There are 27 maxima and 27 minima during the year in each curve, which corresponds to twice the moon's motion.



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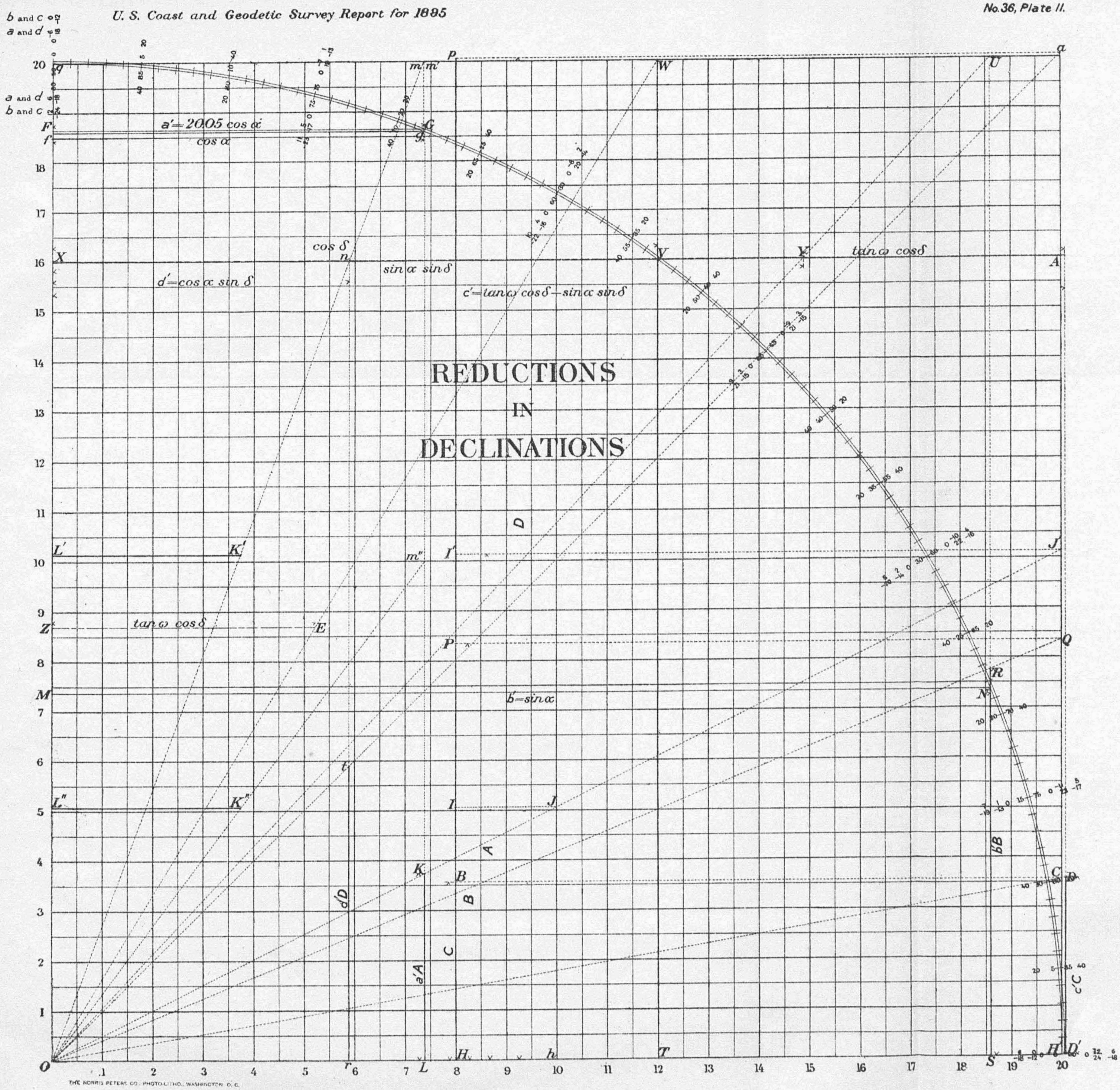

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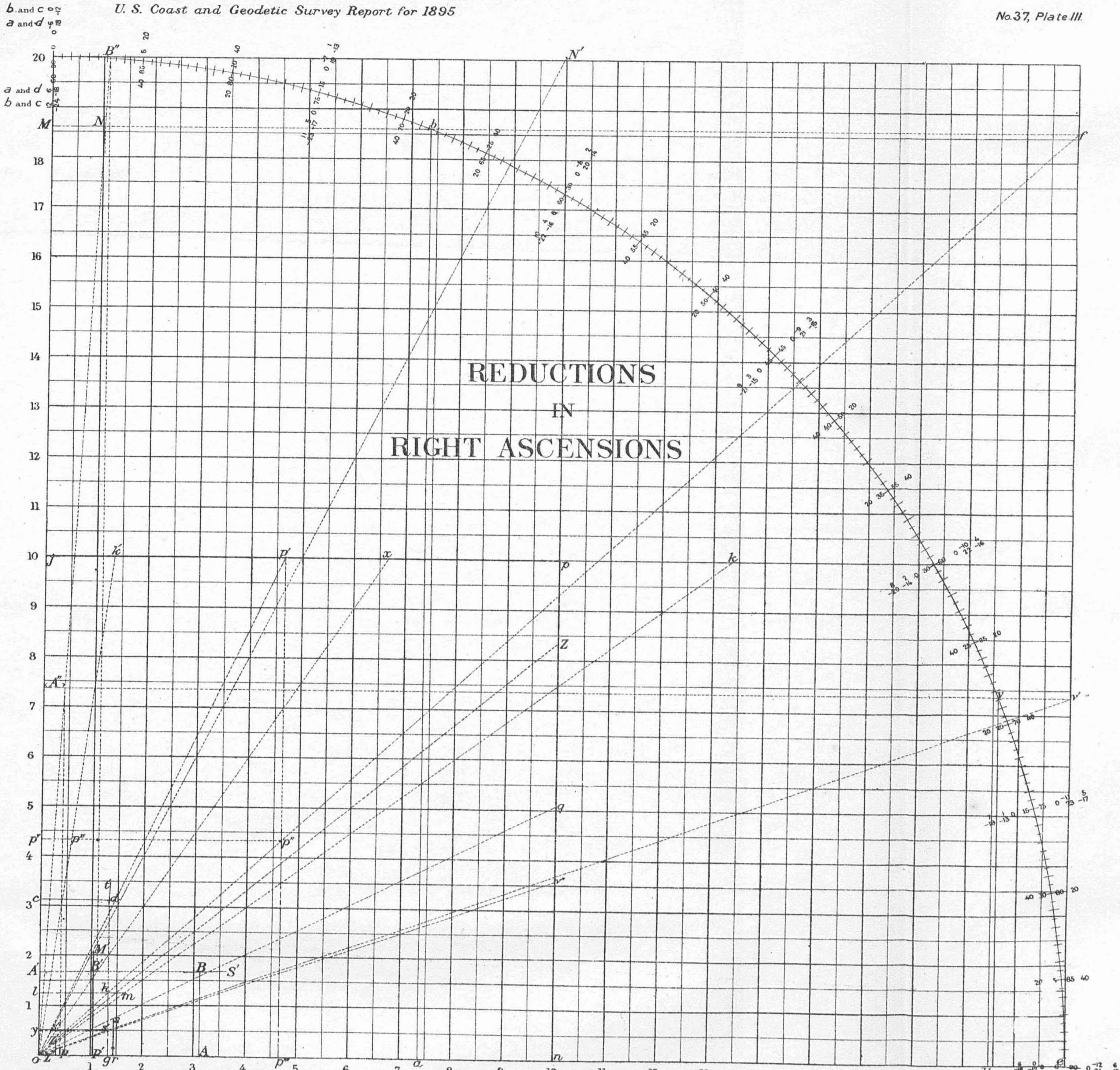

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APPENDIX No. 8—1895.

DESCRIPTION OF LEVELING RODS DESIGNED AND CONSTRUCTED FOR USE IN GEODETIC LEVELING OPERATIONS.

By ISAAC WINSTON, Assistant.

Leveling rods with the graduation on brass strips attached to wooden supports (see Appendix No. 15, Report for 1879, for description of rods as originally designed) have been in use by the Survey for many years. Modifications have been made from time to time with a view of improving the rods, but the rods have never been entirely satisfactory.

The difficulty of determining and applying the proper correction for the change in the length of the scale, due to changes of temperature while the rod is in use in the field, is very great, and has resulted in the attempt to avoid errors due to the source stated above by substituting a wooden rod (thoroughly saturated with paraffin) for the metal strip. The subject was referred to a committee appointed by the Superintendent, and the following is a description of the rod designed by the committee after considering all available data. The details of construction were worked out with great skill by the chief mechanician of the Survey.

White pine was chosen on account of the ease with which it can be impregnated with paraffin to prevent changes due to varying hygrometric conditions. A fine, permanent, and accurate graduation was secured by tracing it on the heads of metal plugs inserted in the rod at proper intervals. Use in the field has shown the rods to be in every way satisfactory.

They are described as follows:

The rod is made of well seasoned white pine wood, thoroughly saturated with paraffin, and is a little more than 3 metres long.

Each rod consists of a main strip of wood, 7 cm. wide and 2·1 cm. thick, along the center of each broad face of which is fastened by screws another strip of equal length and 2·5 cm. thick, thus forming a cross of symmetrical proportions. These strips were dressed very nearly to their proper size, the screw holes (eleven in number, 5 mm. in diameter and 300 mm. apart) were bored, and an additional hole (10 mm. in diameter) was bored in the main strip between each pair of screw holes and then the three pieces forming rod *Q* were immersed in melted paraffin, in a trough heated by a row of Bunsen burners, from 9.30 a. m. to 4 p. m., on February 5, 1895, when the lights were extinguished.

At 8 a. m., February 6, the burners were again lighted and kept so until 3 p. m. and then extinguished. On the next day the paraffin was warmed sufficiently to allow the removal of the rod.

	Kg.
Before paraffining the weight of the rod *Q* was	3·494
After immersion in fully heated paraffin for 12 hours the weight of the rod was	6·825
Paraffin absorbed by rod	3·331

a gain of about 95 per cent in weight.

The second rod, *P*, having been similarly treated, showed a gain of only 65 per cent. It was therefore immersed again.

	Kg.
Weight before paraffining	3·523
After immersion in fully heated paraffin for 15¼ hours it weighed	6·060
Paraffin absorbed	2·537

a gain of about 72 per cent in weight.

In these operations the temperature of the paraffin was uncertain, but it was high enough to cause smoking and to convert water into steam immediately. After the rods had been thus treated the pieces were dressed to their proper size and fastened together. They were then submitted to the Weights and Measures Office to have their coefficients of expansion determined. This determination was made by comparing their expansion during rising and falling temperatures, relatively, to the expansion of two tapes of the standard kind (Woodward's), the coefficients of which can be safely assumed. The coefficient deduced is 0·000 0042 per degree Centigrade.

A test of the hygroscopic properties of the rods was made by submerging one of them in a trough of water for nineteen hours, but no appreciable difference was developed. Holes were then bored in the face of the rod to receive the silver faced brass plugs, 5 mm. in diameter and 20 mm. long, which were inserted at intervals of 0·02 m. to receive the graduation. These plugs fit accurately in the holes made to receive them and are secured in position by a rivet passing through the wood and near the end of the plug. They project slightly above the face of the rod. A single line is cut across the silver end of each plug. The rods were again delivered to the Weights and Measures Office and the length of each 0·1 m. division determined. The fittings were then placed upon the rod.

The target, provided with guide pieces and friction springs, is moved up and down the face of the rod by means of an endless chain passing over a fixed pulley near the bottom of the rod and an adjustable one near the top.

A similar endless chain is attached to a lever and eccentric carried by the target, by means of which the latter can be clamped in any position on the rod without loss of time. An opening is made in the target to permit the graduation to be seen and it carries a millimetre scale 0·02 m. long, with a feather edge mounted on a spring which holds it slightly above the plugs and allows a reading to be easily made without parallax by pressing the scale against the plug while reading the rod. The zero of the graduation corresponds to the foot of the rod, and the zero of the scale to the center of the target. The rod is read directly to 0·001 m. and by estimation to 0·0001 m. A circular level is attached to the rod, by means of which it can be held in a vertical position, and a handle is screwed to its back for convenience in carrying it.

The face of the rod is divided by painting to 0·01 m., which serves the double purpose of a telemeter and of checking the reading of the rod by the rodmen and recorder. The decimetre divisions of the face of the rod are numbered on the face of one rib and marks to distinguish the metres are placed opposite these divisions on the other rib.

The bottom of the rod is made of metal and terminates in a rounded phosphor-bronze boss with a radius of 2·7 cm. It is so constructed that the point of support of the rod is in the same vertical plane as the graduation.

	Kg.
Weight of rod *P* finished	9·4
Weight of rod *Q* "	10·2

The foot plate is a circular disk of cast iron, about 15 cm. in diameter, with a depression (radius of 3·5 cm.) in the center for receiving the foot of the rod, and with prongs on the under side to secure immobility when properly pressed into the ground. These foot plates are similar to those already in use by the Survey.

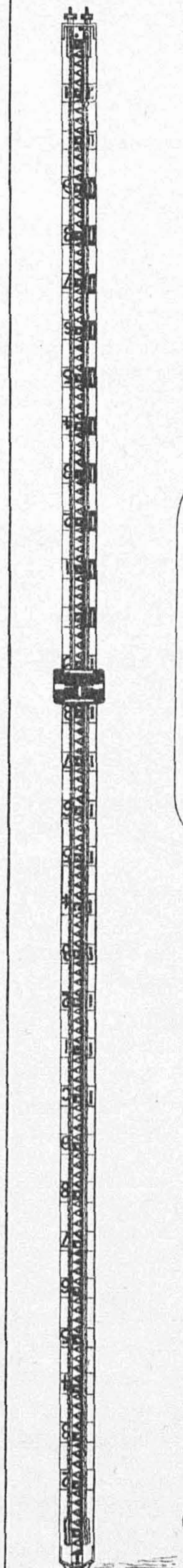

Fig. 1.

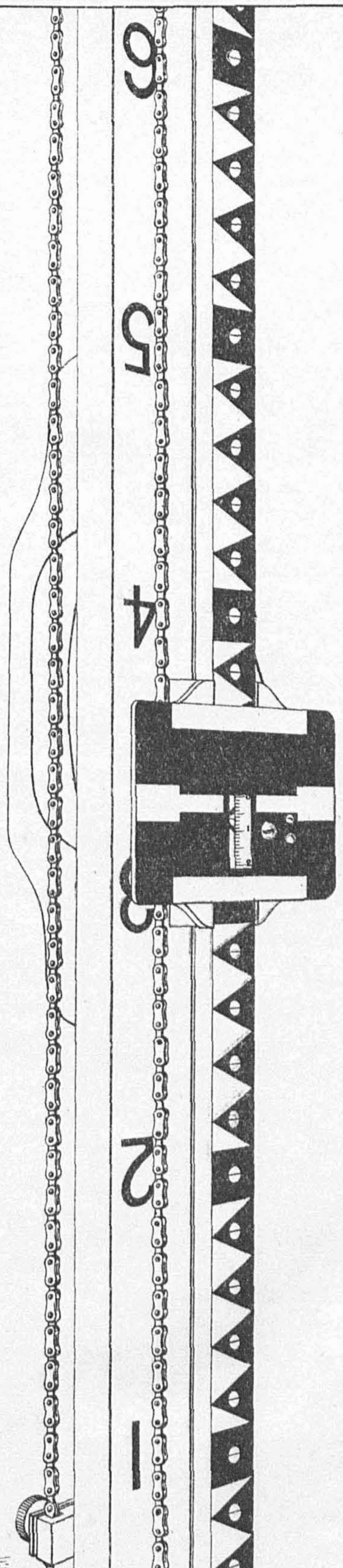

Fig. 2.

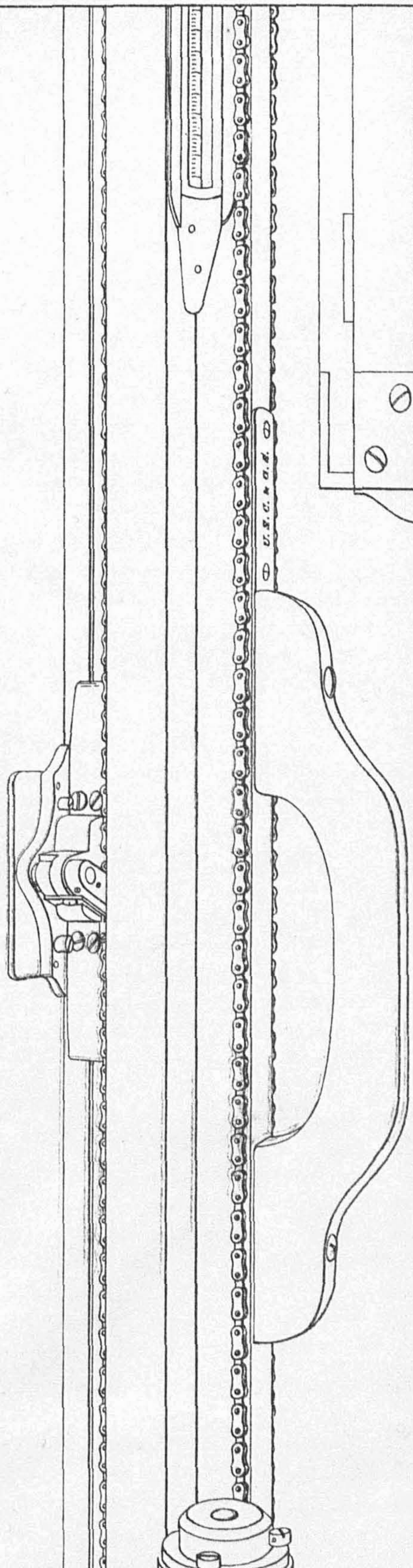

Fig. 3.

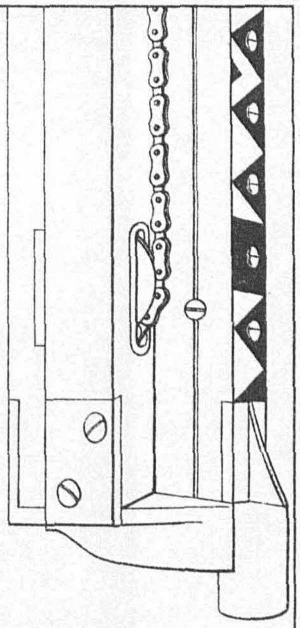

Fig. 4.

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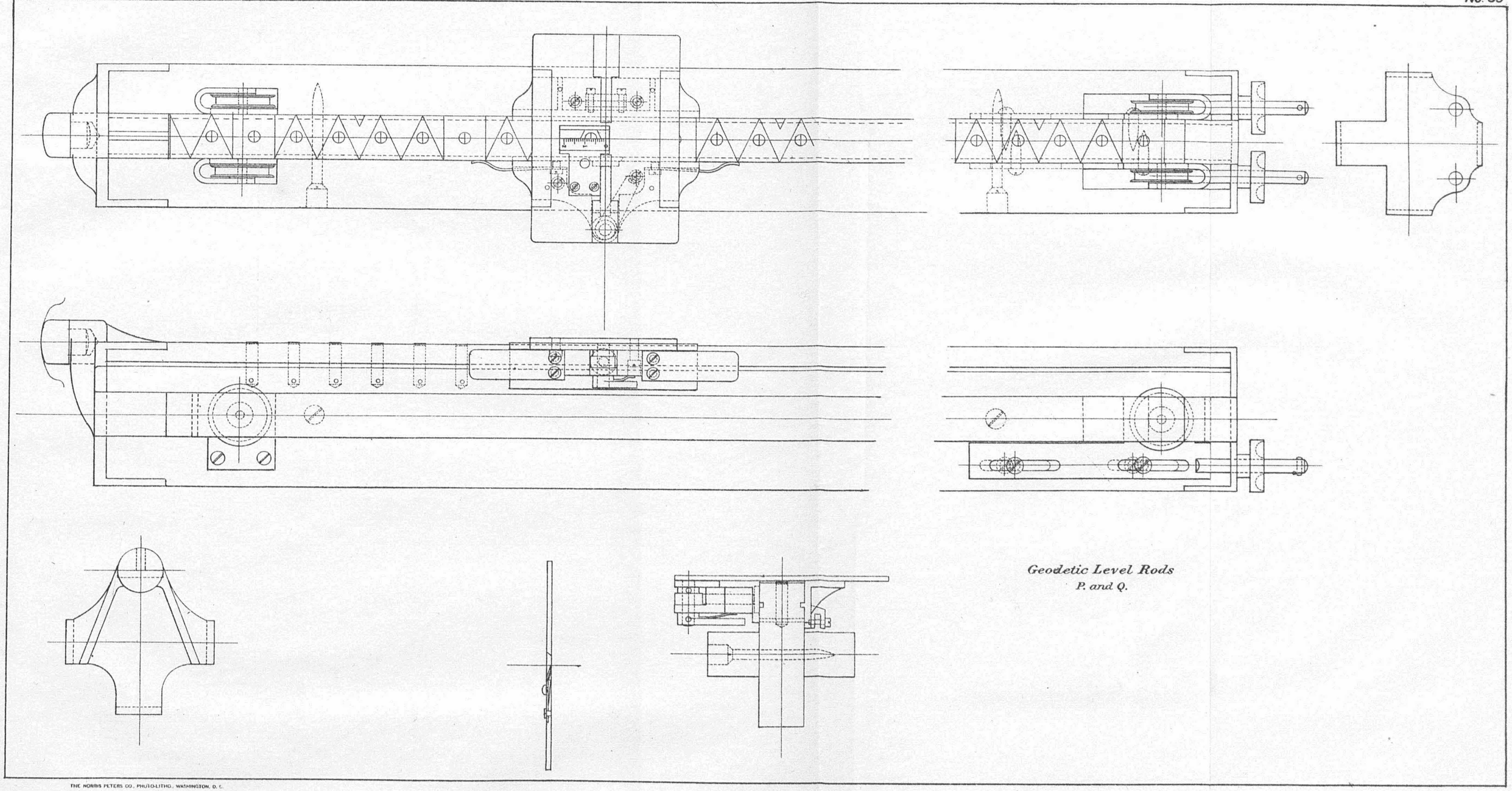

Geodetic Level Rods
P. and Q.

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APPENDIX No. 9—1895.

REPORT ON THE RUEPRECHT BALANCE BELONGING TO THE UNITED STATES OFFICE OF STANDARD WEIGHTS AND MEASURES.

Prepared by JOHN F. HAYFORD, Assistant, C. & G. S.

In September, 1890, the United States Office of Weights and Measures ordered a balance of precision from Alb. Rueprecht, of Vienna, balance manufacturer. It was stipulated in the order that the balance should be similar to one which had been made by the same maker for the International Bureau of Weights and Measures at Paris, and had been used for the intercomparison of the new national and international kilogrammes.

The balance forwarded upon this order was received in May, 1892. On its receipt it was inspected and put together, but because of the lack of a suitable place for mounting, it was not tested by actual use until January, 1895. This appendix exhibits the results of the tests then made.

The peculiar value of this balance as an instrument of precision arises partly from the high grade of workmanship upon it, but still more largely from two special auxiliary devices which enable the observer not only to note the motions of the beam from a distance, but also to interchange the weights upon the scale pans without approaching the balance. With a balance of precision of the ordinary type (at which the observer necessarily remains near the balance during the progress of the weighing), properly mounted in a room in which there are but slow changes of temperature, one of the principal sources of error is the nonuniformity of temperature in different parts of the balance case and balance resulting from the near presence of the observer. Hence the value of the auxiliary devices, which, by removing the observer to a distance, bring about a more uniform and constant temperature within the balance case, resulting in turn in a considerable increase of a precision which is already great by reason of the excellence of the balance proper.

The following description of the balance is, in the main, a free translation of the description of a similar balance, given in "Travaux et Mémoires du Bureau International des Poids et Mesures, Tome I, pp. D. 53–D. 58," and the accompanying plates are reproduced from that volume.

Pl. 40 is a perspective view of the balance after removing the protecting glass case. Pl. 41 is an elevation and plan of that part of the mechanism which is below the scale pans. Corresponding parts are lettered alike in these figures.

The beam is of brass, with steel knife edges. The distance from the middle knife edge to either end knife edge is about 180mm. The planes against which the principal knife edges act are of agate.

The arrestment apparatus, serving to separate the principal knife edges from their opposing planes for safety while the loads upon the pans are being changed, is actuated by the rod *a*, which slides within the central column. The lower end of the rod *a* rests upon one arm of the bell crank *Z*, which is moved by the screw *b*, controlled in turn by the shaft *c*,* which projects outside the balance case. The device at *e* serves as a stop to limit the travel of the screw *b*.

* The shafts shown at d_1, d_2, d_3, d_4 are not, in the balance belonging to the United States, extended through the balance case as indicated in the drawings.

The metal block (not clearly shown in the figures) which carries the agate plane, against which acts the end knife edge of the beam, also carries another agate plane which acts against another knife edge at right angles to the one just mentioned. These two knife edges and the block between them, which is restrained by proper guides, serve as a universal joint. From the knife edge which is parallel to the beam, a rod, jointed by knife edge and plane in two places to form a second universal joint, carries the weight of the scale pan. This pair of universal joints insures with considerable accuracy that the relative position of the beam knife edge and its opposing plane shall always be the same, and that the distribution of pressure along the beam knife edge shall always remain constant.

A special device insures that after the arrestment of the balance, and during transposition of weights, the scale pans shall always be held in exactly the same position. Two rods, f_1 and f_2, carry at their upper extremities a part of a circular ring h, on which are fixed three foot plates of tempered steel, g_1, g_2, and g_3, the upper surface of one of which is convex, of the second is a conical depression, and of the third is a V-shaped groove. Each scale pan carries on its lower side two points and a plane, which rests upon the foot plates when the ring is raised to its highest position. This movement of the ring h is made simultaneously on the right and left by the action of the screws k k, of which the nut is in each case the cross-piece l joining the rods f. These screws are controlled by the shafts and gears m_1, m_2, m_3, m_4, ending on the outside of the case at the shaft c_2. The mechanism shown at n stops the motion when the ring h has reached the proper height and has raised the scale pans slightly.

The beam carries at each end a pointer, which is read against a divided scale. This method of reading the balance is used only in adjusting, or during approximate weighings. For the final weighings the readings are taken from a distance by another method. The beam carries a small horizontal mirror o and a total reflection prism p is fixed to the stationary central column just above o. In front of the balance, about 3·9 metres distant, upon a solid support, is a telescope and horizontal scale (2mm. per division). This telescope being properly adjusted and pointed upon the prism, an image of the horizontal scale is seen, and its displacement indicates the motion of the beam, just as in an ordinary form of galvanometer the displacement of the scale indicates the motion of the needle. To detect changes in the relative position of the prism and the telescope, there is placed just above the prism a small fixed mirror q which gives a second image of the graduated scale, which is stationary as seen in the telescope, so long as the adjustments remain undisturbed.

The transposition apparatus operates as follows: Each scale pan is cut out as shown in the figures to allow certain motions of the cross s, which is carried by the rod t, which in turn is held by a horizontal arm fixed to the shaft v. Shaft v both turns and slides in the boxes w_1 and w_2. Suppose at a given movement that the beam is arrested, the scale pan, with a weight upon it, is supported by the footplates, and the cross s is beneath the pan r. When the mechanism is actuated the rod t rises vertically at first, sliding through the hole u_1, and the cross s rises through the scale pan and lifts the weight from the pan. When the lower end of the rod t escapes from the hole u_1 the whole system turns about the axis v until the lower end of the rod t strikes the stop block y_2. The rod t then descends through the hole u_2, lowering the cross s through the platform x, upon which the weight is left standing.

These three movements of the crosses s are produced simultaneously on both right and left sides of the balance by a single movement of the shaft c_3, which projects outside the balance case. The shaft c_3, through the series of shafts and gears z_1, z_2, z_3, drives the shaft A, which carries the screw threads BB, which engage the wheels CC. Upon the same axis as the wheels CC are the cams DD. The axis v carries a fixed ring E and a loose disk F. Whatever the position of the axis v with the cross s, it always presses by its own weihgt and that of the load being transported upon the disk F, which in turn presses near its edge upon the cam D. As shown in the figures, the cam is cut in two curves, one concentric and the other eccentric with respect to the axis. Suppose the cross s to be underneath the pan and in its lowest position. If the cam is now turned by turning the shaft c_3, the disk F is forced up, carrying with it the cross s, which can not turn about the axis v because the rod t is still in the hole u_1. When t escapes from the hole u_1 the disk F and with it the ring E are carried along by the friction of F upon D and E upon F and the cross s turns around the axis v until the rod t strikes the stop y_2. During this part of the motion the cross neither rises nor falls, because it is then the concentric part of the cam which is in action. Finally, the motion of the shaft c_3 being continued in the same direction, the disk F, and with it E and the cross s, descends until s is at the lowest point it can occupy beneath the platform x. The mechanism indicated at G serves to limit the motion of this part of the transportation apparatus in this direction—and in the other also. It is plain that the motion of the cross on the left side of the balance is the same as that on the right, and that the reverse motion can be produced by turning the shaft c_3 in the opposite direction.

By the manipulation just described in detail the weights are transported from the scale pan to the platforms x. By turning the shaft c_4, which actuates the shafts and gears H_1, H_2, H_3, H_4, the platforms x are turned 180° about the central column of the balance and so exchange places. The crosses s may then again be manipulated so as to transport the weights from the platforms x to the scale pans. The weights will have thus exchanged places in the pans.

All the operations for a weighing by Gauss's method may be made by turning the shafts c_1, c_2, c_3, c_4, which project outside the protecting glass case. Rods about 3·6 metres long were attached to these shafts and their distant ends supported in a convenient position within reach of the observer at the reading telescope, thus enabling him to remain at that distance during the whole progress of a weighing.

The forms of the scale pans, platforms, and crosses are such that weights of various sizes and shapes may be used, provided always that they have sufficiently large plane bases. In case two weights of the same nominal value do not quite balance, they may be equalized by placing small auxiliary known weights on the top of the lighter one—these small weights partaking of its motions during the manipulations and virtually being a part of it for the time.

The parts of the balance shown at K, L, M, and N are for the manipulation of small rider weights. Such weights were not used in the tests here reported.

The balance was, in January, 1895, mounted on a brick pier in a room in the southern part of the Butler Building, the building which serves in part as the library and archives of the Coast and Geodetic Survey. This room has but one outside wall and that (eastern) wall is almost entirely below ground. The three other sides of the room are partition walls. On the south and west the rooms next to the balance room have no artificial heat, and the same is true of the room above. The next room to the northward is, however, artificially heated. During the observations no artificial heat was used in the balance room, no light of day was admitted from the outside, and the necessary artificial light was furnished by incandescent electric lamps, and was consequently accompanied by but little heat. Under these circumstances the temperature conditions in the room were quite favorable to accuracy, as shown by the record. To make the temperature within the balance case still more uniform and constant, it was covered with a complete sheathing of two thicknesses of heavy opaque manila wrapping paper, through which a small hole was cut in the line of sight of the reading telescope.

During the weighings the barometic pressure was determined by a mercurial barometer hanging near the reading telescope, the relative humidity was observed by a hair hygrometer kept within the balance case, and the temperature of the air within the balance case was determined by two large Tonnelot thermometers graduated to tenths of Centigrade degrees and read to hundredths.

The four kilogramme weights intercompared in January and February, 1895, may be designated by the symbols K_4, K_a, K_g, and K_m.

K_4 is one of the two national prototype kilogrammes belonging to the United States. Its composition is 90 per cent platinum and 10 per cent iridium. Its shape is that of a cylinder, with height equal to diameter and with slightly rounded edges. It serves as a standard from which the values of the other three are to be derived.

K_a is a platinum weight, usually known as the Arago kilogramme. It is similar in shape to K_4. It was originally standardized by Arago by comparison with the kilogramme of the archives; was acquired by this country in 1821; was redetermined at the British Standards Office in London in 1879-80, and at the International Bureau of Weights and Measures in Paris in 1884.

K_g is a brass weight electroplated with gold. It is one of a set of such weights from 1 000 gm. to 1gm., which are used as working standards in this office. Its form is that of a cylinder with sharp edges, with a slight hollow in its bottom, and having a knob handle at the top. The handle is continuous with the weight.

K_m is a gilded weight, said to be of brass, and to have been made by the Geneva Society. It now belongs to the Case School of Applied Science at Cleveland, Ohio. The main body of the weight is nearly cylindrical, being slightly smaller at the bottom than at the top. The edges are rounded and the bottom is slightly hollowed out. The top carries a knob handle.

The densities and volumes of these weights are roughly as follows at 0° C.:

Designation.	Density.	Volume in cubic centimetres.
K_4	21·54	46·4
K_a	20·90	47·9
K_g	8·40	119·1
K_m	8·35	119·8

When either of the denser weights was weighed against one of the two brass weights the reduction to vacuo was so great, about 90 mg., that it was difficult to observe the density of the air with sufficient accuracy to enable this reduction to be made with as much accuracy as the balance indicated the relation of the weights in air. This matter will be treated in detail later.

The following weighings were made to obtain the relative masses of the four weights:

K_4	was	weighed	against	K_a	4	times.
K_4	"	"	"	K_g	4	"
K_4	"	"	"	K_m	4	"
K_a	"	"	"	K_g	4	"
K_g	"	"	"	K_m	11	"
K_a	"	"	"	K_m	4	"

Two weights having been previously placed upon the pans, and such auxiliary weights as were necessary to make them nearly balance in air having been placed upon them, the balance was made to oscillate and three readings of the scale were taken; two of the right-hand limit of the oscillation and one of the left-hand limit. The weights were then transposed upon the pans, the weight upon the right pan being moved to the left pan, and vice versa, and three more readings were taken. This process of transposing after each swing was continued until four swings, and therefore twelve readings of the scale, had been secured. The barometer, hygrometer, and thermometers were then read as quickly as possible, and the whole constituted a "weighing," as that term is here used. Each weighing required from twenty to forty minutes. Before proceeding to the next weighing the small auxiliary weights were changed for others.

Each weighing gave rise to an equation such as the following:

$$K_4 - K_a - 2{\cdot}04n + 0{\cdot}086 \text{ mg.} = 0$$

in which the symbols K_4 and K_a indicate the masses of the weights in question, n is the value of one scale division expressed as a mass; the coefficient of n is derived from the scale readings in the usual manner, and the absolute term is the algebraic sum of the masses of the small auxiliary weights and of the reduction to vacuo. The reduction to vacuo consists of the difference of volume of the weights on the two pans multiplied by the weight per unit volume of the surrounding air. The density of the air was computed from the readings of barometer, thermometers, and hygrometer, by means of the tables given in Travaux et Mémoires du Bureau International des Poids et Mésures, Tome I, pp. A. 51–A. 57.

From the four or more such observation equations involving any particular pair of weights, the most probable values for the two unknowns, n and the difference of mass of the two kilogrammes, were determined by a least square adjustment. It was thus assumed that n, the scale value, remained constant only for the few hours during which any one series of weighings was being made. Moreover, the small auxiliary weights were chosen in such a way that n had in the different equations both plus and minus coefficients, of which the sum was so nearly zero that the derived difference of mass of the two weights was nearly independent of n and was derived with sensibly the same accuracy as if n were an absolutely known quantity.

From these adjustments, aside from the various values of n, there was obtained:

$$\begin{aligned}
& \qquad\quad \text{Mg.} \qquad \text{Mg.} \\
K_a - K_4 &= -4{\cdot}6206 \pm 0{\cdot}0104 \\
K_g - K_4 &= +0{\cdot}5741 \pm 0{\cdot}0070 \\
K_m - K_4 &= +3{\cdot}4267 \pm 0{\cdot}0062 \\
K_g - K_a &= +5{\cdot}2133 \pm 0{\cdot}0050 \\
K_m - K_g &= +2{\cdot}7995 \pm 0{\cdot}0156 \\
K_m - K_a &= +8{\cdot}0324 \pm 0{\cdot}0194
\end{aligned}$$

The mean of these probable errors is $\pm$ 0·0106mg.

During the above adjustments the largest residual developed was 0.105mg. or about one ten-millionth of the mass on either scale pan.

For convenience in computation let it be assumed that:

$$\begin{aligned}
& \qquad\quad \text{Mg.} \\
K_a - K_4 &= -4{\cdot}6200 + X_1 \\
K_g - K_4 &= +0{\cdot}5600 + X_2 \\
K_m - K_4 &= +3{\cdot}3900 + X_3
\end{aligned}$$

The equations for the general adjustment are then, preserving the same order, as above:

$$\begin{array}{rrrrl}
 & & & \text{Mg.} & \\
+X_1 & & & +0{\cdot}0006 & = 0 \\
 & +X_2 & & -0{\cdot}0141 & = 0 \\
 & & +X_3 & -0{\cdot}0367 & = 0 \\
+X_1 & -X_2 & & +0{\cdot}3333 & = 0 \\
 & +X_2 & -X_3 & -0{\cdot}0305 & = 0 \\
+X_1 & & -X_3 & +0{\cdot}0224 & = 0
\end{array}$$

The normal equations being formed and solved in the usual way, the residuals from these equations become:

$$\begin{array}{r}
\text{Mg.} \\
-0{\cdot}0009 \\
+0{\cdot}0179 \\
-0{\cdot}0170 \\
-0{\cdot}0002 \\
-0{\cdot}0182 \\
+0{\cdot}0012
\end{array}$$

the largest of which is about 1–55 000 000 of the mass on either scale pan. The probable error of each equation, computed from these residuals, is $\pm$ 0·0118mg., in substantial agreement with the value + 0.0106mg. derived above.

There is also obtained:

$$\begin{aligned}
& \qquad\quad \text{Mg.} \\
X_1 &= -0{\cdot}0015 \pm 0.0084 \\
X_2 &= +0{\cdot}0320 \pm 0{\cdot}0084 \\
X_3 &= +0{\cdot}0197 \pm 0.0084
\end{aligned}$$

If each observation equation be given a relative weight, proportional to reciprocal of the square of the computed probable error of its absolute term, as shown above, the relative weights vary from 1 to 15·2; the residuals and computed probable errors are about the same as before, and

$$\begin{aligned}
& \qquad\quad \text{Mg.} \\
X_1 &= -0{\cdot}0061 \\
X_2 &= +0{\cdot}0251 \\
X_3 &= +0{\cdot}0300
\end{aligned}$$

The assignment of equal weight to the observation equations corresponds to the assumption that when four weighings are made between a given pair of masses there is some error common to all four weighings (and therefore not indicated by any disagreement of the four results) which is large as compared with the computed probable error of the result from the four weighings. On the other hand, the assignment of relative weights proportional to the reciprocals of the squares of the probable errors assumes that there is no constant error whatever which is common to the four weighings of the series. Experience with balances here and elsewhere indicates that the fact lies somewhere between these two assumptions, and hence the mean of the two derived values for each of the quantities X_1, X_2, X_3, will be adopted as the most probable value.

Hence there is obtained as final values:

$$
\begin{aligned}
& \qquad\quad \text{Mg.} \qquad\quad \text{Mg.} \\
X_1 &= -0{\cdot}0038 \pm 0{\cdot}0084 \\
X_2 &= +0{\cdot}0285 \pm 0{\cdot}0084 \\
X_3 &= +0{\cdot}0248 \pm 0{\cdot}0084
\end{aligned}
$$

The mass of K_4, as determined at the International Bureau of Weights and Measures, is 1kg — 0·0050mg ± 0·0020mg.

Combining this with the above values there is obtained:

$$
\begin{aligned}
& \quad \text{Kg.} \quad \text{Mg.} \qquad\quad \text{Mg.} \\
K_a &= 1 - 4{\cdot}6988 \pm 0{\cdot}0086 \\
K_g &= 1 + 0{\cdot}5135 \pm 0{\cdot}0086 \\
K_m &= 1 + 3{\cdot}3398 \pm 0{\cdot}0086
\end{aligned}
$$

This probable error of ± 0·0086mg., as developed from the observations, is less than one part in one hundred million.

It was found in adjusting the six series of weighings, giving them equal weight, that the probable error of the result from each series was ± 0·0118mg., as derived from this general adjustment. If there were just four weighings in each series, this would make the probable error of a single weighing 2 (±0·0118mg.) = ± 0·0236mg., remembering that the coefficients of n very nearly balance in every case. If the circumstance be considered that one of the six series, the first in order of time, contained eleven weighings instead of four, this value will be but slightly increased. In the following discussion then the probable error of a single weighing will be considered ± 0·0236mg.

It is pertinent to attempt to locate some of the separate sources of error of which the combined effect is to produce this resultant error. It is especially pertinent first to estimate the errors which arise from causes external to the balance proper.

In the first place it should be noted that in four of the six series of observations the difference of volume of the two weights placed upon the pans was over 70 cubic centimetres, and the consequent reduction to vacuo about 90 milligrammes. This leads to an inquiry as to the magnitude of the errors arising from defective measurements of barometric pressure, of air temperature, and of relative humidity.

From comparisons of barometers, made in connection with these observations, it would appear that the probable error of a single reading of the barometer is about ± 0·04mm. In view of the fact that the barometer was read at the end of each weighing, and that the required pressure for the middle of each weighing had to be determined by interpolating back over an interval of about eleven minutes, the probable error of a single determination of the mean pressure during a weighing should be increased to about ± 0·071mm.

This is perhaps a fair estimate of the accidental errors. It is quite difficult, however, to estimate the constant error which may exist, arising from an erroneous value for the constant instrumental correction to the barometer. This can not, however, be satisfactorily estimated without recourse to a normal barometer, and such an instrument is not now available.

The barometer upon which depends the reductions to vacuo in these weighings was compared during the progress of the observations with one of the large standard barometers at the United States Weather Bureau Office in Washington. The assigned correction to the Weather Bureau standard depends in turn mainly upon the continued substantial agreement of several such standards, which were transported from Kew several years ago, and upon the correctness of the Kew standards.

The two Tonnelot thermometers which served to determine the temperature of the air within the balance case were hung in a horizontal position at about the same height as the weights, and one was placed with the bulb near the north end of the case, and the other with its bulb near the south end. The zeros of these thermometers were redetermined at the close of the observations. The northern bulb always registered a higher temperature than the southern bulb. The northern wall of the room was the only one on the opposite side of which there was artificial heat, but there were no openings whatever through it.

The differences between the temperatures indicated by the two thermometers, varied from 0°·04 to 0°·15 C., but always preserved the same sign, the mean difference being 0°·09 C. Judging from these differences the accidental errors in temperature may be estimated at ±0°·03 C. This causes an error in the reduction to vacuo, in the case of a brass weight against a platinum weight, of about ±0·0096 mg.

The mean difference of 0°·09 between the two thermometers suggests that there is possibly a constant difference of a few hundredths between the temperature indicated by the mean of the two thermometers and the actual temperature of the air around the weights. When it is considered, however, that the thermometer bulbs were much nearer the weights than to each other, that the weights were moved about frequently from pan to pan, and so tended to acquire a mean temperature, and that the changes of temperature in the balance case were very slow (an extreme range of only 5°·03 in twenty-eight days, and of only 0°·54 during the working hours of any one day), it seems safe to assign 0°·09 as the maximum limit of constant error in the assigned temperature of the air around the weights. This corresponds to a constant error of about 0·0288 mg. in the weighings.

The hair hygrometer was standardized at the beginning and end of the observations by direct comparison with a wet and dry bulb thermometer of the form which is used by whirling to secure good ventilation around the bulbs. From the residuals observed in standardizing the hair hygrometer, and from the observed change in its constants, it is estimated that the assigned values for the relative humidity are in error by ±2 per cent. This corresponds to an error of ±0·0084 mg. in each weighing.

Usually about 90 mg. in small weights had to be used to make the two kilogrammes balance in air. These small weights were changed at every weighing so as to avoid introducing their errors as constant errors. From the recorded values of the probable errors of these small weights it would seem that the probable error introduced into each weighing by the uncertainty in the values assigned to them is about ±0·0040 mg.

The following probable errors have thus been assigned to causes external to the balance proper, in the case of a brass against a platinum kilogramme:

	Mg.
Arising from errors in the barometric pressure	±0·0071
" " " " " temperature	±0·0096
" " " " " relative humidity	±0·0084
" " " " small auxiliary weights	±0·0040

Combining, there is obtained from the probable error in a single weighing arising from these four causes, ±0·0151 mg.

This leaves for the probable error in a single weighing arising from the balance proper, $(0{\cdot}0236)^2-(0{\cdot}0151)^2=\pm 0{\cdot}0181$ mg.

The error of the mere reading of the scale can produce hardly any appreciable portion of this error since each weighing depends upon twelve readings of the scale; the error in any one reading probably does not exceed 0·2 division, and a whole division corresponds to only 0·04 to 0·05 mg. But there are two sources of error which certainly exist which seem sufficient to account for the above error, to wit, changes of the relative temperature of the two arms of the balance, and changes in the sensibility of the balance.

The method of using the balance during the weighings here treated does not assume that the arms are of equal length, but it does assume that the difference of their lengths is a constant for the interval over which the weighing extends. So, if one arm be constantly warmer than the other by a given amount, no error is thereby introduced into the result. But suppose that between the time when the swing is made with the weights in the position A–right, B–left, and the time when the swing is made in the position B–right, A–left, the right arm increases in temperature relatively to the left arm by 0°·001 C. The right arm (brass) will be longer relatively to the left arm by 1–50 000 000 than it was, and the indication of the balance will differ by 1–50 000 000 of 1 kg.= 0·0200 mg. from what it should indicate according to the assumption used in the computation. Half this error, or 0·0100 mg., will affect the mean result from the two swings. So, when a series of four swings are made, as in the observations with which we are here concerned, there will be 0·0100 mg. error in the result for every 0°·001 C., by which the mean* difference of temperature of the two arms for position A–right B–left differs from the corresponding mean* difference for position B–right A–left. When it is noted that the air in the balance case during the weighings was usually changing in temperature at the rate of about 0°·002 C. per minute, and that a complete weighing of four swings required not less than fifteen minutes, it seems as if this cause might account for most of the errors shown to be due to the balance proper.

The observed variations in the zero point of the balance will serve as a criterion for judging of this class of errors. By the zero point is meant that point of the scale which is midway between two observed equilibrium points corresponding to the positions of the weights A–right B–left and B–right A–left. If certain of the earlier observations, during which the balance was continually being readjusted, be omitted, the extreme range in the position of the zero point is from 95·38 to 106·53 on the scale. This range of 11·15 divisions corresponds to about 0·5000 mg., or to a change of 0°·025 C. in the relative temperature of the two arms of the balance. That is to say, the relative temperature of the two arms, as indicated in this way, varied only within a range of 0°·025 C. during weighings extending over the period February 1 to 18.

Let the effect of changes of sensibility be now considered. It is assumed in the computation that the sensibility remains constant during the progress of the four complete weighings between any particular pair of weights—usually a period of about three hours, but sometimes extending over the interval from one afternoon to the next forenoon.

The scale value of the balance is proportional to the distance, which will be called d, from the middle knife-edge down to the center of gravity of the combined beam and its load, considering the weight of the pans and the loads upon them to be concentrated at the outer knife-edges. To fully appreciate the meaning of the assumption that the sensibility remains constant even for a few hours, one must take into consideration the smallness of the distance d. It may be computed in two ways from observation. The length of each arm of the beam is 180 mm., and its period of oscillation with a kilogramme on each pan is about 52 seconds. The beam acts as a pendulum. Its oscillation is evidently just as it would be if the total mass of the pans and their loads was concentrated at the end knife-edges. For not only are all the forces due to gravity and inertia in these parts transmitted unchanged to the knife-edges, but the motion (for the small amplitudes here used) of each and every part of the pan and load being the same as that of the knife-edge, the moments of inertia in question are the same as if the masses were actually at the knife-edges. Compare this actual pendulum with a hypothetical simple pendulum consisting of a mass equal to that of the two kilogramme weights plus the two pans and their suspensions concentrated at a distance of 180 mm. below its point of suspension. The period of such a pendulum by the ordinary formula for a simple pendulum would be $0^s.43$. The time of oscillation for either pendulum is $t=\pi\sqrt{\frac{I}{Mgl}}$ in which I is the moment of inertia about the point of suspension, M is the mass, g is the force of gravity, and l is the distance from the point of suspension to the center of gravity. If the mass and moment of inertia of the beam itself in the actual case be neglected (which is allowable for the rough result here desired, the beam being a small mass as compared with the

*This is necessarily a weighted mean corresponding to the method of computation, which is here such that the first and fourth swings are given half weight.

pans and their loads), I and M become identical in the two cases. Whence it would follow that $\frac{l}{l_1}=\frac{(t')^2}{(t\ )^2}=\frac{d}{180^{mm}}=\frac{(0^s\cdot 43)^2}{(52^s)^2}$ and d proves to be but 12 microns.

Or, starting with the known value of one division of scale in milligrammes, d may be computed from the static relations. One division of scale is 2 mm. in length, and the light traverses a distance of about 7 800 mm. in passing from the scale to the telescope by way of the mirrors on the beam. One division, therefore, represents a motion of the beam of $\frac{2}{7\ 800}=\frac{1}{3\ 900}$ expressed in radians. The observed mean value for one division is 0·043 mg., with a kilogramme on each pan. When the balance is in equilibrium with 1 kg. on one pan and 1 kg.+0·043 mg. on the other pan, the opposing moments being equal, $\frac{d}{3\ 900}(2\text{ kg.})g=(180\text{ mm.})\ (0{\cdot}043\text{ mg.})\ g$, if the mass of the beam and pans be neglected. This makes $d=15$ microns. This may be regarded as a superior limit for d, for if the computation were made more exact by considering the mass of the beam and pans, the computed value of d would necessarily become smaller.

The mean of the two values computed above is 14 microns. This is certainly not too small, since the assumptions in both cases were such as to make the computed d too great. The sensibility being proportional to d, the value of one scale division will change 0·0031 mg. $(=\frac{0{\cdot}043}{14})$ if d changes by a single micron. d necessarily varies almost exactly as does the distance from the middle knife-edge to the line joining the end knife-edges. d, then, varies directly with the elastic flexure of the beam and with distortions of the beam caused by differences of temperature in its different parts. It also depends intimately upon the perfection of all three of the principal knife-edges and the planes upon which they rest. As the computation of each separate weighing involves the reduction of from 0 to 25 scale divisions to absolute value by multiplying by a mean scale value which may easily differ by as much as 0·003 mg. (corresponding to 1 micron change in d) from the real scale value for that moment, it seems evident that here lies a second source from which may arise errors as large as ±0·0181 mg.

The actually observed variations in the scale value corroborate the statements of the last paragraph. Without any change whatever being made in the adjustments, successive groups of four weighings each gave the following values:

					Mg.	
February	1,	one division	of	scale	=0·044	
"	2	"	"	"	=0·044	
"	4–5	"	"	"	=0·048	Mean=0·043 mg.
"	14	"	"	"	=0·039	
"	15	"	"	"	=0·045	
"	18	"	"	"	=0·040	

This range of 0·009 mg. corresponds to a change of three microns in d. As this range is developed between values derived from sets of four weighings each, it seems probable that there was a still larger actual range during the individual weighings.

The arms of the balance are not quite equal. As at present adjusted, the zero is near the middle of the scale for a load of one kilogramme on each pan. But with nominally no loads upon the pans it requires about 12 mg. on the left pan to bring the zero to the same point. From this it appears that the left arm is about 2 microns longer than the right arm.

On February 19 the balance was set to swinging in the forenoon with a kilogramme on each pan and allowed to swing until it came to rest to give an idea of the amount of friction at the knife-edges. It swung for more than four hours after starting, with an initial oscillation of only twenty-one minutes of arc on each side of its equilibrium position.

We may compare the results from this Rueprecht balance with results obtained from similar Rueprecht balances at the International Bureau of Weights and Measures as follows:

Here the probable error of a single weighing, as derived from the interadjustment of various groups of weighings, is ±0·0236 mg., and each weighing consisted of but twelve readings of the scale, and the weights were in four positions. Moreover, most of these weighings were made between brass and platinum, with a reduction to vacuo of about 90 mg.

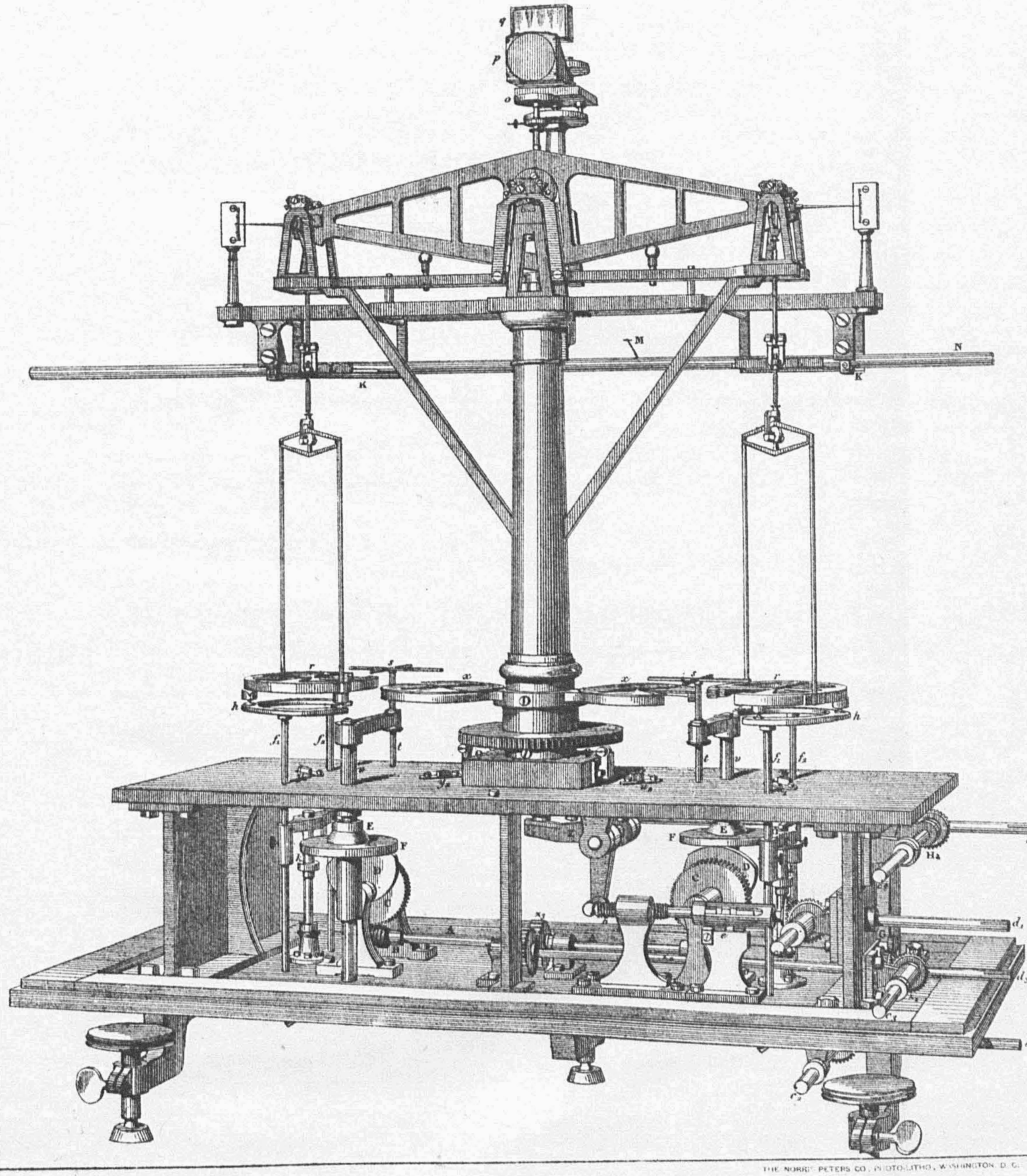
M. W.-J. Marek, p. D. 79, Tome I, Travaux et Mémoires du Bureau International des Poids et Mesures, derives for the probable error of a single weighing $\pm 0{\cdot}0081$ mg. But this is derived from the individual groups, not from the interadjustment; the weights were all of platinum, or of platinum-iridium, and each weighing consisted of thirty-five readings of the scale and seven positions of the weights.

The weighings of the International Bureau, which served to determine the various national prototype kilogrammes, gave for the probable error of a single weighing on the Rueprecht balances $\pm 0{\cdot}0067$ mg. (See p. 107, "Rapport sur la Construction, les Comparaisons et les autres Opérations ayant servi à Déterminer les Équations des Nouveaux Prototypes Métriques.") This value is derived from the interadjustment of groups. But all the weights concerned were nearly of the same volume, and a "single weighing" consisted of one hundred and twenty-eight readings of the scale, and thirty-two positions of the weights, requiring at least four hours of work (not including waits) as contrasted with from twenty to forty minutes per weighing in the work just finished here.

In conclusion, it should be noted, in regard to the work here, that the errors arising from the balance proper are purely accidental in their nature and may easily be reduced to within 0·01 mg. per kilogramme; that, on the other hand, previous experience has shown that it is very difficult indeed to so effectually preserve a kilogramme weight against surface changes (abrasion, collection of dust, deposits of moisture or gases) that its mass shall remain constant within 0·01 mg.; that when a brass kilogramme is weighed against a platinum it requires the greatest care in obtaining the air temperature to insure that a constant error of as much as 0·01 mg. may not arise from this source; and finally, that in determining a brass kilogramme by weighing against a platinum standard the weakest step of all at present is the determination of the absolute barometric pressure.

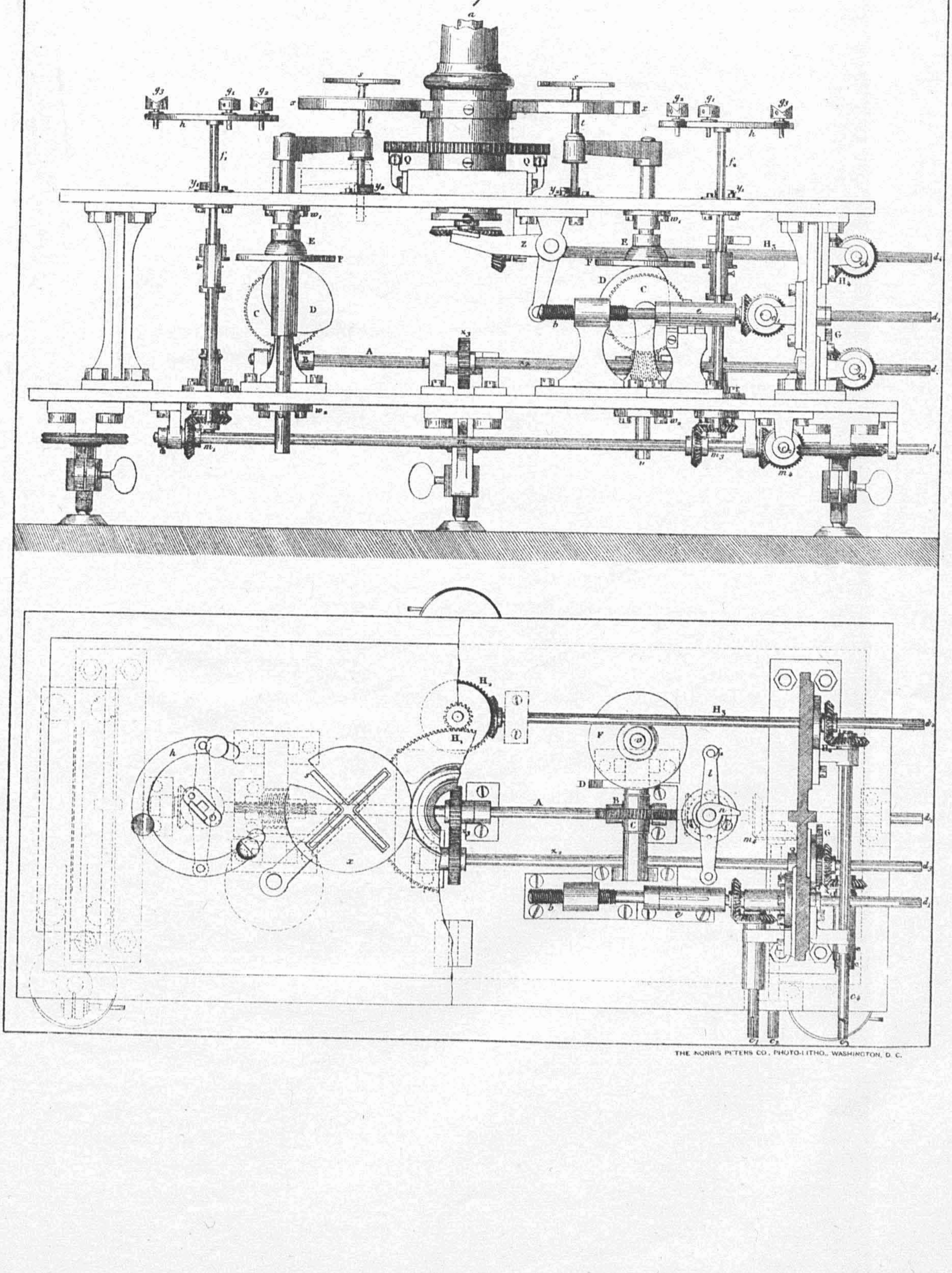
The Rueprecht balance not only performs its functions so accurately as to require the greatest care in the determination of the temperature and pressure of air to insure that errors from this source shall not be greater than those from the balance proper, but, moreover, the combined errors of the balance and its auxiliary instruments are within limits narrower than those within which the surface changes of mass of the weights themselves can be certainly limited.

Balance Ruprecht No. 1



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

Balance Ruprecht No. 1



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APPENDIX No. 10—1895.

TABLES OF AZIMUTH AND APPARENT ALTITUDE OF POLARIS AT DIFFERENT HOUR ANGLES.

By G. R. PUTNAM, Assistant.

The accompanying tables* are intended for field use to facilitate placing an instrument in the meridian. They are also suitable for determining the approximate latitude or meridian. They contain the azimuth of Polaris at intervals of fifteen minutes in hour angle for each degree of north latitude from 30° to 60°, and the apparent altitude at the same intervals and for each fifth degree of latitude.† The tables are computed for the declination of Polaris 88° 46′, but the rate of change in both azimuth and altitude is given with the argument 1′ increase in declination.‡ The tables are intended to be used in connection with the American Ephemeris, where are given the apparent right ascension and declination of Polaris for each day in the year. The approximate local time will in general be known with sufficient accuracy from standard time and the approximate

* Similar tables, but without the corrections for change in declination, were published as Appendix XXII, Report U. S. Coast Survey for 1870. These were computed by Assistant George Davidson for north polar distance 1° 22′.

† The tables were computed with the following formulas:

$$\tan a = \frac{\sin t}{\cos \varphi \tan \delta - \sin \varphi \cos t}$$

$$\sin h = \sin \varphi \sin \delta + \cos \varphi \cos \delta \cos t$$

$$\sin a_0 = \frac{\cos \delta}{\cos \varphi}$$

$$\cos t_0 = \cot \delta \tan \varphi$$

where a = azimuth from true north
t = hour angle
φ = latitude
δ = declination
h = true altitude
a_0 = azimuth at elongation
t_0 = hour angle at elongation.

‡ As the corrections are given with proper sign for increase in declination over 88° 46′, they are to be applied with reversed sign while the declination is less than 88° 46′, as it will be until near the close of the century.

longitude of the place. The following example explains the use of the tables, and the derivation of the hour angle of Polaris:

Position, latitude 36° 20′ N., longitude $5^h\ 20^m\ 30^s$ W. of Greenwich.

	h.	m.	s.	
Time of observation, July 10, 1895, standard (75th mer.) mean time	8	52	40	p. m.
Reduction to local time	—	20	30	
Local mean time	8	32	10	
Reduction to sidereal time (Table III, Amer. Ephem.)	+	1	24	
Sidereal time mean noon, Greenwich, July 10, 1895	7	12	38	
Correction for longitude, $5^h\ 20^m\ 30^s$ (Table III, Amer. Ephem.)	+	0	53	
Local sidereal time	15	47	05	
Apparent right ascension of Polaris, July 10, 1895	1	20	18	
Hour angle before upper culmination	9	33	13	

	°	′	″		°	′
Declination of table	88	46				
Apparent declination, July 10, 1895	88	44	47			
Increase in declination		— 1	13 = —1′·2			
Values from tables (interpolated) azimuth	0	54	12,	apparent altitude	35	21·8
Correction for —1′·2 increase in declination			+52			—1·0
	0	55	04		35	20·8
	East of north.					

It is to be remembered that Polaris is east of the meridian for twelve hours before upper culmination, and west of the meridian for twelve hours after. By setting the instrument at the apparent altitude and sweeping near the meridian Polaris can ordinarily be found and the instrument placed in the meridian some time before dark. With transit instruments not provided with horizontal arc, the value of the azimuth adjusting screw may be readily determined and used.

Without the American Ephemeris these tables may be conveniently used for obtaining the approximate meridian or latitude, in connection with Bulletin 14, United States Coast and Geodetic Survey,* where are given the approximate mean times of culminations of Polaris, and the mean declinations for various epochs.

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* "APPROXIMATE TIMES OF CULMINATIONS AND ELONGATIONS AND OF THE AZIMUTHS AT ELONGATION OF POLARIS FOR THE YEARS BETWEEN 1889 AND 1910."

[Prepared for publication by Chas. A. Schott, Assistant.]

The mean places of Polaris are given as follows:

	α			δ		
	h.	m.	s.	°	′	″
1895	1	20	30.08	88	44	52·68
1900	1	22	33·76	88	46	26·66
1905	1	24	42·48	88	48	00·31
1910	1	26	56·58	88	49	33·61

Hour angle before or after upper culmination.	Azimuth of Polaris computed for declination 88° 46′.											Correction for 1′ increase in declination of Polaris.		Hour angle before or after upper culmination.
	Latitude 30°.	Latitude 31°.	Latitude 32°.	Latitude 33°.	Latitude 34°.	Latitude 35°.	Latitude 36°.	Latitude 37°.	Latitude 38°.	Latitude 39°.	Latitude 40°.	Latitude 30°.	Latitude 40°.	
h. m.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	″	″	*h. m.*
0 15	0 05 40	0 05 43	0 05 47	0 05 51	0 05 55	0 06 00	0 06 05	0 06 10	0 06 15	0 06 20	0 06 26	− 5	− 5	0 15
0 30	0 11 18	0 11 25	0 11 33	0 11 41	0 11 49	0 11 58	0 12 08	0 12 18	0 12 28	0 12 39	0 12 50	− 9	−10	0 30
0 45	0 16 53	0 17 04	0 17 15	0 17 27	0 17 40	0 17 53	0 18 07	0 18 22	0 18 38	0 18 54	0 19 11	−14	−16	0 45
1 00	0 22 23	0 22 38	0 22 53	0 23 09	0 23 26	0 23 44	0 24 02	0 24 22	0 24 43	0 25 04	0 25 27	−18	−21	1 00
1 15	0 27 48	0 28 06	0 28 25	0 28 45	0 29 06	0 29 28	0 29 51	0 30 15	0 30 41	0 31 08	0 31 36	−23	−26	1 15
1 30	0 33 05	0 33 26	0 33 49	0 34 13	0 34 38	0 35 04	0 35 31	0 36 00	0 36 31	0 37 02	0 37 36	−27	−31	1 30
1 45	0 38 13	0 38 38	0 39 04	0 39 32	0 40 00	0 40 30	0 41 02	0 41 35	0 42 11	0 42 47	0 43 26	−31	−36	1 45
2 00	0 43 12	0 43 40	0 44 09	0 44 40	0 45 12	0 45 46	0 46 22	0 47 00	0 47 39	0 48 21	0 49 04	−35	−40	2 00
2 15	0 47 58	0 48 29	0 49 02	0 49 36	0 50 12	0 50 50	0 51 29	0 52 11	0 52 55	0 53 41	0 54 29	−39	−45	2 15
2 30	0 52 32	0 53 06	0 53 42	0 54 19	0 54 59	0 55 40	0 56 23	0 57 09	0 57 57	0 58 47	0 59 40	−43	−49	2 30
2 45	0 56 52	0 57 29	0 58 07	0 58 48	0 59 30	1 00 15	1 01 02	1 01 51	1 02 43	1 03 37	1 04 34	−46	−53	2 45
3 00	1 00 58	1 01 37	1 02 18	1 03 01	1 03 46	1 04 34	1 05 24	1 06 17	1 07 12	1 08 10	1 09 12	−50	−57	3 00
3 15	1 04 47	1 05 28	1 06 12	1 06 58	1 07 46	1 08 36	1 09 29	1 10 25	1 11 24	1 12 25	1 13 30	−53	−60	3 15
3 30	1 08 19	1 09 02	1 09 48	1 10 36	1 11 27	1 12 20	1 13 16	1 14 14	1 15 16	1 16 21	1 17 29	−56	−63	3 30
3 45	1 11 33	1 12 18	1 13 06	1 13 56	1 14 49	1 15 45	1 16 43	1 17 44	1 18 49	1 19 57	1 21 08	−58	−66	3 45
4 00	1 14 28	1 15 15	1 16 05	1 16 57	1 17 52	1 18 50	1 19 50	1 20 54	1 22 01	1 23 11	1 24 25	−61	−69	4 00
4 15	1 17 04	1 17 52	1 18 44	1 19 37	1 20 34	1 21 34	1 22 36	1 23 42	1 24 51	1 26 03	1 27 20	−63	−72	4 15
4 30	1 19 19	1 20 09	1 21 02	1 21 57	1 22 55	1 23 57	1 25 01	1 26 08	1 27 19	1 28 33	1 29 52	−64	−74	4 30
4 45	1 21 14	1 22 05	1 22 59	1 23 55	1 24 55	1 25 57	1 27 03	1 28 12	1 29 24	1 30 40	1 32 00	−66	−75	4 45
5 00	1 22 48	1 23 40	1 24 35	1 25 32	1 26 32	1 27 36	1 28 42	1 29 52	1 31 06	1 32 23	1 33 44	−68	−76	5 00
5 15	1 24 00	1 24 53	1 25 48	1 26 46	1 27 47	1 28 51	1 29 59	1 31 09	1 32 24	1 33 42	1 35 04	−69	−77	5 15
5 30	1 24 51	1 25 44	1 26 40	1 27 38	1 28 39	1 29 44	1 30 52	1 32 03	1 33 18	1 34 37	1 35 59	−69	−78	5 30
5 45	1 25 20	1 26 13	1 27 09	1 28 07	1 29 09	1 30 14	1 31 21	1 32 33	1 33 48	1 35 07	1 36 30	−70	−78	5 45
6 00	1 25 27	1 26 19	1 27 15	1 28 14	1 29 15	1 30 20	1 31 27	1 32 39	1 33 54	1 35 13	1 36 35	−70	−78	6 00
6 15	1 25 12	1 26 04	1 26 59	1 27 57	1 28 59	1 30 03	1 31 10	1 32 21	1 33 36	1 34 54	1 36 16	−69	−78	6 15
6 30	1 24 34	1 25 27	1 26 21	1 27 19	1 28 19	1 29 23	1 30 30	1 31 40	1 32 54	1 34 11	1 35 32	−68	−77	6 30
6 45	1 23 36	1 24 27	1 25 21	1 26 18	1 27 17	1 28 20	1 29 26	1 30 35	1 31 48	1 33 04	1 34 24	−67	−76	6 45
7 00	1 22 16	1 23 06	1 23 59	1 24 55	1 25 53	1 26 55	1 27 59	1 29 07	1 30 18	1 31 33	1 32 52	−66	−75	7 00
7 15	1 20 35	1 21 25	1 22 16	1 23 10	1 24 08	1 25 08	1 26 11	1 27 17	1 28 26	1 29 39	1 30 56	−65	−73	7 15
7 30	1 18 34	1 19 22	1 20 12	1 21 05	1 22 00	1 22 59	1 24 00	1 25 04	1 26 12	1 27 23	1 28 38	−64	−72	7 30
7 45	1 16 13	1 16 59	1 17 48	1 18 39	1 19 33	1 20 29	1 21 28	1 22 30	1 23 36	1 24 45	1 25 57	−62	−69	7 45
8 00	1 13 33	1 14 17	1 15 04	1 15 53	1 16 45	1 17 39	1 18 36	1 19 36	1 20 39	1 21 45	1 22 54	−60	−66	8 00
8 15	1 10 34	1 11 16	1 12 01	1 12 48	1 13 37	1 14 29	1 15 24	1 16 21	1 17 22	1 18 25	1 19 31	−57	−64	8 15
8 30	1 07 17	1 07 57	1 08 40	1 09 25	1 10 12	1 11 01	1 11 53	1 12 48	1 13 45	1 14 45	1 15 48	−54	−61	8 30
8 45	1 03 43	1 04 22	1 05 02	1 05 44	1 06 29	1 07 15	1 08 04	1 08 56	1 09 50	1 10 47	1 11 47	−51	−58	8 45
9 00	0 59 54	1 00 30	1 01 07	1 01 47	1 02 29	1 03 12	1 03 58	1 04 47	1 05 38	1 06 31	1 07 27	−48	−54	9 00
9 15	0 55 49	0 56 23	0 56 58	0 57 34	0 58 13	0 58 54	0 59 37	1 00 22	1 01 09	1 01 59	1 02 51	−45	−50	9 15
9 30	0 51 31	0 52 01	0 52 34	0 53 08	0 53 43	0 54 21	0 55 00	0 55 42	0 56 25	0 57 11	0 57 59	−42	−46	9 30
9 45	0 46 59	0 47 27	0 47 57	0 48 28	0 49 00	0 49 34	0 50 10	0 50 48	0 51 27	0 52 09	0 52 53	−38	−42	9 45
10 00	0 42 16	0 42 42	0 43 08	0 43 36	0 44 05	0 44 35	0 45 08	0 45 42	0 46 17	0 46 54	0 47 34	−34	−38	10 00
10 15	0 37 23	0 37 45	0 38 08	0 38 33	0 38 59	0 39 26	0 39 54	0 40 24	0 40 55	0 41 28	0 42 03	−30	−34	10 15
10 30	0 32 20	0 32 39	0 32 59	0 33 20	0 33 43	0 34 06	0 34 30	0 34 57	0 35 24	0 35 52	0 36 22	−26	−29	10 30
10 45	0 27 09	0 27 25	0 27 42	0 28 00	0 28 18	0 28 38	0 28 59	0 29 20	0 29 43	0 30 07	0 30 32	−22	−24	10 45
11 00	0 21 51	0 22 04	0 22 18	0 22 32	0 22 47	0 23 03	0 23 19	0 23 37	0 23 55	0 24 14	0 24 35	−18	−20	11 00
11 15	0 16 28	0 16 38	0 16 48	0 16 59	0 17 10	0 17 22	0 17 35	0 17 48	0 18 02	0 18 16	0 18 31	−13	−15	11 15
11 30	0 11 01	0 11 08	0 11 14	0 11 22	0 11 29	0 11 37	0 11 46	0 11 54	0 12 04	0 12 13	0 12 23	− 9	−10	11 30
11 45	0 05 31	0 05 34	0 05 38	0 05 42	0 05 45	0 05 49	0 05 53	0 05 58	0 06 02	0 06 07	0 06 12	− 4	− 5	11 45
Elongation: Azimuth....	1 25 27	1 26 20	1 27 16	1 28 14	1 29 16	1 30 20	1 31 28	1 32 40	1 33 55	1 35 14	1 36 36	−69	−78	
	h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*s.*	*s.*	
Hour angle.	5 57 09	5 57 02	5 56 55	5 56 48	5 56 40	5 56 33	5 56 25	5 56 17	5 56 09	5 56 00	5 55 52	+ 2	+ 3	

Hour angle before or after upper culmination.	Azimuth of Polaris computed for declination 88° 46′. Latitude 40°.	Latitude 41°.	Latitude 42°.	Latitude 43°.	Latitude 44°.	Latitude 45°.	Latitude 46°.	Latitude 47°.	Latitude 48°.	Latitude 49°.	Latitude 50°.	Correction for 1′ increase in declination of Polaris. Latitude 40°.	Latitude 50°.	Hour angle before or after upper culmination.
h. m.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	″	″	h. m.
0 15	0 06 26	0 06 32	0 06 39	0 06 45	0 06 52	0 07 00	0 07 08	0 07 16	0 07 25	0 07 34	0 07 44	− 5	− 6	0 15
0 30	0 12 50	0 13 03	0 13 15	0 13 29	0 13 43	0 13 58	0 14 13	0 14 30	0 14 48	0 15 06	0 15 25	−10	−13	0 30
0 45	0 19 11	0 19 30	0 19 48	0 20 08	0 20 29	0 20 52	0 21 15	0 21 40	0 22 06	0 22 33	0 23 02	−16	−19	0 45
1 00	0 25 27	0 25 51	0 26 16	0 26 43	0 27 10	0 27 40	0 28 11	0 28 44	0 29 18	0 29 55	0 30 33	−21	−25	1 00
1 15	0 31 36	0 32 05	0 32 36	0 33 09	0 33 44	0 34 21	0 34 59	0 35 40	0 36 23	0 37 08	0 37 56	−26	−32	1 15
1 30	0 37 36	0 38 11	0 38 48	0 39 27	0 40 09	0 40 52	0 41 38	0 42 26	0 43 17	0 44 11	0 45 08	−31	−38	1 30
1 45	0 43 26	0 44 07	0 44 50	0 45 35	0 46 22	0 47 12	0 48 05	0 49 01	0 49 59	0 51 02	0 52 07	−36	−43	1 45
2 00	0 49 04	0 49 50	0 50 39	0 51 29	0 52 23	0 53 19	0 54 19	0 55 22	0 56 28	0 57 38	0 58 52	−40	−49	2 00
2 15	0 54 29	0 55 20	0 56 14	0 57 10	0 58 10	0 59 12	1 00 18	1 01 28	1 02 4[illegible]	1 03 59	1 05 21	−45	−54	2 15
2 30	0 59 40	1 00 35	1 01 34	1 02 36	1 03 41	1 04 49	1 06 01	1 07 17	1 08 38	1 10 03	1 11 32	−49	−59	2 30
2 45	1 04 34	1 05 34	1 06 38	1 07 44	1 08 54	1 10 08	1 11 26	1 12 48	1 14 15	1 15 47	1 17 24	−53	−64	2 45
3 00	1 09 12	1 10 16	1 11 24	1 12 35	1 13 50	1 15 09	1 16 32	1 18 00	1 19 33	1 21 11	1 22 54	−57	−68	3 00
3 15	1 13 30	1 14 38	1 15 50	1 17 06	1 18 25	1 19 49	1 21 17	1 22 50	1 24 29	1 26 13	1 28 02	−60	−72	3 15
3 30	1 17 29	1 18 41	1 19 57	1 21 16	1 22 39	1 24 08	1 25 40	1 27 18	1 29 02	1 30 51	1 32 46	−63	−76	3 30
3 45	1 21 08	1 22 23	1 23 42	1 25 04	1 26 32	1 28 04	1 29 41	1 31 23	1 33 11	1 35 05	1 37 06	−66	−80	3 45
4 00	1 24 25	1 25 43	1 27 05	1 28 31	1 30 01	1 31 37	1 33 17	1 35 03	1 36 55	1 38 54	1 40 59	−69	−83	4 00
4 15	1 27 20	1 28 40	1 30 04	1 31 33	1 33 07	1 34 45	1 36 29	1 38 18	1 40 14	1 42 16	1 44 25	−72	−86	4 15
4 30	1 29 52	1 31 14	1 32 41	1 34 12	1 35 48	1 37 29	1 39 15	1 41 08	1 43 06	1 45 11	1 47 24	−74	−88	4 30
4 45	1 32 00	1 33 24	1 34 53	1 36 25	1 38 04	1 39 47	1 41 35	1 43 30	1 45 31	1 47 39	1 49 54	−75	−90	4 45
5 00	1 33 44	1 35 10	1 36 40	1 38 14	1 39 54	1 41 38	1 43 29	1 45 25	1 47 28	1 49 38	1 51 55	−76	−91	5 00
5 15	1 35 04	1 36 30	1 38 02	1 39 37	1 41 18	1 43 04	1 44 55	1 46 53	1 48 57	1 51 08	1 53 27	−77	−92	5 15
5 30	1 35 59	1 37 26	1 38 58	1 40 34	1 42 16	1 44 02	1 45 54	1 47 53	1 49 58	1 52 10	1 54 30	−78	−93	5 30
5 45	1 36 30	1 37 57	1 39 29	1 41 05	1 42 47	1 44 34	1 46 26	1 48 25	1 50 30	1 52 43	1 55 03	−78	−94	5 45
6 00	1 36 35	1 38 02	1 39 34	1 41 10	1 42 51	1 44.38	1 46 31	1 48 29	1 50 34	1 52 46	1 55 06	−78	−93	6 00
6 15	1 36 16	1 37 43	1 39 14	1 40 49	1 42 30	1 44 16	1 46 08	1 48 05	1 50 10	1 52 21	1 54 40	−78	−93	6 15
6 30	1 35 32	1 36 58	1 38 28	1 40 03	1 41 42	1 43 27	1 45 18	1 47 14	1 49 17	1 51 27	1 53 44	−77	−92	6 30
6 45	1 34 24	1 35 48	1 37 17	1 38 50	1 40 28	1 42 12	1 44 01	1 45 56	1 47 56	1 50 04	1 52 20	−76	−91	6 45
7 00	1 32 52	1 34 15	1 35 42	1 37 13	1 38 49	1 40 31	1 42 18	1 44 10	1 46 09	1 48 14	1 50 27	−75	−89	7 00
7 15	1 30 56	1 32 17	1 33 42	1 35 11	1 36 45	1 38 24	1 40 09	1 41 59	1 43 54	1 45 57	1 48 06	−73	−87	7 15
7 30	1 28 38	1 29 56	1 31 19	1 32 46	1 34 17	1 35 53	1 37 35	1 39 21	1 41 14	1 43 13	1 45 19	−72	−85	7 30
7 45	1 25 57	1 27 13	1 28 33	1 29 56	1 31 25	1 32 58	1 34 36	1 36 19	1 38 08	1 40 03	1 42 05	−69	−82	7 45
8 00	1 22 54	1 24 07	1 25 24	1 26 45	1 28 10	1 29 40	1 31 14	1 32 53	1 34 38	1 36 29	1 38 26	−66	−79	8 00
8 15	1 19 31	1 20 41	1 21 55	1 23 12	1 24 33	1 25 59	1 27 29	1 29 04	1 30 44	1 32 30	1 34 22	−64	−76	8 15
8 30	1 15 48	1 16 55	1 18 05	1 19 18	1 20 35	1 21 57	1 23 23	1 24 53	1 26 28	1 28 09	1 29 55	−61	−72	8 30
8 45	1 11 47	1 12 49	1 13 55	1 15 05	1 16 18	1 17 35	1 18 56	1 20 21	1 21 51	1 23 26	1 25 07	−58	−68	8 45
9 00	1 07 27	1 08 26	1 09 28	1 10 33	1 11 41	1 12 54	1 14 10	1 15 30	1 16 54	1 18 23	1 19 57	−54	−64	9 00
9 15	1 02 51	1 03 45	1 04 43	1 05 43	1 06 47	1 07 54	1 09 05	1 10 19	1 11 38	1 13 01	1 14 28	−50	−59	9 15
9 30	0 57 59	0 58 49	0 59 42	1 00 38	1 01 37	1 02 38	1 03 44	1 04 52	1 06 04	1 07 21	1 08 41	−46	−55	9 30
9 45	0 52 53	0 53 39	0 54 27	0 55 18	0 56 11	0 57 07	0 58 07	0 59 09	1 00 15	1 01 24	1 02 38	−42	−50	9 45
10 00	0 47 34	0 48 15	0 48 58	0 49 44	0 50 32	0 51 22	0 52 16	0 53 12	0 54 11	0 55 13	0 56 19	−38	−45	10 00
10 15	0 42 03	0 42 39	0 43 18	0 43 58	0 44 40	0 45 25	0 46 12	0 47 01	0 47 53	0 48 49	0 49 47	−34	−40	10 15
10 30	0 36 22	0 36 53	0 37 26	0 38 01	0 38 38	0 39 16	0 39 57	0 40 40	0 41 25	0 42 12	0 43 02	−29	−34	10 30
10 45	0 30 32	0 30 58	0 31 26	0 31 55	0 32 26	0 32 58	0 33 32	0 34 08	0 34 46	0 35 26	0 36 08	−24	−29	10 45
11 00	0 24 35	0 24 56	0 25 18	0 25 42	0 26 06	0 26 32	0 27 00	0 27 28	0 27 59	0 28 31	0 29 05	−20	−23	11 00
11 15	0 18 31	0 18 47	0 19 04	0 19 22	0 19 40	0 20 00	0 20 20	0 20 42	0 21 05	0 21 29	0 21 55	−15	−18	11 15
11 30	0 12 23	0 12 34	0 12 45	0 12 57	0 13 09	0 13 23	0 13 36	0 13 51	0 14 06	0 14 22	0 14 39	−10	−12	11 30
11 45	0 06 12	0 06 18	0 06 23	0 06 29	0 06 36	0 06 42	0 06 49	0 06 56	0 07 04	0 07 12	0 07 21	− 5	− 6	11 45
Elongation: Azimuth....	1 36 36	1 38 03	1 39 35	1 41 11	1 42 53	1 44 40	1 46 32	1 48 31	1 50 36	1 52 48	1 55 08	−78	−93	
	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	s.	s.	
Hour angle.	5 55 52	5 55 43	5 55 34	5 55 24	5 55 14	5 55 04	5 54 53	5 54 42	5 54 31	5 54 20	5 54 07	+ 3	+ 5	

Hour angle before or after upper culmination.	Azimuth of Polaris computed for declination 88° 46′.											Correction for 1′ increase in declination of Polaris.		Hour angle before or after upper culmination.
	Latitude 50°.	Latitude 51°.	Latitude 52°.	Latitude 53°.	Latitude 54°.	Latitude 55°.	Latitude 56°.	Latitude 57°.	Latitude 58°.	Latitude 59°.	Latitude 60°.	Latitude 50°.	Latitude 60°.	
h. m.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	″	″	*h. m.*
0 15	0 07 44	0 07 54	0 08 05	0 08 17	0 08 29	0 08 42	0 08 56	0 09 12	0 09 28	0 09 45	0 10 03	− 6	− 8	0 15
0 30	0 15 25	0 15 46	0 16 08	0 16 31	0 16 56	0 17 22	0 17 50	0 18 20	0 18 53	0 19 27	0 20 04	−13	− 17	0 30
0 45	0 23 02	0 23 33	0 24 06	0 24 41	0 25 18	0 25 57	0 26 39	0 27 24	0 28 12	0 29 03	0 29 58	−19	− 25	0 45
1 00	0 30 33	0 31 14	0 31 58	0 32 44	0 33 33	0 34 25	0 35 21	0 36 20	0 37 23	0 38 31	0 39 44	−25	− 33	1 00
1 15	0 37 56	0 38 47	0 39 40	0 40 38	0 41 38	0 42 43	0 43 52	0 45 06	0 46 24	0 47 48	0 49 19	−32	− 41	1 15
1 30	0 45 08	0 46 08	0 47 12	0 48 20	0 49 32	0 50 49	0 52 11	0 53 39	0 55 12	0 56 52	0 58 40	−38	− 49	1 30
1 45	0 52 07	0 53 17	0 54 31	0 55 49	0 57 12	0 58 41	1 00 16	1 01 56	1 03 44	1 05 40	1 07 44	−43	− 57	1 45
2 00	0 58 52	1 00 11	1 01 34	1 03 03	1 04 37	1 06 16	1 08 03	1 09 57	1 11 58	1 14 08	1 16 28	−49	− 64	2 00
2 15	1 05 21	1 06 48	1 08 21	1 09 59	1 11 43	1 13 33	1 15 31	1 17 37	1 19 52	1 22 16	1 24 51	−54	− 71	2 15
2 30	1 11 32	1 13 08	1 14 48	1 16 35	1 18 29	1 20 30	1 22 39	1 24 56	1 27 24	1 30 01	1 32 50	−59	− 78	2 30
2 45	1 17 24	1 19 07	1 20 55	1 22 51	1 24 54	1 27 04	1 29 23	1 31 52	1 34 31	1 37 21	1 40 23	−64	− 84	2 45
3 00	1 22 54	1 24 44	1 26 41	1 28 44	1 30 55	1 33 15	1 35 43	1 38 22	1 41 12	1 44 13	1 47 28	−68	− 89	3 00
3 15	1 28 02	1 29 59	1 32 02	1 34 13	1 36 32	1 39 00	1 41 37	1 44 25	1 47 25	1 50 37	1 54 03	−72	− 94	3 15
3 30	1 32 46	1 34 49	1 36 58	1 39 16	1 41 42	1 44 18	1 47 03	1 50 00	1 53 08	1 56 30	2 00 07	−76	− 99	3 30
3 45	1 37 06	1 39 14	1 41 29	1 43 52	1 46 25	1 49 07	1 52 00	1 55 04	1 58 21	2 01 51	2 05 37	−80	−104	3 45
4 00	1 40 59	1 43 12	1 45 32	1 48 01	1 50 39	1 53 27	1 56 26	1 59 37	2 03 01	2 06 40	2 10 34	−83	−108	4 00
4 15	1 44 25	1 46 42	1 49 07	1 51 40	1 54 23	1 57 16	2 00 21	2 03 38	2 07 09	2 10 54	2 14 55	−86	−111	4 15
4 30	1 47 24	1 49 44	1 52 13	1 54 50	1 57 37	2 00 35	2 03 44	2 07 06	2 10 42	2 14 32	2 18 39	−88	−114	4 30
4 45	1 49 54	1 52 17	1 54 49	1 57 29	2 00 20	2 03 21	2 06 34	2 10 00	2 13 40	2 17 35	2 21 47	−90	−116	4 45
5 00	1 51 55	1 54 21	1 56 54	1 59 37	2 02 31	2 05 35	2 08 51	2 12 20	2 16 03	2 20 02	2 24 17	−91	−118	5 00
5 15	1 53 27	1 55 54	1 58 29	2 01 15	2 04 10	2 07 16	2 10 34	2 14 05	2 17 50	2 21 51	2 26 09	−92	−119	5 15
5 30	1 54 30	1 56 58	1 59 34	2 02 20	2 05 16	2 08 23	2 11 42	2 15 14	2 19 01	2 23 04	3 27 23	−93	−120	5 30
5 45	1 55 03	1 57 31	2 00 08	2 02 53	2 05 50	2 08 58	2 12 17	2 15 50	2 19 36	2 23 39	2 27 58	−94	−120	5 45
6 00	1 55 06	1 57 34	2 00 10	2 02 56	2 05 52	2 08 58	2 12 17	2 15 49	2 19 35	2 23 37	2 27 56	−93	−120	6 00
6 15	1 54 40	1 57 06	1 59 41	2 02 26	2 05 21	2 08 26	2 11 44	2 15 14	2 18 59	2 22 59	2 27 15	−93	−119	6 15
6 30	1 53 44	1 56 09	1 58 43	2 01 25	2 04 18	2 07 22	2 10 37	2 14 05	2 17 47	2 21 44	2 25 57	−92	−118	6 30
6 45	1 52 20	1 54 42	1 57 14	1 59 54	2 02 44	2 05 45	2 08 57	2 12 21	2 16 00	2 19 53	2 24 03	−91	−116	6 45
7 00	1 50 27	1 52 47	1 55 15	1 57 52	2 00 39	2 03 36	2 06 44	2 10 05	2 13 39	2 17 27	2 21 32	−89	−114	7 00
7 15	1 48 06	1 50 23	1 52 48	1 55 21	1 58 04	2 00 57	2 04 00	2 07 16	2 10 45	2 14 27	2 18 26	−87	−111	7 15
7 30	1 45 19	1 47 32	1 49 52	1 52 21	1 54 59	1 57 47	2 00 45	2 03 55	2 07 18	2 10 54	2 14 46	−85	−108	7 30
7 45	1 42 05	1 44 13	1 46 29	1 48 53	1 51 26	1 54 08	1 57 00	2 00 04	2 03 20	2 06 49	2 10 32	−82	−104	7 45
8 00	1 38 26	1 40 29	1 42 40	1 44 58	1 47 25	1 50 01	1 52 47	1 55 43	1 58 52	2 02 12	2 05 47	−79	−100	8 00
8 15	1 34 22	1 36 20	1 38 25	1 40 38	1 42 58	1 45 27	1 48 06	1 50 54	1 53 54	1 57 06	2 00 32	−76	− 96	8 15
8 30	1 29 55	1 31 48	1 33 47	1 35 52	1 38 06	1 40 28	1 42 58	1 45 39	1 48 30	1 51 32	1 54 47	−72	− 91	8 30
8 45	1 25 07	1 26 53	1 28 45	1 30 44	1 32 50	1 35 04	1 37 26	1 39 57	1 42 39	1 45 31	1 48 35	−68	− 86	8 45
9 00	1 19 57	1 21 37	1 23 22	1 25 13	1 27 11	1 29 17	1 31 30	1 33 51	1 36 23	1 39 05	1 41 57	−64	− 80	9 00
9 15	1 14 28	1 16 01	1 17 38	1 19 22	1 21 12	1 23 08	1 25 12	1 27 24	1 29 44	1 32 14	1 34 55	−59	− 75	9 15
9 30	1 08 41	1 10 06	1 11 36	1 13 12	1 14 53	1 16 40	1 18 34	1 20 36	1 22 45	1 25 03	1 27 30	−55	− 69	9 30
9 45	1 02 38	1 03 55	1 05 17	1 06 44	1 08 16	1 09 53	1 11 37	1 13 28	1 15 25	1 17 31	1 19 45	−50	− 63	9 45
10 00	0 56 19	0 57 28	0 58 42	1 00 00	1 01 23	1 02 50	1 04 23	1 06 03	1 07 48	1 09 41	1 11 41	−45	− 56	10 00
10 15	0 49 47	0 50 48	0 51 53	0 53 02	0 54 15	0 55 32	0 56 54	0 58 22	0 59 55	1 01 34	1 03 20	−40	− 50	10 15
10 30	0 43 02	0 43 56	0 44 52	0 45 51	0 46 54	0 48 01	0 49 12	0 50 27	0 51 48	0 53 14	0 54 45	−34	− 43	10 30
10 45	0 36 08	0 36 52	0 37 39	0 38 29	0 39 22	0 40 18	0 41 18	0 42 21	0 43 28	0 44 40	0 45 57	−29	− 36	10 45
11 00	0 29 05	0 29 41	0 30 18	0 30 58	0 31 41	0 32 26	0 33 14	0 34 05	0 34 59	0 35 57	0 36 59	−23	− 29	11 00
11 15	0 21 55	0 22 22	0 22 50	0 23 20	0 23 52	0 24 26	0 25 02	0 25 41	0 26 21	0 27 05	0 27 51	−18	− 22	11 15
11 30	0 14 39	0 14 57	0 15 16	0 15 37	0 15 58	0 16 21	0 16 45	0 17 10	0 17 38	0 18 07	0 18 38	−12	− 14	11 30
11 45	0 07 21	0 07 30	0 07 39	0 07 49	0 08 00	0 08 11	0 08 23	0 08 36	0 08 50	0 09 04	0 09 20	− 6	− 7	11 45
Elongation: Azimuth....	1 55 08	1 57 36	2 00 13	2 02 59	2 05 55	2 09 02	2 12 21	2 15 54	2 19 40	2 23 43	2 28 02	−93	−120	
	h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*s.*	*s.*	
Hour angle.	5 54 07	5 53 54	5 53 41	5 53 27	5 53 12	5 52 57	5 52 41	5 52 24	5 52 06	5 51 47	5 51 27	+ 5	+ 7	

Hour angle before or after upper culmination.	Apparent altitude of Polaris, computed for declination 88° 46′ and mean refraction.							Correction for 1′ increase in declination of Polaris.	Hour angle before or after upper culmination.
	Latitude 30°.	Latitude 35°.	Latitude 40°.	Latitude 45°.	Latitude 50°.	Latitude 55°.	Latitude 60°.		
h. m.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	′	h. m.
0 00	31 15·6	36 15·3	41 15·1	46 14·9	51 14·8	56 14·6	61 14·5	—1·0	0 00
0 15	31 15·4	36 15·2	41 14·9	46 14·8	51 14·6	56 14·4	61 14·3	—1·0	0 15
0 30	31 14·9	36 14·7	41 14·5	46 14·3	51 14·2	56 14·0	61 13·8	—1·0	0 30
0 45	31 14·2	36 13·9	41 13·7	46 13·5	51 13·3	56 13·2	61 13·0	—1·0	0 45
1 00	31 13·0	35 12·8	41 12·5	46 12·3	51 12·2	56 12·0	61 11·9	—1·0	1 00
1 15	31 11·6	36 11·3	41 11·1	46 10·9	51 10·8	56 10·6	61 10·4	—0·9	1 15
1 30	31 09·9	36 09·6	41 09·4	46 09·2	51 09·0	56 08·8	61 08·6	—0·9	1 30
1 45	31 07·9	36 07·6	41 07·3	46 07·2	51 07·0	56 06·8	61 06·6	—0·9	1 45
2 00	31 05·6	36 05·3	41 05·0	46 04·8	51 04·6	56 04·4	61 04·2	—0·8	2 00
2 15	31 03·0	36 02·7	41 02·4	46 02·2	51 02·0	56 01·8	61 01·6	—0·8	2 15
2 30	31 00·1	35 59·8	40 59·5	45 59·3	50 59·1	55 58·9	60 58·7	—0·8	2 30
2 45	30 57·0	35 56·7	40 56·5	45 56·2	50 56·0	55 55·8	60 55·5	—0·7	2 45
3 00	30 53·7	35 53·4	40 53·1	45 52·9	50 52·6	55 52·3	60 52·1	—0·7	3 00
3 15	30 50·1	35 49·8	40 49·5	45 49·2	50 49·0	55 48·8	60 48·5	—0·6	3 15
3 30	30 46·4	35 46·0	40 45·7	45 45·5	50 45·2	55 45·0	60 44·7	—0·6	3 30
3 45	30 42·4	35 42·1	40 41·8	45 41·5	50 41·3	55 41·0	60 40·7	—0·5	3 45
4 00	30 38·3	35 38·0	40 37·6	45 37·4	50 37·1	55 36·8	60 36·5	—0·5	4 00
4 15	30 34·0	35 33·6	40 33·3	45 33·0	50 32·8	55 32·5	60 32·1	—0·4	4 15
4 30	30 29·6	35 29·2	40 28·9	45 28·5	50 28·3	55 28·0	60 27·6	—0·4	4 30
4 45	30 25·0	35 24·6	40 24·3	45 24·0	50 23·7	55 23·4	60 23·0	—0·3	4 45
5 00	30 20·4	35 20·0	40 19·7	45 19·4	50 19·1	55 18·8	60 18·4	—0·2	5 00
5 15	30 15·6	35 15·3	40 14·9	45 14·6	50 14·3	55 14·0	60 13·6	—0·2	5 15
5 30	30 10·8	35 10·4	40 10·1	45 09·9	50 09·6	55 09·2	60 08·8	—0·1	5 30
5 45	30 06·0	35 05·6	40 05·3	45 05·0	50 04·7	55 04·4	60 04·0	0·0	5 45
6 00	30 01·2	35 00·8	40 00·5	45 00·2	49 59·9	54 59·5	59 59·1	0·0	6 00
6 15	29 56·4	34 56·0	39 55·6	44 55·3	49 55·0	54 54·7	59 54·3	+0·1	6 15
6 30	29 51·6	34 51·2	39 50·8	44 50·5	49 50·2	54 49·9	59 49·6	+0·1	6 30
6 45	29 46·8	34 46·4	39 46·0	44 45·7	49 45·5	54 45·1	59 44·8	+0·2	6 45
7 00	29 42·1	34 41·7	39 41·4	44 41·1	49 40·8	54 40·4	59 40·1	+0·3	7 00
7 15	29 37·5	34 37·1	39 36·8	44 36·4	49 36·2	54 35·8	59 35·4	+0·4	7 15
7 30	29 33·0	34 32·6	39 32·3	44 32·0	49 31·7	54 31·4	59 31·0	+0·4	7 30
7 45	29 28·6	34 28·2	39 27·9	44 27·6	49 27·3	54 27·0	59 26·7	+0·5	7 45
8 00	29 24·4	34 24·0	39 23·7	44 23·4	49 23·1	54 22·8	59 22·5	+0·5	8 00
8 15	29 20·3	34 19·9	39 19·6	44 19·3	49 19·0	54 18·8	59 18·4	+0·6	8 15
8 30	29 16·4	34 16·0	39 15·7	44 15·4	49 15·2	54 14·9	59 14·6	+0·6	8 30
8 45	29 12·7	34 12·3	39 12·0	44 11·7	49 11·5	54 11·2	59 11·0	+0·7	8 45
9 00	29 09·2	34 08·8	39 08·5	44 08·3	49 08·1	54 07·9	59 07·6	+0·7	9 00
9 15	29 05·9	34 05·5	39 05·3	44 05·0	49 04·8	54 04·5	59 04·3	+0·8	9 15
9 30	29 02·8	34 02·5	39 02·2	44 02·0	49 01·8	54 01·5	59 01·3	+0·8	9 30
9 45	29 00·0	33 59·7	38 59·4	43 59·2	48 59·0	53 58·8	58 58·6	+0·8	9 45
10 00	28 57·5	33 57·2	38 56·9	43 56·7	48 56·6	53 56·4	58 56·1	+0·9	10 00
10 15	28 55·3	33 55·0	38 54·7	43 54·5	48 54·3	53 54·1	58 53·9	+0·9	10 15
10 30	28 53·3	33 53·0	38 52·8	43 52·5	48 52·4	53 52·1	58 52·0	+0·9	10 30
10 45	28 51·6	33 51·3	38 51·1	43 50·8	48 50·7	53 50·5	58 50·3	+0·9	10 45
11 00	28 50·2	33 49·9	38 49·7	43 49·5	48 49·4	53 49·1	58 49·0	+1·0	11 00
11 15	28 49·2	33 48·9	38 48·6	43 48·4	48 48·2	53 48·0	58 47·9	+1·0	11 15
11 30	28 48·4	33 48·1	38 47·8	43 47·6	48 47·5	53 47·2	58 47·1	+1·0	11 30
11 45	28 47·9	33 47·6	38 47·4	43 47·1	48 47·0	53 46·8	58 46·7	+1·0	11 45
12 00	28 47·7	33 47·4	38 47·2	43 47·0	48 46·8	53 46·7	58 46·6	+1·0	12 00

APPENDIX No. 11—1895.

SUBDIVISION I.

LIST OF ORIGINAL TOPOGRAPHIC SHEETS, GEOGRAPHICALLY ARRANGED, REGISTERED IN THE ARCHIVES OF THE UNITED STATES COAST AND GEODETIC SURVEY,

FROM

JANUARY, 1834, TO DECEMBER 31, 1895.

NOS. 1 TO 2209, INCLUSIVE.

UNITED STATES COAST AND GEODETIC SURVEY.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, from January, 1834, to December 31, 1895.

NOS. 1 TO 2209, INCLUSIVE.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Northeastern boundary, from Initial Monument to the mouth of the St. Croix River, including Passamaquoddy Bay.				
Maine and New Brunswick.	Monument Stream, from Initial Monument to Greenleaf Brook.	2103	1-10,000	S. Forney	1892.
Do	North Lake and Monument Stream, northeastern boundary.	2102	1-10,000	.....do	1892.
Do	Grand Lake (upper part), northeastern boundary	2048	1-10,000	J. Hergesheimer	1891.
Do	Grand Lake (middle part), northeastern boundary	2049	1-10,000	.....do	1891.
Do	Grand Lake (southern end and arm of), northeastern boundary.	2050	1-10,000	J. Hergesheimer and S. Forney.	1891-92.
Do	Chiputneticook Lake (northern end), northeastern boundary.	2101	1-10,000	S. Forney	1892.
Do	Chiputneticook Lake (upper part), northeastern boundary.	2040	1-10,000	J. A. Flemer	1891.
Do	Chiputneticook Lake (middle part), northeastern boundary.	2038	1-10,000	.....do	1891.
Do	Chiputneticook Lake (lower part), northeastern boundary.	2037	1-10,000	.....do	1891.
Do	St. Croix River, traverse line, with topography from Vanceboro to Elbow Rip.	1931	1-40,000	C. M. Bache	1889.
Do	St. Croix River, traverse line, with topography from Elbow Rip to Meetinghouse Rips.	2000	1-10,000	J. A. Flemer	1890.
Do	St. Croix River, traverse line, with topography from Meetinghouse Rips to the Pondwalk.	2001	1-10,000	.....do	1890.
Do	St. Croix River, traverse line, with topography from Pondwalk to Weatherbys Clearing.	2003	1-10,000	.....do	1890.
Do	St. Croix River, traverse line, with topography from Weatherbys Clearing to Ryans Rip.	2006	1-10,000	.....do	1890.
Do	St. Croix River, traverse line, with topography from Ryans Rip to Calais.	1940	1-10,000	E. Ellicott	1889.
Do	St. Croix River, Calais to Devils Head	1150	1-10,000	W. H. Dennis	1869.
Do	St. Croix River, Devils Head to Robbinstown	1828	1-10,000	.....do	1866.
Maine	St. Croix River, right bank, Devils Head to Mill Cove.	1669	1-10,000	A. W. Longfellow and C. M. Bache	1885-88.
Do	St. Croix River, right bank of, Mill Cove to Lewis Cove.	1863	1-10,000	C. M. Bache	1888.
Do	West shore Passamaquoddy Bay, Lewis Cove to Little River.	1864	1-10,000	.....do	1888.
New Brunswick	St. Andrews Harbor, shore line	1839	1-10,000	W. H. Dennis	1865.
Maine and New Brunswick.	Passamaquoddy Bay, shore line	1841	1-20,000	.....do	1866.
New Brunswick	Passamaquoddy Bay, north shore of Deer Island	1840	1-10,000	.....do	1866.
Maine	Passamaquoddy Bay, Pleasant Point to Boydens Lake.	1932	1-10,000	J. H. Gray	1889.
	Eastport and approaches, from Deadman Head, New Brunswick, to West Quoddy Head, Maine, including Cobscook Bay.				
New Brunswick	Deadman Head to Deer Island, including Letite Passage.	1007	1-10,000	W. H. Dennis	1865.
Do	East shore of Deer Isle and north shore of Campobello Island.	981	1-10,000	.....do	1861-62-63.
Maine and New Brunswick.	Pleasant Point to Lubec, includinug Eastport	979	1-10,000	.....do	1861-65.
Maine	North Lubec, part of Sewards Neck	1933	1-10,000	J. W. Donn	1889.
Maine and New Brunswick.	West Quoddy Bay	980	1-10,000	W. H. Dennis and E. Ellicott.	1861-63-88.
Do	Sheet showing northeastern water boundary, vicinity of Eastport.	2173	1-10,000	D. B. Wainwright	1894.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Eastport and approaches, from Deadman Head, New Brunswick, to West Quoddy Head, Maine, including Cobscook Bay—Continued.				
Maine	Cobscook Bay, northern part, Pennamaquan River and Pembroke.	1859	1-10,000	E. Ellicott	1888.
Do	Cobscook Bay, northwestern part, Dennysville	1838	1-10,000	J. H. Gray	1888.
Do	Cobscook Bay, southwestern part, Whiting	1780	1-10,000	....do	1887.
Do	Cobscook Bay, south shore, West Lubec	1805	1-10,000	E. Ellicott	1887.
Do	Porcupine Hills, West Lubec to Lilly Lake and Trescotts Rock.	1935	1-10,000	J. W. Donn	1889.
	West Quoddy Head to Frenchmans Bay.				
Maine	West Quoddy Head to Moose Cove	1741	1-10,000	E. Ellicott	1886.
Do	Moose Cove to Schooner Brook	1664	1-10,000	....do	1885.
Do	Little River to Cross Island, including Little Machias Bay.	1665	1-10,000	....do	1885.
Do	Machias Bay entrance	1543	1-10,000	C. H. Boyd	1882-84.
Do	Machiasport and vicinity	1540	1-10,000	....do	1883-84.
Do	Machias and vicinity	1739	1-10,000	....do	1885-86.
Do	Little Kennebec Harbor and River	1670	1-10,000	....do	1883-85.
Do	Englishmans Bay to Rodgers Island	1666	1-10,000	E. Ellicott	1885.
Do	Chandlers Bay and Chandlers River, including village of Jonesboro.	1536	1-10,000	....do	1883-84.
Do	Moose-a-bec Reach (upper sheet)	1172	1-10,000	J. W. Donn	1870.
Do	Outer edge of the Moose-a-bec Island	1501	1-10,000	E. Ellicott	1882.
Do	Moose-a-bec Reach (middle sheet)	1171	1-10,000	J. W. Donn	1870.
Do	Moose-a-bec Reach (lower sheet)	1173	1-10,000	....do	1870.
Do	Shores of Pleasant Bay and River, Cape Split to Addison Point.	1524	1-10,000	C. H. Boyd	1881.
Do	The valley of Pleasant River from Addison to Columbia Falls.	1506	1-10,000	A. W. Longfellow	1882.
Do	Shores of Harrington River and Bay	1521	1-10,000	W. H. Dennis and E. Ellicott.	1881-83.
Do	The Narraguagus Valley from Millbridge to Cherryfield.	1519	1-10,000	A. W. Longfellow	1881.
Do	Vicinity of Millbridge	1496 *b*	1-10,000	C. H. Hosmer	1881.
Do	Main shore and islands of Narraguagus Bay and Pigeon Hill Bay.	1496 *a*	1-10,000	....do	1881.
Do	Dyers Neck and Petit Manan Point	1486	1-10,000	H. G. Ogden	1880.
Do	Goldsboro Bay	1039	1-10,000	C. Rockwell and E. F. Dickins.	1865-84.
Do	Winter Harbor to Goldsboro Bay	1040	1-10,000	C. Rockwell, E. F. Dickins, and W. I. Vinal.	1865-83-84.
	Frenchmans Bay and Blue Hill Bay.				
Maine	Egg Rock, entrance of Frenchmans Bay	1334 *c*	1-5,000	J. W. Donn and F. C. Donn.	1874.
Do	Long and Burnt Porcupine Islands, Frenchmans Bay.	1479	1-10,000	C. Hosmer	1878.
Do	East side of Frenchmans Bay from Waukeag Neck to Winter Harbor.	891	1-10,000	C. Rockwell and W. I. Vinal.	1862-83.
Do	Head of Frenchmans Bay and part of Franklin Bay	1491	1-10,000	H. G. Ogden	1879.
Do	Taunton and Hog bays	1492	1-10,000	A. W. Longfellow	1880.
Do	Skillings River	1487	1-10,000	C. Hosmer and H. G. Ogden.	1877-78-79.
Do	Union River Bay to Skillings River, including Jordans River and Lamoine.	1522	1-10,000	A. W. Longfellow	1879-80.
Do	Mount Desert Island, Sands Point to High Head	1365	1-10,000	J. W. Donn	1874.
Do	Mount Desert Island (interior), from Hulls Cove to Pretty Marsh.	1364	1-10,000	....do	1874.
Do	Mount Desert Island, northeastern part	1334 *b*	1-10,000	....do	1873.
Do	Mount Desert Island, Bar Harbor village	1541	1-10,000	A. W. Longfellow and E. F. Dickins.	1884.
Do	Mount Desert Island, southeastern part	1334 *a*	1-10,000	J. W. Donn	1873.
Do	Mount Desert Island, northeast and southeast harbors.	1243	1-10,000	....do	1871.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Frenchmans Bay and Blue Hill Bay—Continued.				
Maine	Great and Little Cranberry islands and Suttons Island.	1244	1-10,000	J. W. Donn	1871.
Do	Bakers Island	463	1-2,500	W. E. Greenwell	1854.
Do	Mount Desert Island, southwestern part, from Bass Head to Seal Cove.	1281	1-10,000	J. W. Donn	1872.
Do	Mount Desert Island, western part	1282	1-10,000	do	1872.
Do	Bartletts Island, Blue Hill Bay	1490	1-10,000	H. G. Ogden	1878.
Do	Head of Union River Bay, with Pattens Bay and Union River, to and including city of Ellsworth.	1494	1-10,000	A. W. Longfellow	1878-79.
Do	Head of Blue Hill Bay, with Newbury Neck and part of West Trenton.	1451	1-10,000	do	1877.
Do	West shore of Blue Hill Bay	1428	1-10,000	W. H. Dennis	1875.
Do	Western part of Long Island, Blue Hill Bay	1489 *a*	1-10,000	H. G. Ogden	1878.
Do	Eastern part of Long Island, Blue Hill Bay	1489 *b*	1-10,000	do	1878.
Do	Black, Pond, Calf, Ship, Bar, Tinkers, Hardwood, and adjacent islands.	1397 *b*	1-10,000	J. W. Donn	1875.
Do	Swan Island	1396	1-10,000	do	1875.
Do	Long, Black, Placentia, Otter, Johns, and Gotts islands.	1397 *a*	1-10,000	F. C. Donn	1875.
Do	Islands lying south of Mount Desert Island	1245	1-10,000	J. W. Donn	1871.
Do	Eastern shore of Eggemoggin Reach	1379 *b*	1-10,000	W. H. Dennis	1874.
	Penobscot Bay.				
Maine	East coast of Eggemoggin Reach	1286 *b*	1-10,000	C. Hosmer and W. H. Dennis.	1872-74.
Do	Northern part of Deer Island	1379 *a*	1-10,000	W. H. Dennis	1873-74.
Do	Southern part of Deer Island and vicinity, Penobscot Bay.	1297	1-10,000	do	1872.
Do	Islands in Jericho Bay south of Naskeag Point	1383 *b*	1-10,000	J. N. McClintock	1874.
Do	Heron Island and outlying ledges off Newhalls	1351 *bis*	1-10,000	J. F. Moser	1877.
Do	Islands in Jericho Bay	1351	1-10,000	J. N. McClintock	1874.
Do	Ledges in Jericho Bay, southeast of Isle au Haut	1383 *c*	1-10,000	do	1874.
Do	Isle au Haut and adjacent islands	1311	1-10,000	do	1872.
Do	Islands in Isle au Haut Bay	1383 *a*	1-20,000	do	1874.
Do	Scrag Island and ledges, southeast of Marsh Island Light-house.	1383 *d*	1-10,000	do	1874.
Do	Smith, Saddleback, and Brownstone islands and adjacent ledges.	1157 *b*	1-10,000	H. M. De Wees	1870.
Do	Southern portion of Fox Island group and adjacent islands and ledges.	1157 *a*	1-10,000	do	1870-71.
Do	Fox Island group, embracing western part of Vinal Haven Island.	1093	1-10,000	F. W. Dorr	1868.
Do	Northern part of Vinal Haven Island	1075	1-10,000	do	1868.
Do	North Haven Island, including ledges and islands north of Main and Little Thoroughfares.	1072	1-10,000	do	1867.
Do	Islands in Penobscot Bay, north of Northern Fox	1350 *a*	1-10,000	J. N. McClintock	1873-74.
Do	Islands in Penobscot Bay, south of Cape Rosier	1350 *b*	1-10,000	do	1873-74.
Do	North part of Eggemoggin Reach	1286 *a*	1-10,000	C. Hosmer and W. H. Dennis.	1872-74.
Do	Shores of Bagaduce River, from the bridge south, including Brooksville and Welkers Pond.	1405 *b*	1-10,000	H. Adams	1875.
Do	Cape Rosier, a part of Brooksville	1330	1-10,000	A. W. Longfellow	1872-73.
Do	Bagaduce River, from the mouth to the bridge	1372	1-10,000	H. Adams	1874.
Do	Castine and part of Penobscot	1377	1-10,000	A. W. Longfellow	1874.
Do	Shores of Northern Bay, head of Bagaduce River, and town of Penobscot.	1405 *a*	1-10,000	H. Adams	1875.
Do	Eastern shore of Penobscot River, Whitmores Island to Moores Cove.	1357 *b*	1-10,000	J. Hergesheimer	1874.
Do	Penobscot River, Indian Point to Sandy Point, including Bucksport, Whitmores Island, and Eastern River.	1357 *a*	1-10,000	do	1873-74.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Penobscot Bay—Continued.				
Maine	Penobscot River, Indian Point to Parkers Point, including Prospect River.	1309	1-10,000	F. W. Dorr	1873.
Do	From Winterport to Hampden, with part of Bucksport and Orrington.	1421	1-10,000	A. W. Longfellow	1875.
Do	Penobscot River, from Hampden to Bangor, with part of Orrington and Brewer.	1434	1-10,000	....do	1876.
Do	Penobscot River, from Bangor to Hampden	1434 *bis*	1-10,000	J. A. Sullivan	1867.
Do	North shore of Penobscot Bay, from Sears Island to Sandy Point.	1329	1-10,000	C. T. Iardella	1872-73.
Do	Belfast and Searsport	1272	1-10,000	....do	1871-72.
Do	Western shore of Penobscot Bay, from Knights Point to Little River.	1288	1-10,000	F. W. Dorr	1872.
Do	North Islesboro	1257	1-10,000	A. W. Longfellow	1871.
Do	South Islesboro	1256	1-10,000	....do	1871.
Do	Islands in Penobscot Bay, south of Islesboro	1167	1-10,000	....do	1870.
Do	Western shore of Penobscot Bay, from Mount Megunticook to Knights Point.	1233	1-10,000	F. W. Dorr	1871.
Do	Western shore of Penobscot Bay, including Camden and Rockport harbors.	930	1-10,000	....do	1863.
Do	Rockland Harbor and vicinity	1160	1-10,000	W. H. Dennis	1870.
Do	Waskeag River and vicinity, Penobscot Bay	1151	1-10,000	....do	1869.
Do	Muscle Ridge Islands, entrance to Penobscot Bay	1287	1-10,000	....do	1871.
Do	The Matinicus group of islands	958	1-20,000	F. W. Dorr	1864.
Do	The Green Islands, at the mouth of Penobscot Bay	959	1-20,000	....do	1864.
Do	Western entrance to Penobscot Bay, including Monhegan, Matinic, and St. Georges Islands.	960	1-20,000	....do	1864.
Do	Seal, Tennants, and Mosquito harbors, Penobscot Bay.	1081	1-10,000	W. H. Dennis	1868.
	Penobscot Bay, to and including Kennebec River.				
Maine	St. Georges River entrance	1117	1-10,000	F. W. Dorr	1867-69.
Do	St. Georges River	1116	1-10,000	C. Hosmer	1868.
Do	Southern part of Muscongus Bay	1002	1-10,000	F. W. Dorr	1865.
Do	Islands and ledges in Muscongus Bay	1001	1-10,000	....do	1865.
Do	Friendship Island	1058	1-10,000	C. Hosmer	1866-67.
Do	Medomac River	1076	1-10,000	....do	1867-68.
Do	Muscongus Bay, from Round Pond to Hocamoe	1028	1-10,000	C. Rockwell	1866.
Do	Part of Pemmaquid Neck, including Johns Bay and Pemmaquid River.	1032	1-10,000	F. W. Dorr	1866.
Do	Pemmaquid Point, including New Harbor and the western part of Muscongus Bay	1033	1-10,000	....do	1866.
Do	Damariscotta River, upper part	994	1-10,000	S. A. Gilbert	1865.
Do	Damariscotta River	995	1-10,000	....do	1865.
Do	Linekins Bay and islands, at the mouth of Damariscotta River.	1000	1-10,000	F. W. Dorr	1865.
Do	Eastern shore of Sheepscot River and Booth Bay Harbor.	961	1-10,000	P. C. F. West	1864-65.
Do	Part of Sheepscot River	954	1-10,000	R. E. McMarth	1864.
Do	Sheepscot, Back, and Ovensmouth rivers	953	1-10,000	....do	1864.
Do	Arrowsic and Westport islands	982	1-10,000	E. Hergesheimer	1865.
Do	Sheepscot and Back rivers, containing Edgecombe and Westport islands.	801	1-10,000	H. Adams and C. Ferguson.	1858-59-60.
Do	Part of Sheepscot River and vicinity	845	1-10,000	W. H. Dennis	1859.
Do	Back River and Montseag Bay	802	1-10,000	C. Ferguson	1860.
Do	Hockomock River	842	1-10,000	H. Adams	1861-64.
Do	Georgetown Island and vicinity	889	1-10,000	C. T. Iardella	1862.
Do	Mouth of Kennebec River	588	1-10,000	H. Adams	1856.
Do	Approaches and mouth of the Kennebec River	587	1-10,000	....do	1856.
Do	Kennebec River, from Coxs Head to Indian Point	666	1-10,000	W. S. Gilbert	1857-58.
Do	Kennebec River, in vicinity of Bath, city of Bath, villages of Woolwich and Winnegance, and one of the entrances of Back River.	728	1-10,000	R. M. Bache and H. L. Whiting.	1858-59-60-90.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Penobscot Bay, to and including Kennebec River—Cont'd.				
Maine	Kennebec River, from Indian Point to Bath	667	1-10,800	W. S. Gilbert	1857.
Do	Peninsula formed by the confluence of the Kennebec and Androscoggin rivers.	967	1-10,000	R. M. Bache	1860-64.
Do	Kennebec River, from Telegraph Point to Merrymeeting Bay.	1061	1-10,000	.....do	1859-65.
Do	Western side of Merrymeeting Bay, including Androscoggin, Muddy, and Cathance rivers.	1214	1-10,000	C. H. Boyd	1871.
Do	Kennebec River, Abagadassett Point to Richmond	1115	1-10,000	C. H. Boyd and H. L. Whiting.	1869-90.
Do	Kennebec River, Richmond to Gardiner	1158	1-10,000	.....do	1870-90.
Do	Kennebec River, Gardiner to Augusta	1996	1-10,000	S. Forney	1890-91.
	Kennebec River, entrance to Saco River.				
Maine	Cape Small and adjacent islands	465	1-10,000	S. A. Gilbert, H. Adams, and C. T. Iardella.	1854-56-57.
Do	Ragged Islands and adjacent islands, near Cape Small	466	1-10,000	S. A. Gilbert, C. T. Iardella, and A. W. Longfellow.	1854-56-65.
Do	Mouth of New Meadow River	655	1-10,000	C. T. Iardella	1857.
Do	A part of Sebaskahegan and Orrs islands, in Casco Bay	1012	1-10,000	A. W. Longfellow	1865.
Do	The heads of Casco Bay, from Middle Bay to New Meadow River.	1129	1-10,000	.....do	1867-69.
Do	New Meadow River, from Fosters Point to New Meadow Bridge.	1021	1-10,000	J. W. Donn	1866.
Do	A part of Harpsnell Neck, with the adjacent islands in Casco Bay.	847	1-10,000	A. W. Longfellow	1860-61.
Do	Maquoit Bay and Middle Bay, with adjacent shores of Freeport, Brunswick, and Harpsnell Neck.	923	1-10,000	.....do	1863.
Do	Halfway Rock, Casco Bay	1056	1-20,000	C. H. Boyd	1867.
Do	Outer islands in Casco Bay	757	1-10,000	A. W. Longfellow	1856-58.
Do	The Green Islands in Casco Bay	756	1-10,000	.....do	1856.
Do	Great Chebeag, Little Johns, and Cousins islands, and main shore to Falmouth.	919 *a*	1-10,000	.....do	1864.
Do	Additional marginal topography in Casco Bay, between Falmouth and Yarmouth.	919 *b*	1-10,000	.....do	1873.
Do	Yarmouth and Freeport entrances, with adjacent shores.	918	1-10,000	.....do	1861-62.
Do	Mouth of the Presumpscot River and islands in Casco Bay.	755	1-10,000	.....do	1855-59.
Do	Portland Harbor and environs	735	1-10,000	.....do	1854-58.
Do	Wharf and shore line, Portland Harbor	1111	1-5,000	A. W. Longfellow and H. W. Bache.	1867.
Do	Portland City and Harbor	1140 *a*	1-1,200	H. L. Whiting and A. Lindenkohl.	1868-69.
Do	.....do	1140 *b*	1-1,200	A. Lindenkohl	1868-69.
Do	.....do	1141 *a*	1-1,200	.....do	1869.
Do	.....do	1141 *b*	1-1,200	C. Hosmer	1869.
Do	.....do	1142 *a*	1-1,200	.....do	1869.
Do	.....do	1142 *b*	1-1,200	J. W. Donn	1869.
Do	.....do	1143 *a*	1-1,200	.....do	1869.
Do	.....do	1143 *b*	1-1,200	C. Hosmer	1869.
Do	.....do	1144 *a*	1-1,200	J. W. Donn	1869.
Do	.....do	1144 *b*	1-2,400	J. N. McClintock	1869.
Do	Reconnoissance of Portland and vicinity	878	1-20,000	F. W. Dorr	1862.
Do	A part of Cape Elizabeth	414	1-10,000	A. W. Longfellow	1852.
Do	Richmonds Island Harbor and the south shore of Cape Elizabeth.	312	1-10,000	.....do	1850.
Do	Goose Fair Creek to Spurwink River	1224	1-10,000	H. Adams	1871.
Do	North shore of Saco Bay, including Staten Island, Bluff Island, and Prouts Neck.	759	1-10,000	A. Murray and C. Fendall.	1859.
Do	Fletchers Neck and vicinity	760	1-10,000	C. Fendall	1859.
Do	Mouth of Saco River and Biddeford Pool from Hoyts Neck.	1188	1-10,000	H. Adams	1870.
Do	Coast of Maine and the towns of Biddeford and Saco	1225	1-10,000	.....do	1871.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Saco River to Cape Ann.				
Maine	Cape Porpoise and vicinity	761	1-10,000	C. Fendall	1859.
Do	Kennebunkport and Cape Porpoise to Hoyts Neck	1159	1-10,000	H. Adams	1870.
Do	From Ogunquit in Wells to Mousam River	1121	1-10,000	.....do	1869.
Do	Cape Neddick and Ogunquit	459	1-10,000	A. S. Wadsworth	1854.
Do	York and Cape Neddick harbors, with the intermediate coast.	440	1-10,000	A. W. Longfellow and A. S. Wadsworth.	1853.
Do	Between Kittery and York	1050	1-10,000	H. Adams	1867.
New Hampshire	Isles of Shoals	762	1-10,000	C. Fendall	1859.
Do	From Rye Harbor to near Portsmouth	1047	1-10,000	H. Adams	1867.
Do	From Great Boars Head to Rye Harbor	1023	1-10,000	.....do	1866.
Do	From East Salisbury to Hampton River	835	1-10,000	H. L. Whiting	1855.
Massachusetts	Harbor and environs of Newburyport and the mouth of the Merrimac River.	355	1-10,000	A. W. Longfellow	1851.
Do	Merrimac River from Kimballs Island to Ring Bolt Rock.	1585	1-2,400	H. Mitchel	1867.
Do	From Rowley River to Newburyport	559	1-10,000	H. Adams, H. L. Whiting	1854.
Do	North shore of Cape Ann, including Ipswich River and vicinity.	467	1-10,000	H. L. Whiting	1853.
Do	North shore of Cape Ann, including Essex River and vicinity.	556	1-10,000	.....do	1852-55.
Do	Annisquam Harbor and vicinity, Cape Ann	396	1-10,000	H. L. Whiting and R. M. Bache.	1852.
Do	The extremity of Cape Ann, from Milk Island to Zanes Cove.	341	1-10,000	.....do	1851.
Do	Cape Ann, including Gloucester Harbor and vicinity	397	1-10,000	.....do	1851.
	Cape Ann to Cape Cod, including Boston Harbor.				
Massachusetts	North shore of Salem Harbor from Beverly Farms to Kettle Cove.	340	1-10,000	H. L. Whiting	1851.
Do	South shore of Cape Ann from Danvers New Mills to Beverly Farms.	304	1-10,000	.....do	1850.
Do	Salem Harbor, including the city and islands	303	1-10,000	.....do	1849-50.
Do	Northwest shore of Massachusetts Bay from Saugus River to Marblehead.	305	1-10,000	.....do	1849-50.
Do	Boston Harbor, The Nahants, and Tinkers Island	235	1-10,000	.....do	1847-49.
Do	Boston Harbor, from Point Shirley to Saugus River	234	1-10,000	H. L. Whiting, S. A. Gilbert, and F. W. Dorr.	1847-66.
Do	Boston Harbor, Governors and Castle islands	231	1-5,000	H. L. Whiting	1846.
Do	Boston Harbor, East Boston and part of South Boston.	230	1-5,000	.....do	1846-47.
Do	Boston Harbor, city of Boston and Charlestown	229	1-5,000	.....do	1846-47.
Do	Roxbury, Cambridge, and Medford	233 *bis*	1-10,000	.....do	1847.
Do	Boston Harbor, from Neponset River to Roxbury	232 *bis*	1-10,000	H. L. Whiting, S. A. Gilbert, and F. W. Dorr.	1847-66.
Do	Southern shore of Boston Harbor and Bay	227	1-10,000	J. B. Glück	1847.
Do	Boston Harbor, including Thompsons Island, Spectacles, Moon Head, and Squantum.	832	1-5,000	H. L. Whiting	1860.
Do	Boston Harbor, including Long Island, Deer Island, and Point Shirley.	833	1-5,000	.....do	1860.
Do	Section of Boston Harbor, including Gallops Island, Lowell Island, Georges Island, Light-House Island, and Great Brewster.	831	1-5,000	.....do	1860.
Do	Section of Boston Harbor, including the outer islands and Brewsters.	830	1-5,000	.....do	1860.
Do	Islands in Boston Harbor	238	1-10,000	J. S. Williams and H. L. Whiting.	1847-49.
Do	Section of Boston Harbor, including Rainsford Island, Petticks Island, and Nantasket.	829	1-5,000	H. L. Whiting	1860.
Do	Township of Hull	237	1-10,000	J. S. Williams	1847.
Do	Southern shore of Boston Bay	228	1-10,000	J. B. Glück	1847.
Do	Lynn Harbor and vicinity	2177	1-10,000	O. H. Tittmann	1894.
Do	Revere and vicinity	2147	1-10,000	C. T. Iardella	1893.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Ann to Cape Cod, including Boston Harbor—Cont'd.				
Massachusetts....	Winthrop Center, Deer Island, and Beachwood, Boston Harbor.	2146	1-10,000	C. T. Iardella	1893.
Do	Boston Harbor, Weymouth, North Weymouth, East Weymouth, and Hingham.	2180	1-10,000	R. M. Bache	1894.
Do	Cohasset, Weir River to North Scituate Beach	2183	1-10,000	H. G. Ogden	1894.
Do	North side of Boston Bay, from Revere and Chelsea to Malden and Medford.	2190	1-10,000	W. I. Vinal	1894.
Do	Quincy, Neponset River to Weymouth Fore River	2191	1-10,000	H. G. Ogden	1894.
Do	Quincy Point to Montclair and Atlantic (tracing)	2169	1-3,600	H. T. Whitman, C. E.	1894.
Do	City of Boston and vicinity	2197	1-10,000	D. B. Wainwright	1895.
Do	Roxbury	2204	1-10,000	C. H. Boyd and D. B. Wainwright.	1894.
Do	Cohasset Harbor and westward	2208	1-10,000	W. I. Vinal	1895.
Do	Boston Harbor, islands in	2155	1-10,000	R. M. Bache	1893.
Do	Boston Harbor, Nantasket Beach and vicinity	2154	1-10,000	....do	1893.
Do	Boston Harbor, Squantum to Weymouth Fore River	2114	1-10,000	....do	1892.
Do	Boston Harbor, from bay to Nantasket Beach	2115	1-10,000	....do	1892.
Do	Vicinity of Boston Harbor, from Cohasset Rocks to Scituate Harbor.	236 *bis*	1-10,000	H. L. Whiting	1847.
Do	Part of North River	719	1-10,000	W. H. Dennis and A. M. Harrison.	1858.
Do	North River (sheet No. 1)	1251 *a*	1-5,000	H. L. Whiting	1870.
Do	North River (sheet No. 2)	1251 *b*	1-5,000	....do	1870.
Do	Duxbury	612	1-10,000	R. M. Bache and A. M. Harrison.	1856-57.
Do	Plymouth Harbor	425	1-10,000	S. A. Gilbert	1853-54.
Do	Plymouth Harbor and vicinity	455	1-10,000	....do	1853.
Do	Western shore of Cape Cod Bay, from Eel River to Ship Pond.	1063	1-10,000	P. C. F. West	1866.
Do	West of Cape Cod Bay (sheet No. 1)	2096	1-30,000	J. A. Flemer	1892-93.
Do	West of Cape Cod Bay (sheet No. 2)	2097	1-30,000	....do	1892-93.
Do	Western shore of Cape Cod Bay, from Ship Pond to West Sandwich.	1062	1-10,000	P. C. F. West	1867.
Do	Route of the proposed Cape Cod Ship Canal	1530	1-10,000	W. H. Dennis	1860.
Do	Part of Cape Cod, from Sandy Neck, near Barnstable, to West Sandwich.	901	1-10,000	A. M. Harrison and P. C. F. West.	1860-61.
Do	Barnstable Harbor and vicinity	795	1-10,000	....do	1859.
Do	North shore of Cape Cod, from North Dennis to Brewster.	1088	1-10,000	P. C. F. West	1868.
Do	Southern shore of Cape Cod Bay, from Orleans to Brewster.	1078	1-10,000	H. Adams	1868.
Do	Wellfleet Harbor, Cape Cod	368	1-10,000	J. B. Glück	1851.
Do	Cape Cod, from Highland to Nauset Lights	260	1-10,000	H. L. Whiting and S. A. Gilbert.	1848.
Do	Cape Cod, from Billingsgate to Pamet River	259	1-10,000	H. L. Whiting	1848.
Do	Extremity of Cape Cod, including Provincetown and part of Truro.	616	1-10,000	....do	1848-57.
Do	High Head and Old East Harbor, Cape Cod	1982	1-10,000	H. L. Marindin	1889.
	Cape Cod to Narragansett Bay.				
Massachusetts....	Part of Nauset Harbor	579	1-10,000	C. T. Iardella	1856.
Do	Eastern shore of Cape Cod, from Pleasant Bay to Nauset Harbor.	1077	1-10,000	H. Adams	1868.
Do	Shore line from Nauset Harbor southward	1704	1-10,000	J. B. Weir	1886.
Do	Shore line in the vicinity of Chatham	1705	1-10,000	....do	1886.
Do	East shore of Cape Cod Bay, from Pleasant Bay to Monomoy Island.	1085 *b*	1-10,000	C. H. Boyd	1868.
Do	Southern entrance of Cape Cod, including the Valley of Chatham.	1085 *a*	1-10,000	C. H. Boyd and H. L. Marindin.	1868-72.
Do	Beaches in proximity to Chatham, Cape Cod	441 *bis*	1-10,000	H. L. Marindin	1873.
Do	Southern extremity of Cape Cod	441	1-10,000	J. B. Glück	1853.
Do	Shore line of the northern part of Monomoy Island	1706	1-10,000	J. B. Weir	1886.
Do	Monomoy Point	1090	1-20,000	P. C. F. West	1868.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Cod to Narrâgansett Bay—Continued.				
Massachuse	Monomoy Island	424	1-20,000	S. A. Gilbert and C. T. Iardella.	1853-56.
Do	Resurvey of Monomoy Point	1683	1-10,000	C. H. Boyd and C. H. Van Orden.	1886.
Do	From Bass River east	402	1-10,000	J. B. Glück	1851.
Do	A part of South Yarmouth	356	1-10,000	A. W. Longfellow	1847.
Do	Southern shore of Cape Cod, between Hyannis and Bass River.	553	1-10,000	H. L. Whiting and J. L. Sullivan.	1855.
Do	From Hyannis Point to West Yarmouth Spire	290	1-10,000	Captain Boyce	1846.
Do	East end of Nantucket, from Great Point to Siasconsett.	206	1-10,000	H. L. Whiting and W. E. Greenwell.	1846.
Do	West end of Nantucket, including Tuckernuck and Muskeget islands.	205	1-10,000	H. L. Whiting, W. E. Greenwell, and F. W. Dorr.	1856-65.
Do	Great Point and Nantucket Harbor	1818	1-10,000	E. L. Taney	1887.
Do	Nantucket Island, from Squam Head to Nebers Head, including town of Siasconsett.	1814	1-10,000	.....do	1887.
Do	Western part of Nantucket Island	1815	1-10,000	.....do	1887.
Do	Tuckernuck and Muskeget islands	1785	1-10,000	.....do	1887.
Do	South shore of Marthas Vineyard, from Nashaquitsa Cliff east.	202	1-10,000	H. L. Whiting	{1846-56. 1871-86.
Do	East end of Marthas Vineyard, from Cape Page to East Chop.	204	1-10,000	.....do	1846.
Do	North shore of Marthas Vineyard, from East Chop to Menemsha Bight.	203	1-10,000	.....do	1845-46-71.
Do	Gay Head and No Mans Land	362	1-10,000	W. M. Boyce and H. L. Whiting.	1845-53.
Do	South opening into Edgartown Harbor and Cotanny Bay, including the shore line and beaches of Cotanny Bay, Skiffs Island, and the outer shore of Choppaquiddick Island.	1702	1-10,000	H. L. Whiting and W. I. Vinal.	1886-87-89.
Do	A portion of Marthas Vineyard Island	1802	1-10,000	W. I. Vinal	1888.
Do	Marthas Vineyard Island, north shore, from Choppaquonsett Pond to Menemsha Creek.	1845	1-10,000	J. W. Donn	1888.
Do	Gay Head, Marthas Vineyard Island	1844	1-2,500	.....do	1888.
Do	Marthas Vineyard Island, south shore, from Gay Head to Nashaquitsa Cliff, and north shore, from Gay Head to Menemsha Creek.	1846	1-10,000	.....do	1888.
Do	Island of No Mans Land	1856	1-5,000	.....do	1888.
Do	From Wiano Beach to Hyannisport	1999	1-10,000	D. B. Wainwright	1890.
Do	Waquoit Bay to Wiano Beach	1998	1-10,000	.....do	1890-91.
Do	From Succonesset Station to Hyannis Point	318	1-10,000	W. M. Boyce	1846.
Do	Vicinity of Succonesset Point	2039	1-10,000	D. B. Wainwright	1891.
Do	From Falmouth Spire to Succonesset Point	289	1-10,000	W. M. Boyce	1846.
Do	Falmouth to Waquoit Bay	1997	1-10,000	D. B. Wainwright	1890.
Do	Eastern Shore of Buzzards Bay	191	1-10,000	W. M. Boyce	1845.
Do	Woods Holl and vicinity	1858	1-5,000	W. I. Vinal	1888-89.
Do	Shore line of Naushon Island	1937	1-10,000	E. L. Taney	1889.
Do	The Elizabeth Island	192	1-10,000	W. M. Boyce	1845.
Do	Islands of Nashewena, Pasque, and Penikese	1938	1-10,000	E. L. Taney	1889.
Do	Cuttyhunk Island	1939	1-5,000	.....do	1889.
Do	Cuttyhunk Island and the Sow and Pigs Shoal	437	1-5,000	H. L. Whiting	1853.
Do	Vicinity of Buzzards Bay	195	1-10,000	.....do	1845.
Do	Great Hill Neck to Sconticut Neck, Buzzards Bay	196	1-10,000	.....do	1845.
Do	New Bedford and vicinity	194	1-10,000	.....do	1844.
Do	West shore of Buzzards Bay, from Mishaum Point to Clarks Cove.	193 *bis*	1-10,000	.....do	1844.
	Narragansett Bay.				
Massachusetts and Rhode Island.	From East Rock to Mishaum Point	183	1-10,000	W. M. Boyce	1844.
Rhode Island	Sakonnet Point	1161	1-10,000	C. Hosmer and H. G. Ogden.	1870.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Narragansett Bay—Continued.				
Rhode Island.....	From Beaver Tail Light to Sakonnet Point, or East Rock.	182	1-10,000	W. M. Boyce....	1844.
Do........	Sakonnet River, Black Point to Eastons Point.......	180	1-10,000	H. L. Whiting......	1844.
Do............	Eastern shore of Rhode Island, Narraganset Bay....	1163	1-10,000	H. G. Ogden..............	1870.
Do............	Part of the island of Rhode Island, including the city of Newport and vicinity.	1194	1-10,000	A. M. Harrison and C. T. Iardella.	1870-71.
Do............	Part of Narragansett Bay, including Coasters Harbor Island and adjacent shores.	869	1-5,000	H. L. Whiting............	1862.
Do............	Coasters Harbor Island, United States Navy Training Station (lower sheet).	2080	1-600	J. A. Flemer..............	1891.
Do............	Coasters Harbor Island, United States Navy Training Station (middle sheet).	2081	1-600	.....do....	1891.
Do............	Coasters Harbor Island, United States Navy Training Station (upper sheet).	2082	1-600	.....do....................	1891.
Do............	East side of Sakonnet River..........................	1156	1-10,000	C. Hosmer................	1870.
Do............	Part of the island of Rhode Island, Narragansett Bay.	1162	1-10,000	A. M. Harrison and C. T. Iardella.	1870.
Do............	Part of the west shore of the island of Rhode Island, from Coddington Cove northward.	896	1-10,000	A. M. Harrison...........	1862.
Do............	Shore line of part of west side of the island of Rhode Island from Bristol Ferry southward.	897	1-10,000	.....do....................	1861.
Do............	Eastern shore of Mount Hope Bay...................	884	1-10,000	.....do....................	1861-65.
Massachusetts	City of Fall River and vicinity	1053	1-10,000	.....do....................	1867-70.
Do............	Part of Taunton River, from Mount Hope Bay northward.	1373 *b*	1-5,000	.....do....................	1875.
Do............	Part of Taunton River................................	1373 *a*	1-5,000	.....do....................	1874.
Do............	Assonet Bay and River and part of Taunton River...	1418	1-5,000	.....do....................	1875.
Do........	Part of Taunton River, at Dighton....................	1419 *a*	1-2,500	.....do....................	1875.
Do............	Part of Taunton River, from Dighton northward....	1419 *b*	1-2,500	.....do....................	1875.
Do............	Part of Taunton River, from Needles southward......	1420 *a*	1-2,500	.....do....................	1875.
Do............	Part of Taunton River, from Weir Village southward.	1420 *b*	1-2,500	.....do....................	1875.
Rhode Island......	The northern shore of Mount Hope Bay.............	1024	1-10,000	.....do....................	1865.
Do............	Detached topography near Warren..................	1120	1-10,000	.....do....................	1869.
Do............	Bristol Neck...	956	1-10,000	A. M. Harrison and C. Hosmer.	1864.
Do............	Part of Providence River............................	913	1-10,000	A. M. Harrison, C. Hosmer, and H. G. Ogden.	1863-65.
Do............	Providence Harbor....................................	914	1-10,000	.....do....................	1865.
Do............	Providence Harbor and River........................	1433 *a*	1-2,400	H. L. Whiting.............	1874.
Do............	Part of Seekonk River................................	1433 *b*	1-2,400	.....do....................	1874.
Do............	Wharf line, city of Providence.......................	1041	1-5,000	A. M. Harrison...........	1867.
Do............	Seekonk River...	978	1-5,000	.....do....................	1865.
Do............	Cowesett Bay and vicinity...............	912	1-10,000	.....do....................	1868.
Do............	The town of East Greenwich and vicinity...........	1079	1-10,000	.....do....................	1868.
Do............	Providence Island, Narragansett Bay................	1054	1-10,000	A.M. Harrison and C. Hosmer.	1866.
Do............	Conanicut, Dutch, and Gould islands, Narragansett Bay.	1119	1-10,000	A. M. Harrison and H. G. Ogden.	1869.
Do............	Quonset Point to South Ferry, Narragansett Bay.....	911	1-10,000	.....do....................	1869.
Do.......	From McSparrew Hill to Point Judith................	92	1-10,000	J. J. S. Hassler............	1839.
Do............	Coast of Rhode Island, from South Ferry to Narragansett Pier.	1118	1-10,000	A. M. Harrison and H. G. Ogden.	1869.
Do............	From McSparrew Hill to Tiffs Hill (interior).........	93	1-10,000	J. J. S. Hassler and O. H. Berryman.	1839.
Do............	Point Judith and vicinity............................	1226	1-10,000	A. M. Harrison...........	1871.
Do............	From Judith to Noyers Point.........................	91	1-10,000	J. J. S. Hassler............	1839.
Do............	Part of coast of Rhode Island, from Cross Mills eastward.	1271	1-10,000	A. M. Harrison.......	1872.
Do............	From Tiffs Hill westward (interior)	94	1-20,000	J. J. S. Hassler............	1839.
Do............	Block Island, New Shoreham, Newport County.......	90	1-10,000	.....do....................	1839.
Do............	Block Island	1735	1-10,000	W. H. Dennis.........	1886.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number	Scale.	Topographer.	Date.
	North shore Long Island Sound.				
Rhode Island	Part of the coast of Rhode Island, from Cross Mills to West Pond.	1312	1-10,000	A. M. Harrison............	1873.
Do............	Joshua Champlin Fairbanks Cut to Sand Hill, southward.	129	1-20,000	J. J. S. Hassler............	1840.
Do............	Kingston, from Fairbanks Cut northward...........	128	1-10,000	.....do....................	1840.
Connecticut	From Big Hill to North Stonington	126	1-10,000	F. H. Gerdes..............	1840.
Connecticut and Rhode Island.	Groton to Westerly	88	1-10,000	F. H. Gerdes and H. L. Whiting.	1839-55.
Do..........	North shore of Long Island Sound, Westerly and vicinity.	1736	1-10,000	W. H. Dennis.............	1866.
Do............	Potter Hill	125	1-10,000	F. H. Gerdes..............	1840.
Connecticut	North Stonington and interior, from Eels Hill to Quaquotogue.	124	1-10,000	.....do....................	1840.
Do............	Milltown and interior, from North Stonington to Niantic village.	123	1-10,000	.....do....................	1840.
Rhode Island and Connecticut.	North shore Fishers Island Sound.....................	1734	1-10,000	W. C. Hodgkins..........	1882-83.
Connecticut	From Fort Hill to Mystic River......................	65	1-10,000	C. Renard	1838.
New York.........	Fishers Island.......................................	57	1-10,000	F. H. Gerdes..............	1838.
Do............	.....do...	1508	1-10,000	E. Hergesheimer.........	1882.
Connecticut	New London and vicinity............................	1531	1-10,000	W. H. Dennis............	1882-83.
Do............	Eastern bank of Thames River.......................	85	1-10,000	J. B. Glück...............	1846.
Do...........	Thames River, from the city of New London to Mohigan Church.	86	1-10,000	F. H. Gerdes..............	1839.
Do............	Naval station near New London......................	1107	1-1,200	H. G. Ogden..............	1869.
Do............	Interior, east of Thames River to Tantem Hill........	89	1-10,000	F. H. Gerdes	1839.
Do...........	Thames River, from Gales Ferry to Whiptop Point...	87	1-10,000	.....do....................	1841.
Do............	Thames River Naval Station to Thamesville..........	1359 *a*	1-10,000	H. G. Ogden and D. B. Wainwright.	1874.
Do............	Thames River, vicinity of Norwich..................	1359 *b*	1-10,000	H. G. Ogden..............	1874.
Do...........	Western bank of Thames River.......................	84	1-10,000	J. B. Glück...............	1846.
Do............	From Black Point to Fort Hill, including Niantic Bay.	64	1-10,000	C. Renard.................	1838.
Do............	Interior of the country between Thames River and Niantic River.	83	1-10,000	F. H. Gerdes	1839.
Do............	North shore of Long Island Sound, from Goshen Point to Four Mile River.	1651	1-10,000	W. H. Dennis.............	1883-87.
Do............	From Black Point to Cornfield Point..................	81	1-10,000	B. F. Sands...............	1838.
Do............	From Niantic River to Lyme City.....................	78	1-20,000	C. Preuss.................	1838.
Do............	Mouth of Connecticut River..........................	297	1-10,000	H. L. Whiting............	1850.
Do............	North shore Long Island Sound, from Four Mile River to Oyster River.	1568	1-10,000	W. C. Hodgkins and J. H. Turner.	1883-85.
Do............	Connecticut River, from Lyme to Westbrook..........	79	1-20,000	J. J. S. Hassler............	1838.
Do............	Connecticut River, from Lyme to Deep River.........	2025	1-10,000	J. W. Donn	1890.
Do............	Connecticut River, from Deep River to Salmon River.	2026	1-10,000	J. W. Donn and W. I. Vinal	1890-91.
Do............	Connecticut River, from Salmon River to Whitmores Dock.	2008	1-10,000	W. C. Hodgkins	1890.
Do............	Connecticut River, from Whitmores Dock to Cromwell.	2009	1-10,000	.....do....................	1890.
Do............	Connecticut River, between Middletown and Cromwell and Portland and Taylortown.	2142	1-10,000	J. W. Donn...............	1893.
Do............	Connecticut River, Cromwell Landing to Dividend Shoal.	2044	1-10,000	W. C. Hodgkins and W. I. Vinal.	1891-92-93.
Do............	Connecticut River, Rocky Hill and South Glastonbury	2045	1-10,000	W. C. Hodgkins and J. W. Donn.	1891-93.
Do............	Connecticut River, Hartford and Wethersfield........	2046	1-10,000	.....do....................	1891-93.
Do............	North shore of Long Island Sound, Chopmans Point to Hammonasset Point, including Westbrook and Clinton.	1551 *a*	1-10,000	W. H. Dennis.............	1883.
Do............	Hammonasset Point to Cornfield Point...............	80	1-10,000	J. J. S. Hassler............	1838.
Do............	North shore of Long Island Sound, Hammock Point to Menunketesuck Point, including Duck Island.	1440	1-5,000	J. Hergesheimer.........	1877.
Do............	Part of Middlesex County	130	1-20,000	T. W. Werner............	1841.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	North shore Long Island Sound—Continued.				
Connecticut	From New Haven to Hammonasset Point	82	1-10,000	W. M. Boyce	1838.
Do	North shore of Long Island Sound, Hammonasset Point to Guilford.	1551 *b*	1-10,000	W. H. Dennis	1884.
Do	Falkners and Goose Island, Long Island Sound	1660	1-10,000	W. H. Dennis and C. H. Van Orden.	1884.
Do	North shore of Long Island Sound, from Guilford to Johnsons Point.	1569 *a*	1-10,000	W. H. Dennis	1885.
Do	Part of New Haven County	105	1-10,000	T. W. Werner	1840.
Do	North shore of Long Island Sound, from Johnsons Point to South End.	1569 *b*	1-10,000	W. H. Dennis	1885.
Do	Region of New Haven (sheet No. 7)	1446 *b*	1-10,000	R. M. Bache	1876-77.
Do	Region of New Haven (sheet No. 4)	1446 *a*	1-10,000	.....do	1875-76-77.
Do	From New Haven to Fairhaven, Catsons Rock and Whitneyville.	76	1-10,000	J. Farley	1838.
Do	Vicinity of New Haven	1605	1-10,000	R. M. Bache	1877.
Do	Region of New Haven (sheet No. 3)	1445	1-10,000	.....do	1871-77.
Do	Region of New Haven (sheet No. 1)	1444 *a*	1-10,000	.....do	1875-77.
Do	Region of New Haven (sheet No. 2)	1444 *b*	1-10,000	.....do	1875-77.
Do	New Haven (sheet No. 6)	1447 *a*	1-10,000	.....do	1877.
Do	Region of New Haven (sheet No. 5)	1447 *b*	1-10,000	.....do	1876-77.
Do	New Haven Harbor	1296	1-10,000	.....do	1872.
Do	West Haven to Black Rock	22	1-10,000	C. M. Eakin	1837.
Do	From Bridgeport to Mill River, East of New Haven (interior).	35	1-10,000	T. W. Werner	1838.
Do	Country between Milford and New Haven	1779	1-10,000	E. L. Taney	1887.
Do	.....do	1566	1-10,000	W. C. Hodgkins and W. I. Vinal.	1887.
Do	Between New Haven and Bridgeport	1567	1-10,000	.....do	1884-86-87.
Do	From Bridgeport to Frost Point, north shore of Long Island Sound.	1527	1-10,000	E. Hergesheimer	1883.
Do	Frost Point to Norwalk River and the Norwalk Islands.	1537	1-10,000	.....do	1884.
Do	From Black Rock to Norroton	19	1-10,000	C. M. Eakin	1835.
Do	From Westport to Bridgeport	51	1-10,000	T. A. M. Craven	1838.
Do	From Cheshire and Mount Carmel to Tashua and Merwin.	106	1-20,000	T. W. Werner	1839-40.
Do	From Tashua westward, Chestnut Hill to New Canaan.	107	1-10,000	T. A. M. Craven	1839.
Do	Between Ridgefield and Reading	131	1-20,000	H. L. Dickins	1839.
Do	Between Darien and Westport	50	1-10,000	T. A. M. Craven	1838.
Do	Norwalk River to Hollys Pond	1737	1-10,000	C. Hosmer	1885-86.
Do	Greenwich Cove and Stanford Harbor	1707	1-10,000	.....do	1885-86.
Connecticut and New York.	Coscob Harbor and Rye Neck	1708	1-10,000	.....do	1885-86.
Connecticut	Norroton Point to Milton	20	1-10,000	C. M. Eakin	1836.
Do	From Darien to Glenville and Horse Neck	49	1-10,000	T. A. M. Craven	1838.
Do	From Round Hill to New Castle	109	1-10,000	.....do	1839.
Do	Scovills and vicinity	108	1-10,000	.....do	1839.
New York and Connecticut.	From Horse Neck to Rye	48	1-10,000	.....do	1838.
New York	From Field west to Round Hill	110	1-10,000	.....do	1839.
Do	From North Castle to Hudson River at Tarrytown	111	1-10,000	.....do	1839.
Do	Hudson River, Greensburg, and vicinity	112	1-10,000	.....do	1839.
Do	From Kingsbridge to Mamaroneck	47	1-10,000	.....do	1837.
Do	Rye Neck to New Rochelle	1709	1-10,000	C. Hosmer	1885-86-87.
Do	Hart and City islands and vicinity	1515 *a*	1-10,000	C. Hosmer and C. T. Iardella.	1882-83-86.
Do	Rodman to Throgs Neck	46 *bis*	1-10,000	W. M. Boyce	1837.
Do	East and Harlem Rivers, from Fort Schuyler to High Bridge.	604	1-10,000	F. W. Dorr	1857-59.
	South shore of Long Island Sound.				
New York	Part of Long Island, from Napeague Harbor to Montauk Point.	62	1-10,000	C. Renard and B. F. Sands.	1838.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	South shore of Long Island Sound—Continued.				
New York	East end of Long Island, from Split Rock to Montauk Point.	2106	1-10,000	C. T. Iardella	1892.
Do	From Napeague to East Hampton, Long Island	60	1-10,000	C. Renard	1838.
Do	East end of Long Island, Amagansett and Acabomack Harbor eastward to Split Rock.	2053	1-10,000	C. T. Iardella	1891-92.
Do	Napeague Beach	61	1-10,000	W. M. Boyce	1845.
Do	Gardiners Island, Long Island Sound	75	1-10,000	T. A. Jenkins	1838.
Do	....do	1574 *a*	1-10,000	C. Hosmer	1882-83.
Do	Bridgehampton to Acabomack and East Hampton	74	1-10,000	T. A. Jenkins and J. B. Glück.	1838-46.
Do	Coast of Long Island, Sag Harbor, Gardiners Bay, and Three Mile Harbor.	72 *bis*	1-10,000	....do	1838-46.
Do	Shore line of the western part of Gardiners Bay, between Acabomack Harbor and Cedar Island Point, Long Island.	1570	1-10,000	C. Hosmer, W. I. Vinal, and C. T. Iardella.	1884-88.
Do	Shelter Island	69	1-10,000	T. A. Jenkins	1838.
Do	Peconic Bay, from Noyack to Sag Harbor, Long Island.	71	1-10,000	....do	1838.
Do	Shore line of the southern part of Shelter Island	1571	1-10,000	C. Hosmer, W. I. Vinal, and C. T. Iardella.	1884-88.
Do	Shore line of Shelter Island	1572	1-10,000	....do	1884-88.
Do	Plum Island and Gull Island, Long Island Sound	1574 *b*	1-10,000	C. Hosmer	1883.
Do	Plum Island and Fishers Island, Gull Island and the Dumplings.	56	1-10,000	F. H. Gerdes	1838.
Do	South shore of Long Island Sound, Oyster Pond Point to Inlet Point, including the villages of Orient and Greenport.	1577 *a*	1-10,000	C. Hosmer and W. I. Vinal.	1883-84.
Do	North shore of Long Island, Southold and Hortons Point.	1577 *b*	1-10,000	....do	1884.
Do	South Peconic Bay, from Cutchogue to Hallecks Point, Long Island.	68	1-10,000	T. A. Jenkins	1838.
Do	South shore of Little Peconic Bay, Long Island	1772	1-10,000	C. T. Iardella	1887.
Do	North shore of Great and Little Peconic bays, Long Island.	1773	1-10,000	....do	1887.
Do	South shore of Great Peconic Bay, Long Island	1774	1-10,000	....do	1887.
Do	Peconic Bay, Good Ground to Noyack, Long Island	70	1-10,000	T. A. Jenkins	1838.
Do	North shore Long Island, from Coopers Hill to Oyster Pond Point.	55	1-10,000	F. H. Gerdes	1838.
Do	North shore Long Island, from Mattituck Hills 2△ᵃ to Goldsmiths Inlet.	1730	1-10,000	W. I. Vinal	1885.
Do	North shore Long Island, from Roanoke △ᵃ to Mattituck Hills 2△ᵃ.	1729	1-10,000	....do	1885.
Do	Part of Long Island, from Old Landing to Coopers Hills (on the Sound).	54	1-10,000	F. H. Gerdes	1838.
Do	Peconic Bay, River Head to Little Hog Neck, Long Island.	67	1-10,000	T. A. Jenkins	1838.
Do	West shore of Great Peconic Bay, Long Island	1775	1-10,000	C. T. Iardella	1887.
Do	Part of Long Island, from River Head to the Sound	53	1-10,000	F. H. Gerdes	1838.
Do	North shore of Long Island, from East Landing, Wading River, to Roanoke △ᵃ.	1728	1-10,000	W. I. Vinal	1885.
Do	North shore of Long Island, from Rocky Point Landing to East Landing.	1727	1-10,000	....do	1885.
Do	Part of Long Island, north shore, from Mount Misery to Friars Head.	52	1-10,000	F. H. Gerdes	1838.
Do	Part of interior of Long Island	77	1-20,000	H. L. Dickins	1838.
Do	North shore of Long Island, from Mount Misery to Rocky Point Landing.	1726	1-10,000	W. I. Vinal	1885.
Do	Port Jefferson, Setauket, and Conscience Bay	1399	1-10,000	F. H. Gerdes	1874.
Do	Port Jefferson, north shore of Long Island	32	1-10,000	....do	1837-38.
Do	Port Jefferson to Stony Brook	1724	1-10,000	C. T. Iardella and W. I. Vinal.	1885-86.
Do	Setauket, north side of Long Island	43	1-20,000	C. Preuss	1837.
Do	Smithtown, Long Island	42	1-10,000	....do	1837.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	South Shore of Long Island Sound—Continued.				
New York	Crane Neck, north shore of Long Island	31	1-10,000	F. H. Gerdes	1837.
Do	Nissequague River, north shore of Long Island	30	1-10,000	.....do	1837.
Do	Stony Brook to Northport Beach	1723	1-10,000	C. T. Iardella	1886.
Do	Crab Meadow, north shore of Long Island	29	1-10,000	F. H. Gerdes	1837.
Do	Red Hook, Bread and Cheese Hollow, and Smithtown.	41	1-10,000	C. Preuss	1837.
Do	Red Hook, north shore of Long Island	40	1-10,000	... do	1837.
Do	Eatons Neck and adjacent shore	1732	1-10,000	W. C. Hodgkins	1885.
Do	Cow Harbor, north shore of Long Island	28	1-10,000	F. H. Gerdes	1837.
Do	Vicinity of West Hills Station, Long Island	44	1-10,000	H. L. Dickins	1836.
Do	Part of the interior of Long Island	45	1-20,000	.....do	1836-37-38.
Do	Lloyds Neck and adjacent shores	1731	1-10,000	W. C. Hodgkins	1885.
Do	From Hog Island to Eatons Neck, north shore of Long Island.	23	1-10,000	F. H. Gerdes	1836.
Do	Harbor and village of Huntington, north shore of Long Island.	24	1-10,000	A. D. Mackay and F. H. Gerdes.	1836.
Do	Oyster Bay, with shore to Mattinicock Point	1733	1-10,000	W. C. Hodgkins	1885.
Do	Cold Spring and Oyster Bay harbors, Long Island	25	1-10,000	F. H. Gerdes	1837.
Do	From Cold Spring to Glen Cove, Long Island	66	1-10,000	T. A. Jenkins	1838.
Do	Mattinicock Point, north shore of Long Island	26	1-10,000	F. H. Gerdes	1837.
Do	Buckram and vicinity, Long Island	39	1-10,000	C. Preuss	1837.
Do	Hempstead Harbor, Long Island	1722	1-10,000	C. T. Iardella	1886.
Do	Hempstead Harbor, north shore of Long Island	27	1-10,000	F. H. Gerdes	1837.
Do	Cow Neck and Manhasset, Long Island	34	1-10,000	T. W. Werner	1837.
Do	From Newlots to Jamaica and Hicksville	38	1-20,000	T. A. Jenkins	1837.
Do	Shore line of Great Neck and Manhasset Neck	1515 *b*	1-10,000	C. Hosmer and C. T. Iardella.	1883-86
Do	Great Neck, City Island, and Hart Island	33 *bis*	1-10,000	T. Werner and H. L. Whiting.	1837-50.
Do	East River, from Lawrences Point to Throgs Neck and Flushing Bay.	1725	1-10,000	E. Hergesheimer and C. T. Iardella.	1885-86.
Do	From Wards Island to Throgs Neck	488	1-10,000	F. H. Gerdes	1855.
Do	From Little Neck Bay to Flushing Bay	605	1-10,000	H. L. Whiting and C. Rockwell.	1858.
Do	Hewletts Cove, Wilkins Point, and Great Bay	14	1-10,000	C. Renard	1837.
	South shore of Long Island.				
New York	East end of Long Island, Fairfield Pond to Anegansett.	2052	1-10,000	C. T. Iardella	1891.
Do	From Good Ground to East Hampton	59	1-10,000	C. Renard	1838.
Do	East end of Long Island, Town Pond to Fairfield Pond, including Mecox Bay.	2051	1-10,000	C. T. Iardella	1891.
Do	Southampton (interior of Long Island)	73	1-10,000	T. A. Jenkins	1838.
Do	Shinnecock Bay (east end)	1928	1-10,000	C. T. Iardella	1889-90.
Do	Shinnecock Bay	1929	1-10,000	.....do	1889.
Do	Moriches Bay, from Harts Cove to Quantuck Bay	1843	1-10,000	.....do	1888.
Do	From Smiths Point to Good Ground	58	1-10,000	C. Renard	1838.
Do	Moriches Bay, from Smiths Point to Harts Cove	1842	1-10,000	C. T. Iardella	1888.
Do	From Fire Place to Center Moriches	2198	1-10,000	.....do	1894.
Do	From Roberts Dock to Patchogue, south shore of Long Island.	1402	1-10-000	.....do	1875.
Do	Between Patchogue and Smiths Point	2	1-10,000	C. Renard	1835.
Do	Fire Island Beach, from △ⁿ Point Cedar to △ⁿ Point Belleville.	1375 *b*	1-10,000	C. Hosmer	1874.
Do	Vicinity of Patchogue, Long Island	1374 *b*	1-10,000	.....do	1874.
Do	Fire Island Beach, from near Fire Island lighthouse, eastward to △ⁿ Point Cedar.	1375 *a*	1-10,000	.....do	1873-74.
Do	Fire Island base	479	1-10,000	C. Renard	1834.
Do	Islip to Blue Point, Long Island	1374 *a*	1-10,000	C. Hosmer	1874.
Do	From Babylon to Patchogue	1	1-10,000	C. Renard	1834.
Do	West end of Fire Island beach and south shore of Long Island and vicinity of Bayshore and Islip.	1314	1-10.000	C. Hosmer	1873.
Do	Fire Island Inlet	1851	1-10,000	W. H. Dennis	1887.

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	South shore of Long Island—Continued.				
New York	Great South Bay and Oak Island Beach	1539 *b*	1-10,000	J. W. Donn	1880.
Do	Conklins Point to Neguntatogue Creek, including Babylon.	1474	1-10,000	C. T. Iardella	1875.
Do	Eastern part of South Oyster Bay, west part of Great South Bay, Gilgoes Inlet, and east end of Jones Beach.	1539 *a*	1-10,000	J. W. Donn	1880.
Do	Breslau to Ridgewood	1849	1-10,000	W. H. Dennis	1887.
Do	Between Rockaway and Fire Island Inlet	3	1-20,000	C. Renard	1835.
Do	East Hempstead and South Oyster bays	1538 *b*	1-10,000	J. W. Donn	1880.
Do	Shores of Hempstead Bay, Long Island	1538 *a*	1-10,000	....do	1880.
Do	Ridgewood to Baldwin	1850	1-10,000	W. H. Dennis	1887.
Do	Hicksville and Jamaica, Brushville and Miltham	37	1-20,000	T. A. Jenkins	1837.
Do	Hempstead Bay, Far Rockaway to Luces Inlet	1471 *a*	1-10,000	J. W. Donn	1879-80.
Do	Far Rockaway, Lawrence, Woodburg, and East Rockaway.	1471 *b*	1-10,000	C. Junken	1879.
Do	Part of Far Rockaway, Long Island	798	1-9,880	F. W. Dorr	1860.
Do	Rockaway Inlet and Jamaica Bay	535	1-20,150	S. A. Gilbert	1855-56-59.
	New York Bay and Harbor, old surveys, 1835 to 1840.				
New York	Between the Pavilion of Rockaway and the Plum Gut.	4	1-20,000	C. Renard	1835.
Do	Fort Hamilton to Plum Gut, including Gravesend	5	1-10,000	....do	1835.
Do	From Brooklyn to Fort Hamilton and Governors Island.	12	1-10,000	....do	1837.
Do	From Brooklyn to Jamaica (interior)	36	1-10,000	T. A. Jenkins	1837.
Do	From Hewletts Cove to Brooklyn	13	1-10,000	C. Renard	1837.
Do	Hewletts Cove, Wilkins Point, and Great Bay	14	1-10,000	....do	1837.
Do	Harlem River and Throgs Neck	15	1-10,000	....do	1837.
Do	Manhattan Island, northern part of New York City to West Farms.	16	1-10,000	....do	1837.
Do	Near Kingsbridge	113	1-10,000	T. A. M. Craven	1839.
Do	Rodman to Throgs Neck	46 *bis*	1-10,000	W. M. Boyce	1837.
Do	Coast of New York and Long Island Sound	21	1-10,000	C. M. Eakin	1837.
Do	From Kingsbridge to Mamaroneck	47	1-10,000	T. A. M. Craven	1837.
Do	Hudson River, Greensburg and vicinity	112	1-10,000	....do	1839.
New York and New Jersey.	West side of Hudson River, from Boompers Hook north as far as Croton Point and west to Goffle Mountain.	132	1-20,000	H. L. Dickins	1840.
New York	From Fort Lee to Boompers Hook	96	1-10,000	T. A. Jenkins	1839.
New Jersey	From North Scralenburg to Passaic River	97	1-10,000	....do	1839.
Do	From Hackensack to Patterson	98	1-10,000	....do	1839.
Do	Between Hackensack and Bergen	17	1-10,000	C. Renard	1837.
Do	From Patterson to Weasel	99	1-10,000	T. A. Jenkins	1839.
Do	Belleville	101	1-10,000	....do	1839.
Do	From Hackensack to Newark and Elizabethtown	100	1-10,000	....do	1839.
Do	From Weasel Mountain to Springfield	102	1-10,000	....do	1839.
Do	From Jersey Point to Constables Point	18	1-10,000	C. Renard	1837.
Do	From Elizabethtown to Newark	10	1-10,000	C. Renard and T. A. Jenkins	1836.
New York	Tompkinsville, Staten Island	6	1-5,000	C. Renard	1835.
Do	Staten Island	9	1-10,000	....do	1835-36.
New Jersey	From Perth Amboy to Elizabethtown	8	1-10,000	....do	1836.
Do	Rahway	104	1-10,000	T. A. Jenkins	1839.
Do	Springfield	103	1-10,000	....do	1839.
Do	South Rahway (interior)	133	1-10,000	T. A. M. Craven	1840.
Do	Woodbridge to New Market (interior)	134	1-10,000	....do	1840.
Do	Bound Brook (interior)	135	1-10,000	....do	1840.
Do	New Brunswick and vicinity	136	1-10,000	....do	1840.
Do	Sand Hills and vicinity	137	1-20,000	....do	1839-40.
Do	Valley of the Raritan, from Perth Amboy to New Brunswick.	11	1-10,000	C. Renard	1836.
New York	From the Highlands of Navesink to South Amboy, north shore of New Jersey.	7	1-10,000	....do	1836.
New Jersey	From Eatontown to Lawrences Brook	122	1-20,000	B. F. Sands	1840.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	New York Bay and Harbor, old surveys, 1885 to 1840—Continued.				
New Jersey	Sandy Hook	239	1-10,000	C. Renard	1836.
Do	From Navesink to Poplar Creek	114	1-10,000	B. F. Sands	1839.
Do	Portions of Middlesex and Monmouth counties	145	1-20,000	H. L. Dickins	1841.
New York and New Jersey.	New York Harbor, from Sandy Hook to New York City and northward.	1947	1-30,000	C. M. Eakin	1843-44.
Do	New York Harbor, from Highlands of Navesink to Jersey City and northward, including Staten Island.	1946	1-30,000	do	1843-44.
	New York Harbor surveys, 1848 to 1875.				
New York	Rockaway Inlet and Jamaica Bay	535	1-20,150	S. A. Gilbert, J. A. Sullivan, W. S. Gilbert, and F. W. Dorr.	1855-56-59.
Do	Coney Island and Dead Horse Inlet	586	1-10,000	S. A. Gilbert and J. A. Sullivan.	1855-56.
Do	From Gowanus Bay to Bath, western end of Long Island.	487	1-10,000	S. A. Gilbert	1855-56.
Do	Gowanus Bay and vicinity, Long Island	599	1-10,000	S. A. Gilbert and J. A. Sullivan.	1857.
Do	do	597	1-10,000	S. A. Gilbert	1856.
Do	do	598	1-10,000	S. A. Gilbert and W. S. Gilbert.	1856.
Do	East River, from Brooklyn to Hell Gate	483	1-10,000	F. H. Gerdes	1855.
Do	Brooklyn and vicinity	917	1-10,000	do	1856-63.
Do	Part of Brooklyn, including Williamsburg and Green Point.	789	1-10,000	F. W. Dorr	1859-60.
Do	Interior of Long Island, between Brooklyn, Flushing, and Jamaica.	924	1-10,000	H. L. Whiting and J. W. Donn.	1862.
Do	From Flushing Bay to Hunters Point	808	1-10,000	H. L. Whiting	1856.
Do	From Little Neck Bay to Flushing Bay	605	1-10,000	H. L. Whiting and C. Rockwell.	1858.
Do	Hell Gate and vicinity	258	1-5,000	H. L. Whiting	1848.
Do	Wards, Randalls, North and South Brother, and Rikers islands.	675	1-5,000	H. L. Whiting and C. Rockwell.	1857.
Do	From Wards Island to Throgs Neck	488	1-10,000	F. H. Gerdes	1855.
Do	East and Harlem rivers, from Fort Schuyler to High Bridge.	604	1-10,000	F. W. Dorr	1857-59.
Do	Cities of New York and Brooklyn	608	1-10,000	A. Boschke	1855-57.
Do	Manhattan Island	475	1-10,000	F. H. Gerdes	1854-55-63.
Do	Upper part of Manhattan Island	658 *a*	1-10,000	J. Mechan	1857.
Do	A compilation of shore line of Harlem River and Spuyten Duyvil Creek, with adjacent topography.	658 *b*	1-10,000	do	1855-59.
Do	From High Bridge to Kings Bridge, east side of Harlem River.	775	1-10,000	F. W. Dorr and C. Rockwell.	1859.
Do	Hudson River, from Spuyten Duyvil to Yonkers	810	1-10,000	H. L. Whiting and C. Rockwell.	1859.
Do	Hudson River, from Spuyten Duyvil Creek to Sounding Point.	419	1-10,000	F. H. Gerdes	1853.
Do	Hudson River, from Jeffreys Hook to Spuyten Duyvil Creek.	418	1-10,000	do	1853.
Do	West shore of Hudson River, from Fort Lee north and south.	609	1-10,000	H. L. Whiting and C. Rockwell.	1857.
New York and New Jersey.	From Guttenberg to Tabby Hook	485	1-10,000	F. H. Gerdes	1856.
New Jersey	Resurvey of west shore of Hudson River from Guttenberg to Bulls Ferry.	610 *c*	1-10,000	H. L. Whiting and R. B. Palfrey.	1875.
New York and New Jersey.	Hudson River, Jersey City to Guttenberg	484	1-10,000	F. H. Gerdes	1855-56.
New Jersey	Resurvey of Hoboken and Jersey City wharf line from Guttenberg to New Jersey Central Railroad pier.	610 *b*	1-10,000	H. L. Whiting, W. M. De Wees, and R. B. Palfrey.	1873-75.
Do	West line of Hudson River, from Jersey City to Guttenberg.	610 *a*	1-10,000	H. L. Whiting, F. W. Dorr, and C. Rockwill.	1857-59.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	New York Harbor surveys, 1848 to 1875—Continued.				
New Jersey	Jersey City to Caven Point	482	1-10,000	A. S. Wadsworth	1855.
New York	Governors, Bedloes, and Ellis islands, New York Harbor.	677	1-5,000	J. Mechan	1857.
Do	Bedloes and Ellis islands	543	1-10,000	F. H. Gerdes	1855.
New Jersey	New York Harbor, Bergen Neck	662	1-10,000	J. Mechan and H. L. Whiting.	1857-75.
New York	New York Harbor, Caven Point to Kill van Kull	489	1-10,000	A. S. Wadsworth	1855.
New Jersey	Bergen Neck, from Centerville to New Jersey Railroad.	733	1-10,000	F. W. Dorr	1858.
New York	Passaic River and Newark Neck	734	1-10,000	....do	1858.
New York and New Jersey.	Newark Bay and part of Kill van Kull	533	1-10,000	A. S. Wadsworth	1855.
New York	From New Brighton to Great Kills, Staten Island	490	1-10,000	....do	1855.
Do	Staten Island, New York Harbor, from New Brighton to Fresh Kills.	816	1-10,000	F. W. Dorr and C. M. Bache.	1856-65.
New York and New Jersey.	Northeastern part of Staten Island and Bergen Point, including resurvey of wharf lines through Kill van Kull.	751	1-10,000	H. L. Whiting and R. B. Palfrey.	1857-75.
New York	Staten Island, from Wards Point to Great Kills	680	1-10,000	H. L. Whiting and F. W. Dorr.	1856.
Do	....do	680 *bis*	1-10,000	....do	1856.
Do	From Great Kills to Wards Point, Staten Island	532	1-10,000	A. S. Wadsworth	1855.
New Jersey	Elizabethport to Rahway Creek	530	1-10,000	....do	1855.
Do	The western shore of Newark Bay and Staten Island Sound, from the mouth of Passaic River to Perth Amboy.	729	1-10,000	F. W. Dorr	1858.
Do	Staten Island Sound, Rahway Creek to Woodbridge Landing.	531	1-10,000	A. S. Wadsworth	1855.
Do	Staten Island Sound, Perth Amboy to Woodbridge Landing.	534	1-10,000	H. Adams	1855.
Do	From South Amboy to Keyport	542	1-10,000	A. M. Harrison and P. R. Hawley.	1855-56.
Do	From Point Comfort eastward, coast of New Jersey	541	1-10,000	A. M. Harrison and W. H. Dennis.	1855-56.
Do	Shore of Sandy Hook and vicinity	486	1-10,000	A. M. Harrison	1855.
Do	Sandy Hook Island	252	1-20,000	S. A. Gilbert	1848.
Do	Sandy Hook	278	1-20,000	H. L. Whiting	1850.
Do	The shore of Sandy Hook, from the Ocean House northward.	342	1-10,000	R. M. Bache	1851.
Do	Shore line of Sandy Hook	413	1-10,000	F. H. Gerdes	1853.
Do	Resurvey of Sandy Hook	894	1-5,000	H. L. Whiting and F. P. Webber.	1862.
	Surveys of New York Bay and Harbor, between 1875 and 1892.				
New York	Eastern part of Jamaica Bay, from Big Mucks Creek to head of bay.	1482 *b*	1-10,000	J. W. Donn	1878.
Do	Rockaway Beach and middle part of Jamaica Bay	1482 *a*	1-10,000	....do	1878.
Do	Rockaway Beach, Long Island	1593	1-10,000	J. Hergesheimer	1885.
Do	Rockaway Beach and Barren Island, Long Island	1594	1-5,000	....do	1885.
Do	West end of Rockaway Beach, Barren Island, and entrance of Dead Horse Inlet, showing changes in Rockaway Inlet since survey of 1856.	1449	1-5,000	J. W. Donn	1877.
Do	Jamaica Bay, western part, from Barren Island to Canarsie Point.	1448 *a*	1-5,000	....do	1877.
Do	Jamaica Bay, northwest portion, including Canarsie Bay.	1448 *b*	1-5,000	....do	1877.
Do	Coney Island, Sheepshead Bay, and Gravesend Bay	1456	1-5,000	....do	1878.
Do	Coney Island	1592	1-5,000	J. Hergesheimer	1885.
Do	Resurvey of the wharf and shore line of the Narrows of New York Harbor.	1413 *a*	1-10,000	H. L. Whiting	1875.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Surveys of New York Bay and Harbor, between 1875 and 1892—Continued.				
New York	Shore line of Long and Staten islands from Red Hook to Unionville, and from North Shore to Fort Tompkins.	1576	1-10,000	D. B. Wainwright	1885.
Do	Resurvey of wharf and shore line, East River and Brooklyn front from Bay Ridge to Astoria.	1414	1-10,000	H. L. Whiting	1875.
Do	East River front of New York and Brooklyn, from Red Hook Battery to Blackwells Island.	1586	1-10,000	E. Hergesheimer	1885.
Do	Blackwells, Wards, and Randalls islands and adjacent shores of East and Harlem Rivers from Fifty-first street, New York City, to Lawrences Point.	1668	1-5,000	do	1885.
Do	Harlem River, from Randalls Island to High Bridge.	1703	1-5,000	D. B. Wainwright	1886.
Do	Harlem River, from High Bridge to Spuyten Duyvil Creek.	1742	1,5,000	do	1886.
Do	Hudson River, from Eightieth street to Spuyten Duyvil Creek.	1743	1-10,000	do	1886.
Do	Shore line and dock line, Hudson River, Fifteenth street to Sixty-third street and opposite shore.	1573	1-5,000	do	1885.
Do	Shore line of the Hudson River, from the Battery to Fifteenth street and opposite shore.	1578	1-5,000	do	1885.
Do	Shore line Cavens Point to New Jersey Central Railroad docks.	1575	1-5,000	do	1885.
Do	Ellis Island	2098	1-2,500	W. P. Ritter	1892.
New York and New Jersey.	Kill van Kull and east shore of Bergen Neck	1579	1-10,000	E. L. Taney	1885.
Do	Newark Bay and mouths of Passaic and Hackensack rivers.	1719	1-10,000	do	1885-86.
New Jersey	Hackensack and Passaic rivers and vicinity	1398 *a*	1-10,000	F. H. Gerdes	1871-74.
Do	Hackensack River, from Erie Railroad Bridge to the town of Hackensack.	1398 *b*	1-10,000	do	1872-73-74.
Do	English Creek, from Little Ferry, on Hackensack River, to the head of navigation.	1398 *c*	1-10,000	do	1873-74.
New York	East shore of Staten Island, from the Narrows to Great Kill.	1710	1-10,000	R. M. Bache	1886.
Do	Quarantine piers, New York Bay	1413 *b*	1-10,000	H. L. Whiting	1875.
Do	Southern shore of Staten Island, from Great Kill to Princess Bay.	1711	1-10,000	R. M. Bache	1886.
New York and New Jersey.	Head of Raritan Bay, including the mouths of Raritan River and Arthur Kill.	1712	1-10,000	do	1886.
Do	Shores of Arthur Kill, from Elizabethport to Rossville.	1720	1-10,000	E. L. Taney	1886.
New Jersey	Raritan River, from Crab Island to New Brunswick	1354 *a*	1-5,000	F. H. Gerdes	1873.
Do	South River (a branch of the Raritan), from Brisset's brickyard to mouth.	1354 *b*	1-5,000	do	1873.
Do	From Keyport to Port Monmouth	1713	1-10,000	D. B. Wainwright	1886.
Do	Port Monmouth to Sandy Hook	1721	1-10,000	do	1886.
Do	North part of Sandy Hook	1580	1-5,000	E. L. Taney	1885.
Do	From Highlands of Navesink to Shrewsbury River	1005	1-10,000	C. M. Bache	1864-65.
	Hudson River.				
New York and New Jersey.	From Guttenberg to Tabby Hook	485	1-10,000	F. H. Gerdes	1855-56.
New York	Hudson River, from Jeffreys Hook to Spuyten Duyvil Creek.	418	1-10,000	do	1853.
Do	Hudson River, from Spuyten Duyvil Creek to Sounding Point.	419	1-10,000	do	1853.
New York and New Jersey.	Hudson River, from Spuyten Duyvil Creek to Yonkers.	810	1-10,000	H. L. Whiting and C. Rockwell.	1859.
Do	Hudson River, from Yonkers up	811	1-10,000	do	1859.
Do	Hudson River, near Piermont	800	1-10,000	J. Mechan	1860.
New York	Hudson River, Hastings to Tarrytown	420	1-10,000	F. H. Gerdes	1853.
Do	From North Castle to Hudson River at Tarrytown	111	1-10,000	T. A. M. Craven	1839.
Do	Tappan Bay, Hudson River	770	1-10,000	J. Mechan	1859.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Hudson River—Continued.				
New York	Hudson River, from Tarrytown to Croton Point	421	1-10,000	F. H. Gerdes	1853.
Do	East shore of Hudson, from near Tarrytown to Croton.	968	1-10,000	H. L. Whiting and J. W. Donn.	1862-64.
Do	Hudson River, from Sing Sing to Stony Point	468	1-10,000	F. H. Gerdes	1854.
New York and Connecticut.	Hudson River, from Croton Point to Bakers Hill and Bald Hill.	95	1-20,000	H. L. Dickins	1839-40.
New York	West side of Hudson River, from Hook Mountain to Haverstraw.	969	1-10,000	C. Rockwell and H. L. Whiting.	1864.
Do	West shore of Hudson River, from Haverstraw to Tompkins Cove.	1514	1-10,000	W. I. Vinal	1881.
Do	East side of Hudson River, from Croton to Peekskill.	1472	1-10,000	H. L. Whiting	1877-78.
Do	Hudson River, from Crugers to Peekskill	480	1-10,000	F. H. Gerdes	1854.
Do	Hudson River, Tompkins Cove to Highland Falls	2084	1-10,000	J. W. Donn	1891.
Do	East shore of Hudson River, Peekskill to Constitution Island.	1516 *a*	1-10,000	H. L. Whiting and W. C. Hodgkins.	1878.
Do	Anthonys Nose to West Point	1010	1-10,000	J. Mechan	1861.
Do	Hudson River, vicinity of West Point	1623	1-10,000	H. L. Whiting	1881.
Do	Reservation for United States Military Academy at West Point.	1504	1-4,800	.....do	1880.
Do	East shore of Hudson River, Constitution Island to Rocky Bluff.	1516 *b*	1-10,000	.....do	1879.
Do	Hudson River, Crows Nest Mountain to Cornwall	2083	1-10,000	J. W. Donn	1891.
Do	Shore line of Hudson River, Cold Spring to Shermans Dock.	1011	1-10,000	F. Mechan	1861.
Do	Hudson River, from Moodna Creek to Newburg and Fishkill Ferry.	2119	1-10,000	J. W. Donn	1892.
Do	Newburg and Fishkill to Roseton and Low Point, Hudson River.	2181	1-10,000	.....do	1894.
Do	Reconnoissance of Rondout Creek	727	1-5,000	E. Blunt	1858.
Do	Town and harbor of Rondout and vicinity	1533 *a*	1-2,500	F. H. Gerdes	1868.
Do	South Rondout westward	1533 *b*	1-2,500	.....do	1868.
Do	Esopus Creek, Ulster County	726	1-5,000	C. Fendall	1858.
Do	Hudson River, Normans Kill to Albany	593	1-5,000	A. S. Wadsworth	1856.
Do	Hudson River, $\triangle^n$ Point Welch to $\triangle^n$ Point Dow	594	1-5,000	.....do	1856.
Do	Hudson River, Cow Island to Bear Island	595	1-5,000	.....do	1856.
Do	Hudson River, $\triangle^n$ Point Ten Eyke to $\triangle^n$ Point Castleton.	596	1-5,000	.....do	1856.
Do	Hudson River, New Baltimore to Coeymans	692	1-5,000	A. Strauss	1856.
	Lake Champlain.				
New York and Vermont.	Lake Champlain, Whitehall to Cold Spring, including South Bay.	1361	1-10,000	Andrew Braid	1874.
Do	Lake Champlain, from below Chipmans Point to Pulpit Point.	1361 *a*	1-10,000	.....do	1874.
Do	Lake Champlain, from Larabel Landing to Chipmans Point, including Fort Ticonderoga.	1360 *b*	1-10,000	.....do	1874.
New York	Lake Champlain, Fort Ticonderoga and vicinity	1360 *c*	1-2,500	.....do	1874.
New York and Vermont.	Lake Champlain, from Plumies Point southward, including town of Crown Point.	1360 *a*	1-10,000	.....do	1874.
Do	Lake Champlain, Elm Point to Crown Point	1368 *b*	1-10,000	C. T. Iardella and H. W. Bache.	1874.
New York	Lake Champlain, fortifications at Crown Point	1368 *c*	1-2,500	C. T. Iardella	1874.
New York and Vermont.	Lake Champlain, Potash Point to Northwest and Button bays.	1368 *a*	1-10,000	C. T. Iardella and H. W. Bache.	1874.
Do	Lake Champlain, Scotch Bonnet to Split Rock Point	1367 *b*	1-10,000	.....do	1874.
Do	Lake Champlain, Split Rock Point to Essex	1367 *a*	1-10,000	.....do	1874.
Do	Lake Champlain, Saxtons Point to Hills Point	1366 *a*	1-10,000	.....do	1874.
Vermont	Lake Champlain, Shelburne Bay and vicinity	1394	1-10,000	H. G. Ogden and Andrew Braid.	1873.
Do	Lake Champlain, Shelburne Point to Apple Tree Point.	1181 *a*	1-10,000	F. W. Dorr	1870.

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	Lake Champlain—Continued.				
Vermont	Lake Champlain, city of Burlington and vicinity	1181 *b*	1-10,000	H. G. Ogden and Andrew Braid.	1872.
Do	Lake Champlain, from Apple Tree Point to Hogs Back Island.	1182	1-10,000	F. W. Dorr	1870.
Do	Malletts Bay and vicinity	1205	1-10,000	C. Hosmer	1871.
Do	Lake Champlain, southeastern part of Grand Island	1186	1-10,000	do	1871.
Do	Lake Champlain, Sand Bar Bridge to Savage Island	1206	1-10,000	do	1871.
Do	Lake Champlain and vicinity, Knights Island and Ladds Point.	1207	1-10,000	do	1871.
Do	Lake Champlain, St. Albans and Lapans bays, including Potters and Woods islands.	1208	1-10,000	do	1871.
Do	Lake Champlain, Butlers Island northward to McQuam Bay.	1209	1-10,000	do	1871.
Do	Lake Champlain, Missisquoi Bay (lower part)	1222	1-10,000	H. G. Ogden and Andrew Braid.	1871.
Vermont and Canada.	Lake Champlain, Missisquoi Bay, from the boundary line southward.	1223	1-10,000	do	1871.
Vermont	Lake Champlain, La Motte and Alburg passages	1220	1-10,000	do	1871.
New York and Vermont.	Lake Champlain, Isle La Motte to the boundary line.	1221	1-10,000	do	1871.
Do	Lake Champlain, Point au Roche to Long and Sandy points.	1219	1-10,000	do	1871.
Do	Lake Champlain, from the Gut to Point au Roche	1218	1-10,000	do	1871.
Do	Lake Champlain, Treadwells Bay and vicinity	1217	1-10,000	do	1871.
New York	Plattsburg and vicinity	1184 *a*	1-10,000	do	1872.
Do	Cumberland Head to Valcours Island	1184 *b*	1-10,000	C. Hosmer	1870.
Do	Bluff Point to Port Kent, including Valcours Island	1320	1-10,000	H. G. Ogden and Andrew Braid.	1873.
Do	Lake Champlain, from Trembleau Point to Port Jackson.	1183	1-10,000	F. W. Dorr	1870.
Do	Lake Champlain, Port Kent to Jones Point	1319 *a*	1-10,000	H. G. Ogden and Andrew Braid.	1873.
Do	Lake Champlain, southwestern shore of Willsboro Bay.	1319 *b*	1-10,000	H. G. Ogden	1873.
Do	Lake Champlain, Trembleau Point to Ligonier Point.	1185	1-10,000	F. W. Dorr and C. Hosmer.	1870.
New York and Vermont.	Lake Champlain, Saxtons Point to Hills Point	1366 *a*	1-10,000	C. T. Iardella and H. W. Bache.	1874.
	Coast of New Jersey.				
New Jersey	From Navesink to Poplar Creek	114	1-10,000	B. F. Sands	1839.
Do	From Eatontown to Lawrences Brook	122	1-20,000	do	1840.
Do	From Highlands of Navesink to Shrewsbury River	1005	1-10,000	C. M. Bache	1864-65.
Do	Long Branch and vicinity	1022	1-10,000	do	1866.
Do	From Poplar Creek to Manasquan River	115	1-10,000	B. F. Sands	1839.
Do	Portions of Middlesex and Monmouth counties	145	1-20,000	H. L. Dickins	1841.
Do	From Deal to Squam Village	1083	1-10,000	C. M. Bache	1867.
Do	From Squam Village to head of Barnegat Bay	1084	1-10,000	do	1868.
Do	Manasquan to Metedeconk River	116	1-10,000	B. F. Sands	1839.
Do	From Tillers Tavern to Blue Ball (interior)	158	1-20,000	H. L. Dickins	1842.
Do	From Toms River northward	1407	1-20,000	C. M. Bache	1875.
Do	From Metedeconk to Cedar Creek	117	1-10,000	B. F. Sands	1839.
Do	Vicinity of Manchester and Toms River (interior)	159	1-20,000	H. L. Dickins	1842.
Do	From Barnegat to Toms River	1371	1-20,000	C. M. Bache	1874.
Do	From Metedeconk River to Barnegat	120	1-20,000	C. Renard	1839.
Do	From Cedar Creek to Barnegat	118	1-10,000	B. F. Sands	1839.
Do	Farrago Forge to Barnegat (interior)	160	1-20,000	H. L. Dickins	1842.
Do	Barnegat Inlet	1015	1-10,000	C. Fendall	1866.
Do	From Barnegat Inlet to Flat Island	121	1-20,000	C. Renard	1839.
Do	From Barnegat Bay to Little Egg Harbor	119	1-20,000	B. F. Sands	1840-41.
Do	Manahawken to Barnegat	1315 *b*	1-20,000	C. M. Bache and H. W. Bache.	1873.
Do	Tuckerton and Manahawken	1315 *a*	1-20,000	do	1872.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Coast of New Jersey—Continued.				
New Jersey	Little Egg Harbor and part of Mullica River	1333	1-20,000	C. M. Bache	1871.
Do	Mullica River, from Port Republic to Green Brook	1318	1-10,000	H. M. De Wees	1873.
Do	From Little Egg Harbor to Bakersville	142	1-20,000	B. F. Sands	1841.
Do	Vicinity of Absecon Inlet	1166	1-20,000	C. M. Bache and H. W. Bache.	1869-70.
Do	Absecon Inlet	952	1-10,000	H. W. Bache	1863-64.
Do	Great Egg Harbor Bay and shore line, from Absecon Inlet southward to Pecks Beach L. S. S.	2054	1-20,000	E. E. Haskell	1891.
Do	From Bakersville to Great Egg Harbor Bay	143	1-10,000	B. F. Sands	1841.
Do	Great Egg Harbor Bay	146	1-10,000	.....do	1842.
New York	Above and below Great Egg Harbor	1744	1-20,000	C. M. Bache	1886.
New Jersey	From Great Egg Harbor to Hereford	147	1-10,000	B. F. Sands	1842.
Do	Southwestward from Corsons Inlet	1597	1-20,000	C. M. Bache	1883-85.
Do	Hereford Inlet, northward	1532	1-10,000	.....do	1881.
Do	From Cold Spring Inlet to Hereford Inlet	1483	1-10,000	.....do	1880.
Do	From Cape May Court-House to Cold Spring	154	1-10,000	F. H. Gerdes	1842.
Do	From Hereford Inlet to Cape May Light-house	148	1-10,000	G. D. Wise	1842.
Do	Cape May City and vicinity	1470	1-10,000	C. M. Bache	1879.
	Delaware Bay and River.				
New Jersey	The peninsula of Cape May	149	1-10,000	G. D. Wise	1842.
Do	From Mareys Landing to Dennis Creek	153	1-10,000	F. H. Gerdes	1842.
Do	From near the Hummocks to New England Creek	1549 *a*	1-20,000	R. M. Bache	1883.
Do	From the Hummocks to Egg Island Light-House	1549 *b*	1-20,000	R. M. Bache and E. L. Taney.	1883-84.
Do	From Cohansey to Dennis Creek	157	1-20,000	H. L. Whiting	1842.
Do	From Cohansey to West Creek, Delaware Bay	152	1-20,000	F. H. Gerdes	1842.
Do	From Egg Island Light to Sea Breeze Beach	1661	1-20,000	R. M. Bache and E. L. Taney.	1884-85.
New Jersey and Delaware.	From Stony Point to Ben Davis Point	63	1-20,000	F. H. Gerdes	1841.
Do	.....do	141	1-10,000	.....do	1841.
New Jersey	From Salem Creek to Cohansey Creek	155	1-20,000	H. L. Whiting	1842-43.
Do	From Jacobs Creek to Sea Breeze	1565	1-20,000	R. M. Bache	1885.
Do	From Elsingboro Point to below Jacobs Creek	1550	1-20,000	.....do	1882-83.
New Jersey and Delaware.	From Listons Point to Pea Patch Island	140	1-10,000	F. H. Gerdes	1841.
Do	From Wilmington to Pea Patch Island	138	1-10,000	.....do	1841.
New Jersey	From Kellys Point to Elsingboro Point	1505 *b*	1-10,000	R. M. Bache	1882.
Do	From Deep Water Point to Kellys Point	1505 *a*	1-5,000	.....do	1881-82.
Do	From Salem Creek to Penns Grove	156	1-10,000	H. L. Whiting	1843.
Delaware	From Wilmington to Newcastle	139	1-10,000	F. H. Gerdes	1839.
Do	North of Wilmington (interior)	162	1-20,000	J. J. S. Hassler	1846.
Delaware and Maryland.	From Wilmington to Maryland boundary (interior)	169	1-20,000	T. W. Werner	1843.
Do	From Ash Signal to Riggs Hill, including head of Elk River (interior).	170	1-20,000	.... do	1843.
New Jersey	Penns Grove to Raccoon Creek	163	1-10,000	J. J. S. Hassler	1846.
New Jersey and Pennsylvania.	From Penns Grove to Lazaretto	161	1-10,000	W. M. Boyce	1841-42.
Do	From Lazaretto to mouth of Schuylkill River	164	1-10,000	.....do	1842.
Do	Vicinity of Philadelphia	165	1-10,000	.....do	1842.
Do	From Philadelphia and Camden north	168	1-10,000	J. J. S. Hassler	1843-44.
Do	From Torresdale to Burlington and Bristol	167	1-10,000	.....do	1843-44.
Do	From Bristol to Morrisville	171	1-10,000	.....do	1843-44.
Do	From Newbolds Island to White Hill	173	1-10,000	.....do	1843-44.
Pennsylvania and New Jersey.	From Bordentown to Trenton	172	1-10,000	G. D. Wise	1844.
Do	From Trenton to Newtown and Hopewell	144	1-20,000	T. A. M. Craven	1841.
New Jersey	Princeton and vicinity	127	1-20,000	F. H. Gerdes	1840.
Do	From near South Penns Grove to Deep Water Point	1509 *b*	1-5,000	R. M. Bache	1881.
Do	From Penns Grove toward Deep Water Point	1509 *a*	1-5,000	.....do	1881.

List of orignal topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Delaware Bay and River—Continued.				
New Jersey	From Old Mans Creek to the outskirts of Penns Grove.	1545	1-5,000	R. M. Bache	1881.
Do	From Old Mans Creek to Raccoon Creek	1615	1-5,000	....do	1881.
Pennsylvania and New Jersey.	From Simpsons Wharf to Chester	1485	1-5,000	C. T. Iardella	1880-81.
Do	From △ⁿ Station Powder Magazine to Simpsons Wharf.	1484 *b*	1-5,000	....do	1880.
Do	From Fort Mifflin to △ⁿ Station Powder Magazine	1484 *a*	1-5,000	....do	1880.
Do	League Island and mouth of Schuylkill River	1991	1-9,600	R. M. Bache	1890.
Do	Philadelphia, Greenwich Point to Fort Mifflin	2100	1-2,400	....do	1891.
Do	Eastern part of League Island, showing condition of Old Back Channel.	1582	1-3,000	G. Davidson	1863.
Do	....do	1583	1-3,000	....do	1863.
Do	Shore line, Delaware River, from Kaighns Point to Howells Cove.	1945	1-4,800	R. M. Bache	1878-79.
Pennsylvania	Shore line, Delaware River, from site of navy-yard to League Island and mouth of Schuylkill River.	1944	1-4,800	....do	1878-79.
Do	Water front of Philadelphia, from Tasker street to Pollock street.	1986	1-1,200	....do	1889.
Pennsylvania and New Jersey.	Delaware River, from Bridesburg to Fort Mifflin	1992	1-9,600	....do	1890.
Pennsylvania	Water front of Philadelphia, from Market street to Tasker street.	1985	1-1,200	....do	1889.
Do	Water front of Philadelphia, from Dickinson street to Poplar street.	1957	1-4,800	....do	1878.
Pennsylvania and New Jersey.	Shore line, Delaware River, from Reading Railroad coal wharves to site of navy-yard.	1943	1-4,800	....do	1878-79
Do	Coopers Point and Pettys Island	1956	1-4,800	....do	1878.
Pennsylvania	Water front of Philadelphia, from Susquehanna avenue to Market street.	1902	1-1,200	....do	1888-89
Do	Philadelphia water front, from Erie avenue to Susquehanna avenue.	2099	1-1,200	....do	1890.
Pennsylvania and New Jersey.	Shore line, Delaware River, Bridesburg to Reading Railroad coal wharves.	1942	1-4,800	....do	1878-79.
Do	Port Richmond to Ten Mile Point	1993	1-9,600	....do	1890.
Pennsylvania	Water front of Philadelphia, from Bridge street to Erie avenue.	1934	1-1,200	....do	1888.
Pennsylvania and New Jersey.	Delaware River, Bridesburg Wharf, and Pensauken Creek to Poquessing Creek and Delanco (five tracings).	2144	1-2,400	Survey department of Philadelphia.	1885.
Pennsylvania	League Island Channel and vicinity	975	1-2,500	R. M. Bache	1865.
Do	Stakes in the Gut east of the bridge, League Island	975 *bis*	1-2,500	....do	1865.
Do	Schuylkill River, from Grays Ferry to Girard Point	1853	1-7,600	J. Hergesheimer	1888.
Do	Schuylkill River, from League Island to Grays Ferry Bridge.	1927	1-4,800	....do	1889.
Do	Schuylkill River, Philadelphia	1854	1-9,600	....do	1888.
Do	Schuylkill River, League Island to Grays Ferry	1313 *a*	1-5,000	H. G. Ogden	1873.
Do	Schuylkill River, Grays Ferry to Suspension Bridge	1313 *b*	1-5,000	....do	1873.
Do	Schuylkill River, Grays Ferry Bridge to Fairmount Dam.	1852	1-4,800	J. Hergesheimer	1888-89.
Pennsylvania and Delaware.	Chester to Naamans Creek △ⁿ	1502 *a*	1-5,000	C. T. Iardella	1881.
Delaware	Naamans △ⁿ to Lippincotts Wharf	1502 *b*	1-5,000	C. T. Iardella	1881.
Delaware and Pennsylvania.	Pennsylvania and Delaware boundary survey (topography and triangulation.)	2140	1-40,000	W. C. Hodgkins	1892-93.
Delaware	Lippincotts Wharf to Edgemoor Marsh	1507 *a*	1-5,000	C. T. Iardella	1881.
Do	Edgemoor Marsh to Maynes Ditch	1507 *b*	1-5,000	....do	1881.
Do	Maynes Ditch to Newcastle, Delaware River	1511 *a*	1-5,000	....do	1881.
Do	Newcastle to Reedy Point	1511 *b*	1-10,000	....do	1882.
Do	St. Georges Creek to Bombay Hook Light	1547 *a*	1-20,000	....do	1882.
Do	Position of proposed range lights near Port Penn	1600	1-5,000	F. C. Donn	1875.
Do	Position of proposed range lights near Listons Point	1601	1-5,000	....do	1875.
Do	Bombay Hook Light to Mahons River Light	1547 *b*	1-20,000	C. T. Iardella	1883.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Delaware Bay and River—Continued.				
Delaware	Bombay Hook Island to Mispillion Creek	150	1-20,000	F. H. Gerdes	1842.
Do	Mahons River Light to △ⁿ Clark	1548 *a*	1-20,000	C. T. Iardella	1883.
Do	△ⁿ Clark to △ⁿ Plum	1548 *b*	1-20,000	....do	1884.
Do	From Mispillion Creek Light to Cape Henlopen	151	1-20,000	F. H. Gerdes	1842.
Do	Cape Henlopen and vicinity	1503	1-20,000	W. I. Vinal	1882.
Do	Cape Henlopen	1503 *bis*	1-20,000	E. Hergesheimer	1884.
Do	From Cape Henlopen to Indian River	226	1-20,000	J. J. S. Hassler	1845.
	Cape Henlopen to Cape Charles.				
Delaware	Cape Henlopen and vicinity	1503	1-20,000	W. I. Vinal	1882.
Do	Cape Henlopen	1503 *bis*	1-20,000	E. Hergesheimer	1884.
Do	From Cape Henlopen to Indian River	226	1-20,000	J. J. S. Hassler	1845.
Delaware and Maryland.	From Salt Pond Beach Signal to Dromedary Signal.	299	1-20,000	G. D. Wise	1850.
Maryland	From Beach House to South Birch	263	1-20,000	G. D. Wise and L. A. Sengteller.	1849-77.
Do	From head of Assateague Bay to Popes Island Beach	264	1-20,000	G. D. Wise	1850.
Do	From Popes Island Beach to Green River Inlet	311	1-20,000	....do	1850.
Maryland and Virginia.	Assateague Island and vicinity	763	1-20,000	C. Ferguson	1859.
Do	From Chincoteague Inlet to Lonesome Hill	522	1-20,000	G. D. Wise	1849.
Do	....do	524	1-20,000	....do	1849.
Maryland	Chincoteague Island and vicinity	723	1-20,000	C. Ferguson and D. B. Wainwright.	1858-87.
Maryland and Virginia.	Chincoteague Bay and Inlet and part of Chincoteague Island.	704	1-20,000	N. S. Finney, G. D. Wise, and J. L. Tilghman.	1857.
Virginia	Line from Chincoteague Bay across the peninsula, Accomac County.	890 *a*	1-20,000	A. M. Harrison	1862.
Maryland and Virginia.	Map of boundary line	890 *b*	1-20,000	C. T. Iardella	1860.
Do	Pocomoke River and part of boundary line	890 *c*	1-20,000	....do	1860.
Virginia	From Assawaman Inlet to Chincoteague Inlet	580	1-20,000	G. D. Wise and D. B. Wainwright.	1856-87.
Do	Wallops and Assawaman islands	378	1-20,000	W. M. Johnson	1851.
Do	From Metomkin Bay to Chincoteague Inlet	492	1-20,000	G. D. Wise	1855.
Do	From Gargathy to Wachapreague Inlet	464 *bis*	1-20,000	....do	1852-54.
Do	Part of Accomac County, from Drummondtown to Onancock.	868	1-20,000	C. Hosmer and F. W. Dorr.	1862.
Do	From Metompkin Inlet to Wachapreague Inlet	510	1-20,000	G. D. Wise	1852.
Do	From Wachapreague Inlet to Little Machipongo Inlet	512	1-20,000	....do	1852.
Do	From Wachapreague Inlet to Great Machipongo Inlet.	1200	1-20,000	J. W. Donn	1871.
Do	Head of Machipongo River	1204	1-20,000	....do	1871.
Do	From Great Machipongo Inlet to Sand Shoal Inlet	1201	1-20,000	J. W. Donn, L. B. Wright, and D. B. Wainwright.	1869-70-88.
Do	From Little Machipongo Inlet to Great Machipongo Inlet.	511	1-20,000	G. D. Wise	1852.
Do	From Great Machipongo Inlet to New Inlet, including Sand Shoal Inlet.	523	1-20,000	....do	1853.
Do	Sand and Shoal Inlet to New Inlet, and from Eastville to Old Plantation Creek.	1202 *a*	1-20,000	J. W. Donn	1869-70.
Do	From Wreck Island to Cape Charles Light	1202 *b*	1-20,000	F. C. Donn and D. B. Wainwright.	1871-88.
Do	From Smiths Island to New Inlet	525	1-20,000	G. D. Wise	1852.
Do	Smiths Island, Cape Charles and vicinity	509	1-20,000	....do	1852.
Do	Cape Charles Light to Old Plantation Creek	1203	1-20,000	J. W. Donn, L. B. Wright, and D. B. Wainwright.	1869-70-88.
	Chesapeake Bay, east side.				
Virginia	Smiths Island, Cape Charles and vicinity	509	1-20,000	G. D. Wise	1852.
Do	Cape Charles Light to Old Plantation Creek	1203	1-20,000	J. W. Donn, D. B. Wainwright, and L. B. Wright.	1869-70-88.
Do	From Cherrystone Creek to Butlers Bluff	495	1-20,000	J. Seib and D. B. Wainwright.	1852-88.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Chesapeake Bay, east side—Continued.				
Virginia	Sand and Shoal Inlet to New Inlet, and from Eastville to Old Plantation Creek.	1202 *a*	1-20,000	J. W. Donn	1869-70.
Do	Cherrystone Inlet	1534	1-10,000	E. Hergesheimer	1884.
Do	Occohannock, Naswaddox, and Hungers creeks, eastern shore.	350	1-20,000	J. Seib	1851.
Do	From Craddock Creek to Pongoteague Creek	307	1-20,000	J. Seib and S. A. Wainwright.	1850.
Do	From Pongoteague Creek to Beach Island	308	1-20,000	....do	1850.
Do	Part of Accomac County, from Drummondtown to Onancock.	868	1-20,000	C. Hosmer and F. W. Dorr.	1862.
Do	Tangier, Watts, and Beach islands	309	1-20,000	J. Seib and S. A. Wainwright.	1850.
Virginia and Maryland.	Pocomoke Sound, from Deep Creek to Pocomoke River.	349	1-20,000	J. Seib	1851.
Do	From Little Fox Island to Big Annemessex River	272	1-20,000	J. Seib, S. A. Wainwright, and C. Junken.	1849-51-72.
Do	Pocomoke Sound, vicinity of Apes Hole Creek	528	1-20,000	S. A. Wainwright	1851.
Virginia	Pocomoke Sound, from Guilford Creek to Messongo Creek.	529	1-20,000	....do	1851.
Virginia and Maryland.	Pocomoke River and part of boundary line	890 *c*	1-20,000	C. T. Iardella	1860.
Virginia	Line from Chincoteague Bay across the peninsula, Accomac County.	890 *a*	1-20,000	A. M. Harrison	1862.
Maryland	Smiths Island	271	1-20,000	J. Seib and R. D. Cutts	1849-72.
Do	Bloodsworth and South Marsh Island	269	1-20,000	J. Seib	1849.
Do	Deals Island to Big Annemessex River	270	1-20,000	J. Seib and S. A. Wainwright.	1849.
Do	Mouth of Honga River and Hoopers Straits	265	1-20,000	R. D. Cutts and J. Seib	1848.
Do	Head of Tangier Sound, including Wicomico River	268	1-20,000	J. Seib	1849.
Do	Fishing Bay and part of Nanticoke River	267	1-20,000	J. Seib and S. A. Wainwright.	1849.
Do	Nanticoke River, from Chapters Point to Vienna	266	1-20,000	....do	1849.
Do	Tar Bay and upper part of Honga River	255	1-20,000	R. D. Cutts and J. Seib	1848.
Do	Meekins Neck, Chesapeake Bay	451	1-20,000	H. L. Whiting	1854.
Do	From Cooks Point to Meekins Neck, including Little Choptank River.	250	1-20,000	G. D. Wise	1847.
Do	Sharps Island	251	1-20,000	....do	1848.
Do	Choptank River, Cooks Point to Hambrook Point	225	1-20,000	R. D. Cutts	1847.
Do	Choptank River, from Hambrook Point to Cabin Creek.	253	1-20,000	R. D. Cutts and J. Seib	1848.
Do	Choptank River, from Cabin Creek to Wings Landing.	254	1-20,000	....do	1848.
Do	From Wades Point to Tilghmans Island, including Poplar Island.	215	1-20,000	G. D. Wise	1846-47.
Do	Chester River, Eastern Bay, Wye, and St. Michaels rivers, and Broad Creek.	223	1-20,000	R. D. Cutts	1847.
Do	Vicinity of Wye Island, St. Michaels River, and Tredhaven Creek.	224	1-20,000	R. D. Cutts	1847.
Do	Western shore of Kent Island, from Lose Point to Kent Point, and location of base line.	181	1-10,000	H. L. Whiting	1844.
Do	Eastern shore of Kent Island and Coxes Creek	222	1-20,000	R. D. Cutts	1847.
Do	Chester River, from its mouth to Piney Point	200	1-20,000	J. C. Neilson	1846.
Do	From Swan Creek to Eastern Neck Inlet	199	1-20,000	R. D. Cutts	1846.
Do	Chester River, from Piney Point north	201	1-20,000	J. C. Neilson	1846.
Do	From Worton Point to Swan Point, including Pools Island.	187	1-20,000	R. D. Cutts	1845.
Do	Chesapeake Bay, from Bush River to Turkey Point	212	1-20,000	G. D. Wise	1845.
Do	Sassafras River, vicinity of Lloyds Creek and Sassafras Creek.	469	1-20,000	H. L. Whiting	1854.
Do	Sassafras River, from Lloyds Creek to Swans Creek	279	1-20,000	J. J. S. Hassler	1846.
Do	South shore of Elk River, from Pond Creek to Cabin Johns Creek.	788	1-20,000	H. Adams	1860.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Chesapeake Bay, east side—Continued.				
Maryland	Elk River, Bohemia River, and Back Creek	186	1-20,000	J. J. S. Hassler and H. L. Whiting.	1845-55.
Delaware and Maryland.	From Ash Signal to Riggs Hill, including head of Elk River (interior).	170	1-20,000	T. W. Werner	1843.
Do	From Wilmington to Maryland boundary (interior)	169	1-20,000	do	1843.
Maryland	Head of Northeast River, Chesapeake Bay	184	1-10,000	J. J. S. Hassler	1844-45.
Do	Northeast River entrance, Chesapeake Bay	185 *bis*	1-10,000	do	1844-45.
	Chesapeake Bay, west side.				
Maryland	Susquehanna River, including Havre de Grace and Port Deposit.	189	1-10,000	R. D. Cutts	1845.
Do	From Havre de Grace to Spesutic Narrows	188	1-10,000	do	1845.
Do	Swan Creek to Bush River	190	1-20,000	do	1845-46.
Do	Chesapeake Bay, from Bush River to Turkey Point	212	1-20,000	G. D. Wise	1845.
Do	Bush, Gunpowder, and Middle rivers	213	1-20,000	do	1846-47.
Do	The intervening country between Bush River and Baltimore.	197	1-20,000	R. D. Cutts	1846.
Do	From Back River to Middle River, including Harts, Millers, and Pools islands.	450	1-20,000	H. L. Whiting	1854.
Do	Back River	214	1-20,000	G. D. Wise	1846-47.
Do	Patapsco Neck, from Bear Creek to North Point	436	1-20,000	H. L. Whiting	1853.
Do	North shore of Patapsco River, from Colgate Creek to Bear Creek.	401	1-20,000	H. L. Whiting and A. Boschke.	1852.
Do	Eastern shore of Patapsco River, from North Point to Colgate Creek.	219	1-20,000	G. D. Wise	1849.
Do	Duplicate of 217	217 *a*	1-10,000	do	1845-46.
Do	Resurvey of Baltimore City	217	1-10,000	J. B. Glück	1849.
Do	Baltimore City and Harbor	216	1-10,000	G. D. Wise	1845.
Do	Patapsco River (original work)	221	1-20,000	do	1847.
Do	Patapsco River, east side (duplicate)	218	1-20,000	do	1845-46.
Do	South shore of Patapsco River, from Gibsons Island to Smiths Cove.	306	1-20,000	J. B. Glück and H. L. Whiting.	1851-55.
Do	Western shore of Patapsco River, from Bodkin Point to Ferry Point.	220	1-20,000	G. D. Wise	1845-46.
Do	From Sandy Point to Bodkin Point	175	1-10,000	F. H. Gerdes	1844.
Do	Magothy River	179	1-10,000	do	1845.
Do	Steelton, Sparrows Point, Patapsco River	2032	1-10,000	J. W. Donn	1891.
Do	North shore of Patapsco River, Lazaretto Light to Bear Creek.	1004	1-10,000	C. T. Iardella	1866.
Do	Vicinity of Baltimore, northeast side	955	1-10,000	do	1864.
Do	Vicinity of Baltimore, northwest side	936	1-10,000	C. M. Bache	1863.
Do	Vicinity of Baltimore, west side	977	1-10,000	C. T. Iardella	1865.
Do	do	929	1-10,000	J. W. Donn	1863.
Do	Baltimore Harbor (sheet No. 1), from Hendersons Wharf to Pratt street.	1441 *a*	1-1,800	do	1876.
Do	Baltimore Harbor (sheet No. 2), from Fort McHenry to Hendersons Wharf.	1441 *b*	1-1,800	J. W. Donn	1876.
Do	Baltimore Harbor (sheet No. 3), Lazaretto Light to Baltimore and Ohio ferry slip.	1442	1-1,800	do	1876.
Do	Baltimore Harbor (sheet No. 4), Lazaretto Light to Ferry Point.	1443 *a*	1-3,600	do	1876.
Do	Baltimore Harbor (sheet No. 5), vicinity of Ferry Point and Smiths Cove.	1443 *b*	1-3,600	R. M. Bache, W. F. Downer, and J. P. Bogart.	1875-76-77.
Do	South shore Patapsco River, Light Street Bridge to Swan Creek.	983	1-10,000	C. T. Iardella	1865.
Do	From Sandy Point to Thomas Point, including mouth of Severn River.	174	1-10,000	F. H. Gerdes	1844.
Do	Severn River, from Tallys Point to county bridge	1857	1-10,000	J. W. Donn	1888.
Do	Bay Ridge, Tallys Point	1861	1-5,000	do	1888.
Do	Naval Academy and Cemetery	1860	1-5,000	do	1888-89.
Do	Severn River, and from Hasketts Point to Tallys Point.	176	1-10,000	F. H. Gerdes	1844.

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	Chesapeake Bay, west side—Continued.				
Maryland	Severn River, lower part	178	1-10,000	G. D. Wise	1844.
Do	Severn River, upper part	177	1-10,000	....do	1844.
Do	Vicinity of South River	248	1-20,000	G. D. Wise and H. L. Whiting.	1847-55.
Do	South River	249	1-20,000	G. D. Wise	1847.
Do	From Saunders Point to Holland Point, including West River and Herring Bay.	198	1-20,000	R. D. Cutts	1846.
Do	From Parkers Creek northward	280	1-20,000	J. J. S. Hassler	1847.
Do	From Parkers Creek to Cove Point	281	2-20,000	....do	1847.
Do	Cove Point, western shore of Chesapeake	388	1-20,000	J. Seib	1852.
Do	Mouth of Patuxent River	256	1-20,000	R. D. Cutts	1848.
Do	Hog Island, Patuxent River	2107	1-500	J. W. Donn	1893.
Do	Patuxent River, from St. Leonards Creek to Battle Creek.	812	1-10,000	H. Adams	1860.
Do	Patuxent River, from Battle Creek to Swansons Creek.	813	1-10,000	....do	1860.
Do	Patuxent River, from Swansons Creek to Black Swamp Creek.	814	1-10,000	....do	1859.
Do	Patuxent River, vicinity of Lower Marlboro	815	1-10,000	....do	1859.
Do	From Cedar Point to Point-no-Point	257	1-20,000	R. D. Cutts and J. Seib	1848.
Do	Mouth of Potomac	458	1-20,000	....do	1849-56.
	Potomac River.				
Maryland	St. Marys River	776	1-20,000	H. Adams	1858-59.
Do	St. Georges Island, St. Marys River	804	1-20,000	....do	1859.
Do	From St. Georges River to Higgins Point, including St. Clements Bay and Bretons Bay.	1103	1-20,000	J. W. Donn	1868.
Do	Wicomico River and St. Catherines Sound and Island, with the shore line to Swan Point.	1105	1-20,000	....do	1868.
Do	Potomac River, from Cob Point to Swan Point	858	1-20,000	C. Hosmer	1862.
Do	Potomac River, from Swan Point to Lower Cedar Point.	859	1-20,000	J. Mechan	1862.
Maryland and Virginia.	Potomac River, from Matomkin to Persimmon Point, including Port Tobacco River.	861	1-20,000	H. L. Whiting	1862.
Maryland	Potomac River, vicinity of Nanjemoy Creek	862	1-20,000	J. Mechan	1862.
Do	Potomac River, from Smiths Point to Nanjemoy Creek.	863	1-20,000	A. W. Longfellow	1862.
Maryland and Virginia.	Potomac River, from Aquia Creek and Smiths Point to Shipping Point.	865	1-20,000	C. Hosmer	1862.
Maryland	Potomac River, from Budds Ferry to Indian Head	866	1-20,000	A. W. Longfellow	1862.
Maryland and Virginia.	Potomac River, from Indian Head to Fox Ferry	875	1-20,000	C. Hosmer	1862.
Maryland	From Broad Creek to Oxen Creek	902	1-10,000	A. M. Harrison	1863.
Do	Vicinity of Rosiers Bluff	895	1-5,000	....do	1862.
Maryland and Virginia.	Potomac River, from Jones Point to Little Falls Bridge.	910*a*	1-15,000	C. H. Boyd and J. Hergesheimer.	1863-74.
Maryland	Site of United States naval magazine, near Marbury Point.	910*b*	1-1,200	J. Hergesheimer	1874.
District of Columbia and Maryland.	Southeast portion of District of Columbia and adjacent country.	925	1-15,000	J. W. Donn	1863.
District of Columbia.	Northeast corner District of Columbia, showing Forts Chapin, Mahan, Sedgwick, and Battery Craven.	1036	1-10,000	C. M. Bache and J. Hergesheimer.	1865-74.
Do	Northeast side District of Columbia	950	1-15,000	C. Ferguson and H. Adams.	1863-64.
Maryland	From Bladensburg to Leesboro, adjacent to District of Columbia.	903	1-15,000	C. Ferguson	1863.
District of Columbia and Virginia.	Potomac River, from Georgetown to Little Falls	1340	1-2,500	C. Junken	1872.
Virginia	Tennallytown to Great Falls	945	1-15,000	F. W. Dorr	1864.
Do	Tennallytown to Rockville	940	1-15,000	J. W. Donn and C. Rockwell.	1864.
Do	Chain Bridge to Prospect Hill	944	1-15,000	F. W. Dorr	1864.

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	Potomac River—Continued.				
Maryland and Virginia.	Potomac River, from Great Falls to Rushville	990	1-10,000	J. W. Donn and McL. W. Thomson.	1865.
Do	Potomac River, from Rushville to Youngs Ford	989	1-10,000	....do	1865.
Do	Potomac River, from Youngs Ford to Whites Ferry	988	1-10,000	....do	1865.
Do	Potomac River, from Whites Ferry to Masons Island No. 2.	987	1-10,000	....do	1865.
Do	Potomac River, from east end of Heters Island to Berlin.	986	1-10,000	....do	1865.
Maryland and West Virginia.	Potomac River, from Berlin to Harpers Ferry	985	1-10,000	J. W. Donn, H. L. Marindin, and McL. W. Thomson.	1865.
Do	Potomac River, from Fort Duncan to High Knob	1013	1-10,000	J. W. Donn	1865-66.
Do	Potomac River, from High Knob to Shepherdstown	1014	1-10,000	....do	1866.
Do	Vicinity of Williamsport (military survey)	879	1-20,000	C. Hosmer and J. Mechan.	1862.
District of Columbia.	Defenses of Washington	1960	1-31,680		1863-64.
Maryland, Virginia, and West Virginia.	Vicinity of Harpers Ferry, Charlestown, and Hagerstown.	1906	1-10,000	H. F. Walling	1881.
Virginia and West Virginia.	Vicinity of Martinsburg	1907	1-42,000	....do	1881.
Do	Vicinity of Winchester	1908		....do	1881.
Virginia	Vicinity of Fort Ethan Allen and Fort Marcy	951	1-15,000	T. W. Robbins	1864.
Do	Aqueduct to Little Falls	943	1-15,000	F. W. Dorr	1864.
Do	Baileys Cross Roads to Miners Hill	942	1-15,000	C. Rockwell	1864.
Do	Part of Arlington	1025	1-1,200	E. Hergesheimer and R. E. McMath.	1864.
Do	....do	1026	1-1,200	....do	1864.
Do	Site of proposed base line, Fort Whipple Reservation.	1461	1-1,200	A. Lindenkohl	1878.
Do	Alexandria to Baileys Cross Roads	941	1-15,000	F. W. Dorr	1864.
Do	Jones Point, near Alexandria	905	1-1,000	A. M. Harrison	1863.
Do	Vicinity of Jones Point, near Alexandria	909	1-1,000	C. M. Bache	1863.
Do	Alexandria to Burkes Station, including Springfield and Annandale.	949	1-15,000	F. W. Dorr	1864.
Do	Vicinity of Fort Lyon	916	1-10,000	C. M. Bache	1863.
Do	Alexandria to Mount Vernon	947	1-15,000	J. Mechan	1864.
Do	Dogue Run to Fairfax Road, Fairfax County, General Heintzelman's division.	948	1-15,000	....do	1861.
Do	Potomac River, from Shipping Point to High Point	867	1-20,000	....do	1862.
Do	Reconnoissance of roads between Fredericksburg and Potomac Creek.	873	1-10,000	T. W. Robbins	1862.
Do	Potomac River from Matomkin Point to Marlboro Point.	864	1-20,000	J. Mechan	1862.
Do	Potomac River, from Mattox Creek to Persimmon Point.	860	1-20,000	....do	1862.
Do	Potomac River, from Mattox Creek to Nomini Cliffs	1106	1-20,000	J. W. Donn	1868.
Do	Potomac River, south shore, between Popes Creek and Mattox Creek, showing site of Washington's birthplace.	1467	1-10,000	A. Lindenkohl	1879.
Maryland	Nomini and Currioman bays, with Nomini Creek and Lower Machodoc River, and shore line east of Jacksons Creek.	1104	1-20,000	J. W. Donn	1868.
Virginia	Potomac River, from Kingcopsico Point to Sandy Point, including Blakistone Island.	1581	1-20,000	S. A. Wainwright	1860.
Do	Yeocomico and Coan rivers, south shore of Potomac.	1102	1-20,000	J. W. Donn	1868.
	District of Columbia.				
District of Columbia.	District of Columbia, water front from Four Mile Run to Jones Point.	2024	1-4,800	D. B. Wainwright	1891.
Do	District of Columbia water front, from Analostan Island to Four Mile Run.	2023	1-4,800	....do	1891.
Do	District of Columbia water front, Aqueduct Bridge to Seventh Street Wharf.	2028	1-4,800	J. W Donn and J. A. Flemer.	1891.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	District of Columbia—Continued.				
District of Columbia.	District of Columbia water front, navy-yard to Seventh Street Wharf, including part of reclaimed river flats.	2029	1-4,800	J. A. Flemer	1891.
Do	South corner of District	1961	1-4,800	....do	1889.
Do	Southeastern part of District, vicinity of Giesboro Road.	1976	1-4,800	....do	1890.
Do	District of Columbia, Giesboro Point and vicinity	1988	1-4,800	D. B. Wainwright	1889-90.
Do	District of Columbia, vicinity of Oxon Run	1987	1-4,800	....do	1890.
Do	District of Columbia, Insane Asylum and vicinity	1962	1-4,800	....do	1889-90.
Do	District of Columbia, inspection sheet, vicinity of Anacostia.	1963	1-4,800	J. W. Donn	1890.
Do	Eastern Branch and eastward, Anacostia Bridge to Baltimore and Potomac Railroad Bridge.	1948	1-4,800	J. A. Flemer	1888-89.
Do	Along northeast boundary, vicinity of Bowen Road	1949	1-4,800	....do	1890.
Do	District of Columbia, along northeast boundary north of Bennings Road.	1978	1-4,800	....do	1889-90.
Do	District of Columbia, northeast corner	1977	1-4,800	J. W. Donn	1890.
Do	Vicinity of Bennings Bridge	1801	1-4,800	W. C. Hodgkins	1888.
Do	....do	1801 *a*	1-4,800	....do	1888.
Do	District of Columbia (sheet No. 10, east)	1821	1-4,800	J. W. Donn and W. C. Hodgkins.	1888(?)-9
Do	District of Columbia (sheet No. 1, east)	1761	1-4,800	J. W. Donn	1887-88 (?).
Do	Experimental square mile	2075			
Do	Between Ivy City and Eastern Branch	1800	1-4,800	W. C. Hodgkins	1887-88.
Do	....do	1800 *a*	1-4,800	....do	1887-88.
Do	District of Columbia (sheet No. 3, east)	1820	1-4,800	J. W. Donn	1888 (?)-91.
Do	District of Columbia (sheet No. 1, west)	1770	1-4,800	....do	1886 (?).
Do	District of Columbia (sheet No. 2, west)	1767	1-4,800	....do	1886 (?).
Do	District of Columbia (sheet No. 3, west)	1740	1-4,800	....do	1886 (?).
Do	District of Columbia, from the boundary, between North Capitol and Sixteenth Streets, NW., northeasterly to District line, including Soldiers' Home, etc.	2041	1-4,800	....do	1881-82 (?).
Do	District of Columbia (sheet No. 4, west)	1714	1-4,800	J. W. Donn, D. B. Wainwright, W. C. Hodgkins, and J. A. Flemer.	1880.
Do	District of Columbia (sheet No. 5, west)	1715	1-4,800	.... do	1880.
Do	Site for the new Naval Observatory	1488	1-1,200	C. Junken and F. C. Donn	1881.
Do	Naval Observatory Circle	2171	1-1,600	E. D. Preston	1894.
Do	District of Columbia (sheet No. 6, west)	1716	1-4,800	W. C. Hodgkins, J. W. Donn, D. B. Wainwright, and J. A. Flemer.	1880.
Do	District of Columbia, northwestern margin of city limits, including part of Rock Creek, etc.	2042	1-4,800	J. W. Donn	1881-82.
Do	District of Columbia (sheet No. 7, west)	1717	1-4,800	J. W. Donn, D. B. Wainwright, W. C. Hodgkins, and J. A. Flemer.	1880.
Do	District of Columbia (sheet No. 8, west)	1718	1-4,800	....do	1880.
Do	District of Columbia (sheet No. 9, west), vicinity of Brightwood and northward.	1819	1-4,800	J. W. Donn	1888.
Do	District of Columbia, Mount Pleasant, Brightwood, etc., northeasterly to District line.	2043	1-4,800	....do	1881-83 (?).
Do	District of Columbia (sheet No. 10, west)	1745	1-4,800	....do	1884 (?).
Do	District of Columbia (sheet No. 11, west)	1751	1-4,800	.... do	1884 (?).
Do	District of Columbia, vicinity of receiving reservoir	2010	1-4,800	J. A. Flemer	1890-91.
Do	District of Columbia (sheet No. 12, west)	1758	1-4,800	J. W. Donn	1883 (?).
Do	District of Columbia (sheet No. 13, west)	1759	1-4,800	....do	1883 (?).
Do	District of Columbia, head waters of Broad Branch, northwest of Tennallytown.	1983	1-4,800	....do	1890-91.
Do	District of Columbia (sheet No. 14, west)	1760	1-4,800	....do	1884 (?).
Do	District of Columbia, vicinity of Rock Creek Ford Road and Daniels Road.	1989	1-4,800	D. B. Wainwright	1890.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	District of Columbia—Continued.				
District of Columbia	District of Columbia, vicinity of Rock Creek Ford Road.	1990	1-4,800	J. A. Flemer	1890.
Do	District of Columbia, along northwestern boundary and northeast of Broad Branch Road.	2022	1-4,800	W. C. Hodgkins	1891.
Do	District of Columbia, along northwestern boundary, vicinity of Daniels Road.	2021	1-4,800	J. A. Flemer	1890-91.
Do	District of Columbia, north corner	2020	1-4,800	J. W. Donn	1890-91.
Do	District of Columbia (sheet No. 15, west)	1752	1-4,800	do	1883 (?).
	Chesapeake Bay, west side, Potomac River to and including Rappahannock River.				
Virginia	Little and Great Wicomico rivers	500	1-20,000	J. Seib	1850-56.
Do	Part of Ingrams Bay, Dividing Creek, and Fleets Bay.	310	1-20,000	J. Seib and S. A. Wainwright.	1850.
Do	Mouth of Rappahannock River	521	1-20,000	J. Seib	1851-56.
Do	Rappahannock River, vicinity of Greys Point and Cherry Point.	660	1-10,000	H. Adams	1857.
Do	Rappahannock River, from Carters Creek to Baileys Bluff.	659	1-10,000	do	1857.
Do	Corrotoman River	661	1-10,000	do	1857.
Do	Rappahannock River, vicinity of Vibanna and Beach Creek.	603	1-10,000	do	1856.
Do	Rappahannock River, from La Grange Creek to Punch Bowl.	602	1-10,000	do	1856.
Do	Estuaries of the Rappahannock River, vicinity of Corrotoman River (hydrographic).	1001	1-20,000	J. W. Donn	1869.
Do	Rappahannock River, from Punch Bowl to Jones Point.	520	1-10,000	A. Strauss and J. Seib	1855.
Do	Rappahannock River, from Jones Point to Accacreek Point.	519	1-10,000	do	1855.
Do	Rappahannock River, from Accacreek Point to Tappahannock.	518	1-10,000	do	1855.
Do	Rappahannock River, from Tappahannock to Accupacia Creek.	517	1-10,000	do	1855.
Do	Rappahannock River, from Accupacia Creek to Leedstown.	516	1-10,000	do	1855.
Do	Rappahannock River, from Leedstown to Green Bay.	515	1-10,000	do	1855.
Do	Rappahannock River, from Port Tobago Bay to Port Royal.	514	1-10,000	J. Seib	1854.
Do	Rappahannock River, from Mill Bank Creek to Skinkers Neck.	513	1-10,000	do	1853-54.
Do	Rappahannock River, from Skinkers Neck to Belvedere.	435	1-10,000	do	1853-54.
Do	Rappahannock River, from Belvedere to Falmouth.	434	1-10,000	do	1853.
Do	Rappahannock River, left bank, vicinity of Fredericksburg.	872	1-10,000	T. W. Robbins	1862.
Do	Rappahannock River, left bank, vicinity of Falmouth and Fredericksburg.	871	1-10,000	C. M. Bache	1862.
Do	Reconnaissance of roads between Fredericksburg and Potomac Creek.	873	1-10,000	T. W. Robbins	1862.
	Rappahannock River to Hampton Roads.				
Virginia	Piankatank River	1100	1-20,000	J. W. Donn	1869.
Do	From Wolf Trap to Piankatank River, including head of East River.	503	1-20,000	J. Seib	1853.
Do	New Point Comfort to Wolf Trap, including Mobjack Bay.	504	1-20,000	do	1853.
Do	Mobjack Bay, North, Ware, and Severn rivers	1101	1-20,000	G. D. Wise and J. W. Donn	1860-68.
Do	Mouth of York River, Chesapeake Bay	496	1-20,000	J. Seib	1853-54.
Do	York River, from Wormleys River to Clay Bank	685	1-20,000	do	1857.
Do	Back and Poquosin rivers	499	1-20,000	do	1853-54.
Do	Mouth of York River, Chesapeake Bay	496	1-20,000	do	1853-54.
Do	York River, from Wormleys River to Clay Bank	685	1-20,000	do	1857.

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	Rappahannock River to Hampton Roads—Continued.				
Virginia	York River, from Clay Bank to Mount Folly	686	1-20,000	J. Seib	1857-58.
Do	York River, from Mount Folly to West Point	722	1-20,000	do	1858.
Do	Entrance of Hampton Roads and Back River	502	1-20,000	J. Seib, A. M. Harrison, and H. P. Ritter.	1853-54-62-92.
Do	Hampton Roads and James River (entrance)	501	1-20,000	J. Seib	1853.
Do	Newport News Point	1008	1-10,000	E. Hergesheimer	1865.
	James River.				
Virginia	James River entrance	497	1-20,000	J. Seib	1853.
Do	James River, Newport News to Pagan Creek	1265	1-20,000	J. W. Donn, F. C. Donn, and S. N. Ogden.	1871-72.
Do	James River, Pagan Creek to Point of Shoals Light-House.	1266	1-20,000	do	1871-72-73.
Do	James River, Burwells Bay to College Creek	1289	1-20,000	J. W. Donn and F. C. Donn	1873.
Do	James River, from College Creek to Chickahominy River.	1290	1-20,000	J. W. Donn	1873-74.
Do	Chickahominy River, from entrance to Wilcox Neck	1337 *a*	1-20,000	J. W. Donn and F. C. Donn	1873-74.
Do	Chickahominy River, from Wilcox Neck to head of river.	1337 *b*	1-20,000	do	1874-75.
Do	James River, from Dillards Wharf to Chippoak Creek	1391 *a*	1-20,000	J. W. Donn	1874-75.
Do	James River, from Sloop Point to City Point	1391 *b*	1-20,000	do	1875.
Do	James River, from City Point to Cogains Point	431	1-10,000	J. Seib	1853.
Do	James River, from Curls Neck to City Point	430	1-10,000	do	1853.
Do	Part of Appomattox River, from City Point to Port Walthall.	390	1-10,000	do	1853.
Do	Part of Appomattox River, with Petersburg	389	1-10,000	do	1853.
Do	Appomattox River, from Gatlings Wharf to James River.	2105	1-10,000	C. H. Boyd	1892.
Do	Appomattox River, from Petersburg to Gatlings Wharf.	2095	1-10,000	do	1892-93.
Do	James River, from City Point to Curls Neck	1438	1-10,000	J. W. Donn and F. C. Donn	1877.
Do	James River, from Curls Neck to Graveyard Reach	1439	1-10,000	J. W. Donn	1877.
Do	James River, vicinity of Trents Reach	393		S. A. Wainwright	1853.
Do	James River, from Dutch Gap to Curls Neck	429	1-10,000	J. Seib	1853.
Do	James River, from Wilton to Dutch Gap	428	1-10,000	do	1853.
Do	James River, from Warwick Bar to Richmond Bar	392	1-5,000	S. A. Wainwright	1853.
Do	James River, from Mayos Bridge to Drurys Island	391	1-5,000	do	1853.
Do	City of Richmond	684	1-5,000	H. Adams	1857-58.
Do	James River, from Mayos Bridge, Richmond, to Lower Rocketts.	1493 *a*	1-10,000	J. W. Donn	1879-80.
Do	James River, from Lower Rocketts to Graveyard Reach.	1493 *b*	1-10,000	do	1879-80.
	Nansemond River.				
Virginia	Nansemond River, from mouth to Campbells Creek	1353	1-10,000	C. M. Bache, H. M. De Wees, and W. Gilbert.	1874.
Do	Nansemond River	505	1-20,000	J. Seib	1853.
Do	Nansemond River, from Campbells Creek north	1352 *a*	1-10,000	C. M. Bache, H. M. De Wees, and W. Gilbert.	1874.
Do	Nansemond River, vicinity of Suffolk (upper sheet)	1352 *b*	1-10,000	do	1874.
Do	Nansemond River, vicinity of Suffolk (△[a] sheet)	1591	1-10,000	do	1874.
Do	Plane table △[a] of Nansemond River	1598	1-10,000	C. M. Bache	1874.
	Norfolk and vicinity.				
Virginia	Craney Island to Nansemond River	1897	1-10,000	C. M. Bache	1883.
Do	Tanners Point to Fort Norfolk, eastern shore of Elizabeth River.	1499 *a*	1-10,000	C. M. Bache, E. Ellicott, J. B. Boutelle, and H. P. Ritter.	1882-92.
Do	Plans of Confederate fortifications, Elizabeth River and vicinity.	851	1-2,500	A. M. Harrison	1862.
Do	Craney Island	1376	1-1,200	J. W. Donn and F. C. Donn	1874.
Do	Elizabeth River (entrance)	498	1-20,000	J. Seib	
Do	Tanners Point to Fort Norfolk, eastern shore of Elizabeth River.	1499 *a*	1-10,000	C. M. Bache, E. Ellicott, J. B. Boutelle, and H. P. Ritter.	1882-92.

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	Norfolk and vicinity—Continued.				
Virginia	Norfolk Harbor, additions to wharf line and Norfolk and Western Railroad.	1936	1-10,000	J. W. Donn	1890.
Do	Norfolk, Portsmouth, and Gosport	1332	1-10,000	J. W. Donn, C. M. Bache, and H. M. De Wees.	1873-74.
Do	Norfolk Harbor, new wharves and changes in old wharves.	1958	1-5,000	F. C. Donn	1882.
Do	United States navy-yard at Gosport and battery at St. Helena.	850	1-2,500	A. M. Harrison	1862.
Do	City fronts of Norfolk Harbor	506	1-10,000	J. Seib	1856.
Do	Southern Branch, Elizabeth River	1387 *c*	1-20,000	J. W. Donn	1873.
Do	Eastern Branch, Elizabeth River	1387 *b*	1-20,000	J. W. Donn and F. C. Donn	1873.
Do	Part of Tanners Creek, Elizabeth River	1387 *a*	1-10,000	.....do	1873.
Do	Northeast of Norfolk	1462 *a*	1-20,000	C. M. Bache	1876-77-82.
Do	From Inlet Creek to Lynn Haven River	1462 *b*	1-20,000	.....do	1877-78.
Do	From Willoughbys Point to Cape Henry	507	1-20,000	J. Seib	1852.
Do	Lynn Haven Bay and vicinity	1659	1-20,000	E. Ellicott	1884.
Do	Cape Henry and vicinity	753	1-20,000	J. Mechan and J. J. S. Hassler.	1859.
	Cape Henry to Cape Hatteras.				
Virginia	Cape Henry and vicinity	753	1-20,000	J. Mechan and J. J. S. Hassler.	1859.
Do	Back Bay and North Bay	743	1-20,000	J. Mechan	1859.
Do	Head of North and Landing rivers	754	1-20,000	.....do	1859.
Virginia and North Carolina.	Chesapeake and Albemarle Canal with Landing and North rivers (hydrographic).	1579 *b*	1-20,000	G. C. Hanus	1884.
Do	From Back Bay to Currituck Sound, including North and Landing rivers.	736	1-20,000	J. Mechan and J. J. S. Hassler.	1858.
North Carolina	Currituck Sound, upper part	657	1-20,000	H. Adams	1857.
Do	Currituck Sound, from Currituck Beach Light, south.	381	1-20,000	J. J. S. Hassler	1851-52.
Do	Currituck Sound, from Jews Quarter Island to Collinston Island, including North River.	292	1-20,000	.....do	1848-49.
Virginia and North Carolina.	Chesapeake and Albemarle Canal, with Landing and North rivers (hydrographic).	1579 *c*	1-20,000	G. C. Hanus	1884.
North Carolina	Kill Devil Hills to Nags Head, including part of Roanoke Island.	351	1-20,000	J. J. S. Hassler	1851.
Do	Bodies Island, from Nags Head to Oregon Inlet	354	1-20,000	A. W. Longfellow	1849.
Do	Bodies Island	791	1-20,000	J. Mechan	1860.
Do	Vicinity of New Inlet and Loggerhead Inlet	367	1-20,000	H. Adams	1852.
Do	From Cape Hatteras north	377	1-20,000	.....do	1852.
	Albemarle Sound.				
North Carolina	Pasquotank River	207	1-20,000	J. C. Neilson	1847.
Do	Omissions at Camden Point, Albemarle Sound	837	1-20,000	J. Mechan	1861.
Do	Albemarle Sound, vicinity of Big Hatty Cove	208	1-20,000	J. C. Neilson	1847.
Do	Little River and Durants Neck	209	1-20,000	.....do	1847.
Do	Perquimans River and Harveys Neck	210	1-20,000	.....do	1848.
Do	Albemarle Sound, Drummond and Laurel points, to Sandy Point.	211	1-20,000	J. J. S. Hassler	1848.
Do	Albemarle Sound, from Edenton to Sandy Point and the south shore.	247	1-20,000	.....do	1848.
Do	Mouth of Chowan River, Albemarle Sound	824	1-20,000	J. Mechan and H. Adams.	1860-61-74.
Do	Chowan River, from its mouth to Coleraine	1335 *a*	1-20,000	H. Adams	1874.
Do	Chowan River, from Coleraine to Harrells Landing.	1335 *b*	1-20,000	.....do	1874.
Do	Batchelors Bay, Swans Bay, and mouth of Roanoke River.	836	1-20,000	J. Mechan	1861.
Do	Roanoke, Eastmost, Middle, and Caskai rivers	922	1-20,000	R. E. Halter	1864.
Do	South shore Albemarle Sound, Long Shoal Point to Laurel Point.	246	1-20,000	J. J. S. Hassler	1848.
Do	Entrance to Alligator River	284	1-20,000	A. W. Longfellow	1849.
Do	Head of Alligator River	285	1-20,000	.....do	1849.
Do	Alligator River (hydrographic reconnoissance of)	1315	1-20,000	R. Wainwright, U. S. N.	1876.
Do	East Lake and South Lake, Albemarle Sound	825	1-20,000	J. Mechan	1861.
Do	Durants Island and Croatan Sound, from Haulover to Redstone Point.	293	1-20,000	J. J. S. Hassler	1848-49.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Albemarle Sound—Continued.				
North Carolina....	Croatan Sound, from Hog Island to Redstone Point..	933	1-20,000	R. E. Halter..............	1864.
Do............	Part of Roanoke Island, from Shallowbag Bay to Broad and Oyster creeks.	826	1-20,000	J. Mechan................	1861.
	Cape Hatteras to Cape Lookout.				
North Carolina....	Cape Hatteras to Hatteras Inlet......................	1246	1-20,000	C. T. Iardella and W. C. Hodgkins.	1872.
Do............	Hatteras Inlet..	623	1-10,000	J. Mechan................	1857.
Do............	....do..	372	1-20,000	H. Adams	1852.
Do............	From Hatteras Inlet to Great Swash................	792	1-20,000	J. Mechan and C. Fendall.	1860-66.
Do............	Ocracoke Inlet	376	1-20,000	H. Adams	1852.
Do............	....do..	622	1-10,000	J. Mechan and C. Fendall.	1857-66.
Do............	Ocracoke Inlet and Bar (hydrographic)..............	1364	1-20,000	R. Wainwright, U. S. N...	1877.
Do............	Portsmouth Island and Cove Beach............	1016	1-20,000	C. Fendall...............	1866.
Do............	Core Sound, from Hog Island to Cedar Inlet..........	1020	1-20,000	W. H. Dennis....	1866.
Do............	Core Sound, from Cedar Inlet to Bells Point.........	1017	1-20,000	.....do.....................	1856.
Do............	Cape Lookout and part of Core Sound and approaches to Beaufort Harbor.	416	1-20,000	A. S. Wadsworth..........	1853.
Do............	Part of Cape Lookout..........	1695	1-20,000	W. C. Hodgkins...........	1886.
	Pamplico Sound.				
North Carolina....	Croatan Sound, from Hog Island to Redstone Point..	933	1-20,000	R. E. Halter..............	1864.
Do............	Pamplico Sound, from Pingleton Point to Roanoke Marsh Light-House.	1385	1-20,000	C.T.Iardella, H.W.Bache, and W.Fraser.	1875.
Do............	Pamplico Sound, from Yesocking Point to Pingleton Point.	1384 *b*	1-20,000	.....do.....................	1874-75.
Do............	Pamplico Sound, from Juniper Bay to Yesocking Point.	1384 *a*	1-20,000	.....do.....................	1874-75.
Do............	Pamplico Sound, from Juniper Bay to Bells Bay......	1355	1-20,000	C. T. Iardella and H. W. Bache.	1873-74.
Do............	Pungo River, from Wades Point to Pungo Creek.....	1273	1-20,000	F. W. Dorr aud W. E. McClintock.	1872.
Do............	Head of Pungo River, and from Yatesville to Leachville.	1310	1-20,000	.....do.....................	1873.
Do............	Pamplico River, from Pamplico Point to Indian Island, including Oyster, Goose, and Bonds creeks, and mouth of Pungo River.	1213	1-20,000	F. W. Dorr	1870.
Do............	Pamplico River, from Adams Point to Rumley Marsh, including North and South creeks.	1212	1-20,000	.... do.....................	1870.
Do............	Pamplico River, from Rumley Marsh to Ragged Point, including Bath and Durhams creeks.	1210	1-20,000	F. W. Dorr, C. T. Iardella, and A. P. Barnard.	1871.
Do............	Pamplico River, from Mauls Point to Rodmans Point, including Blounts, Broad, and Upper Goose creeks and Chocoumity Bay.	1211	1-20,000	.....do.....................	1870-71.
Do............	Washington and vicinity.............................	1274	1-10,000	F. W. Dorr and W. E. McClintock.	1871-72.
Do............	Western shore of Pamplico Sound, from Jones Bay to Pamplico Point.	1095	1-20,000	F. W. Dorr, H. W. Bache, and J. Hergesheimer.	1868-69.
Do............	Bay River..	1094	1-20,000	.....do.....................	1869.
Do............	Neuse River, from Smiths Creek aud Cedar Point to to Piney Point and Browns Creek.	1073	1-20,000	F. W. Dorr and H. W. Bache.	1868.
Do............	Neuse River, from Wilkinson Point to Cedar Point...	1052	1-20,000	F. W. Dorr and L. A. Sengteller.	1867-70.
Do............	Neuse River, from Beards Creek to Wilkinsons Point.	1051	1-20,000	.....do.....................	1867.
Do............	Neuse River, from Johnsons Point to Beards Creek..	1018	1-20,000	F. W. Dorr................	1866.
Do............	Neuse River, from New Berne to Johnsons Point....	1031	1-10,000	.....do.....................	1866.
Do............	Shore line Neuse River, vicinity of New Berne......	928	1-20,000	A. Strauss................	1863-64.
Do............	Neuse River, south shore, from Browns Creek to Point of Marsh.	1074	1-20,000	F. W. Dorr................	1868.
Do............	Cedar Island and vicinity..........................	1277 *a*	1-20,000	C. T. Iardella.............	1872.
Do............	Head of Long Bay....................................	1277 *b*	1-20,000	....do........	1872.
Do............	Main shore of Core Sound, from Halls Point to Bells Point.	1306	1-20,000	.....do.....................	1873.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Lookout to Cape Fear.				
North Carolina....	Beaufort Harbor....................................	315	1-10,000	H. L. Whiting............	1851.
Do............	Beaufort Harbor, resurvey of shore line..............	874	1-10,000	A. Boschke...............	1862.
Do............	Beaufort Harbor (rejected).........................	348	1-10,000	C. P. Bolles...............	1851.
Do............	Vicinity of Beaufort Harbor.........................	438	1-20,000	A. S. Wadsworth..........	1854.
Do............	North and Newport rivers...........................	1328	1-20,000	C. M. Bache, H. M. De Wees, and H. W. Bache.	1873.
Do............	Bogue Sound, from Hooppole Creek to Broad Creek	1110	1-20,000	A. W. Longfellow.........	1867.
Do............	Bogue Sound, from Broad Creek to Queens Creek, including Swansboro and Bogue Inlet.	1215	1-20,000	H. Adams and C. M. Bache.	1871.
Do............	From Bear Inlet to New River Inlet..................	1291	1-20,000	C. M. Bache...............	1872.
Do............	New River and part of Stump Sound.................	558	1-10,000	J. Mechan and A. S. Wadsworth.	1856.
Do............	Resurvey of New River Inlet (hydrography)..........	1841	1-10,000	W. C. Hodgkins...........	1888.
Do............	Topsail and Stump sounds...........................	565	1-10,000	J. Mechan, A. S. Wadsworth, and D. B. Wainwright.	1856-88.
Do............	Topsail Sound, from Stump Inlet to Old Topsail Inlet.	711	1-20,000	J. Mechan................	1857-58.
Do............	From Sidbury Inlet to Rich Inlet, including part of Topsail Sound.	617	1-10,000	J. Mechan and A. S. Wadsworth.	1857.
Do............	Middle and Topsail sounds..........................	618	1-10,000	J. Mechan, A. S. Wadsworth, and D. B. Wainwright.	1857-87.
Do............	Masonboro and Middle sounds.......................	619	1-10,000	.....do.....................	1857-87.
Do............	Myrtle Sound..	620	1-10,000	.....do.....................	1857-88.
Do............	Big Pond to Federal Point...........................	621	1-10,000	.....do.....................	1857-88.
Do............	New Inlet, including Federal Point, Smiths and Zeeks islands.	999	1-10,000	J. S. Bradford............	1865.
Do............	Attack on Fort Fisher...............................	1995	1-10,000	.....do.....................	1865.
Do............	Cape Fear River, vicinity of Federal Point and Snows Marsh.	344	1-10,000	C. P. Bolles...............	1851-52-56.
Do............	Cape Fear River entrance, Oak Island and upper part of Smiths Island, including Southport.	345	1-10,000	.....do.....................	1851.
Do............	Cape Fear River and approaches, from Buzzard Bay to Federal Point.	709	1-10,000	C. P. Bolles and O. Hinrichs.	1858.
Do............	Cape Fear, entrance..................................	708	1-10,000	.....do.....................	1858.
Do............	From Smiths Island to Federal Point................	1756	1-10,000	D. B. Wainwright.........	1887.
Do............	Interior of Smiths Island, Cape Fear River..........	1464 *b*	1-20,000	C. T. Iardella.............	1879.
Do............	Cape Fear River, from Cape Fear Point to Ortons Creek.	1464 *a*	1-20,000	.....do.....................	1878.
Do............	Lower part of Smiths Island, Cape Fear..............	346	1-10,000	C. P. Bolles...............	1851-56.
Do............	Cape Fear River, from Peters Point to Liliput Creek..	446	1-10,000	.....do.....................	1853.
Do............	Cape Fear River and vicinity of Campbell Island....	449	1-10,000	.....do.....................	1853.
Do............	From Ortons Creek to Eagles Island.................	1463 *b*	1-20,000	C. T. Iardella.............	1878.
Do............	Cape Fear River and mouth of Brunswick River and Redmond Creek.	447	1-5,000	C. P. Bolles...............	1853.
Do............	Cape Fear River, vicinity of Wilmington.............	448	1-5,000	.....do.....................	1853.
Do............	Vicinity of Wilmington...............................	1463 *a*	1-20,000	C. T. Iardella.............	1877.
	Cape Fear River to Charleston.				
North Carolina....	Cape Fear River entrance...........................	1771	1-10,000	D. B. Wainwright.........	1887.
Do............	From Cape Fear River entrance northward to Ash Swamp.	674	1-10,000	C. P. Bolles and G. H. Bagwell.	1852.
Do............	Ash Swamp to Lockwoods Folly Inlet................	673	1-10,000	C. P. Bolles, G. H. Bagwell, and W. S. Edwards.	1856.
Do............	Lockwoods Folly Inlet to Bacons Inlet...............	672	1-10,000	C. P. Bolles and O. Hinrichs.	1857.
Do............	Bacons Inlet to Gauses Landing.....................	725 *a*	1-10,000	.....do.....................	1858-59.
Do............	From Gauses Landing to Little River Inlet..........	725 *b*	1-10,000	C. P. Bolles...............	1858.
Do............	Tubbs Inlet and Little River Inlet....................	1959	1-10,000	.....do.....................	1859-60.
North Carolina and South Carolina.	From Little River Inlet to Kettle Swash.............	1295 *b*	1-20,000	O. H. Tittmann and D. B. Wainwright.	1873.
North Carolina....	From Kettle Swash to Big Swamp....................	1295 *a*	1-20,000	.....do.....................	1873.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Fear River to Charleston—Continued.				
South Carolina	From Big Swamp to Midway Inlet	1280 *b*	1-20,000	O. H. Tittmann	1872.
Do	From Midway Inlet to North Inlet	1280 *a*	1-20,000	....do	1872.
Do	Winyah Bay and vicinity	1276	1-20,000	W. H. Dennis	1872.
Do	Winyah Bay, entrance to Georgetown	834	1-20,000	H. L. Whiting and C. Rockwell.	1857-58.
Do	Winyah Bay, entrance	527	1-10,000	S. A. Wainwright and H. L. Whiting.	1853-57.
Do	Winyah Bay, from Marsh Islands to Georgetown	526	1-20,000	....do	1853-57.
Do	Part of the Santee river and vicinity	1308	1-20,000	W. H. Dennis	1873.
Do	Vicinity of Cape Romain	1347	1-20,000	....do	1874.
Do	Vicinity of Bulls Bay and Bacon Key	772	1-20,000	W. S. Edwards	1857.
Do	Bulls Bay and vicinity	1400 *a*	1-20,000	W. H. Dennis	1875.
Do	Bulls Bay to Breach Inlet	1400 *b*	1-20,000	....do	1875.
Do	From Princes Inlet to Dewees Inlet	681	1-20,000	J. N. Maffitt	1856-57.
Do	Long Island, from Breach Inlet to Dewees Inlet	471	1-20,000	R. M. Bache	1854.
	Charleston to Savannah.				
South Carolina	North side of Charleston Harbor	262	1-10,000	S. A. Gilbert and W. S. Edwards.	1849-58.
Do	South side of Charleston Harbor, including city of Charleston.	261	1-10,000	S. A. Gilbert	1849.
Do	Vicinity of Morris Island and Fort Sumter	715	1-10,000	J. Seib	1858.
Do	Charleston and vicinity	710	1-10,000	W. S. Edwards	1857-58.
Do	Cooper and Ashley rivers	1975	1-10,000	F. D. Granger	1890.
Do	Confluence of the Cooper and Wando rivers	2162	1-10,000	W. C. Hodgkins	1894.
Do	....do	2163	1-10,000	J. W. Donn	1894.
Do	....do	2168	1-10,000	C. H. Boyd	1894.
Do	Ashley and Cooper rivers	2167	1-10,000	....do	1894.
Do	Ashley River, from Bull Creek to Lambs	2166	1-10,000	....do	1894.
Do	Ashley River	2165	1-10,000	J. W. Donn	1894-95.
Do	Ashley and Cooper rivers	2164	1-10,000	....do	1894.
Do	Vicinity of Wappoo Creek and parts of Jones and Johns islands.	1604 *a*	1-20,000	C. T. Iardella	1876.
Do	Vicinity of Wappoo Creek	1604 *b*	1-10,000	....do	1879.
Do	Morris and Folly islands	964	1-10,000	W. H. Dennis	1864.
Do	Folly Island, from Light-House Inlet westward	296	1-20,000	S. A. Gilbert	1849.
Do	From Light-House Inlet to Stono Inlet	714	1-20,000	J. Seib	1858.
Do	Stono Inlet	899	1-20,000 1-5,000	C. Rockwell	1862.
Do	Mouth of Savannah River to May River (hydrographic).	803	1-20,000	....do	1859-60.
Do	Kiawah River and Island and west end of Folly Island.	491	1-20,000	R. M. Bache	1854.
Do	Eastern shore of North Edisto River and vicinity	322	1-20,000	G. D. Wise	1851.
Do	Wadmelaw and Stono rivers (hydrographic)	1639	1-20,000	G. C. Hanus, U. S. N	1885.
Do	Western shore of North Edisto River and vicinity	327	1-20,000	G. D. Wise	1851.
Do	Vicinity of South Edisto River	508	1-20,000	J. Seib	1852.
Do	Jehossee Island and upper part of Edisto Island	679	1-20,000	....do	1856-57.
Do	Vicinity of St. Helena Sound	611	1-20,000	J. Seib, W. H. Dennis, and C. Junken.	1856-59-67-75.
Do	Northern end of Hunting Island (supplemental)	611	1-10,000	J. F. Moser	1876.
Do	Coosaw River to Ashepoo River, including part of Ladys Island.	1307 *b*	1-20,000	C. Hosmer	1872-73.
Do	Bull and Combahee rivers (hydrographic)	1084	1-10,000 1-20,000	C. Hosmer and J. N. McClintock.	1871.
Do	Coosaw River and vicinity	996	1-20,000	W. H. Dennis	1865-67.
Do	Fripps Inlet to Port Royal Sound	840	1-20,000	J. Seib, C. Rockwell, and W. H. Dennis.	1859-67.
Do	St. Helena and Ladys islands	1275	1-20,000	C. Hosmer	1871-72.
Do	Paris Island and parts of Port Royal and Ladys islands.	1070	1-20,000	....do	1868.
Do	Vicinity of Port Royal and Beaufort	1006	1-20,000	W. H. Dennis	1865.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Charleston to Savannah—Continued.				
South Carolina....	Beaufort and vicinity	1905	1-20,000	C. Rockwell	1863.
Do	Port Royal Island	1307 *a*	1-20,000	C. Hosmer	1872-73.
Do	Head of Broad River, including Whales Branch	997	1-20,000	C. O. Boutelle and R. E. Halter.	1865.
Do	Pocotaligo and vicinity (war map)	974	1-10,000	F. W. Dorr	1865.
Do	Broad River, from Paris Island to Whales Branch	998	1-20,000	C. O. Boutelle, W. H. Dennis, and R. E. Halter.	1864-65.
Do	Between Broad River and May River	1195	1-20,000	C. Hosmer	1871.
Do	Vicinity of Daw Island	839	1-20,000	J. Seib and C. Rockwell	1859.
Do	Eastern end of Hilton Head Island and part of Paris Island.	809	1-20,000	C. Rockwell	1859-60.
Do	Vicinity of Port Royal and Beaufort	1006	1-20,000	W. H. Dennis	1865.
Do	Mouth of Savannah River to May River	803	1-20,000	C. Rockwell	1859-60.
Do	Savannah River to Cooper River, west of Danfuskie Island.	1196	1-20,000	C. Hosmer	1870-71.
	Savannah River to St. Johns River.				
Georgia	Savannah River entrance	1349	1-5,000	C. Hosmer	1874.
Georgia and South Carolina.	Savannah River, from Fort Pulaski northward, including Elba Island.	379	1-10,000	H. L. Whiting	1852.
Do	Savannah River, vicinity of Long and Bird islands	1348 *b*	1-5,000	C. Hosmer	1874.
Do	Savannah River, vicinity of Elba Island	1348 *a*	1-5,000	....do	1874.
Do	Savannah River, from Elba Island to Savannah	383	1-5,000	H. L. Whiting	1852.
South Carolina....	Shore line, Savannah River, vicinity of Savannah	343	1-10,000	....do	1852.
Georgia	Savannah River, vicinity of Forts Jackson and Lee and Batteries Tatnell and Barnwell.	1027	1-5,000	C. O. Boutelle	1866.
South Carolina and Georgia.	Savannah River, from Savannah to Cross Tides, including city of Savannah.	385	1-10,000	H. L. Whiting	1852.
Do	Savannah River, from Cross Tides to head of Isla Island.	380	1-10,000	....do	1852.
Georgia	Wilmington River and vicinity	992	1-20,000	C. Fendall	1865-67.
Do	Wassaw Sound and vicinity	906	1-20,000	W. H. Dennis	1863.
Do	Ossibaw Sound and vicinity	706	1-10,000	A. M. Harrison, C. Ferguson, and W. H. Dennis.	1858.
Do	Vicinity of Romerly Marsh Creek	1089	1-20,000	C. Hosmer	1869.
Georgia	Vicinity of Ogeechee and Vernon rivers	707	1-10,000	A. M. Harrison, C. Ferguson, and W. H. Dennis.	1858.
Do	Topography of vicinity of fortifications of rivers emptying into Ossibaw Sound.	991	1-20,000	C. Fendall	1865.
South Carolina....	Map, vicinity of Savannah (war map)	972	¾ in. to 1 m.	W. H. Dennis	1865.
Georgia	Between Ossibaw and St. Catherines Sound	841	1-20,000	H. S. Du Val	1858-59-60.
Do	Ogeechee to Medway River, west of Florida Passage	1109	1-20,000	C. Hosmer and H. G. Ogden.	1869.
Do	Northern part of St. Catherines Island and vicinity	1060	1-20,000	C. Rockwell and J. A. Sullivan.	1867.
Do	From Medway River to Julienton River	1155	1-20,000	C. Hosmer and H. G. Ogden.	1869.
Do	Sapelo Sound and adjacent waters	721	1-20,000	A. W. Longfellow	1857-58.
Do	Doboy Sound and vicinity	1080	1-20,000	W. H. Dennis	1868.
Do	Topographical reconnoissance of Sapelo Island	678	1-10,000	H. S. Du Val	1857.
Do	Altamaha Sound and vicinity	1114	1-20,000	W. H. Dennis	1869.
Do	City of Darien and vicinity	1114 *bis*	1-20,000	....do	1869.
Do	St. Simons Island, Long Island, and part of Little St. Simons Island.	1108	1-20,000	C. T. Iardella	1869.
Do	Vicinity of Mackays and Back River	1113	1-20,000	W. H. Dennis	1869.
Do	St. Simons Sound	750	1-10,000	A. W. Longfellow and C. Fendall.	1856-57.
Do	Blythe Island and Brunswick Harbor	778	1-10,000	....do	1856-58.
Do	St. Andrews and Jekyl sounds	1145	1-20,000	C. Rockwell, J. A. Sullivan, and C. M. Bache.	1867-68-70.
Do	Part of Cumberland Island and vicinity	1152	1-20,000	W. H. Dennis	1870.
Do	Reconnaissance for proposed base line, Cumberland Island.	624	1-10,000	A. M. Harrison and W. H. Dennis.	1857.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Savannah River to St. Johns River—Continued.				
Georgia and Florida.	Fernandina Harbor and vicinity	613	1-10,000	A. M. Harrison and W. H. Dennis.	1857.
Do	St. Marys and vicinity	614	1-10,000	....do	1857.
Florida	Nassau Sound and vicinity	1232 *a*	1-20,000	W. H. Dennis	1871.
Do	Part of Amelia River and vicinity	615	1-10,000	A. M. Harrison and W. H. Dennis.	1857.
	St. Johns River to Cape Canaveral.				
Florida	The mouths of St. Johns River and Fort George Inlet.	411	1-10,000 / 1-5,000	R. M. Bache	1853.
Do	St. Johns River entrance	965	1-10,000	W. H. Dennis	1864.
Do	Sisters Creek and vicinity	1232 *b*	1-20,000	....do	1871.
Do	St. Johns River, from light-house to Browns Creek	550	1-10,000	A. M. Harrison	1855.
Do	St. Johns River, from Browns Creek to Point Suarrez.	551	1-10,000	....do	1855.
Do	St. Johns River, from Point Suarrez to Jacksonville	552	1-10,000	A. M. Harrison and P. R. Hawley.	1855-56.
Do	Vicinity of Jacksonville	963	1-10,000	W. H. Dennis	1864.
Do	Triangulation and topography east of Jacksonville, vicinity of New River.	765	1-69,000 (approx.)	M. L. Smith, J. S. Bradford, and W. J. Gerdner.	1859.
Do	St. Johns River, Jacksonville to Mandarin Point	1459 *a*	1-20,000	H. G. Ogden, W. I. Vinal, and C. A. Ives.	1876-77.
Do	St. Johns River, Mandarin Point to San Patricio Point.	1459 *b*	1-20,000	H. G. Ogden and C. A. Ives.	1877.
Do	St. Johns River, Christophers Point to Buckleys Bluff and Doctors Lake.	1459 *c*	1-20,000	....do	1876-77.
Do	St. Johns River, San Patricio Point to Raceys Point.	1465	1-20,000	F. W. Perkins	1878.
Do	St. Johns River, from Raceys Point to Cedar Point	1564 *a*	1-20,000	E. Ellicott	1884-85.
Do	St. Johns River, from Cedar Point to San Mateo	1564 *b*	1-20,000	....do	1884-85.
Do	Reconnaissance of St. Johns River, Jacksonville, to Lake Monroe.	2027	1-80,000	H. G. Ogden	1875.
Do	Reconnaissance of St. Johns River	1512	1-80,000	E. Ellicott	1883.
Do	Seacoast south of St. Johns River (first sheet)	712	1-10,000	J. Mechan	1858.
Do	Seacoast south of St. Johns River (second sheet)	713	1-10,000	....do	1858.
Do	Vicinity of Diego Plains	822	1-20,000	F. W. Dorr	1861.
Do	Part of North and Guano rivers	784	1-20,000	....do	1860-61.
Do	St. Augustine and vicinity	783	1-10,000	....do	1859-60.
Do	From Matanzas Inlet north	1082	1-20,000	C. M. Bache	1867.
Do	Matanzas River and vicinity	1268	1-20,000	A. M. Harrison	1872.
Do	Head of Halifax River and vicinity	1298	1-20,000	....do	1873.
Do	Part of Halifax River	1343	1-20,000	....do	1874.
Do	Mosquito Inlet and vicinity	1344	1-20,000	....do	1874.
Do	Mosquito Inlet and vicinity (supplement)	1344	1-10,000	....do	1874.
Do	Mosquito Lagoon and head of Indian River	1415 *a*	1-10,000	C. Hosmer	1875.
Do	Vicinity of Haulover Canal	1415 *b*	1-5,000	....do	1875.
Do	Part of Mosquito Lagoon, head of Banana River and part of Banana Creek.	1423	1-20,000	....do	1874-75.
Do	Indian River, vicinity of Titusville, with part of Banana Creek.	1422	1-20,000	....do	1875-76.
Do	Vicinity of Cape Canaveral and Banana River	1450 *a*	1-20,000	C. Hosmer and J. Hergesheimer.	1876-77.
Do	Vicinity of Cape Canaveral	300	1-20,000	H. Adams	1850.
Do	Indian River, from Addison Point to Oleander Point.	1435	1-20,000	C. Hosmer	1876.
	Cape Canaveral to Cape Sable, including Florida Keys.				
Florida	Indian River, from Oleander Point to Eau Gallie and part of Newfound Harbor and Banana River.	1450 *b*	1-20,000	C. Hosmer and J. Hergesheimer.	1876-77.
Do	Indian River, from Banana River to Rock Point	1460	1-20,000	R. M. Bache and C. A. Ives.	1878.
Do	Indian River, from Goat Creek to Sebastian River	1478	1-20,000	W. I. Vinal and W. C. Hodgkins.	1879.
Do	Indian River, from Sebastian Creek to the Narrows	1544	1-20,000	W. I. Vinal	1880-81.
Do	Indian River, from the Narrows to the Inlet	1630	1-20,000	C. H. Boyd	1882.
Do	Vicinity of Indian River Inlet	785	1-10,000	C. Ferguson, H. Anderson, and J. S. Bradford.	1860-61.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Canaveral to Cape Sable, including Florida Keys—Continued.				
Florida	Indian River, from the inlet southward	1650	1-20,000	B. A. Colonna	1883.
Do	Indian River, including St. Lucie River, Manatee Creek, and part of Jupiter Narrows.	1652	1-20,000	....do	1883.
Do	Jupiter Narrows, Hobes Sound, Jupiter Sound, and Jupiter River.	1640	1-20,000	....do	1883.
Do	Vicinity of Lake Worth	1649	1-40,000	....do	1883.
Do	Between south end of Lake Worth and Hillsboro Inlet.	1657	1-40,000	....do	1884.
Do	Between Hillsboro and New River Inlets	1656	1-40,000	....do	1884.
Do	New River Inlet to Biscayne Bay	1510	1-20,000	O. H. Tittmann	1883.
Do	Biscayne Key, from Norris Cut north	1049	1-20,000	C. T. Iardella	1867.
Do	Biscayne Bay, from Shoal Point to Miami, including Key Biscayne.	336	1-20,000	H. Adams	1851.
Do	Soldier Key, Ragged Keys, and part of Elliotts Key.	409	1-20,000	....do	1852-53.
Do	Western coast of Biscayne Bay, from Shoal Point to Black Point.	744	1-20,000	C. T. Iardella	1859.
Do	Elliotts Key, Cæsars Creek, and Old Rhodes Key	408	1-20,000	H. Adams	1853.
Do	Western coast of Biscayne Bay, from Turtle Point to Fender Point.	745	1-20,000	C. T. Iardella	1859.
Do	Northern part of Key Largo	573	1-20,000	S. A. Wainwright and H. S. Du Val.	1854-55.
Do	Cards Sound, from Arsenicker Keys southward	746	1-20,000	C. T. Iardella	1859.
Do	Southern part of Cards Sound	747	1-20,000	....do	1859.
Do	Barnes Sound and vicinity (topography and hydrography).	1154	1-40,000	J. G. Oltmans	1870.
Do	South shore of Key Largo, from Point Charles northward.	574	1-20,000	S. A. Wainwright and C. Fendall.	1855.
Do	Topography south of Black Water Bay	758	1-20,000	C. T. Iardella	1859.
Do	Barnes Sound north of Point Charles	857	1-20,000	....do	1860.
Do	Florida Keys, from Point Charles to Lower Matecumbe Key.	640	1-20,000	S. A. Wainwright	1857.
Do	Florida Keys, north shore of Long Key and vicinity	690	1-20,000	F. W. Dorr	1857.
Do	North shores of Upper Matecumbe Key and Windleys Island.	696	1-20,000	C. T. Iardella	1858.
Do	South shore of Lower Matecumbe Key, including Lignum Vitæ Key.	641	1-20,000	S. A. Wainwright	1857.
Do	Barnes Sound and vicinity (topography and hydrography.)	1071	1-30,000	C. T. Iardella	1868.
Do	North shores of Long and Lower Matecumbe keys	694	1-20,000	....do	1858.
Do	Buchanan Keys, Rabbit Key, and adjacent keys	748	1-20,000	....do	1859.
Do	Oyster Keys and adjacent keys	749	1-20,000	....do	1859.
Do	Vicinity of Cape Sable, from Palm Point to upper crossing.	649	1-20,000	F. W. Dorr	1857.
Do	Florida Keys, Long Key to Duck Key	688	1-20,000	....do	1857.
Do	Florida Keys, vicinity of Fat Deer, Crawl, and Grassy keys.	689	1-20,000	....do	1857.
Do	Vicinity of Vaca Keys	651	1-20,000	....do	1857.
Do	From Knights Key and Sombrero Key to Bahia Honda.	339	1-20,000	H. Adams	1851.
Do	Little Pine, Johnson, Flat, and other keys	627	1-20,000	C. T. Iardella	1857.
Do	Big Pine, No Name, Ramrod, Torch, and other keys	625	1-20,000	....do	1857.
Do	Eastern shore of Big Pine Key and western shore of No Name Key.	461	1-20,000	S. A. Wainwright	1854.
Do	Howes, Annette, Spanish, and other keys	626	1-20,000	C. T. Iardella	1857.
Do	Content, Water, Raccoon, Knock 'em Down, Burnt, Torch, and Howes keys.	652	1-20,000	F. W. Dorr	1857.
Do	Sugar Loaf, Cudjo, Summerland, and Loggerhead keys.	568	1-20,000	C. T. Iardella	1856.
Do	Johnstons, Sawyers, and adjacent keys	560	1-20,000	S. A. Wainwight	1856.
Do	Snipe Keys and Saddle Bunch Keys	494	1-20,000	H. Adams	1855.
Do	Keys north and east of Boca Chico	457	1-20,000	....do	1853-54.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Cape Canaveral to Cape Sable, including Florida Keys—Continued.				
Florida	Mud Keys	493	1-20,000	H. Adams	1855.
Do.	Boca Chico and adjacent keys	417	1-10,000	R. M. Bache	1853.
Do	Key West, Stock Island, and adjacent keys	291	1-10,000	H. Adams	1850.
Do	Outer keys and ledges lying southwest of the harbor of Key West.	301	1-10,000	.....do	1850. (?)
Do	Outer keys north and west of the harbor of Key West.	302	1-20,000	.....do	1850.
Do	Marquesas, Boca Grande, and adjacent keys eastward.	319	1-20,000	.....do	1851.
Do	The Dry Tortugas (and supplement)	1410	1-10,000	H. G. Ogden	1875.
	From Cape Sable to Tampa Bay.				
Florida	Cape Sable to Northwest Cape	1930	1-20,000	J. Hergesheimer	1889.
Do	From Palm Point to Northwest Cape	650	1-20,000	F. W. Dorr	1857.
Do	Northwest Cape to Shark Point	1903	1-20,000	J. Hergesheimer	1889.
Do	Shark Point to Porpoise Point	1904	1-20,000	.....do	1889.
Do	Porpoise Point to Rabbit Key	1837	1-20,000	.....do	1888.
Do	Horse Key to Rabbit Key	1836	1-20,000	.....do	1888.
Do	Cape Romano to Horse Key	1835	1-20,000	.....do	1888.
Do	Big Marco Pass to Cape Romano	1553 *a*	1-20,000	.....do	1885.
Do	Coximbas Bay	2004	1-10,000	.....do	1890.
Do	Johns Pass to Big Marco Pass	1553 *b*	1-20,000	.....do	1885.
Do	Inside passage back of Cape Romano	2005	1-10,000	.....do	1890.
Do	Wiggins Pass to Johns Pass	1554 *a*	1-20,000	.....do	1885.
Do	Bowditch Point to Wiggins Pass	1554 *b*	1-20,000	.....do	1885.
Do	San Carlos Bay and approaches	693	1-20,000	F. W. Dorr	1858.
Do	Caloosahatchee River, from entrance to Nigger Head.	2126	1-10,000	J. Hergesheimer	1892.
Do	Caloosahatchee River, from Nigger Head to Hancock Creek.	2122	1-10,000	J. Hergesheimer and W. I. Vinal.	1892-93.
Do	Caloosahatchee River, from Hancock Creek to Beautiful Island.	2123	1-10,000	.....do	1892-93.
Do	Captiva Pass to Sanibel Island, including part of Pine Island.	739	1-20,000	F. W. Dorr and C. Ferguson.	1859.
Do	South shore of Charlotte Harbor entrance	738	1-20,000	.....do	1859.
Do	Vicinity of Matlacha Pass	1048	1-20,000	C. T. Iardella	1866-67.
Do	Boco Grande entrance to Boco Nueva Pass	853	1-20,000	.....do	1860.
Do	Charlotte Harbor, vicinity of Cape Haze and opposite shore.	854	1-20,000	.....do	1860.
Do	Charlotte Harbor, from Key Point to mouth of Peas Creek.	855	1-20,000	.....do	1860.
Do	Peas Creek, head of Charlotte Harbor	856	1-20,000	.....do	1860.
Do	Lemon Bay, from Bocilla Pass to Stump Pass	1518 *b*	1-20,000	J. Hergesheimer	1883.
Do	Lemon Bay, from Stump Pass to Roberts Bay	1518 *a*	1-20,000	.....do	1883.
Do	Little Sarasota Bay and vicinity	1517 *b*	1-20,000	.....do	1883.
Do	Big Sarasota Pass to Caseys Pass	1647	1-20,000	.....do	1883.
Do	Sarasota Bay and vicinity	1517 *a*	1-20,000	.....do	1883.
Do	Eastern shore of Sarasota Bay	1653	1-20,000	.....do	1883.
	Tampa Bay to Pensacola Bay.				
Florida	South shore of Tampa Bay, Palmasola Point to Piney Point.	1346 *b*	1-20,000	H. G. Ogden	1874.
Do	South shore of Tampa Bay, Piney Point to Mangrove Point.	1408 *b*	1-20,000	.....do	1875.
Do	Ballast Point to Mangrove Point	1411 *a*	1-20,000	J. Hergesheimer	1875.
Do	Ballast Point to Tampa	1411 *b*	1-20,000	.....do	1875.
Do	Head of Old Tampa Bay	1409 *b*	1-20,000	H. G. Ogden	1875.
Do	Old Tampa Bay, from Smack Bayou to Rocky Point.	1409 *a*	1-20,000	.....do	1875.
Do	North shore of Tampa Bay, Point Pinelos to Gadsdens Point.	1408 *a*	1-20,000	.....do	1875.
Do	Mullet, Egmont, and Passage Keys, and north end of Palm Key.	1316 *b*	1-20,000	Andrew Braid	1873.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Tampa Bay to Pensacola Bay—Continued.				
Florida	Boca Ceiga Bay	1316 *a*	1-20,000	Andrew Braid	1873.
Do	Head of Boca Ceiga Bay	1301 *b*	1-20,000	H. G. Ogden	1873.
Do	Clearwater Harbor	1301 *a*	1-20,000	....do	1873.
Do	Clearwater Harbor, entrance to Anclote Keys	1698	1-20,000	W. I. Vinal	1884.
Do	Trouble Creek to Cedar Point	1699	1-20,000	....do	1886.
Do	Cedar Point to Wall Creek	1700	1-20,000	....do	1886.
Do	Vicinity of Bay Port	962	1-20,000	N. S. Finney	1860. (?)
Do	Raccoon Point to Chesshowitzka Bay	782	1-20,000	....do	1859.
Do	From Homosassa River southward	781	1-20,000	....do	1860.
Do	Green Point to Homosassa River	779	1-20,000	....do	1858-59.
Do	Homosassa River	691	1-10,000	....do	1858.
Do	Crystal Bay and vicinity	705	1-20,000	....do	1858.
Do	Vicinity of Withlacoochee River	780	1-20,000	....do	1859.
Do	Mouth of Withlacoochee River (reconnaissance)	570	1-10,000	A. M. Harrison	1856.
Do	From Wiccasassa River to Withlacoochee Bay	699	1-20,000	N. S. Finney	1858.
Do	Wiccasassa Reefs	571	1-10,000	A. M. Harrison	1856.
Do	Mouth of Wiccasassa River (reconnaissance)	569	1-10,000	....do	1856.
Do	From Cedar Keys eastward	572	1-10,000	....do	1856.
Do	Vicinity of Cedar Keys	423	1-10,000	F. H. Gerdes	1852-54.
Do	Keys south of Cedar Keys	422	1-10,000	....do	1852.
Do	California Creek to Grassy Key	1426 *b*	1-20,000	F. W. Perkins	1876-77.
Do	Peppermint Keys to California Creek	1426 *a*	1-20,000	....do	1876.
Do	From Dallas Creek to Live Oak Point	1425 *a*	1-20,000	....do	1875.
Do	Peppermint Keys to Steinhatchee River	1425 *b*	1-20,000	....do	1875.
Do	From Live Oak Point to Fenholloway River	1424 *b*	1-20,000	....do	1875.
Do	From Fenholloway River to Ocilla River	1424 *a*	1-20,000	....do	1875.
Do	Ocilla River	454	1-20,000	G. D. Wise	1854.
Do	From St. Marks River to Ocilla River	819	1-20,000	....do	1859-60.
Do	St. Marks River	575	1-20,000	....do	1856.
Do	Ocklockonnee Bay to St. Marks River	820	1-20,000	....do	1859-60.
Do	Ocklockonnee Bay	771	1-20,000	....do	1859.
Do	Alligator Harbor and eastern part of St. Georges Sound.	695	1-20,000	C. T. Iardella	1858.
Do	Vicinity of Carrabee River and Dog Island	697	1-20,000	....do	1858.
Do	Crooked River, with topography (hydrographic)	1390	1-20,000	J. Hergesheimer	1878.
Do	Appalachicola Bay and St. Georges Sound, from Appalachicola to East Pass.	647	1-20,000	G. D. Wise	1856-57.
Do	Vicinity of East Bay, Appalachicola Bay	648	1-20,000	....do	1857.
Do	Mouth of Appalachicola River (with hydrography)	601	1-20,000	....do	1857.
Do	Appalachicola Bay, entrance West Pass to Cedar Point	646	1-20,000	....do	1857.
Do	St. Vincent Sound and Island	698	1-20,000	....do	1858.
Do	St. Josephs Bay, Cape San Blas and vicinity	1065	1-20,000	S. C. McCorkle	1868.
Do	St. Josephs Point to St. Andrews Point	1091	1-20,000	H. M. De Wees	1869.
Do	St. Andrews Bay and Sound	477	1-20,000	G. D. Wise	1855.
Do	East Bay, a tributary of St. Andrews Bay	1147 *b*	1-20,000	C. T. Iardella	1870-71.
Do	Detached topography, St. Andrews East and West Bays.	1146	1-20,000	....do	1870.
Do	North Bay, a tributary of St. Andrews Bay	1147 *a*	1-20,000	....do	1870-71.
Do	From Philips Inlet eastward	1358 *a*	1-20,000	F. W. Perkins	1872.
Do	Vicinity of West Bay, a tributary of St. Andrews Bay	1187	1-20,000	S. C. McCorkle	1871.
Do	Blue Mountain to Phillips Inlet	1358 *b*	1-20,000	F. W. Perkins	1872.
Do	From Blue Mountain westward	1358 *c*	1-20,000	....do	1872.
Do	Eastern part of Choctawhatchee Bay	1270	1-20,000	H. G. Ogden	1872.
Do	Western part of Choctawhatchee Bay	1269	1-20,000	....do	1872.
Do	From East Pass eastward	1587	1-20,000	....do	1872.
Do	East Pass to eastern part of Santa Rosa Sound	1191	1-20,000	....do	1871.
Do	Santa Rosa Sound, from the Narrows eastward	1192	1-20,000	....do	1871.
Do	Santa Rosa Sound, westward of Live Oak Plantation	1193	1-20,000	....do	1871.
Do	Western part of Santa Rosa Sound, Deer Point to Sharp Point.	701	1-10,000	F. H. Gerdes	1859.
Do	Entrance to Pensacola Bay	566	1-10,000	....do	1856.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Pensacola Bay to and including Mobile Bay.				
Florida	Pensacola Bay, from navy-yard to Emmanuel Point, with opposite shore.	567	1-10,000	F. H. Gerdes	1856.
Do	Escambia Bay, from Emmanuel Point to Tora Point, including opposite shore.	717	1-20,000	do	1858.
Do	Vicinity of East Bay	797	1-20,000	do	1860.
Do	Part of East Bay	2160	1-10,000	P. A. Welker	1894-95.
Do	East River, tributary of East Bay	2161	1-10,000	do	1894.
Do	Part of Black Water and East bays	2158	1-10,000	do	1894.
Do	Blackwater Bay	2093	1-10,000	do	1892.
Do	Blackwater River and tributaries	2094	1-10,000	do	1892-93.
Do	Part of East and Escambia bays	2159	1-10,000	do	1894-95.
Do	Part of Escambia Bay	2157	1-10,000	do	1894.
Do	Mouth of Escambia River and vicinity	2030	1-10,000	do	1891.
Do	Head of Escambia Bay	2031	1-10,000	do	1891.
Do	Navy-yard site, Gaberonne to Devils Point, with topography (hydrographic).	1932	1-5,000	do	1889.
Do	Bayou Chico to Gaberonne, including Pensacola	1984	1-10,000	do	1890-95.
Do	Bayou Grande, a tributary of Pensacola Bay	1895	1-10,000	do	1889-95.
Do	From Pensacola Bay entrance westward	700	1-20,000	F. H. Gerdes	1858.
Do	Pensacola Bay entrance	1497	1-10,000	W. H. Bronson, U. S. N	1881.
Do	Vicinity of Big Lagoon	1034	1-10,000	J. G. Oltmans	1867.
Florida and Alabama.	From Big Lagoon to Perdido entrance	*1035	1-10,000	do	1867.
Florida	Big Lagoon, a tributary of Pensacola Bay	2187	1-10,000	P. A. Welker, J. Nelson, and R. L. Faris.	1895.
Do	A portion of Pensacola Bay, vicinity of Old Navy Cove.	2188	1-10,000	do	1895.
Do	A portion of Pensacola Bay, Woolsey, and west end of Santa Rosa Island.	2189	1-10,000	do	1895.
Do	Perdido Bay, vicinity of Inerarity Point and Tar Kiln Bay.	1980	1-10,000	S. Forney and W. I. Vinal.	1890.
Florida and Alabama.	Perdido Bay, from Palmetto Creek and Tar Kiln Bayou to Lillian.	1981	1-10,000	S. Forney and C. T. Iardella.	1890-91.
Do	Perdido Bay, from Lillian to mouth of Perdido River	2034	1-10,000	S. Forney	1891.
Do	Perdido Bay, Red Bluff to Millview (hydrography)	2074	1-10,000	do	1891.
Do	Perdido River, from Perdido Bay to mouth of Blackwater River.	2035	1-10,000	do	1891.
Do	Perdido Bay, vicinity of Perdido entrance and Bay La Launch.	1979	1-10,000	S. Forney and C. T. Iardella.	1890.
Alabama	Portage Creek and Long and Cotton bayous	2036	1-10,000	S. Forney	1891.
Do	Wolf Bay and tributaries	2033	1-10,000	do	1891.
Do	Perdido entrance to Little Lagoon	1042	1-10,000	J. G. Oltmans	1867.
Do	Shore line, from Little Lagoon eastward to Alabama Point.	2088	1-20,000	J. B. Baylor and W. I. Vinal.	1892.
Do	Vicinity of Bon Secours Bay	277	1-20,000	W. E. Greenwell	1849.
Do	Shore line, from Mobile Point eastward to Little Lagoon.	2087	1-20,000	J. B. Baylor and W. I. Vinal.	1892.
Do	Entrance to Mobile Bay (and duplicate)	240	1-20,000	F. H. Gerdes	1847.
Do	Entrance to Mobile Bay	1066	1-20,000	J. G. Oltmans	1868.
Do	Mobile Bay entrance	2086	1-10,000	W. I. Vinal	1892.
Do	Bon Secours Bay, from Mullet Point to Cypress Point.	276	1-20,000	W. E. Greenwell	1849.
Do	Mobile Bay, Mullet Point to Ragged Point	286	1-20,000	do	1849.
Do	Mobile Bay, from Ragged Point to mouth of Apalachee River.	294	1-10,000	do	1849.
Do	Head of Mobile Bay, from mouth of Apalachee River to Grand Bay.	288	1-20,000	do	1850.
Do	Vicinity of Mobile	295	1-10,000	do	1850.
Do	Mobile Bay, Choctow Point to Deer River Point	287	1-20,000	do	1850.
Do	Mobile Bay, from Deer River Point to Alabama Point.	275	1-20,000	do	1849.
Do	Eastern part of Dauphin Island	406	1-10,000	do	1853.
Do	Eastern end of Dauphin Island, base line survey	326	1-10,000	F. H. Gerdes	1845-46.

*And supplement.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Mobile Bay to Mississippi River.				
Alabama	Petit Bois Island	245	1-20,000	W. E. Greenwell	1848.
Mississippi	Horn Island Pass	241	1-10,000	F. H. Gerdes	1847.
Do	Horn Island Pass (hydrography)	1666	1-20,000	J. M. Hawley, U. S. N.	1886.
Do	Horn Island	274	1-20,000	W. E. Greenwell	1849.
Do	Ship Island	244	1-20,000	....do	1848.
Do	....do	407	1-10,000	....do	1853.
Alabama	Mississippi Sound, Grand Point to Grand Batture Island.	243	1-20,000	....do	1848.
Mississippi	South shore Mississippi Sound, from Grand Batture Island to West Pascagoula River.	273	1-20,000	....do	1848.
Do	Mississippi Sound, West Pascagoula River to Biloxi Bay.	323	1-20,000	....do	1851.
Do	Deer Island, Mississippi Sound	384	1-10,000	....do	1852.
Do	Harbor and Back Bay of Biloxi	324	1-10,000	....do	1851.
Do	Mississippi Sound, Mississippi City to Pitcher Point	369	1-20,000	....do	1852.
Do	Harbor of Pass Christian	325	1-10,000	....do	1851.
Do	Bay St. Louis and town of Shieldsboro	370	1-20,000	....do	1852.
Do	Grand Bayou to Pearl River, including Malheureux Island.	371	1-20,000	....do	1852.
Mississippi and Louisiana.	Pearl River Island and vicinity	633	1-20,000	R. M. Bache	1856.
Louisiana	The Rigolets	656	1-20,000	....do	1855.
Do	Passes connecting Lakes Borgne and Pontchartrain	773	1-20,000	W. S. Gilbert	1858.
Do	Lake Pontchartrain, Salt Bayou to Bonfuca Bayou	774	1-20,000	....do	1859.
Do	Lake Pontchartrain, Bonfuca Bayou to Ragged Point	796	1-20,000	M. Seaton	1860.
Do	Lake Pontchartrain, Bayou Cushon to Bayou Le Bar	799	1-20,000	....do	1860.
Do	Vicinity of Point aux Herbes	786	1-20,000	W. S. Gilbert	1859.
Do	Lake Borgne, from Proctorville to Chef Menteur Pass	629	1-20,000	....do	1857.
Do	Lake Borgne, from Point aux Marchettes to Proctorville	628	1-20,000	....do	1857.
Do	Eastern shore of Lake Borgne, Malheureux Point to Point aux Marchettes.	405	1-20,000	W. E. Greenwell	1853.
Do	South shore Mississippi Sound, Nine Mile Bayou to Isle à Pitre.	404	1-20,000	....do	1852-53.
Do	Cat Island and Isle à Pitre	242	1-20,000	....do	1848.
Do	Western shore of Chandeleur Islands, vicinity of Brush and Martins islands.	654	1-20,000	S. Harris	1857.
Do	Chandeleur Sound, south of Bay Bodreau	768	1-20,000	....do	1858-59.
Do	West side Chandeleur Sound, from Barrel Key to Point Chico.	769	1-20,000	....do	1858-59.
Do	West side Chandeleur Sound, from Morgans Harbor to Indian Mound Bay.	1198	1-20,000	C. H. Boyd	1871.
Do	West side of Breton Island Sound, from Otter Bayou to Point Comfort.	1148	1-20,000	....do	1870.
Do	West side of Breton Island Sound, from Otter Bayou to Gardners Point.	1099	1-20,000	....do	1869-70.
Do	Western shore, Breton Island Sound, from Raccoon Island to California Point.	1098 *a*	1-20,000	....do	1869.
Do	Vicinity of California Point, Breton Island Sound	1098 *b*	1-20,000	....do	1869.
Do	Western shore of Breton Sound, vicinity of Quarantine Bay, *Hog* and *Battledore islands.*	1096	1-20,000	....do	1868-69.
Do	Chandeleur Islands, from Chandeleur Light to Big Bayou.	548	1-20,000	J. G. Oltmans	1855.
Mississippi	North Point of Chandeleur Islands	366	1-10,000	F. H. Gerdes	1852.
Do	Freemason Keys and part of Chandeleur Islands	549	1-20,000	J. G. Oltmans	1855.
Do	Chandeleur Sound (hydrographic)	1171	1-40,000	F. D. Granger	1873.
Do	Mississippi River, from Bohemia to Poverty Point (hydrographic).	1154	1-20,000	C. H. Boyd	1872.
Do	Errol Islands, Breton Island Sound	1092	1-20,000	....do	1869.
Do	Breton Island	1097	1-20,000	....do	1869.
	Mississippi River.				
Louisiana	Vicinity of Pass à l'Outre and Northeast Pass	794	1-20,000	F. H. Gerdes	1859-60.
Do	South, Grand, and Southeast passes	1038	1-20,000	J. W. Donn	1867.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Mississippi River—Continued.				
Louisiana	Mouth of South Pass, Mississippi Delta	1386	1-4,800	H. L. Marindin	1875.
Do	Southwest Pass and portions of Southeast, West, and Gordon Island bays.	1037	1-20,000	J. W. Donn	1867.
Do	Isle au Breton Bay (hydrographic)	999	1-10,000	F. P. Webber	1869.
Do	Vicinity of Cubits Crevasse	*1412 *a*	1-4,800	Andrew Braid	1876.
Do	Vicinity of Cubits Crevasse and main pass	1412 *b*	1-10,000	H. L. Marindin	1877.
Do	Mississippi River, from Cubits Crevasse to the Forts, including Grand Bay and Bird Island Sound.	1069	1-20,000	C. H. Boyd	1868.
Do	Grand Pass to Schofield Bayou	1658	1-30,000	C. Hosmer	1884.
Do	Plan of Fort Jackson	870	1-600	F. H. Gerdes	1862.
Do	Mississippi River, from the Forts to Grand Prairie	1149	1-20,000	C. H. Boyd	1870.
Do	Mississippi River, Grand Prairie to Point à la Hache.	1197	1-20,000	....do	1871.
Do	Mississippi River, Bohemia to Poverty Point	1258 *a*	1-20,000	....do	1872.
Do	Mississippi River, Poverty Point to Jesuits Church	1258 *b*	1-20,000	....do	1872.
Do	Mississippi River, Jesuits Bend to Powder House Point.	1300	1-20,000	....do	1873.
Do	Mississippi River, New Orleans and vicinity	1403	1-20,000	C. H. Boyd and Andrew Braid.	1874-75.
Do	Vicinity of Algiers and Gretna	1404 *a*	1-10,000	C. H. Boyd	1874-75.
Do	West shore of Mississippi River, opposite New Orleans.	1404 *b*	1-20,000	....do	1874-75.
Do	Mississippi River, from Carrollton to Boutte Station	1429 *a*	1-20,000	....do	1876.
Do	Mississippi River, from Boutte Station to Bonnet-Carré Point.	1429 *b*	1-20,000	....do	1876.
Do	Mississippi River, from Belle Point to Vacherie Road.	1480 *a*	1-20,000	....do	1876-77.
Do	Mississippi River, from Vacherie Road to Brilliant Point.	1481 *a*	1-20,000	....do	1877.
Do	Mississippi River, from Brilliant Point to Point Houmas.	1481 *b*	1-20,000	....do	1877.
Do	Mississippi River, vicinity of Donaldsonville	1611	1-10,000	W. H. Dennis	1880.
Do	Mississippi River, below Baton Rouge	1613	1-10,000	C. Hosmer	1880.
Do	Vicinity of Baton Rouge	1610	1-10,000	C. H. Boyd	1880.
Do	Vicinity of West Baton Rouge	1612	1-10,000	....do	1880.
Mississippi and Louisiana.	Reconnaissance of Mississippi River, Rodney to Grand Gulf and vicinity.	1920	1-20,000	F. H. Gerdes	1864.
Do	Grand Gulf, including Federal and Confederate defenses.	937	1-5,000	....do	1864.
Mississippi and Arkansas.	Reconnaissance of approaches to Vicksburg	935	1-10,000	....do	1863.
Mississippi	Vicinity of Helena	1608	1-10,000	C. H. Boyd	1878.
Various	Reconnaissance and survey sketches of Mississippi, Red, and Tennessee rivers.	1923	Various.	F. H. Gerdes	1862-63-64.
	Mississippi River to Galveston entrance.				
Louisiana	Grand Pass to Schofield Bayou	1658	1-30,000	C. Hosmer	1884.
Do	South coast of La Rouquille Bay to Schofield Bayou	1648	1-30,000	C. H. Boyd	1883.
Do	Lower part of Barataria Bay and vicinity	1468 *a*	1-20,000	W. H. Dennis	1877.
Do	Upper part of Barataria Bay and vicinity	1468 *b*	1-20,000	....do	1877.
Do	Head of Barataria Bay	1607	1-20,000	....do	1878.
Do	Bayou Moreau to Caminada Bay	1766	1-20,000	F. W. Perkins	1887.
Do	Grand Pass, Timballier to Bayou Moreau	1765	1-20,000	....do	1887.
Do	Timballier and Caillou	1764	1-20,000	....do	1887.
Do	Vine Island and eastern part of Isle Dernière	1763	1-20,000	....do	1887.
Do	Western part of Isle Dernière	1762	1-20,000	....do	1887.
Do	....do	410	1-10,000	F. H. Gerdes	1853.
Do	Shore line of Caillou Bay	1691	1-20,000	F. W. Perkins	1886.
Do	From Oyster Bayou to Caillou Bayou	1692	1-20,000	....do	1886.
Do	From Point au Fer to near Oyster Bayou	1690	1-20,000	....do	1886.
Do	Point au Fer, Shell Reef, Atchafalaya Bay	636	1-9,660·33	F. H. Gerdes	1855.
Do	Atchafalaya Bay, Point au Fer to Turn Point	637	1-9,660·33	....do	1855.
Do	Atchafalaya Bay, Turn Point to mouth of Atchafalaya River.	638	1-9,660·33	....do	1855.
Do	Atchafalaya River, from Atchafalaya Bay to Sword Point.	1822	1-10,000	C. H. Sinclair	1888.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Mississippi River to Galveston entrance—Continued.				
Louisiana	Atchafalaya River, from Sword Point to Batemans Lake.	1823	1-10,000	C. H. Sinclair	1888.
Do	Atchafalaya River, from Batemans Lake to Morgan City.	1824	1-10,000	do	1888.
Do	Atchafalaya Bay, Atchafalaya River to Belle Isle	639	1-9,660·33	F. H. Gerdes	1855.
Do	Atchafalaya Bay, vicinity of Point Chevreuil	632	1-20,000	do	1856.
Do	Vicinity of Cote Blanche Bay	631	1-20,000	do	1857.
Do	Eastern part of West Cote Blanche Bay	764	1-20,000	do	1859.
Do	West part of West Cote Blanche Bay	793	1-20,000	do	1860.
Do	Wicks Bay and east shore of Vermilion Bay	1687	1-20,000	F. W. Perkins	1886.
Do	North shore of Vermilion Bay, including Petite Anse Bayou and Canal.	1693	1-20,000	do	1886.
Do	Continuation of Petite Anse Bayou	1694	1-20,000	do	1886.
Do	Western part of Vermilion Bay, including Vermilion River and Schooner Bayou.	1685	1-20,000	do	1886.
Do	South and east shore of Marsh Island	1680	1-20,000	do	1886.
Do	Southwest Pass and entrance to Vermilion Bay and vicinity.	1684	1-20,000	do	1886.
Do	Chenier Le Tigre and vicinity	1686	1-30,000	do	1886.
Do	Fresh Water Bayou to Big Constance Bayou, including Pecan Island.	1688	1-30,000	do	1886.
Do	*From Big Constance Bayou westward*	1689	1-30,000	do	1886.
Do	From Mermenteau River eastward	1655	1-20,000	do	1884-88.
Do	From Calcasieu Pass eastward	1654	1-20,000	do	1884-88.
Do	From longitude 93° 31′ to Calcasieu Pass	1642	1-20,000	do	1883.
Do	Between Sabine and Calcasieu passes	1644	1-20,000	do	1883.
Louisiana and Texas.	From Sabine Pass eastward	1643	1-20,000	do	1883.
Do	Sabine Lake (lower part)	1641	1-20,000	do	1883.
Do	Sabine Pass and Lake (hydrographic)	1646 *a*	1-20,000	F. H. Crosby, U. S. N.	1885.
Do	Vicinity of Sabine Pass	1356	1-20,000	J. N. McClintock	1874.
Do	East of Sabine Pass, vicinity of Round Lake	1635	1-20,000	F. W. Perkins	1882.
Do	Vicinity of Salt Bayou	1633	1-20,000	do	1882.
Do	Vicinity of East Bay Bayou	1634	1-20,000	do	1882.
Do	Vicinity of East Bay	329	1-20,000	J. M. Wampler	1851.
Do	South shore of Bolivar Peninsula	1636	1-20,000	F. W. Perkins	1882.
	Galveston Bay to the Rio Grande.				
Texas	Galveston Bay, Harbor, and City	282	1-20,000	J. M. Wampler	1850.
Do	Red Fish Bar, Galveston Bay	298	1-20,000	do	1850.
Do	Galveston Bay, Smiths Point to Turtle Bay	330	1-20,000	do	1851.
Do	Galveston Bay, vicinity San Jacinto Bay	331	1-20,000	do	1851.
Do	Galveston Bay, from Red Bluff to entrance of West Bay.	283	1-20,000	do	1850.
Do	Galveston Bay, from Smiths Point to Edwards Point (hydrographic).	324	1-20,000	T. A. Craven, U. S. N.	1852.
Do	Galveston, West Bay, and part of Galveston Island	328	1-20,000	J. M. Wampler	1851.
Do	Chocolate Bay and western part of Galveston Island.	374	1-20,000	do	1852.
Do	San Luis Pass to Brazos River	375	1-20,000	do	1852.
Do	Mouth of the Brazos River	2047	1-10,000	H. G. Ogden	1891-93.
Do	Between Brazos River and Matagorda Bay	412	1-20,000	J. S. Williams	1853.
Do	Eastern part of Matagorda Bay and Peninsula	557	1-20,000	S. A. Gilbert	1856.
Do	Matagorda Bay and Peninsula, Live Oak Bay to Matagorda.	642	1-20,000	do	1855-56-57.
Do	Matagorda Bay and Peninsula, from Matagorda to Oyster Lake.	600	1-20,000	do	1857.
Do	Matagorda Peninsula, from Pass Cavallo eastward	643	1-20,000	do	1856.
Do	Matagorda Bay, from Tres Palacios Bay to Karankawa Bay.	737	1-20,000	M. Seaton	1856.
Do	Karankawa Bay (hydrographic)	1095	1-20,000	F. D. Granger	1871.
Do	Matagorda Bay, from Karankawa Bay to Cedar Point.	645	1-20,000	S. A. Gilbert	1857-58.
Do	Eastern shore of Lavaca Bay, from Coxes Bay to Benado Creek.	742	1-20,000	M. Seaton	1858.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	Galveston Bay to the Rio Grande—Continued.				
Texas	Western shore of Lavaca Bay, from Chocolate Bay to Benado Creek.	740	1-20,000	M. Seaton	1858.
Do	Vicinity of Indianola	752	1-20,000	....do	1859.
Do	East end of Matagorda Island and shore of southwest end of Matagorda Bay.	644	1-20,000	C. Hosmer and S. A. Gilbert.	1857-59.
Do	Espiritu Santo and San Antonio bays	766	1-20,000	W. H. Dennis	1859.
Do	Reconnaissance coast of Texas, from Pass Cavallo to Aransas Pass.	720	1-50,000	S. A. Gilbert	1858.
Do	Northern part of San Antonio Bay	767	1-20,000	W. H. Dennis	1859.
Do	St. Charles Bay and part of San Antonio Bay	828	1-20,000	W. S. Gilbert	1860.
Do	Matagorda Island, from Panther Point westward	1030	1-20,000	W. H. Dennis	1859.
Do	Vicinity of Mesquite Bay and western part of St. Josephs Island.	787	1-20,000	W. S. Gilbert	1860.
Do	From Aransas Pass eastward	823	1-20,000	W. S. Gilbert and C. Hosmer.	1860-61-66.
Do	Vicinity of Aransas, Copano, and St. Charles bays	838	1-20,000	W. S. Gilbert	1861. (?)
Do	West end of Copano Bay	827	1-20,000	....do	1861.
Do	Corpus Christi Bay, vicinity of Mustang and Dagger islands.	1044	1-20,000	C. Hosmer	1867.
Do	Corpus Christi and western part of Corpus Christi Bay.	1043	1-20,000	....do	1867.
Do	Nueces Bay	1513	1-20,000	R. E. Halter	1882.
Do	Nueces Bay, vicinity of Corpus Christi	1584	1-20,000	C. Hosmer	1867.
Do	Vicinity of Corpus Christi Pass and Oso Creek	1626	1-20,000	R. E. Halter	1881-82.
Do	Laguna Madre, from Peat Island to Griffins	1628	1-20,000	....do	1881-82.
Do	Laguna Madre and entrance to Baffins Bay	1627	1-20,000	....do	1881-82.
Do	Baffins Bay and vicinity	1624	1-20,000	....do	1881.
Do	Laguna Madre, from Griffins Point to Cuba Island	1679	1-20,000	....do	1881.
Do	Laguna Madre, from latitude 26° 57′ to 27° 05′	1678	1-20,000	....do	1881.
Do	Laguna Madre, from latitude 26° 50′ to 26° 57′	1677	1-20,000	....do	1879-81.
Do	Laguna Madre, from latitude 26° 42′ to 26° 50′	1676	1-20,000	....do	1879-81.
Do	Laguna Madre, from latitude 26° 35′ to 26° 42′	1477 *b*	1-20,000	....do	1879-80.
Do	Laguna Madre, from latitude 26° 27′ to 26° 35′	1477 *a*	1-20,000	....do	1879-80.
Do	Laguna Madre, from latitude 26° 20′ to 26° 27′	1476 *b*	1-20,000	....do	1879-80.
Do	Laguna Madre, from latitude 26° 13′ to 26° 20′	1476 *a*	1-20,000	....do	1879-80.
Do	Eastern shore of Laguna Madre, from Point Isabel and Brazos Santiago northward.	1045	1-20,000	C. H. Boyd	1867.
Do	Western shore of Laguna Madre, from Point Isabel northward.	1046	1-20,000	....do	1867.
Do	Vicinity of the Rio Grande	453	1-20,000	W. E. Greenwell	1854.
	PACIFIC COAST.				
	San Diego to Point Conception.				
Mexico	Islands of Los Coronados	332	1-80,000	R. D. Cutts	1851.
California	From San Diego Bay to the boundary	365	1-10,000	A. M. Harrison	1852.
Do	San Diego Bay, from San Diego south	364	1-10,000	....do	1852.
Do	Lower part of San Diego Bay	1808	1-10,000	A. F. Rodgers	1887.
Do	San Diego Bay, entrance to San Diego	333	1-10,000	A. M. Harrison	1851.
Do	Entrance to San Diego Bay	2012	1-10,000	A. F. Rodgers	1889.
Do	Part of San Diego Bay, including city of San Diego	1807	1-10,000	....do	1887.
Do	Vicinity of False Bay	363	1-10,000	A. M. Harrison	1852.
Do	From False Bay to La Jolla	2013	1-10,000	A. F. Rodgers	1889.
Do	Valley of San Dieguito to Soledad Valley and southward.	2014	1-10,000	....do	1889.
Do	San Marcos Valley to valley of San Dieguito, including Encinitas.	1898	1-10,000	....do	1887-88.
Do	From Buena Vista Valley to San Marcos Valley, including Carlsbad.	1899	1-10,000	....do	1887-88.
Do	Vicinity of La Margarita River and Oceanside	1900	1-10,000	....do	1887-88.
Do	From Homo Cañon to Cañada Aliso, including Las Flores.	2015	1-10,000	....do	1889.
Do	San Mateo Creek to Herno Cañon	2016	1-10,000	....do	1889.
Do	From San Juan by the Sea to San Mateo Creek	1738	1-10,000	....do	1886.

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State.	Localities	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	San Diego to Point Conception—Continued.				
California	Vicinity of San Juan Capistrano	1645	1-10,000	A. F. Rodgers	1885.
Do	Between San Juan Capistrano and Newport Bay	1646	1-10,000	.....do	1885.
Do	Vicinity of Newport Bay	1392	1-10,000	A. W. Chase	1875.
Do	Bolsas Creek to Santa Aña River	1369	1-10,000	.....do	1874.
Do	New River to Bolsas Creek, including Anaheim Landing.	1345	1-10,000	.....do	1873.
Do	Wilmington to Long Branch	1283	1-10,000	A. W. Chase and F. Westdahl.	1872-87.
Do	Town sites of Long Beach and Alametos Beach	1792	1-10,000	G. Davidson	1887.
Do	Point Fermin to San Gabriel River	892	1-10,000	W. M. Johnson	1859.
Do	San Pedro Harbor, Wilmington Breakwater (hydrographic).	706 *b*	1-10,000	A. W. Chase	1873.
Do	Point Fermin and Point Pedro	476	1-10,000	W. M. Johnson	1854.
Do	San Clemente Island, Santa Barbara Channel	1526	1-20,000	S. Forney	1878-79.
Do	Eastern end of Santa Catalina Island	1606	1-20,000	.....do	1878.
Do	West end of Santa Catalina Island	1603	1-20,000	.....do	1876-77.
Do	Vicinity of Catalina Harbor and Isthmus Cove	1299 *a*	1-10,000	A. W. Chase	1873.
Do	Vicinity of Catalina Harbor and Isthmus Cove	1299 *b*	1-10,000	A. M. Harrison	1853.
Do	Point Fermin to Point Vincente	1153	1-10,000	A. W. Chase	1870.
Do	From Point Vincente northward	1231	1-10,000	.....do	1871.
Do	Wharf and town site of Redondo Beach	2127	1-10,000	F. Westdahl	1893.
Do	Vicinity of Port Ballona	1432 *b*	1-20,000	A. W. Chase	1876.
Do	Topographical sketch of proposed harbor of Port Ballona.	1791	1-10,000	G. Davidson	1887.
Do	Vicinity of Santa Monica	1427	1-10,000	A. W. Chase	1876.
Do	Santa Monica (with hydrography)	2125	1-10,000	F. Westdahl	1893.
Do	Point Dume to Malaga Creek and eastward	1432 *a*	1-20,000	A. W. Chase	1877.
Do	Point Dume to Cañada Isique	703	1-10,000	W. M. Johnson	1857.
Do	Santa Barbara Island	1180	1-10,000	A. W. Chase	1871.
Do	San Nicholas Island, Santa Barbara Channel	1523	1-20,000	S. Forney	1879.
Do	Point Mugn to Cañada Isique	702	1-10,000	W. M. Johnson	1857.
Do	From Hueneme to Point Magu	893	1-10,000	.....do	1857.
Do	From Santa Clara River to Hueneme	576	1-10,000	.....do	1855.
Do	San Buenaventura to Santa Clara River	683	1-10,000	.....do	1855.
Do	San Buenaventura and vicinity	1190	1-10,000	W. E. Greenwell	1870.
Do	From Point Gorda to San Buenaventura	1189	1-10,000	.....do	1870.
Do	Sand Point to Point Gorda	1127	1-10,000	.....do	1869.
Do	From Santa Barbara to Sand Point	1128	1-10,000	.....do	1869.
Do	Santa Barbara and vicinity	1229	1-10,000	.....do	1870.
Do	.....do	373	1-10,000	A. M. Harrison	1852.
Do	Survey of point near Santa Barbara for light-house site.	470	1-10,000	W. M. Johnson	1854.
Do	Anacopa Island and part of Santa Cruz Island	555	1-10,000	.....do	1855.
Do	Eastern end of Santa Cruz Island	1437	1-20,000	S. Forney	1875.
Do	Santa Cruz Island, vicinity of Prisoners and Chinese harbors.	876	1-10,000	W. M. Johnson	1859.
Do	Western end of Santa Cruz Island	1436	1-20,000	S. Forney	1874-75.
Do	Santa Cruz Island, from Posa Anchorage to Alamos Arch.	1003	1-10,000	W. M. Johnson	1860.
Do	East end of Santa Rosa Island	1326	1-20,000	S. Forney	1872-73.
Do	West end of Santa Rosa Island	1325	1-20,000	.....do	1872-73.
Do	San Miguel Island	1242	1-20,000	.....do	1871.
Do	From Santa Barbara to Goleta Point	1230	1-10,000	W. E. Greenwell	1870.
Do	From Goleta Point eastward to Cañada de Los Dos Pueblos.	1267	1-10,000	.....do	1871.
Do	Vicinity Cañada del Refugio and Cañada del Capitan.	1247	1-10,000	.....do	1871.
Do	From Cañada Quemada to Gaviota Wharf	1338	1-10,000	.....do	1873.
Do	From Gaviota Wharf to Little Coxo	1339	1-10,000	.....do	1873.
Do	Point Conception and vicinity	1122 *a*	1-10,000	C. Rockwell	1869.
Do	.....do	1122 *b*	1-30,000	.....do	1869.
Do	Vicinity of Point Conception	313	1-20,000	A. M. Harrison	1850.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Point Conception to San Francisco Bay.				
California	Vicinity of Espeda Landing	1520 *a*	1-10,000	A. W. Chase	1877.
Do	Vicinity of Point Arguello	1520 *b*	1-10,000	....do	1877.
Do	From Lompoc Landing to Bear Valley	1555 *a*	1-10,000	W. E. Greenwell	1879.
Do	From Lompoc Landing to Shumans Cañon	1555 *b*	1-10,000	....do	1879.
Do	From Shumans Cañon to Santa Maria River, including Point Sal.	1595	1-10,000	....do	1879.
Do	From Point Sal southward	1055	1-5,000	....do	1867.
Do	From Santa Maria River to Arroyo Grande	1596	1-10,000	....do	1879.
Do	South Point Rock to Arroyo Grande	1393	1-10,000	L. A. Sengteller	1873-74-84.
Do	San Luis Obispo Bay	1321	1-10,000	....do	1871-72.
Do	From Point San Luis Obispo to Avila, showing wharves and railroads.	1321 *bis*	1-10,000	....do	1875-84.
Do	From Point Buchon southward	1500 *a*	1-10,000	W. E. Greenwell	1881.
Do	From Point Buchon to Moro Rock	1500 *b*	1-10,000	....do	1881.
Do	From Moro Bay to Willow Creek	1662	1-10,000	S. Forney	1883-84.
Do	From Villa Creek to Cayucas Point	1663	1-10,000	....do	1884.
Do	From Villa Creek to Santa Rosa Creek	1753	1-10,000	....do	1886.
Do	Santa Rosa Creek to San Simeon Bay	1784	1-10,000	....do	1887.
Do	San Simeon Bay and vicinity	1278	1-10,000	C. Rockwell and G. Davidson.	1871-84.
Do	Point Piedras Blancos and vicinity	1395 *a*	1-10,000	C. Rockwell	1872-73.
Do	Arroyo San Carpofora and vicinity	1395 *b*	1-10,000	....do	1874.
Do	San Carpofora Creek to Salmon Creek and westward.	1829	1-10,000	S. Forney	1887.
Do	From White Rock No. 2 northward, including Villa Cañon and Alder Creek.	1901	1-10,000	....do	1888.
Do	Villa Creek to Prewett Creek	1896	1-10,000	....do	1888.
Do	Pacific Valley northward, including Mill Creek	2076	1-10,000	A. F. Rodgers and C. Rockwell.	1890.
Do	Prewett Creek to Mill Creek	2089	1-10,000	A. F. Rodgers	1890.
Do	Rockland Landing to Lopez Point	2090	1-10,000	....do	1890.
Do	Lopez Rock northward to Dolans Cañon	2077	1-10,000	A. F. Rodgers and C. Rockwell.	1890.
Do	Partingtons Sea View Landing southward to Hot Spring Cañon.	2078	1-10,000	A. F. Rodgers	1891.
Do	Partingtons Point to Pfeiffers Point	2092	1-10,000	....do	1891.
Do	Pfeiffers Point to Point Sur	2091	1-10,000	A. F. Rodgers and . CRockwell.	1878-91.
Do	Coopers Point to Point Sur	1525 *b*	1-10,000	A. F. Rodgers	1878.
Do	Point Sur	1599	1-2,500	C. Rockwell	1875.
Do	Point Sur to Kaslers Point	1525 *a*	1-10,000	A. F. Rodgers	1876-77.
Do	From Carmel Bay southward	1458 *b*	1-10,000	....do	1876.
Do	From Monterey Bay to Carmel Bay	1458 *a*	1-10,000	.... do	1876.
Do	Point Pinos	320	1-10,000	A. M. Harrison	1851.
Do	Monterey Harbor	357	1-10,000	R. D. Cutts and A. F. Rodgers.	1852-74.
Do	Northward from Monterey Harbor	554	1-10,000	W. M. Johnson	1854.
Do	From Salinas River southward	478	1-10,000	....do	1854.
Do	From Pajaro River to Salinas River	473	1-10,000	W. M. Johnson and A. F. Rodgers.	1854-74.
Do	From Pajaro River northward	442	1-10,000	.... do	1853-74.
Do	Sanguel Cove and vicinity	443	1-10,000	A. M. Harrison, W. M. Johnson, and A. F. Rodgers.	1853-74.
Do	Santa Cruz Harbor and vicinity	444	1-10,000	....do	1853-74.
Do	From Point Año Nuevo southward	445	1-10,000	....do	1853-74.
Do	From Point Año Nuevo northward to Point Bolsa	653	1-10,000	W. M. Johnson and A. F. Rodgers.	1854-74.
Do	From Point Bolsa to Tunitas Creek	682	1-10,000	W. M. Johnson	1854.
Do	From Tunitas Creek northward to Point Miramontes.	1009	1-10,000	A. F. Rodgers	1866-74.
Do	Half Moon Bay and vicinity	993	1-10,000	W. M. Johnson, A. F. Rodgers, and G. Davidson.	1861-74-84.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Point Conception to San Francisco Bay—Continued.				
California	Pillar Point to Point San Pedro	1019	1-10,000	A. F. Rodgers and G. Davidson.	1866-84.
Do	From Point San Pedro northward	395	1-10,000	A. M. Harrison	1853.
Do	From Point Lobos southward	382	1-10,000	....do	1852.
Do	South Farallon Island	1259	1-5,000	A. F. Rodgers	1872.
Do	The North Farallones	1831	1-5,000	G. Davidson	1886.
	San Francisco Bay surveys between 1850 and 1877.				
California	South shore of Golden Gate, from Point Lobos to San Francisco.	314	1-10,000	R. D. Cutts	1850.
Do	Vicinity of Point Lobos (revised junction of sheets)	427	1-10,000	A. F. Rodgers	1853.
Do	Revisionary, for determination of light-houses and defensive works, San Francisco entrance.	663	1-10,000	A. F. Rodgers and G. Davidson.	1857-77.
Do	Yerba Buena Island, San Francisco Bay	353	1-10,000	A. F. Rodgers	1851.
Do	City of San Francisco and vicinity	687	1-10,000	....do	1857.
Do	City of San Francisco	398	1-10,000	R. D. Cutts and A. F. Rodgers.	1852-53.
Do	City of San Francisco and vicinity	352	1-10,000	A. F. Rodgers	1852.
Do	Outskirts of San Francisco	1059	1-10,000	....do	1867.
Do	Interior of San Francisco Peninsula	1067	1-10,000	C. Rockwell	1867.
Do	Western shore of San Francisco Bay, vicinity of Sierra Point to Point San Bruno.	460	1-10,000	A. F. Rodgers	1854.
Do	Milbrae and vicinity, interior San Francisco Peninsula.	1068	1-10,000	C. Rockwell	1867.
Do	From Point San Mateo to Angel Creek, San Francisco.	433	1-10,000	A. F. Rodgers	1853.
Do	San Francisco Bay, from Angel Creek to Ravenswood.	664	1-10,000	....do	1857.
Do	Redwood City and vicinity, San Francisco Bay	665	1-10,000	....do	1857.
Do	Pulgas Base, Redwood City to Ravenswood	432	1-10,000	R. D. Cutts	1853.
Do	Head of San Francisco Bay	676	1-10,000	A. F. Rodgers	1857.
Do	San Francisco Bay, from Calaveras Point to Potrero Point.	634	1-10,000	....do	1857.
Do	San Francisco Bay, from Coyote Hills to Thompsons Landing.	635	1-10,000	....do	1857.
Do	San Francisco Bay, from Thompsons Landing to Alameda.	481	1-10,000	....do	1855.
Do	San Antonio Creek and vicinity	360	1-10,000	R. D. Cutts	1852.
Do	Vicinity of Oakland and Alameda	592	1-10,000	A. F. Rogers	1856.
Do	From Oakland northward	591	1-10,000	....do	1856.
Do	....do	358	1-10,000	R. D. Cutts	1852.
Do	Eastern shore San Francisco Bay, from Point Potrero northward.	399	1-10,000	A. M. Harrison	1853.
Do	Point San Pablo to Penole Point	561	1-10,000	A. F. Rodgers	1856.
Do	Point Wilson to Lone Tree Point	562	1-10,000	....do	1856.
Do	Mare Island and Straits of Karquines	316	1-10,000	R. D. Cutts	1851.
Do	Benicia and vicinity, Straits of Karquines	577	1-10,000	A. F. Rodgers	1856.
Do	Suisun Bay	1029	1-20,000	....do	1866.
Do	Mare Island and Napa Creek	563	1-10,000	....do	1856.
Do	Napa Creek and Napa City	777	1-10,000	....do	1858.
Do	San Pablo Bay, from Petaluma Point to Navy-Yard Slough.	564	1-10,000	....do	1856.
Do	Petaluma Creek, from Lakeville Landing southward.	817	1-10,000	....do	1860.
Do	Head of Petaluma Creek	818	1-10,000	....do	1860.
Do	From Point San Pedro to Petaluma Creek	472	1-10,000	....do	1854.
Do	From Bluff Point to San Raphael	415	1-10,000	....do	1853.
Do	Angel Island and Bluff Point	361	1-10,000	....do	1852.
Do	Vicinity of Fort Point, Lime Point, Point Cavallo, and Alcatraz Island.	359	1-10,000	R. D. Cutts	1852.
Do	Fort Point and Alcatraz Island, showing positions for light-houses (supplementary sketch of San Francisco Harbor from De Wolfras exploration).	338	1-10,000	...do	1851.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	San Francisco Bay surveys between 1850 and 1877—Cont'd.				
California	North shore of Golden Gate	321	1-10,000	A. F. Rodgers	1850.
Do	Resurvey of San Francisco Bay, San Leandro Bay to Roberts Landing.	2195	1-10,000	....do	1895.
Do	Richardsons Bay	334	1-10,000	....do	1851.
Do	Interior of Tamalpais Peninsula	1284	1-10,000	....do	1872.
Do	Topography of Tamalpais Mountain and Eastward Ridge.	1302	1-10,000	....do	1873.
Do	Point Bonita to Ballenas Bay	400	1-10,000	A. M. Harrison	1853.
Do	Ballenas Bay and vicinity	452	1-10,000	A. F. Rodgers	1854.
	San Francisco Bay, surveys between 1881 and 1895.				
California	Point Lobos southward and eastward, including Golden Gate Park.	1631	1-10,000	L. A. Sengteller	1882.
Do	Shore line and rocks in Golden Gate	2128	1-10,000	A. F. Rodgers	1887-92.
Do	Fort Point to Point San José	1632	1-10,000	....do	1882.
Do	Point San José to Point Avisadero, including city of San Francisco.	1629	1-10,000	....do	1882.
Do	City of San Francisco	1619	1-10,000	....do	1882.
Do	City of San Francisco, water front, wharf lines, and pierheads.	2205	1-10,000	....do	1895.
Do	Oakland and Alameda, including wharves, roads, and railroads.	1625	1-10,000	....do	1881-82.
Do	Oakland Point northward, including Berkeley and West Berkeley.	1622	1-10,000	....do	1881.
Do	San Francisco Bay, from Point San Mateo northward	2207	1-10,000	....do	1894-95.
Do	Contra Costa shore, including wharves, roads, and railroads.	1621	1-10,000	....do	1881.
Do	San Francisco Bay, from Hunters Point southward	2206	1-10,000	....do	1895.
Do	San Pablo Bay, Penole Point to Lone Tree Point	1697	1-10,000	....do	1886.
Do	Straits of Karquines	1696	1-10,000	....do	1886.
Do	Suisun Bay, from Bulls Head Point to Middle Point, including Pyers and Roe islands.	1803	1-10,000	G. Davidson	1886.
Do	Suisun Bay, from Middle Point to New York Slough, including Honker Bay.	1793	1-10,000	....do	1886-87.
Do	Suisun Bay, part of railroads between New York Slough and Antioch.	1804	1-10,000	....do	1887.
Do	Suisun Bay, vicinity of Sacramento and San Joaquin River.	1830	1-10,000	....do	1887.
Do	Suisun Bay, part of Montezuma Creek.	1855	1-10,000	L. A. Sengteller	1888.
Do	Suisun Bay, including Nourse Slough to Denverton	1974	1-10,000	....do	1888.
Do	Suisun Bay and part of Montezuma Creek	1893	1-10,000	....do	1888.
Do	Suisun Bay, Montezuma Creek eastward	1847	1-10,000	....do	1887-88.
Do	Suisun Bay, part of Simmons or Eads Island	1848	1-10,000	....do	1887.
Do	Suisun Bay, Suisun City southward	1973	1-10,000	....do	1888.
Do	Suisun Bay, Bridgeport southward, including parts of Cordelia, Suisun, and Montezuma creeks.	1972	1-10,000	....do	1888.
Do	Suisun Bay, from Suisun Creek southward	1892	1-10,000	....do	1888.
Do	Vicinity of Mare Island and Vallejo, San Pablo Bay	1825	1-10,000	J. S. Lawson	1886.
Do	Vicinity of Tolay and Sonoma Creeks, San Pablo Bay	1826	1-10,000	....do	1886-87.
Do	Vicinity of Petaluma Creek, San Pablo Bay	1827	1-10,000	....do	1887.
Do	San Raphael and San Quentin	1620	1-10,000	L. A. Sengteller	1881.
Do	Head of Richardsons Bay, toward San Raphael	1616	1-10,000	....do	1881.
Do	Point Bonita to Sausalito, including part of Richardsons Bay and Angel Island.	1618	1-10,000	....do	1881.
Do	From Rocky Point eastward toward Point Bonita	1617	1-10,000	....do	1881.
Do	From Ballenas southward to Rocky Point	1614	1-10,000	....do	1881.
Do	Topography vicinity of Mount Tamalpais	1302 *bis*	1-10,000	G. Davidson	1882.
	San Francisco Bay to Cape Blanco.				
California	Ballenas Point and vicinity	456	1-10,000	A. F. Rodgers	1854.
Do	From Ballenas Point northward	807	1-10,000	....do	1859-60.
Do	From Drakes Bay eastward	806	1-10,000	....do	1859-60.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	San Francisco Bay to Cape Blanco—Continued.				
California	Drakes Bay and Drakes Estero	805	1-10,000	A. F. Rodgers	1859-60.
Do	Point Reyes and vicinity	403	1-10,000	J. S. Lawson	1852-53.
Do	From Point Reyes northward	881	1-10,000	A. F. Rodgers	1862.
Do	Abbotts Lagoon, northward and southward	882	1-10,000	do	1862.
Do	Tomales Bay, upper part	849	1-10,000	do	1862.
Do	Head of Tomales Bay	880	1-10,000	do	1862.
Do	Sketch of Tomales Bay Station	578	1-10,000	C. B. Ellis	1856.
Do	Tomales Bay, entrance	439	1-10,000	J. S. Lawson	1853-54.
Do	From Salmon Creek to Tomales Bay, including Bodega Head.	883	1-10,000	A. F. Rodgers	1862.
Do	Salmon Creek to Duncans Landing	1430 *a*	1-20,000	L. A. Sengteller	1875-76.
Do	Duncans Landing northward, including Russian River.	1430 *b*	1-20,000	do	1875-76.
Do	Fort Ross Reef to Salt Point, including Timber Cove.	1457	1-10,000	do	1876.
Do	From Salt Point to Fishermans Bay	1497 *a*	1-10,000	do	1877-78.
Do	From Fishermans Bay to Walalla River	1497 *b*	1-10,000	do	1878-79.
Do	Walalla River to Havens Neck	1535 *a*	1-10,000	do	1879-80.
Do	Havens Neck northward to Ross Gulch	1535 *b*	1-10,000	do	1880.
Do	Point Arena northward and southward	1228	1-10,000	do	1870.
Do	Alder Creek to Bridgeport Landing	1279	1-10,000	do	1870.
Do	From Bridgeport Landing to Cuffeys Cove	1305	1-10,000	do	1871.
Do	Navarro River to Albion River	1362	1-10,000	do	1872.
Do	Little River to Point Cabrillo, including Mendocino Bay.	1363 *a*	1-10,000	do	1872-73.
Do	Point Cabrillo to Pudding Creek, including Casper Creek and Noyo River Landing.	1363 *b*	1-10,000	do	1873.
Do	From Pudding Creek to Ten Mile River	1380 *a*	1-10,000	A. F. Rodgers	1874.
Do	From Ten Mile River to Abalone Point	1380 *b*	1-10,000	do	1874.
Do	From Abalone Point to Williams Point, including Cape Vizcaino.	1322	1-10,000	do	1873.
Do	Williams Point to Big White Rock, including Ussal Creek.	1323	1-10,000	do	1873.
Do	Timber Ridge to Bear Landing	1324	1-10,000	do	1873.
Do	Bear Landing to Shelter Cove	1285	1-10,000	do	1872.
Do	Shelter Cove and northward	1236	1-10,000	do	1871.
Do	Horse Mountain Cove to Buck Creek	1237	1-10,000	do	1871.
Do	Buck Creek to Hadleys Creek	1238	1-10,000	do	1871.
Do	Frasers Creek to Cooskie Creek	1239	1-10,000	do	1871.
Do	Punta Gorda and vicinity	1240	1-10,000	do	1871.
Do	Between Cape Mendocino and Punta Gorda	1241	1-10,000	do	1871.
Do	Cape Mendocino northward to Cape Fortunas	1134	1-10,000	do	1869.
Do	Cape Fortunas northward to Centerville	1135	1-10,000	do	1869.
Do	Eel River and vicinity (and tracing)	1136 *a*	1-10,000	do	1869.
Do	Mouth of Eel River (resurvey)	1136 *b*	1-10,000	do	1869-70.
Do	Mouth of Eel River	1816	1-20,000	G. Davidson	1888.
Do	Humboldt Bay, entrance southward to Table Bluff	1137	1-10,000	A. F. Rodgers	1869.
Do	Entrance and part of Humboldt Bay	474	1-10,000	J. S. Lawson	1854.
Do	Humboldt Bay, entrance and southward	1174	1-10,000	A. F. Rodgers	1870.
Do	Humboldt Bay, vicinity of Eureka	1175	1-10,000	do	1870.
Do	Humboldt Bay, Eureka Slough to Arcata	1176	1-10,000	do	1870.
Do	From Mad River northward and southward	1177	1-10,000	do	1870.
Do	From Dows Prairie to Trinidad	1178	1-10,000	do	1870.
Do	From Trinidad Head to Rocky Point	1179	1-10,000	do	1870
Do	False Klamath to Rocky Point (reconnaissance)	1378	1-20,000	A. W. Chase	1873.
Do	Klamath River, northward to False Klamath Rock	1370	1-10,000	do	1874.
Do	False Klamath Rock to Midway Point	1248 *b*	1-10,000	do	1871.
Do	Midway Point to Cushing Creek	1248 *a*	1-10,000	do	1871.
Do	Crescent City and vicinity	741	1-10,000	J. S. Lawson	1859.
Do	Point St. George and vicinity	1132	1-10,000	A. W. Chase	1869.
Do	Vicinity of Lakes Talawa and Earl	1199	1-10,000	do	1870.
Do	Smiths River and vicinity	1216	1-10,000	do	1870.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	San Francisco Bay to Cape Blanco—Continued.				
California and Oregon.	Winchuck River to Chetko River	1227	1-10,000	A. W. Chase	1870.
Oregon	Goat Island to Barnacle River, including Cape Ferrelo.	1260	1-10,000	do	1871.
Do	From Macks Reef southward	1317	1-10,000	do	1872.
Do	Crooks Point to Cape Sebastian	1588	1-10,000	do	1873.
Do	Port Orford .o Cape Sebastian (reconnaissance)	1862	1-40,000	E. F. Dickins	1888.
Do	Cape Blanco to Port Orford and southward (reconnaissance).	1133	1-20,000	A. W. Chase	1869.
Do	Port Orford and vicinity	347	1-10,000	A. M. Harrison	1851.
Do	Orford Reef	1131	1-10,000	A. W. Chase	1869.
Do	Cape Blanco and vicinity	1130	1-10,000	do	1869.
	Cape Blanco to mouth of Columbia River.				
Oregon	Blacklock Point to Five Mile Point, including Coquille River (reconnaissance).	1813	1-40,000	E. F. Dickins	1887.
Do	Entrance to Coos Bay	846	1-10,000	J. S. Lawson	1861.
Do	Coos Bay, from entrance to North Slough	1971	1-10,000	E. F. Dickins	1889.
Do	Coos Bay, from North Slough to head of bay	1970	1-10,000	do	1889.
Do	Coos Bay	927	1-20,000	J. S. Lawson	1863.
Do	Whisky Run to Ten Mile Creek, including Coos Bay entrance (reconnaissance).	1812	1-40,000	E. F. Dickins	1887.
Do	Between Ten Mile Creek and Coos Bay entrance	1877	1-10,000	do	1888.
Do	Ten Mile Creek and vicinity	1876	1-10,000	do	1888.
Do	Lake Jarvis southward	1769	1-10,000	L. A. Sengteller	1886.
Do	Umpqua River entrance and vicinity	1757	1-10,000	do	1882-83-85.
Do	Umpqua River, vicinity of Gardiner	1768	1-10,000	do	1885.
Do	Heceta Head southward to Umpqua River (reconnaissance).	1811	1-40,000	E. F. Dickins	1887.
Do	Alseya Bay to Heceta Head (reconnaissance)	1810	1-40,000	do	1887.
Do	Alseya Bay to Yaquina Bay (reconnaissance)	1809	1-40,000	do	1887.
Do	Entrance to Yaquina Bay	1086	1-10,000	A. W. Chase	1868.
Do	Yaquina River, from Yaquina City eastward	1754	1-10,000	do	1868.
Do	From Yaquina Head to Cascade Head (reconnaissance).	1776	1-40,000	C. Rockwell	1887.
Do	From Cascade Head northward to Cape Meares (reconnaissance.	1777	1-40,000	do	1887.
Do	Nestuggah Bay and River	1529	1-10,000	do	1883.
Do	Cape Meares to Tillamook Bay (reconnaissance)	1778	1-40,000	do	1887.
Do	Tillamook Bay (hydrographic)	936	1-10,000	J. Kincheloe	1866-67.
Do	From mouth of Tillamook Bay northward	1417	1-10,000	J. J. Gilbert	1875.
Do	Mouth of Nehalem River and vicinity	1416 *b*	1-10,000	do	1875.
Do	Cape Falcon northward to Hug Cape	1416 *a*	1-10,000	do	1875.
Do	South of Tillamook Head, vicinity of Elk Creek	1382 *a*	1-10,000	do	1874.
Do	Tillamook Head	1382 *b*	1-10,000	do	1874.
Do	Nekanakum Creek and vicinity	1381 *a*	1-10,000	do	1874.
Do	Between Point Adams and Nekanakum Creek	1381 *b*	1-40,000	do	1874.
Do	South shore of Columbia River entrance	1112	1-10,000	C. Rockwell	1868.
	Columbia River.				
Oregon and Washington.	Point Adams and Sand Island	335	1-10,000	A. M. Harrison	1851.
Do	Mouth of Columbia River	317	1-22,762	W. B. McMurtrie	1850-51.
Oregon	Columbia River, Youngs Bay to John Days River	1123	1-10,000	C. Rockwell	1868.
Do	Astoria and vicinity	1806	1-10,000	J. F. Pratt	1887.
Do	South shore of Columbia River, John Days River to Warrens Landing.	1234	1-10,000	C. Rockwell	1870.
Oregon and Washington	Columbia River, Warrens Landing to Three Tree Point.	1235	1-10,000	do	1870.
Do	Columbia River, Three Tree Point to Puget Island	1250	1-10,000	do	1871.

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State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Columbia River—Continued.				
Oregon and Washington.	Columbia River, vicinity of Cathalamet and Westport, including Puget Island.	1331	1-10,000	C. Rockwell	1872.
Do	Columbia River, Puget Island to Wallaces Island	1401 *a*	1-10,000	do	1874.
Do	Columbia River, Wallaces Island to Grims Island	1401 *b*	1-10,000	do	1874.
Do	Columbia River, vicinity of Wallaces Island	1431 *b*	1-10,000	J. J. Gilbert	1876.
Do	Columbia River, Grims Island to Walkers Island	1431 *a*	1-10,000	do	1876.
Do	Columbia River, vicinity of Mount Coffin	1454	1-10,000	do	1876-77.
Do	Columbia River, Cowlitz River and vicinity	1455 *a*	1-10,000	do	1877.
Do	Columbia River, Cottonwood Island to Deer Island	1455 *b*	1-10,000	do	1877.
Do	Columbia River, from near Kalama to Columbia City.	1495	1-10,000	C. Rockwell	1879.
Do	Columbia River, Columbia City to Bachelors Island	1563	1-10,000	do	1880.
Do	Columbia River, vicinity of Bachelors Island	1542	1-10,000	do	1882.
Do	Columbia River, from Falles Landing to Haydens Island and the Willamette River to Swan Island.	1562	1-10,000	do	1884.
Do	Columbia River, from Haydens Island westward, including Vancouver.	2007	1-10,000	do	1890.
Do	Columbia River, vicinity of Government Island	2085	1-10,000	do	1891.
Oregon	Willamette River, Swan Island to Ross Island	1546	1-10,000	do	1884.
Washington	Columbia River, Grays Point to Snag Island, including Grays Bay.	1249	1-10,000	do	1870.
Do	North shore Columbia River, Chinook Point to Grays Point.	1139 *a*	1-10,000	do	1869.
Do	Scarboro Hill, near Point Ellice	1894	1-20,000	do	1889.
Do	Sandy Island and Chinook Spit	1139 *b*	1-10,000	do	1869.
Do	North shore Columbia River, Cape Disappointment to Chinook Point.	1138	1-10,000	do	1869
Do	Cape Disappointment	337	1-10,000	A. M. Harrison	1851.
	Columbia River to Strait of Juan de Fuca.				
Washington	Between Willapa Bay and Columbia River	1341 *a*	1-10,000	J. J. Gilbert	1873.
Do	Willapa Bay, from Bakers Slough northward	1341 *b*	1-10,000	do	1873.
Do	Willapa Bay, from Oysterville to Long Island	1293	1-10,000	do	1872.
Do	Leadbetter Point, entrance to Willapa Bay	1261	1-10,000	do	1871.
Do	Islands in Willapa Bay	1264	1-10,000	do	1871.
Do	Willapa Bay, vicinity of North River and Bruceport	1263	1, 10,000	do	1871.
Do	Mouth of Willapa River	1342 *b*	1-10,000	do	1873.
Do	Willapa Bay, from Palux River southward	1292	1-10,000	do	1872.
Do	Willapa Bay, from North Nemur River to Long Island.	1294	1-10,000	do	1872.
Do	Willapa Bay, from Bear River to Long Island	1342 *a*	1-10,000	do	1873.
Do	Willapa Bay entrance, Cape Shoalwater to Cedar River.	1262	1-10,000	do	1871.
Do	Grays Harbor entrance and southward to Shoalwater Bay.	1701	1-20,000	do	1886.
Do	Entrance of Grays Harbor	821	1-20,000	J. S. Lawson	1860.
Do	From Point Brown to Connor Creek	1781	1-20,000	J. F. Pratt and F. Morse	1887.
Do	From Copalis River to Wreck Creek	1782	1-20,000	do	1887.
Do	From Wreck Creek to Arch Island	1783	1-20,000	do	1887.
Do	From Arch Island to Destruction Island	1786	1-20,000	do	1887.
Do	From Destruction Island to Teahwhit Head	1787	1-20,000	do	1887.
Do	From Teahwhit Head to Cape Johnson	1788	1-20,000	do	1887.
Do	From Cape Johnson to Osette River	1789	1-20,000	do	1887.
Do	From Osette River to Cape Flattery	*1790	1-20,000	do	1887.
Do	Cape Flattery	387	1-10,000	J. S. Lawson	1852.
Do	Cape Flattery, vicinity of Nee-ah Bay	386	1-10,000	do	1852.
	Straits of Juan de Fuca to the boundary.				
Washington	Port Angeles (sheet No. 1)	2109	1-4,800	J. J. Gilbert	1892.
Do	Port Angeles (sheet No. 2)	2110	1-4,800	do	1892.

*And supplement.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Straits of Juan de Fuca to the boundary—Continued.				
Washington	New Dungeness, Straits of Juan de Fuca	539	1-10,000	J. S. Lawson	1855.
Do	Part of New Dungeness	1168	1-10,000	do	1870.
Do	Protection Island to New Dungeness	1169	1-10,000	do	1870.
Do	Washington Harbor, Straits of Juan de Fuca	1165	1-10,000	do	1870.
Do	Entrance and approaches to Port Discovery	1124	1-10,000	do	1868-69.
Do	Part of Port Discovery	1125	1-10,000	do	1868.
Do	Head of Port Discovery	1126	1-10,000	do	1869-70.
Do	Port Townsend, Admiralty Inlet	582	1-10,000	do	1856.
Do	do	581	1-10,000	do	1856.
Do	Port Townsend Harbor (sheet No. 1, topography and hydrography).	2071	1-4,800	J. J. Gilbert	1891.
Do	Port Townsend Harbor (sheet No. 2, topography and hydrography).	2072	1-4,800	do	1891.
Do	Sketch and profile of Port Townsend Base	589	1-10,000	George Davidson and J. S. Lawson.	1856.
Do	Port Townsend Bay	2079	1-10,000	J. F. Pratt	1891.
Do	Kilisut Harbor	1255	1-10,000	J. S. Lawson	1871.
Do	Oak Bay	1304	1-10,000	do	1872.
Do	Sketch of Mats Mats, Port Ludlow	540	1-10,000	do	1855.
Do	Port Ludlow, entrance to Hoods Canal	537	1-10,000	do	1855.
Do	Entrance to Hoods Canal	669	1-10,000	do	1857.
Do	Port Gamble and part of Hoods Canal	585	1-10,000	do	1856.
Do	Position of buoys at entrance to Port Gamble	671	1-10,000	do	1857.
Do	Hoods Canal, Port Gamble to Hazel Point	1556	1-20,000	J. J. Gilbert	1878.
Do	Hoods Canal, head of Daboys and Quilcine bays	1557 *a*	1-10,000	do	1883.
Do	Hoods Canal, vicinity of Daboys Bay	1557 *b*	1-10,000	do	1883.
Do	Hoods Canal, entrance to Daboys Bay	1558 *a*	1-10,000	do	1883.
Do	Hoods Canal, vicinity of Oak Head and Seabeck	1558 *b*	1-10,000	do	1884.
Do	Hoods Canal, vicinity of Quatsap Point and Woods Point.	1559 *a*	1-10,000	do	1883.
Do	Hoods Canal, Tekin Point to Chinom Point	1559 *b*	1-10,000	do	1883-84.
Do	Hoods Canal, from Ayock Point south	1560 *a*	1-10,000	do	1884.
Do	Hoods Canal, vicinity of Annas Bay	1560 *b*	1-10,000	do	1884.
Do	Hoods Canal, vicinity of Sisters Point	1561 *a*	1-10,000	do	1884.
Do	Head of Hoods Canal	1561 *b*	1-10,000	do	1884.
Do	Cases Inlet, from its head to Heron Island, including Picking Passage.	1528	1-20,000	E. Ellicott	1879-80.
Do	From Nisqually Reach to Totten Inlet	1672	1-20,000	do	1878.
Do	Hammersleys Inlet, Puget Sound	1609	1-10,000	do	1879-80.
Do	Totten Inlet, Puget Sound	1673	1-10,000	do	1879.
Do	Eld Inlet	1675	1-10,000	do	1880.
Do	Entrance to Budds Inlet	1327 *a*	1-10,000	J. S. Lawson	1873.
Do	Head of Budds Inlet	1327 *b*	1-10,000	J. S. Lawson and J. J. Gilbert.	1873.
Do	Olympia Harbor (upper sheet)	2073	1-4,800	J. J. Gilbert	1891.
Do	Olympia Harbor (lower sheet)	2074	1-4,800	do	1891.
Do	From Nisqually Reach to Totten Inlet	1672	1-20,000	E. Ellicott	1878.
Do	From Point Defiance to Anderson Island, Puget Sound.	1671	1-20,000	do	1877-78.
Do	Carrs Inlet	1674	1-20,000	do	1878.
Do	Commencement Bay, Puget Sound	1453	1-10,000	do	1877.
Do	City and water front of Tacoma	1749	1-10,000	J. J. Gilbert	1886.
Do	From Restoration Point to Robinsons Point	1452 *a*	1-20,000	E. Ellicott	1876-77.
Do	From Robinsons Point to south end of Vashon Island, including Quartermasters Harbor.	1452 *b*	1-20,000	do	1876-77.
Do	Fauntleroy Cove, Admiralty Inlet	670	1-10,000	G. Davidson and J. S. Lawson.	1857.
Do	Port Orchard, Puget Sound	1637	1-20,000	E. Ellicott	1881.
Do	Proposed site for a navy-yard	1951	1-5,000	J. F. Pratt	1889.
Do	Proposed site for a navy-yard at Port Orchard	1941	1-5,000	do	1889.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Straits of Juan de Fuca to the boundary—Continued.				
Washington	Eastern part of Puget Sound Naval Station, Port Orchard (topography and hydrography).	2196	1-1,000	J. J. Gilbert	1895.
Do	East shore of Bainbridge Island, Admiralty Inlet	1303 *a*	1-10,000	J. S. Lawson	1872.
Do	Murdens Cove, Admiralty Inlet	584	1-20,000	....do	1856.
Do	Vicinity of Duwamish Bay	590	1-40,000	G. Davidson	1856.
Do	Duwamish Bay, Admiralty Inlet	1390 *b*	1-10,000	J. S. Lawson	1874.
Do	Vicinity of Seattle and head of Duwamish Bay	1406	1-10,000	....do	1875.
Do	City and water front of Seattle	1750	1-10,000	J. J. Gilbert	1886.
Do	Vicinity of Port Madison, Admiralty Inlet	1087	1-10,000	J. S. Lawson	1868.
Do	From Point No Point to President Point, Admiralty Inlet.	1303 *b*	1-10,000	....do	1872.
Do	Apple Cove, Admiralty Inlet	583	1-20,000	G. Davidson and J. S. Lawson.	1856.
Do	Vicinity of Point No Point, Admiralty Inlet	668	1-10,000	J. S. Lawson	1857.
Do	Vicinity of Shilshole Bay, Admiralty Inlet	1064	1-10,000	....do	1867.
Do	From Point Wells to Meadow Point, Admiralty Inlet.	1390 *a*	1-10,000	....do	1874.
Do	Possession Sound to Edmund Point	1389 *b*	1-10,000	....do	1872-74.
Do	Possession Sound	1389 *a*	1-10,000	....do	1872-74.
Do	Possession Sound, vicinity of Point Elliott	1552	1-20,000	J. F. Pratt	1884.
Do	Snohomish River	1681	1-20,000	....do	1884-85.
Do	Possession Sound and entrance to Port Susan	1682	1-20,000	....do	1885.
Do	Saratoga Passage and Holmes Harbor	1994	1-20,000	....do	1890.
Do	Port Susan and Stillaguamish River	1755	1-20,000	....do	1886.
Do	Saratoga Passage, Penns Cove, Oak Harbor, and Crescent Harbor.	2011	1-20,000	....do	1888.
Do	Skagit Bay, Delta, and River	2156	1-20,000	F. W. Pratt	1889.
Do	Harbor of Laconner	2108	1-4,800	J. J. Gilbert	1892.
Do	Useless Bay, Admiralty Inlet	1388 *b*	1-10,000	J. S. Lawson	1872-74.
Do	From Lagoon Point to Double Bluff, Admiralty Inlet.	1388 *a*	1-10,000	....do	1872-74.
Do	Admiralty Bay, Puget Sound	1164	1-10,000	....do	1870.
Do	From Point Partridge eastward	1254	1-10,000	....do	1871.
Do	From Point Partridge north, Whidbey Island	1253	1-10,000	....do	1871.
Do	Smiths Island, Straits of Juan de Fuca	538	1-10,000	....do	1855.
Do	....do	1170	1-10,000	....do	1870.
Do	Whidbey Island, vicinity of Deception Pass	1252	1-10,000	....do	1871.
Do	Deception Pass to Ship Harbor	1667	1-10,000	J. J. Gilbert	1885.
Do	Thatcher Pass to Watmough Bight	1953	1-10,000	....do	1889.
Do	North end of Lopez Island	1955	1-10,000	....do	1889.
Do	Part of Orcas Island, Washington Sound	1954	1-10,000	....do	1889.
Do	Patos, Lucia, and Matia islands, Gulf of Georgia	1870	1-10,000	....do	1888.
Do	....do	730	1-20,000	J. S. Lawson	1858.
Do	North shore of Saturna Island and Samuel Island, Gulf of Georgia.	731	1-20,000	....do	1858.
Do	Vicinity of Active Pass, Gulf of Georgia	732	1-20,000	....do	1858.
Do	Point Roberts, Gulf of Georgia	1874	1-10,000	J. J. Gilbert	1888.
Do	Birch Bay to boundary, Gulf of Georgia	1873	1-10,000	....do	1888.
Do	Vicinity of Point White Horn, Gulf of Georgia	1872	1-10,000	....do	1888.
Do	Vicinity of Lummi Bay, Gulf of Georgia	1871	1-10,000	....do	1888.
Do	Nooksack River, Bellingham Bay	1799	1-10,000	....do	1887.
Do	North part of Bellingham Bay	1798	1-10,000	....do	1887.
Do	Bellingham Bay, Whatcom Harbor (topography and hydrography).	2069	1-5,000	....do	1891.
Do	Lummi and Eliza islands and Point Francis	1797	1-10,000	....do	1887.
Do	Northeast part of Orcas Island, from Lawrence Point to Point Thompson.	1869	1-10,000	....do	1888.
Do	Part of Orcas and Blackeley islands, Washington Sound.	1952	1-10,000	....do	1889.
Do	Cypress, Guernes, and Sinclair islands	1748	1-10,000	....do	1886.
Do	Strawberry Bay, Cypress Island, Washington Sound.	462	1-10,000	J. S. Lawson	1854.
Do	Samish Flats to Bellingham Bay, Washington Sound.	1796	1-10,000	J. J. Gilbert	1887.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Straits of Juan de Fuca to the boundary—Continued.				
Washington	Bellingham Bay, Fairhaven Harbor and vicinity (topography and hydrography).	2070	1-5,000	J. J. Gilbert	1891.
Do	Vicinity of Samish Bay, Washington Sound	1795	1-10,000	....do	1887.
Do	Guernes, Samish, and Vendovi islands, Washington Sound.	1794	1-10,000	....do	1887.
Do	Cypress, Guernes, and Sinclair islands	1748	1-10,000	....do	1886.
Do	Ship Harbor and Padilla Bay, Washington Sound	1746	1-10,000	....do	1886.
Do	Anacostes Harbor (sheet No. 1)	2111	1-4,800	....do	1892.
Do	Anacostes Harbor (sheet No. 2)	2112	1-4,800	....do	1892.
Do	Anacostes Harbor (sheet No. 3)	2113	1-4,800	....do	1892.
Do	Fidalgo and Padilla bays, Washington Sound	1747	1-10,000	....do	1886.
Do	Orcas and Waldron islands, Washington Sound	2192	1-10,000	....do	1894.
Do	Stuart, Spieden, and other islands, Washington Sound	2193	1-10,000	....do	1894.
Do	San Juan and Henry islands, Washington Sound	2194	1-10,000	....do	1894.
	Alaska.				
Alaska and British Columbia.	Portland Inlet and vicinity	1882	1-40,000	J. McHenry	1888.
Do	Part of Portland Inlet and Portland Canal	1883	1-40,000	....do	1888.
Do	Wales Harbor, Somerville Bay, Winter Harbor, and Fillmore Inlet.	1890	Various.	H. L. Ford and J. McHenry	1888.
Alaska	Willard Inlet	1881	Arbitrary.	J. McHenry and A. M. Beecher.	1888. (?)
Do	Hidden Inlet, Pearse Canal	1879	Arbitrary.	J. McHenry	1888. (?)
Alaska and British Columbia.	Halibut Bay and part of Portland Canal	1880	1-5,000	H. L. Ford	1888. (?)
Do	Portland Canal (middle sheet)	1884	1-40,000	J. McHenry	1888.
Do	Bear River Flats and head of Portland Canal	1878	1-20,000	H. L. Ford	1888.
Alaska	Boca de Quadra	2117	1-80,000	W. I. Moore and H. L. Ford	1892.
Do	Vixen Bay, Boca de Quadra	2118 *b*	1-10,000	W. I. Moore and J. J. Ernsoule.	1892.
Do	Behm Canal, lower part (southeastern Alaska)	2056	1-80,000	H. B. Mansfield	1891.
Do	South end of Mary Island and western parts of Cat Island and Duke Island.	2104	1-10,000	W. P. Ray	1892.
Do	Shore line, Danger Pass, etc.	2104 *a*	1-10,000	....do	1892.
Do	Duke Harbor	2104 *b*	1-10,000	....do	1892.
Do	Morse Cove	2104 *c*	1-10,000	....do	1892.
Do	East shore Duke Island, △ Vense to △ Choskee	2104 *d*	1-10,000	....do	1892.
Do	Fitzgibbon Cove, southeastern Alaska; Saks Cove, southeastern Alaska; Shoalwater Pass, southeastern Alaska; Smeaton Bay Anchorage, southeastern Alaska	*2062	1-10,000; 1-10,000; 1-20,000; 1-20,000	H. B. Mansfield	1891.
Do	Rudyerd Bay, southeastern Alaska	2057	1-20,000	....do	1891.
Do	Walker Cove, southeastern Alaska	2058	1-20,000	....do	1891.
Do	Thome Arm, southeastern Alaska	2060	1-40,000	....do	1891.
Do	Carroll Inlet and George Inlet, southeastern Alaska	2059	1-40,000	....do	1891.
Do	Tea Cove, George Inlet, southeastern Alaska; Great Cove, Carroll Inlet, southeastern Alaska.	2061	1-10,000; 1-10,000	....do	1891.
Do	Behm Canal (upper part), southeastern Alaska	2055	1-80,000	....do	1891.
Do	Bell Arm, Convenient Cove, and McDonald Bay, southeastern Alaska.	2063	1-20,000	....do	1891.
Do	Unuk River (topographical reconnaissance)	2141	1-40,000	E. F. Dickins	1893.
Do	Topographical reconnaissance of the Unuk River from mouth of Second Cañon to the 10 marine league limit.	2178	1-40,000	....do	1894.
Do	Stikine River (topographical reconnaissance)	2145	1-40,000	J. A. Flemer	1893.
Do	....do	2143	1-40,000	....do	1893.
Do	Etolin Harbor, Wrangell Island	2138 *a*	1-10,000	G. Davidson	1869.
Do	Stikine River, from Point Rothsay to Popoff Glacier reconnaissance).	2130	1-40,000	E. F. Dickins	1893.

*The general title of this sheet is Harbor Sheets, Behm Canal, southeast Alaska.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Alaska—Continued.				
Alaska	Stikine River, from Popoff Glacier to Big Bend	2152	1-40,000	J. E. McGrath	1893.
Do	Stikine River, from Big Bend to Ten League Post	2153	1-40,000	O. H. Tittmann	1893.
Do	Keku Strait	2116	1-80,000	W. I. Moore and H. L. Ford.	1893.
Do	Chapin Bay, Hamilton Bay, and Seclusion Harbor	2118 *a*	{1-10,000 / 1-20,000}	do	1892.
Do	Saginaw Bay	2120	1-20,000	W. I. Moore and J. J. Ernsoule.	1892.
Do	Security Bay	2121	1-20,000	do	1892.
Do	Frederick Sound and Stephens Passage	1964	1-80,000	H. B. Mansfield	1889.
Do	Wocwodski and Eliza harbors	1966	1-10,000	do	1889.
Do	Cleveland Passage and vicinity	1968	1-10,000	do	1889.
Do	Gambier Bay	1965	1-20,000	do	1889.
Do	Stephens Passage and Seymour Canal	1969	1-80,000	do	1889.
Do	Holkham Bay and Tracy Arm	1967	1-80,000	do	1889.
Do	Lynn Canal and Stephens Passage (additions to topography).	2170	1-200,000	G. B. Harber	1894.
Do	Stephens Passage	1887	1-40,000	J. McHenry	1888.
Do	Stephens Passage and entrance to Taku Inlet	1888	1-40,000	J. D. McDonald	1888.
Do	Port Snettisham	1885	1-20,000	J. McHenry	1888.
Do	Port Snettisham and Speel River	1886	1-20,000	G. R. Slocum	1888.
Do	Slocum Inlet and parts of Whiting and Speel rivers	1891	1-20,000	J. McHenry	1888.
Do	Stephens Passage	1889	1-40,000	A. M. Beecher	1888.
Do	I-yonk-een Cove, Chatham Strait, and Linderberg Harbor, Peril Strait.	2138 *b*	1-10,000	G. Davidson	1869.
Do	Lynn Canal entrance and part of Chatham Strait	2019	1-80,000	H. B. Mansfield	1890.
Do	Lynn Canal and Taku Inlet	2017	1-80,000	do	1890.
Do	Sketch of the Taku River (topographical) below the boundary.	2182	1-40,000	H. G. Ogden	1893.
Do	Head of Lynn Canal	2018	1-80,000	H. B. Mansfield	1890.
Do	Topographical reconnaissance of the Chilkat and Chilkoot inlets.	2179	1-40,000	E. F. Dickins	1894.
Do	Sitka Sound	2148	1-40,000	Lieut. Commander W. I. Moore, U. S. N.	1893.
Do	Sitka Harbor	2149	1-20,000	do	1893.
Do	do	2150	1-10,000	do	1893.
Do	Entrance to De Monti Bay and western shore of Khantaak Island.	2124	1-20,000	J. G. Doyle	1892.
Do	St. Paul Harbor, Kadiak Island	2137	1-40,000	G. Davidson and A. T. Mosman.	1867.
Do	Porpoise Harbor, Nagai Island	2131	1-7,843	W. H. Dall	1872.
Do	Sanborn Harbor, Unalaska Island	2134	1-10,000	do	1872.
Do	Popoff Strait and Humboldt Harbor	2133	1-10,000	do	1872.
Do	Coal Harbor, Zachareffskaia Bay, Unga Island	2132	1-10,000	do	1872.
Do	Ilinlink Harbor (with hydrography)	1950	1-40,000	G. Davidson and A. T. Mosman.	1867.
Do	Ilinlink Harbor, Unalaska Island	2135	1-5,000	W. H. Dall	1871-72.
Do	St. Michael	2067	1-1,000	J. H. Turner	1891.
Do	St. Michael and vicinity	2068	1-20,000	do	1891.
Alaska and Northwest Territory.	Porcupine River from Fort Yukon eastward	2065	1-20,000	do	1890.
Do	Porcupine River from Camp Colonna westward	2064	1-20,000	do	1890.
Do	Camp Colonna and vicinity	2066	1-5,000	do	1890.
Alaska	Kyska Harbor, Kyska Island	2136	1-10,000	W. H. Dall	1873.
Do	Traverse line from boundary on Forty-Mile Creek to McQuestions Post.	2202	1-40,000	J. E. McGrath	1890.
Do	Traverse line from McQuestions Post down the Yukon to Flag No. 7.	2203	1-40,000	do	1890.
Do	Sketch showing the Fairweather Mountains and shore line from Dall △ to Cape Fairweather.	2174	1-80,000	do	1894.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	PACIFIC COAST—continued.				
	Alaska—Continued.				
Alaska	Sketch showing shore line from Osar River to Icy Cape.	2175	1-80,000	J. E. McGrath	1894.
Do	Sketch showing Yahtse base and shore line from Yahna River to Icy Cape.	2176	1-20,000	....do	1894.
Do	Topographical reconnaissance of the Unuk River from mouth of Second Cañon to the 10 marine league limit.	2178	1-40,000	E. F. Dickins	1894.
Do	Topographical reconnoissance of the Chilkat and Chilkoot inlets.	2179	1-40,000	....do	1894.
Do	Taku River below the boundary (topographical sketch).	2182	1-40,000	H. G. Ogden	1893.
Do	Chatham Strait	2184	1-80,000	Lieut. Commander W. I. Moore, U. S. N.	1894.
Do	Tenakee Inlet	2185	1-40,000	....do	1894.
Do	Alaska Harbors, Killisnoo and lower part of Freshwater Bay.	2186	1-10,000 1-20,000	....do	1894.
Do	Photographic reconnaissance of Chilkoot and Taiya inlets (sheets Nos. 1, 2, 3, and 4).	2199	1-80,000	J. A. Flemer	1894.
Do	Topographic reconnaissance of Chilkat River and adjoining country.	2200	1-80,000	H. P. Ritter	1894.
Do	Point Turner, Yakutat Bay	2201	....	J. H. Turner	1892.
Do	Head of Portland Canal and adjoining country	2209	1-40,000	P. A. Welker	1895.
	MISCELLANEOUS AND WAR MAPS.				
Massachusetts	Subplan No. 6, showing the boundary lines in tide water of a portion of the cities and towns in Essex County, Mass., as located and defined pursuant to chapter 196, acts of 1881.	1865	1-2,500	F. A. Walker, H. L. Whiting, and N. S. Shaler.	1888.
Do	Plan No. 7, showing the boundary lines in tide water of a portion of the cities and towns in Barnstable, Plymouth, Norfolk, Suffolk, and Essex counties, Mass., as located and defined pursuant to chapter 196, acts of 1881.	1866	1-80,000	....do	1888.
Do	Plan No. 8, showing the boundary lines in tide water of a portion of the cities and towns in Suffolk and Essex counties, Mass., as located and defined pursuant to chapter 196, acts of 1881.	1867	1-40,000	....do	1888.
Do	Plan No. 10, showing the boundary lines in tide water of a portion of the cities and towns in Essex County, Mass., as located and defined pursuant to chapter 196, acts of 1881.	1868	1-80,000	....do	1888.
Do	Plan showing the boundary in tide water of the cities and towns bordering on the sea in Bristol, Dukes, Nantucket, and part of Barnstable and Plymouth counties.	1833	1-80,000	....do	1887.
Do	Part of Hoosac Mountain	1589	1-10,000	C. S. Pierce	1873-74.
Pennsylvania and West Virginia.	State line between Pennsylvania and West Virginia from southwest corner of Pennsylvania to the Maryland corner.	1834	1-40,000	C. H. Sinclair and C. H. Van Orden.	1883-85.
Do	State line between Pennsylvania and West Virginia, beginning at southwest corner of Pennsylvania and running east.	1924	1-40,000	....do	1883.
Pennsylvania, West Virginia, and Ohio.	Meridian boundary of West Virginia and Pennsylvania from the Ohio River to the southwest corner of Pennsylvania.	1925	1-80,000	....do	1883.
Do	....do	1926	1-40,000	....do	1883.
Michigan	Burnt Island, Lake Huron	1832	1-1,000	C. H. Sinclair	1888.
Illinois	American Bottom base line	1817	1-5,280	J. E. McGrath	1888.
California	Round Top △ Station	1466 *a*	1-10,000	G. Davidson and E. F. Dickins.	1879.
Do	Sketch showing position and approaches to Round Top △.	1466 *b*	4 m. to 1 in.	....do	1880.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	MISCELLANEOUS AND WAR MAPS—continued.				
California	Sketch of Mount Lola △	1466*c*	1-20,000	G. Davidson and F. F. Dickins.	1879.
Do	Part of Table Mountain, Tuolumne County	1469	1-10,000	E. Hergesheimer	1879.
Do	Moraines of Fallen Leaf Lake	1473	1-10,000	do	1879.
Do	Yolo base line, preliminary examination	1602	1-20,000	G. Davidson and C. Rockwell.	1876.
Do	Summit of Mount Diablo, Contra Costa County	1475	1-20,000	G. Davidson	1880.
Washington and Oregon.	The Dalles, Columbia River	1498	1-10,000	E. Hergesheimer	1880.
California, Nevada, Arizona.	Lake Tahoe, California and Nevada boundary survey (not plotted).	2151	1-10,000	C. H. Sinclair	1893.
California and Nevada.	California and Nevada boundary survey, Colorado River at latitude 35°.	2129	1-10,000	do	1893.
California, Utah, and Nevada.	Sierra Nevada and Wahsatch mountains, diagram showing proposed connection.	2139	1-600,000	A. F. Rodgers	1878.
United States	Map of United States on Lambert's zenithal projection.	2172	1-7,000,000	A. Lindenkohl	1893-94.
Alaska	Geographic chart from Tobolsk to Cape Chukobski, made during Siberian Expedition under command of Vitus Ivanovich Bering, 1725 and 1739.	2002*a*			
Do	Chart of voyage from Kamchatka to discover North America, by Captain Commanding Bering, 1741, from journal kept by Swen Waxel, lieutenant of fleet.	2002*b*			
Nicaragua	Grey Town Harbor	1875	1-10,000	P. C. F. West	1865.
Virginia	Manassas Junction and vicinity, Confederate defenses.	848	1-10,000	H. L. Whiting	1862.
North Carolina	Attack on Fort Fisher	1995	1-5,000	J. S. Bradford	1865.
South Carolina	Defenses of Charleston	976	Various.	C. O. Boutelle	1865.
Tennessee	Approaches and defenses of Knoxville	939	1-10,000	C. Rockwell	1863-64.
Do	Lookout Valley north of Wauhatchee and parts of Lookout and Raccoon mountains.	966	1-10,000	J. W. Donn	1863.
North Carolina	Goldsboro west of the Wilmington and Western Railroad, including its defenses and portions of Neuse and Little rivers.	970	1-10,000	F. W. Dorr	1865.
Do	Approaches to Goldsboro, west of Wilmington and Western Railroad.	971	1-10,000	C. Rockwell	1865.
Tennessee and Georgia.	Summit of Lookout Mountain (and tracing)	973	1-10,000	C. H. Boyd	1865.
Tennessee	Approaches and defenses of Knoxville	920	1-10,000	Gen. J. G. Foster and R. H. Talcott.	1863-64.
Do	Chattanooga and approaches	926	1-10,000	W. F. Smith and F. W. Dorr.	1863.
Do	Supplement, map of the battlefield of Chattanooga	926	1-42,240	do	1863.
Do	Approaches to Nashville from the south and west	931	1-10,000	F. W. Dorr	1864.
Do	Edgefield and approaches to Nashville from the north	932	1-10,000	J. W. Donn	1864.
Georgia	Chickamauga battlefield	934	1-20,000	C. H. Boyd	1864.
Do	Mission Ridge (tracing)	934	1-5,000	Major Monhart	1864. (?)
Do	Battlefield, supplementary sketch (tracing)	934	1-20,000	C. H. Boyd	1865.
Illinois, Kentucky, and Tennessee.	Tennessee River, from Paducah, Ky., to Clifton, Tenn. (reconnaissance).	1909	1-40,000	F. H. Gerdes	1865.
Alabama	Tennessee River, from Chickasaw to Florence	1901	1-40,000	do	1865.
Tennessee, Mississippi, and Alabama.	Tennessee River, from Clifton, Tenn., to Eastport, Miss. (reconnaissance).	1910	1-40,000	do	1865.
Illinois	River front and harbor of naval depot at Mound City	1912	1-4,000	do	1864.
Do	Navy-yard at Mound City	1913	1-10,000	do	1864.
Kentucky, Illinois, and Missouri.	Mississippi River, from Cairo to Grays Point (reconnaissance).	1914	1-20,000	do	1865.
Do	do	1915	1-40,000	do	1865.

List of original topographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Topographer.	Date.
	MISCELLANEOUS AND WAR MAPS—continued.				
Illinois and Missouri.	Mississippi River, from Grays Point to Wittenberg (reconnaissance).	1916	1-20,000	F. H. Gerdes	1865.
Do	... do	1917	1-40,000	...do	1865.
Do	Mississippi River, from Wittenberg to St. Marys (reconnaissance).	1918	1-20,000	...do	1865.
Illinois and Kentucky.	Ohio River, from Mound City to Cairo (reconnaissance).	936	1-10,000	...do	1864.
Illinois and Missouri.	Mississippi River, from Wittenberg to St. Marys (reconnaissance).	1919	1-40,000	... do	1865.
Louisiana	Red River above Alexandria, showing position of breakwaters at the Falls.	1921	1-2,000	...do	1862-64.
Do	Approaches to Fort De Russy (below Alexandria)	1922	1-5,000	...do	1864.
Missouri	Military Defenses of St. Louis	852	1-10,000	J. Mechan	1862.
Do	Carondelet	907	1-10,000	R. M. Bache	1863.
Do	Fortifications of St. Louis	908	1-10,000	...do	1862.
Do	St. Louis and vicinity	921	1-20,000	R. D. Cutts	1862.

APPENDIX No. 11—1895.

SUBDIVISION 2.

LIST OF ORIGINAL HYDROGRAPHIC SHEETS, GEOGRAPHICALLY ARRANGED, REGISTERED IN THE ARCHIVES OF THE UNITED STATES COAST AND GEODETIC SURVEY

FROM

JANUARY, 1834, TO DECEMBER 31, 1895.

NOS. 1 TO 2222, INCLUSIVE.

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UNITED STATES COAST AND GEODETIC SURVEY.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey from January, 1834, to December 31, 1895.

NOS. 1 TO 2222, INCLUSIVE.

State.	Locality.	Registered number.	Scale.	Hydrographer.	Date.
Labrador	Isle of Ponds to Cape Chudleigh	817	1-600,000	A. Murray, U. S. N.	1860.
	Profile chart, North Atlantic Ocean	1532	1-2,400,000	Compiled	1882.
Maine to Massachusetts.	Gulf of Maine and Georges Shoals	1305	1-400,000	....do	1853-75.
Nova Scotia to Massachusetts.	Off Cape Sable and coasts of Maine, New Hampshire, and Massachusetts.	1208	1-1,200,000	J. A. Howell, U. S. N.	1872-73.
Maine to Massachusetts.	Gulf of Maine (see No. 1305)	1303 *a*	1-400,000	C. D. Sigsbee, U. S. N.	1875.
Do	....do	1302 *a*	1-400,000	J. A. Howell, U. S. N.	1874.
	Grand Manan Bank	1302 *b*	1-80,000	....do	1874.
Do	Off Maine, New Hampshire, and Massachusetts	700	1-300,000	A. Murray, U. S. N.	1858-59.
Maine and New Hampshire.	Matinicus Rock to Isle of Shoals (see No. 1305)	1304	1-200,000	R. Platt, U. S. N.	1874.
Maine	Cashes Ledge, Gulf of Maine (see No. 1305)	1303 *b*	1-40,000	C. D. Sigsbee, U. S. N.	1875.
New Hampshire	Jeffreys Ledge (see No. 1305)	861	1-150,000	T. S. Phelps, U. S. N.	1863.
Massachusetts	Massachusetts Bay, Stellwagen Bank	516	1-80,000	H. S. Stellwagen, U. S. N.	1854-55.
Do	Massachusetts Bay, Stellwagen Bank (see No. 1305)	457	1-100,000	....do	1854.
Do	Massachusetts coast (see No. 1305)	593	1-300,000	C. R. P. Rodgers, U. S. N.	1857.
Do	Georges Shoal	1207 *c*	1-3,018	J. E. Pillsbury, U. S. N.	1885.
Do	Georges Shoal (reconnaissance) (see No. 1305)	1207 *b*	1-40,000	J. A. Howell, U. S. N.	1872.
Do	Cultivator Shoal (see No. 1305)	1207 *a*	1-20,000	....do	1872.
Do	Georges Bank	1837	1-400,000	J. E. Pillsbury, U. S. N.	1888-89.
Do	Nantucket Shoals, Davis Bank and Fishing Rip	2089	1-40,000	C. E. Vreeland, U. S. N.	1891.
Do	Nantucket Shoals, Phelps Bank and Asia Rip	745	1-100,000	T. S. Phelps, U. S. N.	1860-61.
Do	Nantucket Shoals, approaches (see No. 1305)	440	1-300,000	H. S. Stellwagen, U. S. N.	1853-4-5-6.
Do	Nantucket to the southward	406	1-400,000	....do	1853.
Massachusetts to Florida.	Georges Bank to Jupiter Inlet (current sections across Gulf Stream).	1499 *a*	1-1,200,000	J. R. Bartlett, U. S. N.	1880-81.
Do	....do	1499 *b*	1-1,200,000	....do	1880-81.
Massachusetts to North Carolina.	Georges Bank to Cape Hatteras	1498 *a*	1-1,200,000	Compiled	1880-81-82.
Do	Cape Cod to Cape Lookout	1458 *a*	1-1,200,000	J. R. Bartlett, U. S. N.	1880.
Massachusetts to Virginia.	Nantucket to Cape Henry (see Nos. 1498 *a*, *b*)	1537	1-1,200,000	J. R. Bartlett and W. H. Brownson, U. S. N.	1882.
Massachusetts to Delaware.	Gay Head to Cape Henlopen (compiled)	670	1-400,000	T. R. Gedney, R. Bache, and C. H. McBlair, U. S. N.	1859.
Massachusetts to New York.	Phelps Bank to Montauk Point	1782	1-300,000	J. E. Pillsbury, U. S. N.	1887.
Massachusetts and Rhode Island.	No Mans Land to Point Judith	283	1-100,000	J. Swartwout, U. S. N.	1851.
New York to Bermuda.	Montauk Point to Gibbs Hill Light (soundings and temperatures).	1652 *a*	1-729,600	Compiled	1882.
Do	....do	1652 *b*	1-729,600	....do	1882.
New York to Delaware.	Montauk Point to Cape Henlopen	1558	1-300,000	W. H. Brownson, U. S. N.	1882-83.
Do	....do	100	1-400,000	T. R. Gedney, U. S. N.	1842.
Do	Block Island to Cape Henlopen	101	1-400,000	....do	1844.
New Jersey	Barnegat to Cape May	749	1-200,000	T. S. Phelps, U. S. N.	1861.
Delaware and Maryland.	Southeast of Delaware Bay entrance	189	1-200,000	S. P. Lee, U. S. N.	1847.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Delaware to North Carolina.	Cape Henlopen to Cape Hatteras	237	1-400,000	T. A. Jenkins, U. S. N.	1849-50.
Delaware to Maryland.	Cape Henlopen to Cape Charles	1720	1-200,000	J. E. Pillsbury, U. S. N.	1886.
Virginia	Cape Charles to the eastward	2118	1-100,000	C. E. Vreeland, U. S. N.	1892.
Virginia to North Carolina.	Cape Charles to Cape Hatteras	1721	1-200,000	J. E. Pillsbury, U. S. N.	1886.
Do	Cape Henry to Cape Hatteras	674	1-200,000	A. Murray, U. S. N.	1859.
Do	Cape Henry to Cape Lookout (see Nos. 1498 *a*, *b*)	1500 *a*	1-600,000	J. R. Bartlett, U. S. N.	1881.
North Carolina	Cape Hatteras to Cape Fear	686	1-200,000	A. Murray, U. S. N.	1859.
Virginia to North Carolina.	Cape Henry to Cape Lookout	767	1-500,000	.....do	1859.
North Carolina to Florida.	Currituck Light to Jupiter Inlet (Gulf Stream examination).	1561	1-1,200,000	J. R. Bartlett, U. S. N.	1880-81.
Do	Cape Hatteras to Cape San Blas (Gulf Stream axis temperature).	468	1-1,800,000	O. H. Berryman, U. S. N.	1855.
North Carolina to Bermuda.	Cape Hatteras to Bermuda Islands (temperatures)	1563 *a*	1-729,600	J. R. Bartlett, U. S. N.	1882.
North Carolina	Ocracoke Inlet to Cape Fear	884	1-240,000	R. Platt, U. S. N.	1865-66.
North Carolina to Florida.	Cape Lookout to St. Augustine	768	1-500,000	A. Murray, U. S. N.	1860.
North Carolina to South Carolina.	Cape Lookout to Cape Romain	1458 *b*	1-1,200,000	J. R. Bartlett, U. S. N.	1880.
North Carolina to Bahamas.	Cape Hatteras to Bahama Islands	1498 *b*	1-1,200,000	Compiled	1880-81-82.
North Carolina to Florida.	Cape Lookout to St. Augustine	1500 *b*	1-600,000	J. R. Bartlett, U. S. N.	1881.
North Carolina	Frying Pan Shoals	1517	1-40,000	W. H. Brownson, U. S. N.	1882.
North Carolina and South Carolina.	Cape Fear to Cape Romain	694	1-300,000	J. P. Bankhead, U. S. N.	1859.
South Carolina	Coast approaches	622	1-200,000	J. N. Maffitt, U. S. N.	1857.
South Carolina to Florida.	Coast approaches (condemned)	653	1-300,000	T. B. Huger, U. S. N.	1858.
South Carolina and Georgia.	Coast approaches	717	1-300,000	.....do	1858.
Do	.....do	728	1-300,000	J. P. Bankhead, U. S. N.	1860.
Florida	Fernandina to Cape Florida	770	1-400,000	A. Murray, U. S. N.	1860.
Do	St. Augustine to Jupiter Inlet (see No. 1498)	1500 *c*	1-600,000	J. R. Bartlett, U. S. N.	1881.
North Carolina to Georgia.	Cape Fear to Savannah River (section lines across Gulf Stream).	1958	1-506,880	.....do	1881.
Florida	St. Johns River to Jupiter Inlet (section lines across Gulf Stream).	1957	1-506,880	.....do	1881.
	Gulf Stream section lines	1959	1-506,880	.....do	1881.
Florida	Straits of Florida	1624	1-200,000	J. E. Pillsbury, U. S. N.	1885.
Florida and Bahama.	Straits of Florida and Northwest Providence Channel.	1625	1-200,000	.....do	1885.
Florida	Straits of Florida	1090	1-400,000	R. Platt, U. S. N.	1869.
Do	.....do	1091	1-400,000	.....do	1869.
Do	.....do	1665	1-300,000	J. E. Pillsbury, U. S. N.	1886.
Do	Straits of Florida, Sombrero Key to Sand Key	1066	1-160,000	R. Platt, U. S. N.	1868.
Florida and Cuba.	Straits of Florida, Key West to Cuba	1956	1-400,000	.....do	1866.
Bahama	Bahama Bank to the eastward (see No. 1498)	1584	1-1,200,000	W. H. Brownson, U. S. N.	1882-83.
Florida	Key West to Charlotte Harbor	911	1-400,000	R. Platt, U. S. N.	1867.
Do	West coast approaches	1354	1-600,000	C. D. Sigsbee, U. S. N.	1875-76.
	Gulf of Mexico, southeastern part	1399	1-800,000	.....do	1877-78.
	Gulf of Mexico (soundings and temperatures)	599	1-1,200,000	B. F. Sands, U. S. N.	1857-58.
	.....do	483	1-1,200,000	.....do	1854-55.
Florida	West coast	1138	1-600,000	J. A. Howell, U. S. N.	1872.
Florida to Texas	Tortugas, half way to Rio Grande	1353	1-600,000	C. D. Sigsbee, U. S. N.	1875-76-77.
Louisiana	Mississippi Delta	1351	1-400,000	.....do	1875-76-77.
Do	.....do	420	1-600,000	B. F. Sands, U. S. N.	1854.
Florida to Louisiana.	Between Key West and Mississippi Delta (soundings and temperatures).	528	1-662,050	.....do	1856.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Louisiana and Texas.	Southwest Pass and mouth of Rio Grande	1350	1-600,000	C. D. Sigsbee, U. S. N	1875-76-77.
Louisiana to Florida.	Rio Grande, half way to Tortugas	1352	1-600,000	do	1875-76-77.
Louisiana to Texas.	Timbalier Bay to Galveston Bar	657	1-635,000	J. K. Duer, U. S. N	1858.
Mexico	Between Mexico and the Yucatan Banks (northern part).	1355	1-600,000	C. D. Sigsbee, U. S. N	1876-77.
Do	Between Mexico and the Yucatan Banks (southern part).	1356	1-600,000	do	1876-77.
Do	Yucatan Channel, Cape San Antonio to Cape Catoche.	1137	1-200,000	R. Platt, U. S. N	1872.
West Indies	West India Islands and Caribbean Sea (compiled)	1514 *a*	1-2,400,000	J. R. Bartlett, U. S. N	1879.
Do	West India Islands and Caribbean Sea (in colors)	1514 *b*	1-2,400,000	Constructed	1879.
Do	Caribbean Sea (temperature sections)	1599	1-2,400,000	J. R. Bartlett, U. S. N	1878-79-80.
	Gulf of Mexico, Yucatan Channel and Florida Straits (temperatures).	1600 *a*	1-1,200,000	C. D. Sigsbee, U. S. N	1876-78.
	Gulf of Mexico, Yucatan Channel and Florida Straits (cross sections).	1600 *b*	1-400,000	do	1876-78.
Florida to Texas.	Gulf of Mexico, Egmont Key to Padre Island	1600 *c*	1-2,400,000	do	1876-78.
	Gulf of Mexico (profile lines)	1600 *d*		do	1876-78.
	Caribbean Sea	1600 *e*	1-10,000,000	J. R. Bartlett, U. S. N	1879.
	Caribbean Sea (profile and temperatures)	1563 *b*	1-2,400,000	do	1878-80-81.
Labrador	Eclipse Harbor	818	1-40,000	A. Murray, U. S. N	1866.
Maine and New Brunswick.	Monument Stream, North Lake, and Thorofare	2139	1-10,000	J. Hergesheimer	1892.
Do	Grand Lake, head to Piney Point	2138	1-10,000	do	1892.
Do	Grand Lake, Piney Point to Black Rock	2137	1-10,000	do	1892.
Do	Grand Lake, Black Rock to Round Rock	2136	1-10,000	do	1892.
Do	Grand Lake, south end Chiputneticook Lake to Hinkley Point.	2171	1-10,000	S. Forney	1892.
Do	Chiputneticook Lake, Hinkley Point to Musquash River.	2172	1-10,000	do	1892.
Do	Chiputneticook Lake, Musquash River to St. Croix	2173	1-10,000	do	1892.
Do	St. Croix River, St. Croix to Jo George Rips	1931	1-10,000	C. M. Bache	1890.
Do	St. Croix River, Jo George Rips to Meeting House Rips.	2000	1-10,000	J. A. Flemmer	1890.
Do	St. Croix River, Meeting House Rips to Millbury Brook.	2001	1-10,000	do	1890.
Do	St. Croix River, Millbury Brook to Gibbs Landing	2003	1-10,000	do	1890.
Do	St. Croix River, Gibbs Landing to Ryans Rip	2006	1-10,000	do	1890.
Do	St. Croix River, Ryans Rip to Calais	1940	1-10,000	E. Ellicott	1889.
Do	St. Croix River, Calais to Oak Bay	1796	1-10,000	F. H. Crosby, U. S. N	1887.
Do	St. Croix River, Oak Bay to Robbinston	1795	1-10,000	do	1887.
Do	St. Croix River, Robbinston to north end Deer Island.	1794	1-10,000	do	1887.
Do	St. Croix River, north end Deer Island to Eastport	1793	1-10,000	do	1887.
Do	Head harbor and eastern approaches to Friar Roads.	848	1-10,000	C. O. Boutelle	1861.
Do	Friar Roads, Kendall Head to Lubec	847	1-10,000	do	1861.
Do	Friar Islands to West Quoddy Head	895	1-10,000	H. L. Marindin	1866.
Maine	Cobscook Bay, Treat Island to Shackford Head.	2027	1-10,000	S. M. Ackley, U. S. N	1890.
Do	Cobscook Bay, Shackford Head to Denbows Neck	1798	1-10,000	F. H. Crosby, U. S. N	1887.
Do	Cobscook Bay, Denbows Neck to Pembroke	1840	1-10,000	do	1888.
Do	Cobscook Bay, Denbows Neck to Dram Island and Whiting.	1838	1-10,000	do	1888.
Do	Cobscook Bay, Dram Island to Dennysville	1839	1-10,000	do	1888.
Do	West Quoddy Head to Cross Island, off shore	1693	1-40,000	J. M. Hawley and F. H. Crosby, U. S. N.	1886-87.
Do	West Quoddy Head to Jims Head	1692	1-10,000	J. M. Hawley, U. S. N	1886.
Do	Jims Head to Black Point Cove	1691	1-10,000	do	1886.
Do	Black Point Cove to Cape Wash, including Little Machias Bay.	1690	1-10,000	do	1886.
Do	Cross Island to Nash Island, off shore	1576	1-40,000	A. S. Snow, U. S. N	1883.
Do	Machias Bay, entrance and Cross Island Narrows	1689	1-10,000	J. M. Hawley, U. S. N	1886.
Do	Machias Bay, Bucks Head to Round Island	1688	1-10,000	E. D. F. Heald, U. S. N	1885.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Maine	Machias Bay, Round Island to Machias	1687	1-10,000	E. D. F. Heald, U. S. N.	1885.
Do	Libby Islands to Little Kennebec Bay	1686	1-10,000	....do	1885.
Do	Englishmans Bay and Rogue Island Harbor	1685	1-10,000	....do	1885.
Do	Chandler Bay and River	1684	1-10,000	....do	1885.
Do	Moose-a-bec Reach and eastern approaches	1059	1-10,000	F. F. Nes	1870.
Do	Black Ledges to Egg Rock and Mud Hole Channel	1574	1-10,000	A. S. Snow, U. S. N.	1883.
Do	Great Wass Island to Nash Island	1060	1-10,000	F. F. Nes	1870.
Do	Indian and West rivers to Plummer Island	1061	1-10,000	....do	1870.
Do	Black Rocks and vicinity	1835	1-10,000	J. E. Pillsbury, U. S. N.	1888.
Do	Nash Island to Schoodic Point, off shore	1398	1-40,000	T. F. Jewell, U. S. N.	1878.
Do	Pleasant Bay	1608	1-10,000	E. D. F. Heald, U. S. N.	1884.
Do	Pleasant River	1644	1-10,000	....do	1885.
Do	Harrington Bay and tributaries	1610	1-10,000	....do	1884.
Do	Narraguagus Bay to Half Tide Ledge and Pigeon Hill Bay.	1567 *b*	1-10,000	....do	1883.
Do	Narraguagus Bay, Half Tide Ledge to Millbridge.	1567 *a*	1-10,000	....do	1883.
Do	Narraguagus Bay to Narraguagus River	1609	1-10,000	....do	1884.
Do	Pigeon Hill Bay and approaches	1528	1-10,000	H. G. Colby, U. S. N.	1882.
Do	Dyer Bay	1510	1-10,000	....do	1881.
Do	Gouldsboro Bay	1505	1-10,000	....do	1881.
Do	Prospect and Schoodic harbors and approaches	1127	1-10,000	H. Anderson	1871.
Do	Schoodic Head to Great Spoon Island, off shore	1372	1-40,000	J. F. Moser, U. S. N.	1877.
Do	Frenchmans Bay, Baker Island to Iron Bound Island.	1424	1-20,000	C. M. Chester, U. S. N.	1879.
Do	Frenchmans Bay, Stony Beach to Schooner Head	1215	1-10,000	J. W. Donn	1873.
Do	Frenchmans Bay, Schooner Head to Bar Harbor	1216	1-10,000	....do	1873.
Do	Frenchmans Bay, Schoodic Point to Jordans Island and Winter Harbor.	938	1-10,000	H. Anderson	1867.
Do	Frenchmans Bay, Bar Harbor to Meadow Point	1217	1-10,000	J. W. Donn	1873.
Do	Frenchmans Bay, Bar Harbor to Calf Island	1402	1-10,000	S. W. Ackley, U. S. N.	1878.
Do	Frenchmans Bay, Flanders Bay	1436 *b*	1-10,000	J. F. Moser, U. S. N.	1879.
Do	Frenchmans Bay, Sullivan Harbor to The Nub	1436 *a*	1-10,000	....do	1879.
Do	Frenchmans Bay, Taunton Bay to Sullivan Harbor	1474 *a*	1-10,000	S. M. Ackley, U. S. N.	1880.
Do	Frenchmans Bay, Skilling River and approaches	1474 *b*	1-10,000	....do	1880.
Do	Southwest Harbor and Bunkers Ledge	1121	1-10,000	J. W. Donn	1871.
Do	Northeast Harbor and Somes Sound	1122	1-10,000	....do	1871.
Do	Race Point to Bass Harbor Head	1120	1-10,000	....do	1871.
Do	Blue Hill Bay, Bass Harbor Head to Bar Island	1164	1-10,000	....do	1872.
Do	Blue Hill Bay, Mackerel Cove to Trumpet Island	1401	1-10,000	J. M. Hawley, U. S. N.	1878.
Do	Blue Hill Bay, Herrick Bay to Hardwood Island	1433 *a*	1-10,000	U. Sebree, U. S. N.	1879.
Do	Blue Hill Bay, Bartlett Narrows to Dodges Point	1245 *b*	1-10,000	J. W. Donn	1874.
Do	Blue Hill Bay, Tinker Island to Newbury Neck	1433 *b*	1-10,000	U. Sebree, U. S. N	1879.
Do	Blue Hill Bay, Blue Hill Harbor to Allen Cove	1434	1-10,000	C. M. Chester, U. S. N.	1879.
Do	Blue Hill Bay, Morgan and Union River bays	1435 *a*	1-10,000	....do	1879.
Do	Blue Hill Bay, Goose Cove to Bartlett Island	1435 *b*	1-10,000	....do	1879.
Do	Blue Hill Bay, Mount Desert Narrows to Bartlett Narrows.	1245 *a*	1-10,000	J. W. Donn	1874.
Do	Blue Hill Bay, Jordan River	1474 *c*	1-10,000	S. M. Ackley, U. S. N	1880
Do	Great Gott Island to Long Island and Harbor Island.	1453	1-10,000	J. F. Moser, U. S. N	1879.
Do	Burnt Coat Harbor to Marshall Island	1452	1-10,000	....do	1879.
Do	Casco Passage and Eggemoggin Reach to Sedgwick Harbor.	1366	1-10,000	J. M. Hawley, U. S. N.	1876-77.
Do	Eggemoggin Reach, Sedgwick Harbor to Bucks Harbor.	1260	1-10,000	H. Anderson	1874.
Do	Great Spoon Island to Seal Island, off shore	1074	1-20,000	F. P. Webber	1870
Do	Isle au Haut, Head Harbor	1357	1-5,000	J. M. Hawley, U. S. N.	1877
Do	Jericho Bay, Saddle Back Island to Great Spoon Island.	1407	1-10,000	J. F. Moser, U. S. N.	1878
Do	Merchants Row and Deer Island Thoroughfare	1400 *a*	1-10,000	J. M. Hawley, U. S. N.	1877.
Do	Deer Isle, Southeast Harbor and approaches	1400 *b*	1-10,000	....do	1878.
Do	Seal Island to Metinic Island, off shore	1051	1-20,000	C. Junken	1866.
Do	Seal Island to Muscle Ridge Islands, off shore	943	1-20,000	....do	1866-67.
Do	East Penobscot Bay, Isle au Haut Bay, Saddle Back Ledge to Eagle Island.	1028	1-20,000	....do	1869.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Maine	East Penobscot Bay, Isle au Haut Bay, The Washers to Thurlow Island.	1406	1-10,000	J. F. Moser, U. S. N	1878.
Do	East Penobscot Bay, south of Fox Islands	1073	1-10,000	F. P. Webber	1870.
Do	East Penobscot Bay, Seal Bay and vicinity	1142	1-10,000	....do	1871.
Do	East Penobscot Bay, Fox Islands Thoroughfare, east entrance.	983	1-10,000	C. Junken	1868.
Do	East Penobscot Bay, Mark Island to Little Deer Isle.	1321	1-10,000	J. M. Hawley, U. S. N	1875.
Do	East Penobscot Bay, Fox Islands to Bucks Harbor	1261	1-10,000	H. Anderson	1873-74.
Do	East and West Penobscot bays, Dillinghams to Dice Head.	1143	1-20,000	F. P. Webber	1871.
Do	East Penobscot Bay, Castine Harbor and Bagaduce River to Narrows.	1259	1-10,000	H. Anderson	1873.
Do	East Penobscot Bay, Bagaduce River and Narrows	1472	1-10,000	S. M. Ackley, U. S. N	1880.
Do	West Penobscot Bay, Green Island Light to Crockett Cove.	1029	1-10,000	C. Junken	1869.
Do	West Penobscot Bay, The Basin, Vinal Haven Island.	1075	1-10,000	F. P. Webber	1870.
Do	West Penobscot Bay, Fox Island Thoroughfare, west entrance.	982	1-10,000	C. Junken	1868.
Do	West Penobscot Bay, east of Muscle Ridge Channel	1030	1-20,000	....do	1869.
Do	West Penobscot Bay, Owls Head Bay and Rockland Harbor.	819	1-10,000	W. S. Edwards	1863.
Do	West Penobscot Bay, Owls Head Bay to Job Island	1086	1-20,000	F. P. Webber	1869.
Do	West Penobscot Bay, island south of Long Island	1087	1-10,000	....do	1869.
Do	West Penobscot Bay, Rockport and Camden harbors.	873	1-10,000	H. Anderson	1865.
Do	West Penobscot Bay, Gilkey Harbor southward	1144	1-10,000	F. P. Webber	1871.
Do	West Penobscot Bay, Belfast Bay and River	1068	1-10,000	H. Anderson	1872.
Do	Penobscot River, Long Island to Searsport and Sandy Point.	1258	1-20,000	....do	1872.
Do	Penobscot River, Sandy Point to Bucksport	1257*a*	1-10,000	....do	1874.
Do	Penobscot River, Bucksport to Parker Point	1257*b*	1-10,000	....do	1874.
Do	Penobscot River, Parker Point to Smith Cove	1473	1-10,000	S. M. Ackley, U. S. N	1880.
Do	Penobscot River, Smith Cove to Bangor	934	1, 10,000	J. A. Sullivan	1867.
Do	Muscle Ridge Islands	953	1-10,000	R. E. Halter	1866.
Do	Muscle Ridge Channel	952*a*	1-10,000	R. E. Halter and C. Junken.	1866-67.
Do	Weskeag River	952*b*	1-10,000	J. S. Bradford	1873.
Do	Matinicus Rock to Seguin Island, off shore	1836	1-40,000	J. E. Pillsbury, U. S. N	1888.
Do	Metinic Island to Monhegan Island	823*a*	1-40,000	E. Cordell	1863.
Do	Monhegan Island to Pumpkin Island, off shore	746	1-20,000	T. S. Phelps, U. S. N	1860.
Do	Metinic Island	823*b*	1, 20,000	C. Junken	1867.
Do	Monhegan Island	823*c*	1-20,000	....do	1867.
Do	Sprucehead Island to Mosquito Island	907	1-10,000	R. E. Halter	1866.
Do	Georges Islands	872	1-10,000	R. E. Halter and C. Fendall.	1865.
Do	St. Georges River to Narrows	859	1-10,000	F. P. Webber	1864.
Do	St. Georges River Narrows to Thomaston	858	1-10,000	....do	1864.
Do	Meduncook River and Pleasant Point Gut	951	1-10,000	R. E. Halter	1867.
Do	Muscongus Bay, Pemaquid Point to Cranberry Island.	986	1-10,000	....do	1868.
Do	Muscongus Bay, Cranberry Island to Hungry Island.	950	1-10,000	....do	1867.
Do	Medomak River, from Bremen, Long Island, to Waldoboro.	960	1-10,000	H. Anderson	1866.
Do	Johns Bay and River, from entrance to head	920	1-10,000	R. E. Halter	1867.
Do	Damariscotta River and Linekin Bay, from Pumpkin Island to Miller Island.	791	1-10,000	J. P. Bankhead	1860.
Do	Damariscotta River, from Miller Island to Newcastle.	903	1-10,000	E. Hergesheimer	1866.
Do	Seguin Island to Cape Elizabeth, off shore	933	1-40,000	R. Platt, U. S. N	1867.
Do	Damiscove Island to Small Point	696	1-40,000	J. Wilkinson, U. S. N	1859.
Do	Sheepscot River, mouth, and Booth Bay, from Damiscove Island to Hendricks Head Light.	771	1-10,000	T. S. Phelps, U. S. N	1860.
Do	Sheepscot River, from Hendricks Head Light to Hodgdons Ledge.	675	1-10,000	J. H. Moore, U. S. N	1858.
Do	Sheepscot River, from Hodgdons Ledge to Wiscasset.	676	1-10,000	....do	1858.
Do	Back River and Ebenicook Harbor	891	1-10,000	E. Hergesheimer	1866.
Do	Hockomock Bay, Knubble Bay, and approaches	776	1-10,000	F. H. Gerdes	1862.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Maine	Great and Little Hell Gate and Goose Rock Passage	930	1-10,000	J. S. Bradford	1867.
Do	Hockomock Bay, Knubble Bay, and Brooking Bay	929	1-10,000	do	1867.
Do	Montseag Bay	775	1-10,000	F. H. Gerdes	1862-67.
Do	Upper Hell Gate	893 *a*	1-10,000	H. Anderson	1865.
Do	Hell Gate, Back Door	893 *b*	1-5,000	J. S. Bradford	1867.
Do	Sagadahoc Bay and Todd Bay	971	1-10,000	do	1868.
Do	Kennebec River, approaches and entrance	552	1-10,000	S. D. Trenchard, U. S. N.	1856-57.
Do	Kennebec River, Cox Head to Bath	639	1-10,000	do	1857.
Do	Kennebec River, Bath to Lines Island	693	1-10,000	J. H. Moore, U. S. N	1858.
Do	Kennebec River, Merrymeeting Bay, Lines Island, to Swan Island.	790	1-10,000	F. H. Gerdes	1861.
Do	Kennebec River, Swan Island to Richmond	1064	1-10,000	C. H. Boyd	1869.
Do	Kennebec River, Richmond to Gardiner	1065	1-10,000	do	1870.
Do	Kennebec River, Gardiner to Augusta	2036	1-10,000	S. Forney	1890.
Do	Casco Bay, approaches	860	1-40,000	T. S. Phelps, U. S. N	1864.
Do	do	664	1-40,000	W. G. Temple, U. S. N	1857-58.
Do	Casco Bay, lower part	754	1-20,000	C. A. Schott	1861.
Do	Casco Bay, lower part, part of No. 754	726	1-20,000	J. Wilkinson, U. S. N	1859.
Do	Casco Bay, lower part	602	1-10,000	S. D. Trenchard, U. S. N	1856.
Do	do	614	1-10,000	do	1856.
Do	Casco Bay, lower part; Cape Small, Lumbo Ledge, and Halfway Rock.	972	1-10,000	J. S. Bradford	1868.
Do	Casco Bay, upper part	820	1-10,000	W. S. Edwards	1863.
Do	Casco Bay, Quohog Bay	857	1-10,000	A. Strausz	1864-65.
Do	Casco Bay, Harpswell Sound	839	1-10,000	F. H. Gerdes	1863.
Do	Casco Bay, Maquoit Bay, Middle Bay, and Mare Point Bay.	840	1-10,000	do	1863.
Do	Casco Bay, Maquoit Bay, Middle Bay, Head of Harpswell Sound, and waters connecting.	1008	1-10,000	H. Anderson	1869.
Do	Casco Bay, New Meadow River	899	1-10,000	J. W. Donn	1866.
Do	Casco Bay, Portland Harbor approaches	403	1-20,000	M. Woodhull, U. S. N	1853.
Do	Casco Bay, Portland Harbor rocks	796	1-20,000	T. S. Phelps, U. S. N	1863.
Do	do	841	1-20,000	do	1863.
Do	Casco Bay, Portland Harbor, rocks off Cape Elizabeth.	824	1-789	M. Woodhull, U. S. N	1853.
Do	Casco Bay, Portland Harbor, Trinity Reef to Portland Head, and Whitehead Passage.	788	1-20,000	D. Cordell	1862.
Do	Casco Bay, Portland Harbor, approaches	601	1-5,000	F. A. Roe	1857.
Do	Casco Bay, Portland Harbor and approaches	404	1-10,000	M. Woodhull, U. S. N	1852-53.
Do	Casco Bay, Portland Harbor	949	1-5,000	R. Platt, U. S. N	1867.
Do	Casco Bay, Portland Harbor, bank off Union Wharf.	600	1-5,000	S. D. Trenchard, U. S. N	1857.
Do	do	684	1-5,000	J. Wilkinson, U. S. N	1859.
Do	Casco Bay, Portland Harbor, east part	1033 *a*	1-2,400	H. Anderson	1869.
Do	Casco Bay, Portland Harbor, west part	1033 *b*	1-2,400	do	1869.
Do	Casco Bay, Portland Harbor	1032	1-1,200	do	1868.
Do	Casco Bay, Portland Harbor, Standwater Creek	1034 *a*	1-2,400	do	1869.
Do	Casco Bay, Portland Harbor, Back Creek	1034 *b*	1-2,400	do	1869.
Do	Cape Elizabeth to Kennebunkport	699	1-40,000	A. Murray, U. S. N	1859.
Do	Richmond Island Harbor	243	1-10,000	M. Woodhull, U. S. N	1850.
Do	Saco Bay, from Spurwink River to Scarboro River	1634 *a*	1-10,000	J. E. Pillsbury, U. S. N	1885.
Do	Saco Bay, from Old Orchard Beach to Hoyts Neck	1634 *b*	1-10,000	F. F. Nes	1875.
Do	Saco River, approaches and Wood Island Harbor	1117 *b*	1-10,000	J. S. Bradford	1871.
Do	Wood Island Harbor	739	1-10,000	A. Murray, U. S. N	1859.
Do	Saco River, entrance	882	1-5,000	G. Davidson	1866.
Do	Saco River to Chandler Point	942	1-5,000	F. F. Nes	1867.
Do	Saco River to Chandler Point to Biddeford	941	1-5,000	do	1867.
Do	Cape Porpoise and Stage Island Harbor	1117 *a*	1-10,000	J. S. Bradford	1871.
Do	do	740	1-10,000	A. Murray, U. S. N	1859.
Do	Kennebunkport to Isles of Shoals	667	1-40,000	do	1858.
Do	York River, entrance and harbor	376	1-10,000	M. Woodhull, U. S. N	1853.
Do	Boon Island to York Harbor, off shore	366	1-20,000	do	1853.
Do	Moore Rock	667 *bis*	1-10,000	J. F. Moser, U. S. N	1879.
Maine and New Hampshire.	Portsmouth Harbor, approaches	294	1-20,000	M. Woodhull, U. S. N	1851.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Maine and New Hampshire.	Isles of Shoals	741 *a*	1-10,000	A. Murray, U. S. N.	1859.
Do	....do	741 *b*	1-10,000	R. Platt, U. S. N.	1874.
New Hampshire	Pulpit Rock to Great Boars Head	1068	1-10,000	H. Anderson	1870.
Do	Great Boars Head to East Salisbury	1069	1-10,000	....do	1870.
Massachusetts	Newburyport to Portsmouth	627	1-20,000	C. R. P. Rodgers, U. S. N.	1857.
Do	Merrimac River, entrance	1395	1-5,000	C. M. Chester	1878.
Do	Newburyport Harbor	292	1-10,000	M. Woodhull, U. S. N.	1851.
Do	Merrimac River, Mitchells Falls	1012	200 ft. to 1 in.	H. Mitchell	1867.
Do	Cape Ann to Newburyport	594	1-20,000	C. R. P. Rodgers, U. S. N.	1857.
Do	Annisquam to Ipswich	574	1-20,000	S. D. Trenchard, U. S. N.	1856.
Do	Annisquam and Ipswich harbors	346	1-10,000	M. Woodhull, U. S. N.	1852.
Do	Thatcher Island to Annisquam	597	1-20,000	C. R. P. Rodgers, U. S. N.	1857.
Do	Gloucester Harbor and approaches	396 *a*	1-10,000	H. S. Stellwagen, U. S. N.	1853.
Do	Bar, between Emmerson Point and Milk Island	396 *b*	1-10,000	J. S. Bradford and J. E. Pillsbury, U. S. N.	1873-85.
Do	Salem Harbor and approaches	284	1-10,000	C. H. McBlair, U. S. N.	1850-51.
Do	Salem Harbor, off Marblehead	651	1-5,000	W. G. Temple, U. S. N.	1858.
Do	Chelsea Beach to Marblehead Neck	413	1-20,000	H. S. Stellwagen, U. S. N.	1853-54.
Do	Lynn Harbor	662	1-10,000	A. Murray, U. S. N.	1858.
Do	Broad Sound and entrance to Lynn Harbor	2129	1-10,000	L. K. Reynolds, U. S. N.	1892.
Do	Boston Harbor and approaches	221	1-20,000	C. H. Davis, U. S. N.	1846-47-48.
Do	Boston Harbor (comparative map)	1960	1-20,000	A. S. Wadsworth and C. S. Davis, U. S. N.	1817-46-53.
Do	Boston Harbor (reduction of No. 1960)	1961	1-20,000	A. S. Wadsworth	1817.
Do	Boston Harbor, Centurian and Hangman rocks	652	1-10,000	W. G. Temple, U. S. N.	1858.
Do	Boston Harbor, Shirley Gut, examination	648	1-5,000	....do	1858.
Do	Boston Harbor, entrance	2146	1-10,000	E. M. Hughes, U. S. N.	1892.
Do	Boston Harbor, middle part	2161	1-10,000	W. F. Low, U. S. N.	1892-93.
Do	Boston Harbor, Chelsea and Charles rivers and Mystic River.	2156	1-10,000	....do	1892-93.
Do	Boston Harbor, inner	850	1-10,000	A. Boschke	1861.
Do	Boston Harbor (compiled)	1955	1-10,000	....do	1861.
Do	Boston Harbor, water front, along wharves	2141	1-2,500	W. F. Low, U. S. N	1892.
Do	Boston Harbor, inner harbor	178	1-5,000	C. H. Davis, U. S. N.	1846.
Do	Boston Harbor (current chart)	1971	1-20,000	....do	1847-48.
Do	....do	1972	1-20,000	....do	1847-48.
Do	....do	1973	1-20,000	....do	1847-48.
Do	Boston Harbor, Town, Fore, and Back rivers, and Weymouth River above the bridge.	1021	1-10,000	J. S. Bradford	1869.
Do	Boston Harbor, Minots Ledge to Scituate Harbor	2133	1-10,000	C. E. Vreeland, U. S. N.	1892.
Do	Cohasset Harbor	2134	1-5,000	....do	1892.
Do	Minots Ledge, off Boston Harbor	412	1-5,000	H. S. Stellwagen, U. S. N.	1853.
Do	Stellwagen and other dangerous ledges near Cohasset, off Boston Bay.	582	1-10,000	....do	1856.
Do	Massachusetts Bay and Stellwagen Bank	516	1-80,000	....do	1854-55.
Do	Phelps Ledge, Green Harbor River entrance	183	1-40,000	C. H. Davis, U. S. N.	1854.
Do	Plymouth Harbor	422	1-10,000	M. Woodhull, U. S. N.	1853.
Do	Plymouth Harbor, approaches from Manomet Point to Pier Head.	1339	1-10,000	F. F. Nes	1875.
Do	Plymouth Harbor	1067	1-10,000	H. Anderson	1870.
Do	Duxbury Bay	1035	1-10,000	....do	1867-70.
Do	Cape Cod Bay, Provincetown Harbor	578	1-40,000	H. S. Stellwagen, U. S. N.	1856.
Do	Cape Cod Bay, Provincetown Harbor (No. 578 enlarged).	578 *bis*	1-10,000	A. Boschke	1868.
Do	Cape Cod Bay, Scusset Beach	772	1-10,000	J. Wilkinson, U. S. N.	1860.
Do	Cape Cod Bay, Barnstable Harbor	751	1-10,000	H. Mitchell	1861.
Do	Cape Cod Bay, Wellfleet Harbor	249	1-20,000	C. H. McBlair, U. S. N.	1849-50.
Do	Cape Cod Bay, Provincetown Harbor	2019	1-10,000	H. L. Marindin	1890.
Do	Cape Cod Bay, Provincetown Harbor, east part	2053 *a*	1-10,000	H. L. Whiting	1867.
Do	Cape Cod Bay, Provincetown Harbor, west part	2053 *b*	1-5,260	....do	1867.
Do	Cape Cod, north and west shore, and west part of Provincetown Harbor.	1952	1-10,000	H. L. Marindin	1889.

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Massachusetts	Cape Cod, north and east shore, and east part of Provincetown Harbor.	1951	1-10,000	H. L. Marindin...........	1889.
Do....	Cape Cod, from Wood End to Nauset Harbor	519	1-40,000	H. S. Stellwagen, U. S. N ..	1855-56.
Do............	Cape Cod, east shore, from Highland Light to Cahoons Hollow.	1903	1-10,000	H. L. Marindin..........	1888.
Do............	Cape Cod, east shore, from Cahoons Hollow to Nauset Harbor.	1902	1-10,000	.....do....	1888.
Do............	Cape Cod, east shore, Nauset Beach (cross sections)..	1817	1-10,000	.....do....................	1887.
Do............	Cape Cod, east shore, from Nauset Lights to Monomoy.	570	1-40,000	H. S. Stellwagen, U. S. N ..	1856.
Do......	Cape Cod, east shore, cross sections off Nauset Beach.	1818	1-10,000	H. L. Marindin...........	1887.
Do...	Cape Cod, east shore, cross sections off Chatham Beach.	1901	1-10,000	.....do....................	1888.
Do............	Cape Cod, east shore, Monomoy Island, off Nauset Beach.	1726	1-10,000	J. E. Pillsbury, U. S. N....	1886.
Do............	Chatham Harbor.....................................	293	1-10,000	M. Woodhull, U. S. N......	1851.
Do............	Monomoy Island, east side, from the point to latitude 41° 37′ N.	1727	1-10,000	J. E. Pillsbury, U. S. N.....	1886.
Do............	Monomoy Island, east side	1284	1-10,000	J. C. Kennett, U. S. N......	1875.
Do............	Monomoy Shoals	387	1-30,000	M. Woodhull, U. S. N......	1853.
Do............	.....do	2224	1-20,000	H. G. O. Colby, U. S. N.....	1895.
Do............	.....do	1149	1-20,000	F. D. Granger.............	1872.
Do............	Monomoy Shoals (reconnaissance)...................	961 *a*	1-40,000	G. S. Blake, U. S. N., and F. F. Nes.	1868.
Do............	.....do	961 *b*	1-20,000	.....do....................	1868.
Do............	Monomoy Passage...................................	1573	1-20,000	W. H. Brownson, U. S. N ..	1883.
Do............	Monomoy and Nantucket shoals.....................	1195 *a*	1-20,000	F. D. Granger.............	1873.
Do............	Nantucket Shoals, South Shoals.....................	223	1-40,000	C. H. Davis, U. S. N.......	1847-48.
Do............	Nantucket Shoals, Old and New South shoals.	179	1-40,000	.....do....................	1846.
Do............	Nantucket Shoals, Davis Bank, and Fishing Rip......	2089	1-40,000	C. E. Vreeland, U. S. N	1891.
Do............	Nantucket Shoals, Rose and Crown, Great Rip, Old South, and Davis shoals, and southern part of Davis Bank.	2095	1-40,000	E. M. Hughes, U. S. N	1891.
Do............	Nantucket Shoals and Great Point Rip	1195	1-10,000	F. D. Granger	1873.
Do............	Nantucket Shoals, south of Nantucket Island	2081	1-40,000	C. E. Vreeland, U. S. N	1891.
Do............	Nantucket Shoals, approaches to Great Point Shoal, Pollock Rip, Great Round, Little Round, Bearses, and Stone Horse shoals.	2101 *a b*	1-20,000	L. K. Reynolds, U. S. N....	1891.
Do............	Nantucket Shoals, approaches........................	1285	1-40,000	J. C. Kennett, U. S. N......	1875.
Do............	Nantucket Shoals, entrance	569	1-40,000	H. S. Stellwagen, U. S. N ..	1856.
Do............	Nantucket Shoals, eastern entrance..................	2121	1-40,000	C. E. Vreeland, U. S. N.....	1892.
Do............	Nantucket Sound	527	1-30,000	C. R. P. Rodgers, U. S. N...	1855-56.
Do............	Nantucket Sound, eastern entrance................ ..	2225	1-20,000	H. G. O. Colby, U. S. N.....	1895.
Do............	Nantucket Sound, Handkerchief Shoal	1306	1-20,000	R. D. Hitchcock, U. S. N ...	1875.
Do............	.....do	2043	1-20,000	W. P. Elliott, U. S. N.... ..	1890.
Do............	Nantucket Sound, from Monomoy to Bishop and Clerks Light.	1243	1-20,000	F. D. Granger	1874.
Do............	Nantucket Sound, from Monomoy Island to Point Gammon.	1948	1-20,000	W. P. Elliott, U. S. N.......	1889.
Do............	Nantucket Sound, west of Monomoy.................	455 *a*	1-40,000	M. Woodhull, U. S. N......	1854.
Do............	Nantucket Sound, eastern end	2193	1-40,000	G. W. Mentz, U. S. N.......	1894.
Do............	Nantucket Sound, Hyannis to Falmouth	1880	1-20,000	S. C. Paine, U. S. N........	1888.
Do............	Nantucket Sound, Maddequet Harbor, Tuckernuck, Edwards, Shovelful, Long, and Hawes shoals.	1947	1-20,000	W. P. Elliott, U. S. N.......	1889.
Do............	Nantucket Sound, Muskegat Channel	1879	1-20,000	S. C. Paine, U. S. N.........	1889.
Do......	Nantucket Sound, Chatham Roads and Stage Harbor.	1949	1-10,000	W. P. Elliott, U. S. N.......	1889.
Do............	Nantucket Sound, Bass River and Kill Pond Bar.....	245	1-20,000	C. H. McBlair, U. S. N......	1849.
Do............	Nantucket Sound, Hyannis Harbor entrance.........	184	1-20,000	J. N. Maffitt, U. S. N.	1847.
Do..	Nantucket Sound, Nantucket Harbor and approaches.	1878	1-20,000	S. C. Paine, U. S. N.........	1888.
Do............	Nantucket Sound, Nantucket Harbor................	181	1-20,000	C. H. Davis, U. S. N	1846.
Do............	.....do	180	1-10,000	.....do....................	1846.
Do............	.....do	1877	1-5,000	S. C. Paine, U. S. N.........	1888.
Do............	Nantucket Sound, Nantucket Harbor, upper part....	1163	1-20,000	F. D. Granger..............	1872.
Do............	Nantucket Sound, Nantucket Harbor to Great Point.	2168	1-10,000	H. L. Marindin...........	1893.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Massachusetts	Nantucket Sound, Nantucket Harbor to Tuckernuck Island.	2209	1-10,000	H. L. Marindin...........	1894.
Do............	Nantucket Island, off shore to eastward	2051	1-20,000	E. M. Hughes, U. S. N......	1890.
Do............	Nantucket Island, east shore, from Great Point to Sankaty Head.	2039	1-10,000	H. L. Marindin...........	1890.
Do............	Nantucket Island, south shore, from Sankaty Head to Surfside.	2040	1-10,000	....do	1890.
Do............	Nantucket Island, off shore, from Siasconsett to Surfside.	2052	1-20,000	E. M. Hughes, U. S. N......	1890.
Do............	Nantucket Island, off shore, south side..............	2041	1-40,000	....do	1890.
Do............	Nantucket Island, south side........................	445	1-40,000	H. S. Stellwagen, U. S. N..	1854.
Do............	Nantucket Island, south side, from Miaconitt Rip to Tuckernuck Island.	1942	1-20,000	J. F. Moser, U. S. N........	1889.
Do............	Nantucket Island, south side, from Miaconitt Rip to Long Pond.	2093	1-10,000	H. L. Marindin...........	1891.
Do............	Nantucket Island, south side, Great Neck...........	2094	1-10,000	... .do	1891.
Do............	Nantucket Island and Marthas Vineyard Island.....	1941	1-40,000	J. F. Moser, U. S. N........	1889.
Do............	Muskegat Channel..................................	239	1-20,000	C. H. Davis, U. S. N., and C. H. McBlair, U. S. N.	1848-50.
Do............	....do	1844	1-20,000	J. F. Moser, U. S. N........	1888.
Do............	Marthas Vineyard Island, south side..................	378	1-40,000	H. S. Stellwagen, U. S. N.	1853.
Do............	Marthas Vineyard Island, Edgartown Harbor and Cotamy Bay.	1126	1-10,000	H. Mitchell and J. M. Hawley, U. S. N.	1871-86.
Do............	Marthas Vineyard Island, Edgartown Harbor........	182	1-10,000	C. H. Davis, U. S. N........	1846.
Do............	Marthas Vineyard Island, Edgartown Harbor and east shore.	2210	1-10,000	H. L. Marindin............	1894.
Do............	Marthas Vineyard Island, south shore...............	2130	1-10,000	.....do	1892.
Do............	... .do	2131	1-10,000	.....do	1892.
Do............	Marthas Vineyard Island, south shore and part of north shore, vicinity of Gay Head.	2132	1-10,000	.....do	1892.
Do............	Marthas Vineyard Island, south shore, Cotamy Bay .	2090	1-10,000	.....do	1891.
Do............	Vineyard Sound, Edgartown Harbor...........	222	1-20,000	C. H. Davis, U. S. N........	1846.
Do............	Vineyard Sound and part of Buzzards Bay	163	1-20,000	.....do	1845-46.
Do............	Vineyard Sound, Cape Poge to West Chop...........	1829	1-10,000	C. P. Perkins, U. S. N......	1887.
Do............	Vineyard Sound, l'Homme Dieu Shoal	455 *b*	1-10,000	W. H. Brownson, U. S. N..	1883-84.
Do............	Vineyard Sound, West Chop to Robinson Hole	1802	1-20,000	C. P. Perkins, U. S. N......	1887.
Do............	Vineyard Sound, Lackey Bay, Naushon Island.......	595	1-20,000	C. R. P. Rodgers, U. S. N...	1857.
Do............	Vineyard Sound, east entrance and southern approaches.	1802	1-20,000	C. P. Perkins, U. S. N......	1887.
Do............	Vineyard Sound, Holmes Hole	161	1-20,000	G. S. Blake, U. S. N........	1845.
Do............	Vineyard Sound, Vineyard Haven Harbor...........	1106	1-10,000	H. Mitchell...............	1871.
Do............	Vineyard Sound, approaches to southern and western end.	1843	1-40,000	J. F. Moser, U. S. N........	1888.
Do............	Vineyard Sound, western approaches................	238	1-40,000	C. H. McBlair, U. S. N	1851.
Do............	Vineyard Sound, Block Island, Cuttyhunk, and Gay Head, off shore.	204	1-20,000	R. Bache and J. R. Goldsborough, U. S. N.	1847-48.
Do............	Vineyard Island, Old Man and Lone Rock, in channel between No Mans Land and Marthas Vineyard Island.	344	1-20,000	C. H. McBlair, U. S. N.....	1852.
Do............	Vineyard Sound, Cuttyhunk, Gay Head, No Mans Land, and vicinity.	596	1-40,000	C. R. P. Rodgers and J. E. Pillsbury, U. S. N.	1857-86.
Massachusetts and Rhode Island.	Vineyard Sound and Narragansett Bay approaches..	1788	1-40,000	J. F. Moser, U. S. N........	1887.
Massachusetts	Buzzards Bay and Vineyard Sound..................	163	1-20,000	C. H. Davis, U. S. N........	1845-46.
Do............	Buzzards Bay	160	1-20,000	G. S. Blake, U. S. N	1845.
Do............	.....do	159	1-20,000	.....do	1845.
Do............	Woods Hole	1833	1-5,000	C. P. Perkins, U. S. N......	1887.
Do............	Sippican Harbor	829	1-5,000	H. Mitchell................	1863.
Do............	.....do	826	1-5,000	.....do	1863.
Do............	New Bedford Harbor and approaches...............	158	1-20,000	G. S. Blake, U. S. N	1845.
Do............	.....do	2229 2230 2231	1-10,000	G. C. Hanus, U. S. N	1895.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Massachusetts	Sow and Pigs Reef, end of Cuttyhunk Island	357	1-5,000	M. Woodhull, U. S. N	1853.
Do	Sow and Pigs Reef, proposed site for light-house	358	1-120	....do	1853.
Do	Turnipus Beach to Black Rock	1792	1-10,000	J. F. Moser, U. S. N	1887.
Do	Westport Harbor	155	1-10,000	G. S. Blake, U. S. N	1845.
Massachusetts and Rhode Island.	Narragansett Bay approaches	1788	1-40,000	J. F. Moser, U. S. N	1887.
Do	Mishaum Point to Sakonnet Point	154	1-20,000	G. S. Blake, U. S. N	1844.
Do	Turnipus Beach to Sachuest Point	1791	1-10,000	J. F. Moser, U. S. N	1887.
Rhode Island	Schuyler Ledge, off Sakonnet Point	1443	1-10,000	U. Sebree, U. S. N	1879.
Do	Narragansett Bay	1787	1-40,000	J. F. Moser, U. S. N	1887.
Do	Narragansett Bay approaches, Sakonnet Point to Point Judith.	153	1-20,000	G. S. Blake, U. S. N	1844.
Do	Narragansett Bay approaches	206	1-20,000	G. S. Blake and J. R. Goldsborough, U. S. N.	1847-48.
Do	Narragansett Bay approaches, Point Judith to Beavertail Light.	1789	1-10,000	J. F. Moser, U. S. N	1887.
Do	Narragansett Bay approaches, Breton Point to Sachuest Point.	1790	1-10,000	....do	1887.
Do	Narragansett Bay, Sakonnet River	205	1-10,000	J. R. Goldsborough, U.S.N.	1848.
Do	Narragansett Bay, Newport Harbor	785	1-10,000	H. Mitchell and F. P. Webber.	1865.
Do	Narragansett Bay, Eastern Passage, measured mile for speed course.	1938	1-10,000	J. S. Pillsbury, U. S. N	1889.
Do	Narragansett Bay, Newport Harbor	811	1-5,000	F. P. Webber	1865.
Do	Narragansett Bay, Coasters Island Harbor	1468	1-5,000	J. R. Bartlett and J. F. Moser, U. S. N.	1880-87.
Do	Narragansett Bay, Dutch Island Harbor	786	1-10,000	H. Mitchell	1862.
Do	Narragansett Bay, Rose Island to Prudence Island	787 *a*	1-10,000	....do	1862.
Do	Narragansett Bay, Dutch Island Harbor (replotting of No. 786).	787 *b*	1-10,000	....do	1862.
Do	Narragansett Bay, The Brothers to Quonset Point	992	1-10,000	F. P. Webber	1868.
Do	Narragansett Bay, Patience Island to Quonset Point	939	1-10,000	....do	1867-68.
Do	Narragansett Bay, Greenwich Bay	940	1-5,000	....do	1867.
Do	Narragansett Bay, Prudence Island to Fall River	792 *a*	1-20,000	W. P. Trowbridge	1861.
Do	Narragansett Bay, Taunton River, vicinity Fall River	792 *b*	1-20,000	....do	1861.
Do	Narragansett Bay, Warren River	888	1-5,000	F. P. Webber	1866.
Do	Narragansett Bay, Providence River, Prudence Island to Starvegoat Island.	880	1-10,000	....do	1865.
Do	Narragansett Bay, Starvegoat Island to Providence	878	1-5,000	....do	1865.
Do	Narragansett Bay, Providence River and Harbor, Fuller Rock to Providence.	1327 *a*	1-2,400	H. Mitchell	1878.
Do	Narragansett Bay, Seekonk River	865	1-5,000	A. M. Harrison	1865.
Do	Narragansett Bay, Seekonk River, Indian Point Bridge to Red Bridge.	1326	1-2,400	H. Mitchell	1874.
Do	Narragansett Bay, Seekonk River, Indian Point Bridge to Red Bridge (current chart).	1327 *b*	1-2,400	....do	1874.
Do	Narragansett Bay, approaches east of Block Island	162	1-40,000	G. S. Blake, U. S. N	1845.
Do	Block Island, East Ground	1312	1-20,000	J. S. Bradford	1874.
Do	Point Judith	1529 *b*	1-10,000	W. H. Brownson, U. S. N	1884.
Do	Block Island Sound, Point Judith to Quonocontang Pond.	84	1-20,000	T. R. Gedney, U. S. N	1839.
Do	Block Island Sound, Quonocontang Pond to Wilderness Point.	86	1-20,000	....do	1839.
Connecticut and New York.	Block Island Sound, Fishers Island to Plum Island	87	1-20,000	....do	1839.
Rhode Island	Block Island Sound, Point Judith to Gardiners Point	1529 *a*	1-40,000	W. H. Brownson, U. S. N	1882.
Do	Block Island Sound, east coast	1396 *a*	1-10,000	C. M. Chester, U. S. N	1878.
Do	Block Island Sound, west coast	1396 *b*	1-10,000	....do	1878.
Do	Block Island, southwest ledge	1397	1-40,000	....do	1878.
Connecticut	Block Island Sound, north side, from Brightmans Pond to Great Gull Island.	91	1-20,000	T. R. Gedney, U. S. N	1839.
New York	Montauk Point, Great Eastern Rock	780	1-20,000	T. S. Phelps, U. S. N	1863.
Connecticut	Fishers Island Sound	96	1-20,000	G. S. Blake, U. S. N	1839.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Connecticut	Fishers Island Sound	97	1-10,000	G. S. Blake and R. Clover, U. S. N.	1839-82.
Do	Fishers Island Sound and Pawcatuck River	99	1-10,000	G. S. Blake, U. S. N	1839.
Do	Fishers Island Sound, Watch Hill to Lattimer Reef	1577 *a*	1-10,000	A. V. Wadhams, U. S. N	1883.
Do	Fishers Island Sound, Latimer Reef to Race Point Light-house.	1577 *b*	1-10,000	....do	1883.
Do	Pawcatuck River, entrance to Marsh Point	98	1-10,000	G. S. Blake, U. S. N	1839.
Do	Reefs between Watch Hill and East Point, Fishers Island.	85	1-20,000	C. P. Patterson, U. S. N	1847.
Do	Stonington Harbor, examination, Middle Ground	1820	1-10,000	S. C. Paine, U. S. N	1888.
Do	Mystic River approaches	1526	1-10,000	R. Clover, U. S. N.	1882.
Do	New London Harbor and approaches	1527	1-10,000	....do	1882.
Do	New London Harbor, Franks Ledge	94	1-10,000	R. Bache, U. S. N	1847.
Do	New London Harbor, Black Ledge to Groton	93	1-10,000	G. S. Blake, U. S. N.	1839.
Do	Thames River, New London to Gates Ferry	114	1-10,000	....do	1839.
Do	Thames River, Naval Station to Norwich	1242	1-10,000	H. G. Ogden	1874.
Do	Thames River, off the Naval Station	1006	1-1,200	C. Junken	1869.
Do	Thames River, Rocky Point to Cregg Cove	115	1-10,000	G. S. Blake, U. S. N	1841.
Do	Long Island Sound, north shore, Mumford Cove to Griswold Island.	92	1-10,000	....do	1839.
Do	Long Island Sound, north shore, Fishers Island to Oyster Pond Point.	92 *bis*	1-10,000	....do	1839.
Do	Long Island Sound, north shore, Race Rock to Plum Gut.	1590 *a*	1-20,000	J. T. Sullivan, U. S. N.	1883.
Do	Long Island Sound, north shore, Griswold Cove to Black Point.	42	1-10,000	G. S. Blake, U. S. N	1838.
Do	Long Island Sound, north shore, Goshen Point to Hatchet Point.	1603 *a*	1-10,000	J. D. Keeler, U. S. N.	1883.
Do	Long Island Sound, north shore, Hatchet Point to Cornfield Point.	1603 *b*	1-10,000	....do	1883.
Do	Long Island Sound, Connecticut River, entrance to Elys Ferry.	233	1-10,000	J.R.Goldsborough, U.S.N.	1849.
Do	Long Island Sound, Connecticut River Bar	275	1-20,000	M. Woodhull, U. S. N.	1851.
Do	....do	276	1-10,000	....do	1851.
Do	Long Island Sound, Connecticut River, Lyme to Deep River.	2032	1-10,000	W. I. Vinal	1890.
Do	Long Island Sound, Connecticut River, Deep River and East Haddam.	2033	1-10,000	....do	1890.
Do	Long Island Sound, Connecticut River	2034	1-10,000	....do	1890.
Do	Long Island Sound, Connecticut River, Middle Haddam to Cromwell.	2035	1-10,000	....do	1890.
Do	Long Island Sound, Connecticut River, Cromwell to North Glastonbury.	2086	1-10,000	....do	1891.
Do	Long Island Sound, Connecticut River, North Glastonbury to Farmington River.	2087	1-10,000	....do	1891.
Do	Long Island Sound, north shore, Hatchet Point to Hammonasset Point.	39	1-20,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, north shore, Connecticut River entrance to Westbrook Harbor.	41	1-10,000	....do	1838.
Do	Long Island Sound, north shore, Cornfield Point to Hammonasset Point.	1603 *c*	1-10,000	J. D. Keeler, U. S. N.	1883.
Do	Long Island Sound, north shore, Westbrook Harbor to Hammonasset Beach.	38	1-10,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, north shore, Menunketesuck Point to Hammock Point.	1345	1-5,000	J. Hergesheimer	1877.
Do	Long Island Sound, north shore, Hammonasset Point to Johnson Point.	35	1-20,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, north shore, Hammonasset Beach to Hoadley Point.	37	1-10,000	....do	1838.
Do	Long Island Sound, north shore, Hammonasset Point to Sachems Head.	1637 *a*	1-10,000	W. G. Cutler, U. S. N.	1884.
Do	Long Island Sound, north shore, Sachems Head to Negro Head.	1637 *b*	1-10,000	....do	1884.

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Connecticut......	Long Island Sound, north shore, Little Harbor to Mansfield Point.	34	1-10,000	G. S. Blake, U. S. N........	1838.
Do............	Long Island Sound, north shore, Stratford Point to Jeffreys Point.	29	1-20,000	.....do.....................	1838.
Do............	Long Island Sound, north shore, Negro Head to Southwest Ledge Light-House.	1638 *a*	1-10,000	W. G. Cutler, U. S. N	1884.
Do............	Long Island Sound, north shore, Southwest Ledge Light-House to Cedar Point.	1638 *b*	1-10,000	.....do.....................	1884.
Do............	Long Island Sound, north shore, New Haven Harbor.	32	1-10,000	G. S. Blake, U. S. N........	1838.
Do............	Long Island Sound, north shore, New Haven Harbor entrance and Luddington Shoal.	647	1-5,000	W. G. Temple, U. S. N.....	1858.
Do............	Long Island Sound, north shore, New Haven Harbor entrance to Charles Point.	28	1-10,000	G. S. Blake, U. S. N........	1838.
Do............	Long Island Sound, north shore, Milford Haven (reconnaissance).	1428	1-10,000	E. P. Lull, U. S. N..........	1878.
Do............	Long Island Sound, north shore, New Haven Harbor.	1170 *a*	1-10,000	R. M. Bache...............	1872.
Do............	Long Island Sound, north shore, New Haven Harbor, Townshend Ledge.	1170 *b*	1-10,000	F. H. Gerdes...............	1872.
Do............	Long Island Sound, north shore, Quinnipiac River at Fair Haven.	33	1-10,000	G. S. Blake, U. S. N.......	1838.
Do............	Long Island Sound, north shore, Charles Island to Black Rock Light.	23	1-10,000	.....do.....................	1837.
Do............	.....do..	24	1-10,000	.... do.....................	1837.
Do............	Long Island Sound, north shore, Cedar Point to Stratford Point.	1735	1-10,000	S. C. Paine, U. S. N.........	1885.
Do............	Long Island Sound, north shore, Stratford Point to Bridgeport.	1736	1-10,000	.....do.....................	1885.
Do............	Long Island Sound, north shore, Bridgeport Bar and Harbor.	25	1-5,000	G. S. Blake, U. S. N........	1835.
Do............	Long Island Sound, north shore, Black Rock Harbor.	1575	1-5,000	W. H. Brownson, U. S. N..	1883.
Do............	Long Island Sound, north shore, Black Rock to Sheffield Light.	18	1-10,000	G. S. Blake, U. S. N........	1835.
Do............	Long Island Sound, north shore, Sheffield Light to Frost Point.	19	1-10,000	.....do.....................	1835.
Do............	Long Island Sound, north shore, Black Rock Light to Sherwood Point.	20	1-10,000	.....do.....................	1835.
Do............	Long Island Sound, north shore, Fairfield Bar to Cockenoes Island.	1750	1-10,000	S. C. Paine, U. S. N........	1885.
Do............	Long Island Sound, north shore, Cockenoes Island to Sheffield Island.	1751	1-10,000	.....do.....................	1885.
Connecticut and New York.	Long Island Sound, north shore, Sheffield Island to Oak Neck.	8 *bis*	1-10,000	G. S. Blake, U. S. N........	1836.
Connecticut	Long Island Sound, north shore, Sheffield Light to Great Captain Island.	9	1-10,000	.....do.....................	1836.
Do............	Long Island Sound, north shore, Sheffield Island to Stamford Light.	1698	1-10,000	D. D. V. Stuart, U. S. N....	1886.
Do............	Long Island Sound, north shore, Stamford Light to Manursing Island.	1699	1-10,000	.....do.....................	1886.
Do............	Long Island Sound, north shore, Great Captain Island Harbor and Little Captain Island Harbor.	4	1-10,000	G. S. Blake, U. S. N........	1836-37.
New York.........	Long Island Sound, north shore, Rye Neck to Davids Island.	1683	1-10,000	D. D. V. Stuart, U. S. N.....	1886.
Do............	Long Island Sound, north shore, Prospect Point to Throgs Neck.	1	1-10,000	G. S. Blake, U. S. N........	1837.
Do............	Long Island Sound, north shore, City Island Harbor.	1560 *b*	1-10,000	C. Hosmer.................	1883.
Do	Long Island Sound, north shore, Throgs Point to South and Blackwells Island.	67	1-10,000	T. R. Gedney and G. M. Bache, U. S. N.	1837-41.
Connecticut and New York.	Block Island Sound....................................	1529 *a*	1-40,000	W. H. Brownson, U. S. N ..	1882.
Do............	.....do..	86	1-20,000	T. R. Gedney, U. S. N......	1839.
New York.........	Block Island Sound, Phelps Ledge and Great Eastern Rock.	780	1-20,000	T. S. Phelps, U. S. N.......	1863.
Do............	Block Island Sound, south shore, Montauk Point.....	1539	1-20,000	C. Hosmer.................	1882.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New York	Block Island Sound, south shore, Napeague Bay and Harbor.	88	1-40,000	C. H. Davis, U. S. N.	1845.
Do	Black Island Sound, south shore, Napeague Bay and Harbor, Montauk Point.	89	1-40,000	....do	1845.
Do	Block Island Sound, west end	87	1-20,000	T. R. Gedney, U. S. N.	1839.
Do	Block Island Sound, west end, and Long Island Sound, east end.	95	1-10,000	G. S. Blake, U. S. N.	1839.
Do	Block Island Sound, west end, Bedford Reef, Plum Island, Great Gull Island (compiled).	90	1-10,000	Gedney, Blake, and Davis, U. S. N.	1839-45.
Do	Plum Gut	1255	1-5,000	J. S. Bradford	1874.
Do	Gardiners Bay	80	1-20,000	T. R. Gedney, U. S. N.	1838.
Do	Gardiners Bay, Three Mile, and Napeague Harbor	1543	1-20,000	E. M. Hughes, U. S. N.	1882.
Do	Long Island Sound, south shore, Plum Island to Browns Hill.	43	1-10,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, south shore, Plum Island to Inlet Point.	1590 *b*	1-20,000	J. T. Sullivan, U. S. N.	1883.
Do	Greenport Harbor, Orient Bay, Southhold Bay	78	1-10,000	T. R. Gedney, U. S. N.	1838.
Do	Shelter Island Sound	1568	1-10,000	C. Hosmer	1883.
Do	Greenport Harbor and Southhold Bay	79	1-10,000	T. R. Gedney, U. S. N.	1838.
Do	Orient Harbor	81	1-10,000	....do	1839.
Do	Sag Harbor	82	1-10,000	....do	1839.
Do	Sag Harbor and vicinity	83	1-10,000	....do	1839.
Do	Shelter Island Sound, Sag Harbor and approaches	2082	1-10,000	W. P. Elliott, U. S. N.	1891.
Do	Shelter Island Sound, Noyack Bay, and eastern part of Little Peconic Bay.	2083	1-10,000	....do	1891.
Do	Great Peconic Bay and Little Peconic Bay	77	1-20,000	T. R. Gedney, U. S. N.	1838.
Do	Little Peconic Bay and entrance to Great Peconic Bay.	2097	1-10,000	W. P. Elliott, U. S. N.	1891.
Do	Great Peconic Bay, eastern part	2098	1-10,000	....do	1891.
Do	Great Peconic Bay, western part	2099	1-10,000	....do	1891.
Do	Long Island Sound, south shore, Mulfords Point to Mattituck Creek.	40	1-20,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, south shore, Inlet Point to Old Landing.	1591	1-40,000	J. T. Sullivan, U. S. N.	1883.
Do	Long Island Sound, south shore, Mattituck Creek to Herod Point.	36	1-20,000	G. S. Blake, U. S. N.	1838.
New York and Connecticut.	Long Island Sound, Falkner Island to Startford Shoal.	1733	1-40,000	F. H. Crosby, U. S. N.	1886.
Do	Long Island Sound, Stratford Shoal to Eatons Neck.	1731	1-40,000	....do	1886.
New York	Long Island Sound, Herod Point to Old Field Point.	30	1-20,000	G. S. Blake, U. S. N.	1838.
Do	Long Island Sound, Port Jefferson (part of No. 30)	31	1-10,000	....do	1838.
Do	Long Island Sound, Port Jefferson, Setauket Harbor, and Conscience Bay entrance.	1283 *a*	1-5,000	F. H. Gerdes	1874.
Do	Long Island Sound, Port Jefferson, Setauket Harbor, and Conscience Bay.	1283 *b*	1-10,000	....do	1874.
Do	Long Island Sound, south shore, Oldfield Point to Eatons Neck.	21	1-20,000	G. S. Blake, U. S. N.	1837.
Do	Long Island Sound, south shore, Port Jefferson Harbor and vicinity.	1734	1-10,000	F. H. Crosby, U. S. N.	1886.
Do	Long Island Sound, south shore, Oldfield Point to Nissequague River.	26	1-10,000	G. S. Blake, U. S. N.	1837.
Do	Long Island Sound, south shore, Stony Brook and vicinity.	27	1-10,000	....do	1837.
Do	Long Island Sound, south shore, Smithton Bay	1709	1-10,000	W. J. Sears, U. S. N.	1886.
Do	Long Island Sound, south shore, Nissequague Point to Eaton Point.	22	1-10,000	G. S. Blake, U. S. N.	1837.
Do	Long Island Sound, south shore, Eaton Point to Oak Neck.	10	1-10,000	....do	1837.
Do	Long Island Sound, south shore, Eaton Point to Execution Rock.	1732	1-20,000	F. H. Crosby, U. S. N.	1886.
Do	Long Island Sound, south shore, Huntington Bay approaches.	1708	1-10,000	F. S. Carter and W. J. Sears, U. S. N.	1886.
Do	Long Island Sound, south shore, Huntington Bay, Northport Bay, Huntington and Lloyd harbors.	16	1-3,333	G. S. Blake, U. S. N.	1837.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New York........	Long Island Sound, south shore, Huntington Bay, Huntington and Lloyd harbors.	17	1-10,000	G. S. Blake, U. S. N........	1836-37.
Do............	Long Island Sound, south shore, Huntington Bay.....	1707	1-10,000	F. S. Carter and W. J. Sears, U. S. N.	1886.
Do............	Long Island Sound, south shore, Northport Bay......	15	1-10,000	G. S. Blake, U. S. N........	1837.
Do............	Long Island Sound, south shore, Oyster Bay, Oyster Bay Harbor, and Cold Spring Harbor.	11	1-10,000	.....do....................	1836-37.
Do............	.....do..	12	1-10,000	.....do....................	1836-37.
Do............	.....do..	13	1-3,333	.....do....................	1836-37.
Do............	.....do..	14	1-3,333	.....do....................	1836-37.
Do............	Long Island Sound, south shore, Oyster Bay..........	1710	1-10,000	F. S. Carter, U. S. N........	1886.
Connecticut and New York.	Long Island Sound, west end, Greenwich Point to Baker Point.	4	1-10,000	G. S. Blake, U. S. N........	1836-37.
Do............	Long Island Sound, west end, Little Captain Island to Baker Point.	5	1-10,000	.....do....................	1836-37.
New York......	Long Island Sound, south shore, Matinicock Point to Willets Point.	3	1-10,000	.....do....................	1836-37.
Do............	Long Island Sound, south shore, Hempstead Harbor.	7	1-10,000	.....do....................	1836-37.
Do............	.....do..	692	1-10,000	T. B. Huger, U. S. N........	1859.
Do............	.....do..	1700	1-10,000	D. D. V. Stuart, U. S. N.....	1886.
Do............	Long Island Sound, west end, Elm Point to Sands Point.	1560 *a*	1-10,000	C. Hosmer................	1883.
Do............	Long Island Sound, west end, Whortleberry Island to Hewlett Point.	2	1-10,000	G. S. Blake, U. S. N........	1837.
Do............	Long Island Sound, west end, Little Neck Bay and East River from Throgs Neck to College Point.	1569	1-10,000	C. Hosmer................	1883.
Do............	Long Island, Montauk Point, speed-trial course of U. S. S. Philadelphia.	2020	1-80,000	C. E. Vreeland, U. S. N....	1890.
Do............	Long Island, Montauk Point to Napeague............	253	1-40,000	M. Woodhull, U. S. N......	1851.
Do............	Long Island, Montauk Point to Shinnecock Bay......	74	1-20,000	T. R. Gedney, U. S. N......	1838.
Do............	Long Island, Montauk Point to west end of Shinnecock Bay.	75	1-20,000	.....do....................	1838.
Do............	Long Island, Montauk Point to east end of Shinnecock Bay.	76	1-40,000	.....do....................	1838.
Do............	Long Island, Napeague Harbor to Quantuck Bay....	232	1-40,000	M. Woodhull, U. S. N......	1850.
Do............	Long Island, Shinnecock Bay to Bellport Bay.........	73	1-40,000	T. R. Gedney, U. S. N......	1838.
Do............	Long Island, Mecox Bay and Georgica Pond..........	2123	1-10,000	C. T. Iardella.............	1891.
Do............	Long Island, Shinnecock Bay, east end...............	2031	1-10,000	.....do....................	1890.
Do............	Long Island, Shinnecock Bay to Fire Island Beach...	72	1-20,000	T. R. Gedney, U. S. N......	1838.
Do............	Long Island, Quantuck Bay to Gilgo Inlet............	203	1-40,000	R. Bache, U. S. N..........	1848.
Do............	Long Island, Quantuck Bay and Moriches Bay, east end.	2030	1-10,000	C. T. Iardella.............	1890.
Do............	Long Island, Moriches Bay, west end................	2068	1-10,000	.....do....................	1891.
Do............	Long Island, Fire Island Inlet........................	48	1-10,000	T. R. Gedney, U. S. N......	1834-35.
Do............	Long Island, Fire Island Inlet and part of Great South Bay.	1198 *a*	1-20,000	C. Hosmer................	1873.
Do............	Long Island, Fire Island Inlet Bar....................	1851	1-10,000	W. H. Dennis.............	1887.
Do............	Long Island, Great South Bay, Conklin Point to Greens Point.	44	1-10,000	T. R. Gedney, U. S. N......	1834.
Do............	.....do..	45	1-20,000	.....do....................	1834.
Do............	Long Island, Great South Bay, Nicolls Point to Howell Point.	1198 *b*	1-20,000	C. Hosmer................	1874.
Do............	Long Island, Great South Bay, Browns Point to Bellport Point.	46	1-20,000	T. R. Gedney, U. S. N......	1835.
Do............	Long Island, Great South Bay, Howell Point to East Bay entrance, and Bellport Bay.	1281	1-10,000	C. T. Iardella.............	1875.
Do............	Long Island, Great South Bay and South Oyster Bay.	1481 *a*	1-10,000	J. W. Donn...............	1880.
Do............	Long Island, Fire Island Beach to Coney Island......	47	1-40,000	T. R. Gedney, U. S. N......	1835.
Do............	Long Island, Gilgo Inlet..............................	49	1-10,000	.....do....................	1835.
Do............	Long Island, New Inlet...............................	50	1-10,000	.....do....................	1835.
Do............	Long Island, Hempstead Bay, New and Jones inlets..	1481	1-10,000	J. W. Donn...............	1880.
Do............	Long Island, Hempstead Bay, Far Rockaway Bay to Luci Inlet.	1437	1-10,000	.....do....................	1879.
Do............	Long Island, off Rockaway Beach.....................	51	1-20,000	T. R. Gedney, U. S. N......	1835.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New York	Long Island, Rockaway Bay and Jamaica Bay entrance.	129	1-10,000	G. M. Bache, U. S. N.	1841.
Do	Long Island, Rockaway Inlet and Bar	1359	1-5,000	W. Maynard and E. B. Thomas, U. S. N.	1877-81.
Do	Long Island, Rockaway Inlet	1834	1-10,000	J. Hergesheimer	1888.
Do	Long Island, Jamaica Bay, western part, and Canarsie Landing.	1358	1-5,000	W. Maynard, U. S. N.	1877.
Do	Long Island, Jamaica Bay, eastern part	1392	1-10,000	W. I. Moore, U. S. N.	1878.
Do	Long Island, Jamaica Bay, Cornell and Mill Creek	1494	1-2,400	J. W. Donn	1880.
New York and New Jersey.	New York Harbor approaches, Rockaway to Sandy Hook.	54	1-20,000	T. R. Gedney, U. S. N.	1840.
Do	New York Harbor approaches, Rockaway to Sandy Hook (copy of part of No. 54).	56	1-5,000	do	1840.
Do	New York Harbor approaches	526	1-20,000	T. A. Craven, U. S. N.	1855-56.
Do	New York Harbor approaches, South and North Channel.	55	1-5,000	T. R. Gedney, U. S. N.	1840.
Do	New York Harbor approaches	1578 *a*	1-40,000	H. B. Mansfield, U. S. N.	1883.
Do	do	1578 *b*	1-80,000	do	1883.
Do	New York Harbor entrance, Sandy Hook Bar	53	1-10,000	T. R. Gedney, U. S. N.	1835.
Do	New York Harbor entrance, Sandy Hook Bar (part of No. 53).	57	1-10,000	do	1835.
Do	New York Harbor entrance, Sandy Hook Bar	52	1-10,000	do	1835.
Do	New York Harbor, Romer and Flynns knolls, East and West Swash channels.	356	1-20,000	M. Woodhull, U. S. N.	1853.
Do	New York Harbor entrance, South Gedney and East channels.	207	1-10,000	R. Bache, U. S. N.	1848.
New Jersey	New York Harbor entrance, channel between Sandy Hook, Flynns Knoll and Scotland Shoal.	1009	1-20,000	F. F. Nes	1869.
New York	New York Harbor entrance, South and Gedney channels.	1663	1-10,000	G. C. Hanus, U. S. N.	1885.
Do	New York Harbor entrance (tracing)	1506	1-10,000	E. B. Thomas, U. S. N.	1881-82.
New Jersey	New York Harbor entrance, off Sandy Hook	1718	1-20,000	G. C. Hanus, U. S. N.	1886.
New York and New Jersey.	New York Harbor entrance, Sandy Hook Bar, Raritan and Newark bays, and Staten Island Sound.	62	1-20,000	T. R. Gedney, U. S. N.	1836.
Do	New York Harbor entrance, Sandy Hook, around point.	784 *a*	1-5,000	H. Mitchell	1863.
Do	New York Harbor entrance, Sandy Hook (within No. 784 *a*).	784 *b*	1-5,000	F. F. Nes	1873.
New Jersey	New York Harbor entrance, False Hook and False Hook Channel.	769	1-20,000	A. Murray, U. S. N.	1860.
New York and New Jersey.	New York Harbor, Lower Bay, Sandy Hook and Raritan bays, Arthur Kills, and Kill van Kull.	61	1-10,000	T. R. Gedney, U. S. N.	1836.
New York	New York Harbor, Lower Bay, Swash Channel	897 *a*	1-20,000	W. S. Edwards	1866.
Do	New York Harbor, Lower Bay, shoals near Sandy Hook.	897 *b*	1-20,000	F. F. Nes	1872.
Do	New York Harbor, Lower Bay	1662	1-10,000	G. C. Hanus, U. S. N.	1885.
Do	New York Harbor, Lower Bay, Gedney and Swash channels.	1601	1-10,000	J. M. Orchard, U. S. N.	1884.
Do	New York Harbor, Lower Bay, Swash Channel (compiled).	1564	1-10,000		1879-81.
Do	New York Harbor, Lower Bay, Sandy Hook to Fort Tompkins.	1275	1-20,000	F. F. Nes	1872-73-74.
Do	New York Harbor, Lower Bay	1189	1-20,000	do	1872.
Do	do	1661	1-20,000	G. C. Hanus, U. S. N.	1885.
Do	New York Harbor, Lower Bay, Dumping Ground	1145 *b*	1-10,000	H. L. Marindin	1872.
Do	New York Harbor, Lower Bay, bulkhead of West Bank Channel (compiled).	1962	1-10,000	T. A. Craven, U. S. N., and F. F. Nes.	1855-56-74.
Do	New York Harbor, Lower Bay, Gravesend Bay	59	1-20,000	G. M. Bache and R. C. Walsch, U. S. N.	1841.
Do	do	128	1-10,000	G. M. Bache, U. S. N.	1841.
Do	New York Harbor, Lower Bay and Narrows	1664	1-10,000	G. C. Hanus, U. S. N.	1885.
Do	New York Harbor, Narrows	1175	1-10,000	F. F. Nes	1872.
Do	do	63	1-10,000	T. R. Gedney, U. S. N.	(?)

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New York	New York Harbor, Upper Bay	1719	1-5,000	G. C. Hanus, U. S. N	1886.
New York and New Jersey.	New York Harbor, Upper Bay and Kill van Kull	1667	1-10,000	W. G. Cutler, U. S. N	1885.
Do	New York Harbor, Upper Bay, Jersey Flats and Governors Island.	1145 *a*	1-10,000	H. L. Marindin	1871-72.
New York	New York Harbor, Upper Bay, East River to Suspension Bridge.	1660	1-5,000	J. M. Hawley, U. S. N	1885.
Do	New York Harbor, Upper Bay, Ellis Island and vicinity.	2005	1-2,500	W. P. Elliott, U. S. N	1890.
Do	New York Harbor, Upper Bay, Ellis Island and vicinity, Dredged Channel.	2140	1-2,500	C. E. Vreeland, U. S. N	1892.
Do	New York Harbor, Upper Bay, Fort Tompkins to Bedloe Island.	490	1-10,000	T. A. Craven, U. S. N	1855.
Do	New York Harbor, Upper Bay, Robbins Reef Light to Governors Island.	970	1-10,000	F. H. Gerdes	1868.
Do	do	783	1-10,000	T. R. Phelps, U. S. N	1863.
New Jersey	New York Harbor, Upper Bay, Jersey Flats	423	1-10,000	M. Woodhull, U. S. N	1853.
New York	New York Harbor, Upper Bay, East River	1968	1-10,000	F. F. Nes	1872.
Do	New York Harbor, Upper Bay (dynamic chart)	1977	1-10,000	H. L. Marindin	1872-75.
Do	New York Harbor, Upper Bay, Gowanus Bay	1209	1-10,000	F. F. Nes	1872.
New York and New Jersey.	New York Harbor, Upper Bay, Kill van Kull	492	1-10,000	R. Wainwright, U. S. N	1855.
Do	New York Harbor, Upper Bay, Communipaw Flats, Gowanus Bay, and Buttermilk Channel.	130	1-10,000	G. M. Bache, U. S. N	1841.
New York	New York Harbor, Upper Bay, Buttermilk Channel	208	1-5,000	D. D. Porter, U. S. N	1848.
Do	New York Harbor, Upper Bay, Diamond and Princess reefs.	226	1-2,500	M. Woodhull, U. S. N	1850.
New York and New Jersey.	New York Harbor and vicinity, North and East rivers.	460	1-10,000	do	1854.
New York	New York Harbor, Diamond and Coenties reefs	497	1-20,000	T. A. Craven, U. S. N	1855.
Do	New York Harbor, off the Battery	678	1-5,000	do	1859.
Do	New York Harbor, Princess and Coenties reefs	697	1-5,000	J. Wilkinson, U. S. N	1859.
Do	New York Harbor, Diamond Reef	698	1-5,000	do	1859.
Do	do	748	1-2,500	T. S. Phelps, U. S. N	1861.
Do	do	1580	1-5,000	H. B. Mansfield, U. S. N	1884.
Do	New York Harbor, off the Battery	910	1-2,500	W. S. Edwards	1867.
Do	New York Harbor, off the Battery, Reported Rock	1950	1-2,500	W. P. Elliott, U. S. N	1890.
Do	New York Harbor (current chart)	1981	1-10,000	F. F. Nes, H. L. Marindin, and J. B. Weir.	1872-73.
Do	New York Harbor, East River, Governors Island to northeast end of Blackwells Island.	491 *a*	1-10,000	T. A. Craven, U. S. N	1855.
Do	New York Harbor, East River, Governors Island to northeast end of Blackwells Island (copy of 491 *a*).	491 *b*	1-10,000	do	1855.
Do	New York Harbor, East River, off Nineteenth street.	491 *c*	1-10,000	F. F. Nes	1873.
Do	New York Harbor, East River, Governors Island to Blackwells Island.	66	1-10,000	T. R. Gedney, U. S. N	1837.
Do	New York Harbor, East River, Blackwells Island to Throgs Neck.	67	1-10,000	T. R. Gedney and G. M. Bache, U. S. N.	1837-41.
Do	New York Harbor, East River, Hell Gate to Throgs Neck.	580	1-10,000	T. A. Craven, U. S. N	1856.
Do	New York Harbor, East River, Rickers Island and vicinity.	580 *a*	1-10,000	W. H. Brownson, U. S. N	1883.
Do	New York Harbor, East River, Suspension Bridge to south end of Blackwells Island.	1659	1-5,000	J. M. Hawley, U. S. N	1885.
Do	New York Harbor, East River, channels from south end of Blackwells Island to Astoria.	1658	1-2,500	do	1885.
Do	New York Harbor, East River, Lawrence Point to College Point and Flushing Bay.	1703	1-5,000	C. P. Perkins, U. S. N	1886.
Do	New York Harbor, East River and Upper Bay, Fulton Ferry to Bay Ridge.	1968	1-10,000	F. F. Nes	1872.
Do	New York Harbor, East River, Battery to Blackwells Island (dynamic chart).	1978	1-10,000	H. L. Marindin and J. B. Weir.	1872-75.
Do	New York Harbor, East River and Blackwells Island Channel (dynamic chart).	1979	1-10,000	do	1872-75.

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New York	New York Harbor, East River, Wallabout Bay	1085	1-1,250	F. F. Nes	1869.
Do	....do	1994	1-2,500	W. P. Elliott, U. S. N	1890.
Do	New York Harbor, East River, Hell Gate	224	1-2,500	D. D. Porter, U. S. N	1848.
Do	New York Harbor, East River, Hell Gate and approaches.	645	1-5,000	T. A. Craven, U. S. N	1856.
Do	New York Harbor, East River, Hell Gate, Frying Pan, and Pot Rocks.	896	1-1,200	W. S. Edwards	1866.
Do	New York Harbor, East River, Hell Gate and vicinity.	1704	1-2,500	C. P. Perkins, U. S. N	1886.
Do	New York Harbor, East River, Hell Gate (hydrographic sketch).	1974	1-5,000	D. D. Porter, U. S. N	1848.
Do	New York Harbor, East River, Hell Gate (course and velocity of tide).	1975	1-18,320	C. H. Davis, U. S. N	1845.
Do	New York Harbor, East River, Hell Gate (current chart).	1976	....	....do	1845.
Do	New York Harbor, East River, Harlem River and Little Hell Gate.	225	1-2,500	M. Woodhull, U. S. N	1849.
Do	New York Harbor, Harlem River, Spuyten Duyvil Creek, Harlem Bridge to Hudson River.	646	1-10,000	T. A. Craven, U. S. N	1856.
Do	New York Harbor, Harlem River, Randalls Island to High Bridge.	1702	1-5,000	C. P. Perkins, U. S. N	1886.
Do	New York Harbor, Harlem River, Spuyten Duyvil Creek, Hudson River, High Bridge to Kings Bridge.	1705	1-5,000	....do	1886.
New York and New Jersey.	New York Harbor, Governors Island to West Hoboken.	1181	1-10,000	H. L. Marindin	1873.
Do	New York Harbor, Battery to Castle Point	1668	1-5,000	W. G. Cutler, U. S. N	1885.
Do	New York Harbor, Castle Garden to Long Dock	70	1-5,000	T. R. Gedney, U. S. N	1837.
Do	New York Harbor, Castle Garden to Jeffreys Hook	71	1-10,000	....do	1837.
Do	New York Harbor, Castle Garden to Guttenberg	477	1-10,000	R. Wainwright, U. S. N	1855.
Do	New York Harbor, Battery to Seventy-ninth street (dynamic chart).	1980	1-10,000	H. L. Marindin and J. B. Weir.	1872-75.
Do	Hudson River, Castle Point to Bulls Ferry	1699	1-5,000	W. G. Cutler, U. S. N	1885.
Do	Hudson River, Guttenberg to Spuyten Duyvil	68	1-5,000	T. R. Gedney, U. S. N	1837.
Do	Hudson River, Manhattanville to Spuyten Duyvil Creek (copy of No. 68).	69	1-5,000	....do	1837.
Do	Hudson River, Guttenberg to beyond Jeffreys Hook	496	1-10,000	R. Wainwright, U. S. N	1855.
Do	Hudson River, Bulls Ferry to One hundred and forty-first street.	1670	1-5,000	W. G. Cutler, U. S. N	1885.
Do	Hudson River, One hundred and forty-first street to Tubby Hook.	1701	1-5,000	C. P. Perkins, U. S. N	1886.
Do	Hudson River, Jeffreys Hook to Hastings	408	1-10,000	R. Wainwright, U. S. N	1853.
Do	Hudson River, Tubby Hook to Spuyten Duyvil, Harlem River.	1705	1-5,000	C. P. Perkins, U. S. N	1886.
Do	Hudson River, Tubby Hook to Yonkers	475	1-10,000	R. Wainwright, U. S. N	1855.
New York	Hudson River, Hastings to Nyack	409	1-10,000	....do	1854.
Do	Hudson River, Nyack to Teller Point	410	1-10,000	....do	1854.
Do	Hudson River, Teller Point to Cauldwells	458	1-10,000	....do	1854.
Do	Hudson River, Cauldwells to Fort Montgomery	459	1-10,000	....do	1854.
Do	Hudson River, Fort Montgomery to Buttermilk Falls.	630	1-5,000	J. H. Moore, U. S. N	1857.
Do	Hudson River, Buttermilk Falls to Stony Point	631	1-5,000	....do	1857.
Do	Hudson River, Stony Point to Balmville	632	1-10,000	....do	1857.
Do	Hudson River, Sherman Dock to Old Lime Kiln	729	1-10,000	C. M. Fauntleroy, U. S. N	1859.
Do	Hudson River, Old Lime Kiln to New Paltz	730	1-10,000	....do	1859.
Do	Hudson River, New Paltz to Indian Rock	735	1-10,000	....do	1859.
Do	Hudson River, Indian Rock Ice House Wharf, Rhinebeck.	736	1-10,000	....do	1860.
Do	Hudson River, Rondout Creek	665	1-5,000	A. Murray, U. S. N	1858.
Do	Hudson River, Rondout Harbor, entrance to Sleights Ferry.	979	1-1,250	F. F. Nes	1868.
Do	Hudson River, Rondout Harbor, Sleights Ferry to entrance Delaware and Hudson Canal.	978	1-2,500	....do	1868.
Do	Hudson River, Ice House Wharf, Rhinebeck, to Glasco.	752	1-10,000	J. Mechan	1861.
Do	Hudson River, Glasco to Tivoli	753	1-10,000	....do	1861.
Do	Hudson River, Esopus Creek	666	1-5,000	A. Murray, U. S. N	1858.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New York	Hudson River, Tivoli to Upper Coal Beds Light	798	1-10,000	J. Mechan	1862.
Do	Hudson River, Upper Coal Beds Light to Percy Reach Light.	799	1-10,000	do	1862.
Do	Hudson River, Percy Reach Light to Coxsackie	800	1-10,000	do	1862-63.
Do	Hudson River, Coxsackie to Houghtailing Island	844	1-10,000	A. Strausz	1863.
Do	Hudson River, New Baltimore to Albany	549	1-5,000	R. Wainwright, U. S. N	1856.
Do	Hudson River, Albany to Troy	843	1-10,000	A. Strausz	1863.
Vermont	Lake Champlain, Canadian boundary to Butler Island.	1182	1-20,000	C. Junken	1873.
Vermont and New York.	Lake Champlain, Canadian boundary to Isle La Motte Light.	1173	1-10,000	do	1873.
Do	Lake Champlain, Isle La Motte Light to Cumberland Head Light.	1151	1-20,000	Junken, Wright, and Hergesheimer.	1872.
Vermont	Lake Champlain, Butler Island to Sand Bar Bridge	1162	1-20,000	L. B. Wright	1873.
Vermont and New York.	Lake Champlain, Cumberland Head to Valcour Island.	1058	1-20,000	C. Junken	1870.
Do	Lake Champlain, Valcour Island to Trembleau Point.	1118 *a*	1-20,000	F. D. Granger	1871.
Vermont	Lake Champlain, Colchester and Hogsback reefs, (part of 1118 *a*).	1118 *b*	1-10,000	do	1871.
Vermont and New York.	Lake Champlain, Trembleau Point to Ligonier Point.	1119	1-20,000	do	1871.
Vermont	Lake Champlain, Burlington Harbor	1105	1-10,000	do	1871.
Vermont and New York.	Lake Champlain, Shelburn and Willsborough bays	1246 *b*	1-10,000	C. Junken	1874.
Do	Lake Champlain, Four Brothers to Rock Harbor	1244 *a*	1-20,000	L. B. Wright	1873.
Do	Lake Champlain, Rock Harbor to Crown Point Light.	1244 *b*	1-20,000	do	1873.
Do	Lake Champlain, Crown Point Light to Crown Point Landing.	1246 *a*	1-10,000	C. Junken	1874.
Do	Lake Champlain, Crown Point Landing to Laribee Landing.	1247 *a*	1-10,000	do	1874.
Do	Lake Champlain, Laribee Landing to Benson Landing.	1247 *b*	1-10,000	do	1874.
Do	Lake Champlain, Benson Landing to Light Beacon No. 9.	1248 *a*	1-10,000	do	1874.
Do	Lake Champlain, Light Beacon No. 9 to Whitehall, including South Bay.	1248 *b*	1-10,000	do	1874.
New York and New Jersey.	Raritan Bay, with Sandy Hook Bar, Staten Island Sound, and Newark Bay.	62	1-20,000	T. R. Gedney, U. S. N	1836.
Do	Raritan Bay, with Sandy Hook Bay, Newark Bay, Arthur Kills, and Kill van Kull.	61	1-10,000	do	
New York	Raritan Bay, with Great Kills and Staten Island, from Elm Tree Light to Seguine Point.	127	1-10,000	G. M. Bache, U. S. N	1841.
New Jersey	Raritan Bay, Sandy Hook to Perth Amboy	126	1-10,000	do	1841.
New York and New Jersey.	do	1712	1-20,000	G. C. Hanus, U. S. N	1886.
Do	Raritan Bay, Seguine Point to South Amboy	572	1-20,000	T. A. Craven, U. S. N	1857.
New Jersey	Raritan Bay, Middletown Creek	58	1-10,000	G. M. Bache, U. S. N	1841.
Do	Raritan River, mouth to Marsh Island	1172	1-5,000	F. H. Gerdes	1872.
Do	Raritan River, Marsh Island to city of Brunswick	1204	1-5,000	do	1873.
Do	Raritan River, South River	1205	1-5,000	do	1873.
New York and New Jersey.	Raritan Bay, Arthur Kills	64	1-10,000	T. R. Gedney, U. S. N	1836.
Do	Raritan Bay and Newark Bay, lower part	1716	1-5,000	G. C. Hanus, U. S. N	1886.
Do	Raritan Bay, Perth Amboy to Elizabethport	495	1-10,000	R. Wainwright, U. S. N	1855.
Do	Raritan Bay, Arthur Kills, Ward Point to Woodbridge Creek.	1713	1-5,000	G. C. Hanus, U. S. N	1886.
Do	Raritan Bay, Arthur Kills, Woodbridge Creek to Fresh Kills.	1714	1-5,000	do	1886.
Do	Raritan Bay, Arthur Kills, Elizabethport to Newark Bay entrance.	494	1-10,000	R. Wainwright, U. S. N	1855.
Do	Raritan Bay, Arthur Kills, Fresh Kills to Dividing Creek.	1715	1-5,000	G. C. Hanus, U. S. N	1886.
New Jersey	Newark Bay	493	1-10,000	R. Wainwright, U. S. N	1855-56.
Do	Newark Bay (replotting of No. 493)	547	1-10,000	do	1855-56.
Do	Newark Bay, lower part, to Passaic Light	1166 *b*	1-10,000	F. H. Gerdes	1871-72.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New Jersey	Newark Bay, Passaic Light to head of bay	1166 *a*	1-5,000	F. H. Gerdes	1871-72.
Do	Newark Bay, New Jersey Central Railroad Bridge to head of bay.	1717	1-10,000	G. C. Hanus, U. S. N	1886.
Do	Passaic River Bar	65	1-5,000	T. R. Gedney, U. S. N	1836.
Do	Passaic River, Morris Turnpike Bridge to bridge 1 mile above Newark.	1167	1-5,000	F. H. Gerdes	1871.
Do	Passaic River and Hackensack River to New Jersey Railroad Bridge.	1706	1-10,000	C. P. Perkins, U. S. N	1886.
Do	Hackensack River, Morris Canal to Upper Bridge	131	1-10,000	G. M. Bache, U. S. N	1841.
Do	Hackensack River, New Jersey Railroad Bridge to Erie Railroad Bridge.	1282	1-5,000	F. H. Gerdes	1871.
Do	Hackensack River, Delaware and Lackawanna Railroad Bridge to Hackensack Bridge.	* 1398 *b*	1-10,000	do	1872-74.
Do	Hackensack River, English Creek	1398 *c*	1-10,000	do	1873-74.
New York and New Jersey.	New York Harbor approaches	1538	1-40,000	E. B. Thomas, U. S. N	1882.
New Jersey	Sandy Hook to Barnegat	106	1-40,000	T. R. Gedney, U. S. N	1840.
Do	Sandy Hook to Long Branch (part of No. 106)	103	1-20,000	do	1840.
Do	Long Branch to Metedeconk River (part of No. 106)	104	1-20,000	do	1840.
Do	Metedeconk River to Barnegat (part of No. 106)	105	1-20,000	do	1840.
Do	Long Branch to Barnegat Inlet (part of No. 106)	102	1-20,000	do	1840.
Do	Shrewsbury Rocks	1278	1-10,000	H. O. Handy, U. S. N	1875.
Do	Shrewsbury and Navesink rivers	107	1-10,000	G. M. Bache, U. S. N	1840.
Do	Shrewsbury and Navesink rivers (copy of No. 107)	60	1-10,000	do	1840.
Do	Barnegat Bay and Inlet and Toms River	108	1-10,000	do	1840.
Do	Barnegat Inlet	883	1-10,000	C. Fendall	1866.
Do	Barnegat Bay and Toms River	1317	1-20,000	J. F. Moser, U. S. N	1876.
Do	Barnegat Bay	1197 *b*	1-20,000	W. I. Vinal	1874.
Do	Barnegat Light-House to New Inlet	111	1-20,000	T. R. Gedney, U. S. N	1841.
Do	Barnegat Light-House to New Inlet (copy of No. 111)	112	1-40,000	do	1841.
Do	Barnegat Light-House to Tuckers Beach	113	1-20,000	do	1847.
Do	Tucker Beach to Cape May	116	1-40,000	G. S. Blake, U. S. N	1843.
Do	New Inlet and Little Egg Harbor entrance	109	1-10,000	G. M. Bache, U. S. N	1840.
Do	do	110	1-10,000	do	1840.
Do	do	1158 *a*	1-10,000	W. I. Vinal	1872.
Do	do	1158 *b*	1-10,000	do	1874.
Do	Little Egg Harbor	1196	1-10,000	do	1873.
Do	Little Egg Harbor and Manahawkin Bay	1197 *a*	1-10,000	do	1873.
Do	Great Bay	1125	1-10,000	W. W. Harding	1871.
Do	Mullica River	1159	1-10,000	W. I. Vinal	1872.
Do	Great Egg Harbor, upper part	2116	1-20,000	E. E. Haskell	1891.
Do	Great Egg Harbor and adjacent waters	2054	1-20,000	R. A. Marr and E. E. Haskell.	1891.
Do	Brigantine Inlet and adjacent waters	1165	1-10,000	W. I. Vinal	1872.
Do	Absecom Inlet	837	1-10,000	T. S. Phelps, U. S. N	1864.
Do	Absecom Inlet and adjacent waters	1160	1-10,000	W. I. Vinal	1872.
Do	Peck Beach to Hereford Inlet	1696	1-40,000	J. E. Pillsbury, U. S. N	1886.
Do	Corsons Inlet to Leaming Sound, inland waters	2165	1-20,000	R. A. Marr and E. E. Haskell.	1891.
Do	Hereford Inlet and inland waters	2166	1-10,000	do	1891.
Do	Richardson Sound to Cape Island Sound, inland waters.	2164	1-10,000	do	1891.
New Jersey and Delaware.	Delaware Bay entrance, Five Fathom Bank to Capes May and Henlopen.	117	1-40,000	T. R. Gedney, U. S. N	1841.
New Jersey	Delaware Bay entrance, off Cape May	1533	1-40,000	H. Osterhaus, U. S. N	1882.
New Jersey and Delaware.	Delaware Bay entrance, off Cape May and Cape Henlopen.	151	1-40,000	G. S. Blake, U. S. N	1844.
Do	Delaware Bay entrance, Hen and Chickens Shoal and part of Five Fathom Bank.	1633	1-40,000	G. C. Hanus, U. S. N	1884.
Delaware	Delaware Bay entrance, Hen and Chickens Shoal	149	1-20,000	G. S. Blake, U. S. N	1844.
New Jersey and Delaware.	Delaware Bay entrance and River to Trenton (compiled).	148	1-80,000	do	1841-42-43.

* Topographic number.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New Jersey	Delaware Bay entrance, Middle and South Shoals	125	1-20,000	R. Bache, U. S. N	1847.
Do	Delaware Bay entrance, off Cape May	1655	1-10,000	F. H. Crosby, U. S. N	1885.
New Jersey and Delaware.	Delaware Bay, Capes to Fishing Creek and Clark Point.	118	1-20,000	G. S. Blake, U. S. N	1842-43.
Do	Delaware Bay, Capes to Mispillion Creek Light	119	1-20,000	.....do	1842.
Delaware	Delaware Bay, vicinity of Delaware Breakwater	801	1-3,600	C. P. Patterson	1863.
New Jersey and Delaware.	Delaware Bay, Round Shoal to Brown Shoal	1566	1-20,000	G. C. Hanus, U. S. N	1883.
Do	Delaware Bay, Cape May and Cedar Beach to False Egg Island Point and Mahon River Light.	122	1-20,000	G. S. Blake, U. S. N	1842.
New Jersey	Delaware Bay, Crow Shoal (copy of part of No. 118)	120	1-20,000	.....do	1842.
Do	Delaware Bay, Crow Shoal and Cape May Roads	157	1-10,000	Compiled	1836-42. 1843-47.
New Jersey and Delaware.	Delaware Bay, Brown Shoal and Mispillion Creek to False Egg Island Point and Mahon River Light.	123	1-20,000	G. S. Blake, U. S. N	1842.
Do	Delaware Bay, Main Ship Channel, Brown Shoal to Swash Channel and Joe Flogger Shoal.	1476 *a*	1-20,000	E. B. Thomas, U. S. N	1880.
New Jersey	Delaware Bay, southeastern part, Sea Grove, Cape May to Fishing Creek.	1632	1-20,000	G. C. Hanus, U. S. N	1884.
Delaware	Delaware Bay, Broad Kill to Mispillion Light and Lower, Middle, and Brown Shoals.	1582	1-20,000	.....do	1883.
New Jersey	Delaware Bay, Fishing Creek to Maurice River Light.	1678	1-20,000	F. H. Crosby, U. S. N	1885.
Do	Delaware Bay, Maurice River Cove and Egg Island Flats.	1679	1-20,000	.....do	1885.
New Jersey and Delaware.	Delaware Bay, Duck, Mahon, and Cohansey Creeks and Maurice River.	121	1-20,000	G. S. Blake, U. S. N	1843.
New Jersey	Delaware Bay, Maurice River	1677	1-10,000	F. H. Crosby, U. S. N	1885.
New Jersey and Delaware.	Delaware Bay, Fourteen Foot Bank and southern part of Joe Flogger Shoal.	1476 *b*	1-10,000	E. B. Thomas, U. S. N	1880.
Delaware	Delaware Bay, Mispillion Creek to Murderkill Creek.	1631	1-20,000	G. C. Hanus, U. S. N	1884.
New Jersey and Delaware.	Delaware Bay and River, Jones Creek to Mahon River.	1581	1-20,000	H. B. Mansfield and C. McR. Winslow, U. S. N.	1882-83-85.
Do	Delaware Bay, Swash Channel, Joe Flogger Shoal to Ben Davis Point Shoal.	1475 *b*	1-20,000	E. B. Thomas, U. S. N	1880.
Do	Delaware Bay, Main Ship Channel, Ben Davis Point Shoal to Ship John Shoal Light and Cohansey Creek approaches.	1475 *a*	1-20,000	.....do	1880.
Do	Delaware River, Cross Ledge to Ship John Shoal	124	1-20,000	G. S. Blake, U. S. N	1841.
Delaware	Delaware River, Mahon and Dona rivers	352	1-10,000	M. Woodhull, U. S. N	1852.
Do	Delaware River, Joe Flogger Shoal and Dona River	299	1-20,000	.....do	1852.
New Jersey and Delaware.	Delaware River, Mahon Ditch to Bombay Hook and Nantuxent Point to sea.	1544	1-20,000	H. L. Marindin	1882.
Do	Delaware River, Ben Davis Point to Liston Point	132	1-20,000	G. S. Blake, U. S. N	1841.
Do	Delaware River Channel from Ship John Shoal to Pea Patch Island.	1249 *a*	1-20,000	F. F. Nes	1875.
Do	Delaware River, Cohansey Light-House to Oyster Cove.	1520	1-10,000	H. B. Mansfield, U. S. N	1882.
Do	Delaware River, Bombay Hook to Collins Beach	1519	1-10,000	H. L. Marindin	1882.
Do	Delaware River, Collins Beach to Reedy Island Light.	1504 *b*	1-10,000	H. B. Mansfield, U. S. N	1881.
Delaware	Delaware River, vicinity of Reedy Island	2160	1-2,400	H. L. Marindin	1893.
New Jersey and Delaware.	Delaware River, Liston Point to New Castle	133	1-10,000	G. S. Blake, U. S. N	1840-41.
Do	Delaware River, Stony Point to Delaware City, excluding channel.	1249 *b*	1-20,000	J. M. Grimes, U. S. N	1875.
Do	Delaware River, Reedy Island Light to Finns Point Light.	1504 *a*	1-10,000	H. L. Marindin	1881.
Do	Delaware River, Reedy Point to New Castle	808	1-10,000	G. Davidson	1861.
Do	Delaware River, Finns Point Light to New Castle	1503 *b*	1-10,000	H. L. Marindin	1881.
Do	Delaware River, Bulkhead Shoal	156	1-10,000	McArthur and Goldsborough, U. S. N.	1846-47.
Do	Delaware River, Pea Patch Island to New Castle Light.	134	1-20,000	G. S. Blake, U. S. N	1843.
Delaware	Delaware River, front of New Castle	1183 *a*	1-1,250	C. Junken	1873.
Do	.....do	1183 *b*	1-1,250	.....do	1873.
New Jersey and Delaware.	Delaware River, New Castle to Deep Water Point Light.	1503 *a*	1-5,000	H. L. Marindin	1881.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New Jersey and Delaware.	Delaware River, New Castle to Cherry Island Range Lights.	135	1-10,000	G. S. Blake, U. S. N	1841.
Do	Delaware River, New Castle to Cherry Island Range Lights (copy of part of No. 135).	136	1-10,000	do	1841.
Delaware	Delaware River, Christiana and Brandywine creeks, mouth to bridges (enlarged from No. 135).	137	1-5,000	do	1841.
New Jersey, Delaware, and Pennsylvania.	Delaware River, Newcastle Flats to Marcus Hook Bar.	1394	1-10,000	C. Junken	1878.
Do	Delaware River, Deep Water Light to Penn Grove	1502 *b*	1-5,000	H. L. Marindin	1881.
Do	Delaware River, Penn Grove to Old Man Creek	1502 *a*	1-5,000	do	1881.
Do	Delaware River, Cherry Island Range Lights to Tonkins Island.	138	1-10,000	G. S. Blake, U. S. N	1842.
Do	Delaware River, Old Man Creek to Raccoon Creek	1501 *b*	1-5,000	H. L. Marindin	1881.
Do	Delaware River, Raccoon Creek to Chester Bar	1501 *a*	1-5,000	H. B. Mansfield, U. S. N	1881.
New Jersey and Pennsylvania.	Delaware River, Tonkins Island to Maiden Island	139	1-10,000	G. S. Blake, U. S. N	1842.
Pennsylvania	Delaware River, Welsh Street Wharf to Carson Wharf, Chester.	1057 *b*	1-1,200	C. Junken	1870.
Do	Delaware River, Ridley Creek to Welsh Street Wharf, Chester.	1057 *a*	1-1,200	do	1870.
New Jersey and Pennsylvania.	Delaware River, Chester Bar to east end Tinicum Island.	1490 *b*	1-5,000	H. B. Mansfield, U. S. N.	1881.
Do	Delaware River, Tinicum Island to Fort Mifflin	1490 *a*	1-5,000	H. L. Marindin	1881.
Do	Delaware River, Maiden Island to Fort Mifflin	140	1-5,000	G. S. Blake, U. S. N	1842.
Do	Delaware River, Fort Mifflin to Windmill Island	141	1-10,000	do	1842.
Do	Delaware River, Fort Mifflin to Gloucester Point	1114 *a*	1-5,000	F. F. Nes	1871.
Do	Delaware River, Fort Mifflin to Fish Club House (replotting of part of No. 141).	1422 *b*	1-4,800	G. S. Blake, U. S. N.	1843.
Do	Delaware River, Fort Mifflin to Horseshoe	1432 *b*	1-4,800	H. L. Marindin	1878.
Pennsylvania	Delaware River, Schuylkill River, Gloucester Point to Penrose Ferry Bridge.	1200 *c*	1-20,000	C. Junken	1875.
Do	Delaware River, Schuylkill River, League Island to Grays Ferry Bridge.	1943	1-4,800	J. Hergesheimer	1889.
Do	do	1200 *a*	1-5,000	F. F. Nes	1871.
Do	Delaware River, Schuylkill River, Rambo Point to Grays Ferry Bridge.	1630	1-1,200	C. Junken	1885.
Do	Delaware River, Schuylkill River, Grays Ferry Bridge to Suspension Bridge.	1200 *b*	1-5,000	F. F. Nes	1871.
Do	Delaware River, Schuylkill River, Grays Ferry Bridge to Fairmount Dam.	1944	1-4,800	J. Hergesheimer	1889.
Do	do	*1852	1-4,800	do	1888-89.
Do	Delaware River, League Island Channel, back of League Island.	862	1-2,500	E. Hergesheimer	1865.
Do	Delaware River Docks, Gloucester Point to Cooper Point.	1939	1-9,600	J. Hergesheimer	1889.
New Jersey and Pennsylvania.	Delaware River, Horseshoe to Kaighns Point	1432 *a*	1-4,800	H. L. Marindin	1878.
Do	Delaware River, Fish Club House to Smith Island (replotting part of No. 141).	1422 *a*	1-4,800	G. S. Blake, U. S. N	1843.
Do	Delaware River, Gloucester Point to Windmill Island.	1114 *b*	1-5,000	F. F. Nes	1871.
Do	Delaware River, Kensington to Kaighns Point	1431 *b*	1-4,800	H. L. Marindin	1878.
Do	Delaware River, Kaighns Point to Eight Mile Point	142	1-10,000	G. S. Blake, U. S. N	1843.
Pennsylvania	Delaware River, Gravel and Shingle Bank, foot of Christian street, Philadelphia.	1657	1-300	H. L. Marindin	1878.
New Jersey and Pennsylvania.	Delaware River, Smith Island to Petty Island (replotting, part of No. 142).	1421 *b*	1-4,800	G. S. Blake, U. S. N	1843.
Do	Delaware River Docks, Cooper Point to east end Petty Island.	1940	1-9,600	J. Hergesheimer	1889.
Do	Delaware River, Kensington to Bridesburg	1431 *a*	1-4,800	H. L. Marindin	1878.
Do	Delaware River, Petty Island to Eight Mile Point (replotting, part of No. 142).	1421 *a*	1-4,800	G. S. Blake, U. S. N	1843.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
New Jersey and Pennsylvania.	Delaware River, submerged jetty to White Sheet Bay	2183	1-4,800	H. L. Marindin	1886.
Do	Delaware River, Eight Mile Point to Dunks	144	1-10,000	G. S. Blake, U. S. N.	1844.
Do	Delaware River, Dunks to Tullytown	145	1-10,000	do	1844.
Do	Delaware River, Tullytown to south end Duck Island	146	1-10,000	do	1844.
Do	Delaware River, south end Duck Island to Trenton Bridge.	147	1-10,000	do	1844.
Do	Delaware River (current sheet)	1982	1-4,800	H. L. Marindin	1878.
Do	do	1983	1-4,800	do	1878.
Do	do	1984	1-4,800	do	1878.
Do	do	1985	1-4,800	do	1877-78.
Do	do	1986	1-4,800	do	1878.
Do	do	1987	1-4,800	do	1878.
Do	do	1988	1-4,800	do	1878.
Delaware	Hen and Chickens Shoal	152	1-20,000	S. P. Lee, U. S. N.	1848.
Do	Cape Henlopen to Indian River Inlet	149	1-20,000	G. S. Blake, U. S. N	1844.
Do	Rehoboth to Indian River Inlet	1697	1-40,000	J. E. Pillsbury, U. S. N.	1886.
Do	Indian River Inlet and Bay and Rehoboth Bay	150	1-20,000	R. Bache, U. S. N	1847.
Delaware and Maryland.	Indian River Inlet to State line	212	1-40,000	S. P. Lee, U. S. N.	1848.
Maryland	Ocean City to Sinepuxent Bay	213	1-40,000	do	1849.
Delaware and Maryland.	Inside waters, Miller Creek to Sinepuxent Bay	1816	1-20,000	D. B. Wainwright	1887.
Maryland	North end Sinepuxent Bay to north end Assateague Bay.	251	1-40,000	S. P. Lee, U. S. N.	1848.
Do	Chincoteague Bay, upper part	1455 *b*	1-20,000	E. P. Lull, U. S. N., and D. B. Wainwright.	1880-87.
Maryland and Virginia.	Chincoteague Bay, lower part	1455 *a*	1-20,000	D. B. Wainwright	1887.
Maryland	Baltic Shoal	761	1-40,000	T. S. Phelps, U. S. N	1863.
Virginia	North end Assateague Bay to Chincoteague Inlet	297	1-20,000	J. J. Almy, U. S. N	1851.
Do	North end Assateague Bay to Gargathy Inlet	298	1-40,000	do	1851.
Do	Chincoteague Shoal and Inlet	1487	1-20,000	Bradford and Wainwright	1881-87.
Do	Gargathy Inlet to Great Machipongo Inlet	348	1-40,000	J. J. Almy, U. S. N.	1852.
Do	Metompkin Inlet	349	1-10,000	do	1852.
Do	Metompkin Inlet and Bay	795	1-20,000	A. M. Harrison	1862.
Do	Inside waters, Chincoteague Inlet to Floyd Bay	1803	1-20,000	D. B. Wainwright	1887-88.
Maryland	Wachapreague and Machipongo inlets	354	1-20,000	J. J. Almy, U. S. N.	1852.
Do	Little Machipongo Inlet to head of Broadwater	1104	1-20,000	J. W. Donn	1871.
Do	Broadwater, Great Machipongo River and branches	1103	1-20,000	do	1871.
Virginia	Hog Island to Cape Henry	397	1-40,000	J. J. Almy, U. S. N	1853.
Do	Sand Shoal and Ship Shoal inlets	388	1-20,000	do	1853.
Do	Broadwater, Sand Shoal Inlet to Hog Island Inlet	1070 *b*	1-10,000	W. W. Harding	1870.
Do	Broadwater, Ship Shoal Inlet to Sand Shoal Inlet	1070 *a*	1-20,000	J. W. Donn	1870.
Do	Chesapeake Bay entrance, Little Inlet to Cape Henry	1873	1-20,000	M. L. Wood, U. S. N.	1888.
Do	Chesapeake Bay entrance, Smith Inlet to Magothy Bay.	1875	1-10,000	do	1888.
Do	Chesapeake Bay entrance, Magothy Bay	1013	1-20,000	W. W. Harding	1869.
Do	Chesapeake Bay entrance	286	1-20,000	B. F. Sands, U. S. N	1851.
Do	Chesapeake Bay entrance to Wolf Trap Light	364	1-40,000	J. J. Almy, U. S. N	1852.
Do	Chesapeake Bay entrance, Cape Charles and vicinity	345	1-20,000	do	1852.
Do	Chesapeake Bay entrance, Cape Charles to Old Plantation Creek.	1874	1-20,000	M. L. Wood, U. S. N.	1888.
Do	Chesapeake Bay, east shore, Cherrystone Inlet	353	1-20,000	J. J. Almy, U. S. N	1852.
Do	Chesapeake Bay, east shore, Cherrystone Inlet and Old Plantation Creek.	1169	1-10,000	J. S. Bradford	1873.
Do	Chesapeake Bay, east shore, Mattawoman Creek to Nandua Creek, and west shore, Wolf Trap Spit to Rappahannock Spit.	285	1-40,000	J. J. Almy, U. S. N	1851.
Do	Chesapeake Bay, east shore, Hunger Creek approaches and adjacent creeks.	368	1-20,000	do	1853.
Do	Chesapeake Bay, east shore, Hunger Creek entrance	976 *c*	1-20,000	C. Fendall	1868.
Do	Chesapeake Bay, east shore, Naswaddox Creek	976 *b*	1-20,000	do	1868.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Virginia	Chesapeake Bay, east shore, Occohannock Creek approaches and Heaths Landing.	367	1-20,000	J. J. Almy, U. S. N	1853.
Do	Chesapeake Bay, east shore, Craddock and Nandua creeks.	976 *a*	1-20,000	C. Fendall	1868.
Virginia and Maryland.	Chesapeake Bay, east shore, Nandua Creek to Smith Island, and west shore, Rappahannock Spit to Smith Point.	252	1-40,000	S. P. Lee, B. F. Sands, and J. J. Almy, U. S. N.	1849-50-51.
Virginia	Chesapeake Bay, east shore, Pengoteague Creek and approaches.	332	1-20,000	B. F. Sands and J. J. Almy, U. S. N., and C. Fendall.	1850-51. 1852-68.
Virginia and Maryland.	Chesapeake Bay, east shore, Pocomoke Sound	515	1-40,000	J. J. Almy, U. S. N.	1855.
Virginia	Chesapeake Bay, east shore, Pocomoke Sound, Onancock Creek to Mussongo Creek.	993	1-20,000	W. W. Harding	1869.
Virginia and Maryland.	Chesapeake Bay, east shore, Pocomoke River, entrance to Taylors.	1004	1-10,000	....do	1869.
Maryland	Chesapeake Bay, east shore, Pocomoke River, Taylors to Leaning Pine.	1022 *a*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Leaning Pine to Ilsleys House.	1022 *b*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Ilsleys House to Longs House.	1023 *a*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Longs House to Double.	1023 *b*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Double to Mattapony.	1024 *a*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Mattapony to Broad Creek.	1024 *b*	1-5,000	....do	1869.
Do	Chesapeake Bay, east shore, Pocomoke River, Broad Creek to Snow Hill.	1024 *c*	1-5,000	....do	1869.
Maryland and Virginia.	Chesapeake Bay, east shore, Tangier Sound, Watts Island Light to Clay Island Light.	557	1-40,000	J. J. Almy, U. S. N.	1856.
Do	Chesapeake Bay, east shore, south end Smith Island to Billy Island, and west shore, Smith Point to Point No Point.	211	1-20,000	S. P. Lee, U. S. N.	1849.
Virginia	Chesapeake Bay, east shore, Tangier Sound, vicinity of Smith, Goose, and Fox islands.	997	1-20,000	W. W. Harding	1869.
Maryland	Chesapeake Bay, east shore, Little Annemessex River, Crisfield Harbor.	985	1-10,000	....do	1868-69.
Do	Chesapeake Bay, east shore, Little Annemessex River, Big Annemessex River, Manokin River, Monie Bay, Wicomico River, and Ellis Bay.	707	1-20,000	W. T. Muse, U. S. N.	1858-59.
Do	Chesapeake Bay, east shore, Billy Island to Meekins Neck, and west shore, Point No Point to Cove Point Light.	209	1-20,000	S. P. Lee, U. S. N.	1848.
Do	Chesapeake Bay, east shore, Nanticoke River and Fishing Bay.	673	1-20,000	....do	1858.
Do	Chesapeake Bay, east shore, Meekins Neck to Tilghman Island and Cove Point Light to latitude 38° 40′.	199	1-20,000	W. P. McArthur, U. S. N.	1848.
Do	Chesapeake Bay, east shore, Little Choptank River or Hudson River.	200	1-20,000	....do	1848.
Do	Chesapeake Bay, east shore, Little Choptank River and tributaries.	1346 *b*	1-10,000	W. W. Harding	1871.
Do	Chesapeake Bay, east shore, Choptank River entrance.	201	1-20,000	W. P. McArthur, U. S. N.	1848.
Do	Chesapeake Bay, east shore, Choptank Light to Wing Landing, Fredhaven Creek and tributaries.	202	1-40,000	R. Bache, U. S. N.	1848.
Do	Chesapeake Bay, east shore, Choptank River and tributaries, Jenkins, Secretary, and Cabin creeks.	1346 *a*	1-10,000	W. W. Harding	1871.
Do	Chesapeake Bay, east shore Choptank River, Wing Landing to Denton.	1048	1-10,000	....do	1870.
Do	Chesapeake Bay, east shore, Fredhaven Creek and tributaries.	1049 *a*	1-10,000	....do	1870.
Do	Chesapeake Bay, east shore, Harris, Porters, and Broad creeks.	1049 *b*	1-10,000	....do	1870.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Maryland	Chesapeake Bay, east shore, Tilghman Island to latitude 38° 54'; west shore, latitude 38° 40' to South River.	188	1-20,000	S. P. Lee, U. S. N.	1846.
Do	Chesapeake Bay, east shore, Eastern Bay, Wye and Miles rivers.	177	1-20,000	W. P. McArthur, U. S. N., and W. W. Harding.	1847-70.
Do	Chesapeake Bay, east shore, St. Michael River and tributaries.	1050 *b*	1-10,000	W. W. Harding	1870.
Do	Chesapeake Bay, east shore, Wye River and tributaries.	1050 *a*	1-10,000	do	1870.
Do	Chesapeake Bay, east shore, latitude 38° 54' to latitude 39° 00'; west shore, Thomas Point to Sandy Point.	167	1-20,000	G. M. Bache, U. S. N.	1844.
Do	Chesapeake Bay, east shore, north end of Kent Island, Fairlee Creek; west shore, Sandy Point to Robbins Point.	166	1-20,000	do	1845.
Do	Chesapeake Bay, east shore, Chester River mouth	175	1-20,000	W. P. McArthur, U. S. N.	1847.
Do	Chesapeake Bay, east shore, Chester River, entrance to Chestertown.	174	1-20,000	do	1846.
Do	Chesapeake Bay, east shore, Chester River, Chestertown to Possum Point.	1026 *a*	1-5,000	W. W. Harding	1869-70.
Do	Chesapeake Bay, east shore, Possum Point to Crumpton.	1027	1-5,000	do	1869-70.
Do	Chesapeake Bay, east shore, Chester River, Morgan Creek Bridge to head of navigation.	1026 *b*	1-5,000	do	1870.
Do	Chesapeake Bay, east shore, Chester River, Langford Creek.	1078	1-10,000	do	1870.
Do	Chesapeake Bay, east shore, Fairlee Creek to Howell Point; west shore, Robbins Point to Old Womans Gut.	187	1-10,000	S. P. Lee, U. S. N.	1846.
Do	Chesapeake Bay, east shore, Fairlee, Churn, Stillpond, and Lloyd creeks.	1072	1-10,000	W. W. Harding	1870.
Do	Chesapeake Bay, east shore, Howell Point to Turkey Point; west shore, Old Womans Gut to Sandy Point.	186	1-10,000	S. P. Lee, U. S. N.	1846.
Do	Chesapeake Bay, east shore, Sassafras River, Grove Point to Wilsons Wharf.	176	1-20,000	W. P. McArthur, U. S. N.	1847.
Do	Chesapeake Bay, east shore, Sassafras River, Wilsons Wharf to head and tributary.	1071	1-10,000	W. W. Harding	1870.
Do	Chesapeake Bay, east shore, to Elk River, Turkey Point, Elk Landing.	172	1-10,000	W. P. McArthur, U. S. N.	1846.
Do	Chesapeake Bay, east shore, Bohemia River and Back Creek.	170	1-10,000	do	1846.
Do	Chesapeake Bay head, Turkey Point to Havre de Grace.	185	1-10,000	S. P. Lee, U. S. N.	1846.
Do	Chesapeake Bay head, Northeast River	173	1-10,000	W. P. McArthur, U. S. N.	1846.
Do	Chesapeake Bay head, Susquehanna River, Spesutic Island to Havre de Grace.	898	1-10,000	F. P. Webber	1872.
Do	Chesapeake Bay head, Susquehanna River, Havre de Grace Light to Silver Island.	168	1-10,000	W. P. McArthur, U. S. N.	1846.
Do	do	326	1-10,000	do	1846.
Do	Chesapeake Bay, west shore, Romney Creek	1072	1-10,000	W. W. Harding	1870.
Do	Chesapeake Bay, west shore, Bush River	171	1-20,000	W. P. McArthur, U. S. N.	1846.
Do	Chesapeake Bay, west shore, Gunpowder, Middle, and Back rivers.	169	1-20,000	do	1846.
Do	Chesapeake Bay, west shore, Patapsco River entrance.	415	1-20,000	R. Wainwright, U. S. N.	1854.
Do	Chesapeake Bay, west shore, Patapsco River mouth.	913	1-20,000	F. P. Webber	1866.
Do	Chesapeake Bay, west shore, Patapsco River, Belvidere Shoal and Swash Channel.	469	1-20,000	A. Boschke	1852.
Do	Chesapeake Bay, west shore, Patapsco River, Brewerton Channel, lower part.	915	1-10,000	F. P. Webber	1866.
Do	Chesapeake Bay, west shore, Patapsco River and Baltimore Harbor.	165	1-10,000	G. M. Bache, U. S. N.	1845.
Do	Chesapeake Bay, west shore, Patapsco River, Brewerton Channel.	914	1-10,000	F. P. Webber	1866.

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Maryland	Chesapeake Bay, west shore, Patapsco River, tributary creeks.	1007	1-20,000	J. W. Donn	1869.
Do	Chesapeake Bay, west shore, Patapsco River, Sparrow Point and vicinity.	2067	1-10,000	....do	1891.
Do	Chesapeake Bay, west shore, Patapsco River, Sparrow Point to Leading.	339	1-10,000	C. H. McBlair, U. S. N.	1852.
Do	Chesapeake Bay, west shore, Patapsco River, Lazaretto Point to Hawkins Point.	1451	1-10,000	C. Junken	1880.
Do	Chesapeake Bay, west shore, Baltimore Harbor, Lazaretto Point to Ferry Point Bridge.	1450 *a*	1-3,600	J. W. Donn	1876.
Do	Chesapeake Bay, west shore, Baltimore Harbor, Ferry Point Bridge to head of Spring Garden.	1450 *b*	1-3,600	....do	1877.
Do	Chesapeake Bay, west shore, Baltimore Harbor, Fort McHenry to Henderson Wharf.	1449 *a*, *b*	1-1,800	....do	1876.
Do	Chesapeake Bay, west shore, Baltimore Harbor, Henderson Wharf to head of basin.	1448	1-1,800	....do	1876.
Do	Chesapeake Bay, west shore, Magothy River	164	1-10,000	G. M. Bache, U. S. N	1845.
Do	Chesapeake Bay, west shore, Annapolis Harbor	1842	1-10,000	M. L. Wood, U. S. N.	1888.
Do	Chesapeake Bay, west shore, Severn and South rivers, tributaries.	1077 *a*	1-10,000	W. W. Harding	1870.
Do	Chesapeake Bay, west shore, Severn River above Round Bay.	1077 *b*	1, 10,000	....do	1870.
Do	Chesapeake Bay, west shore, Patuxent River mouth to Setterly Point.	210	1-20,000	S. P. Lee, U. S. N.	1848.
Do	Chesapeake Bay, west shore, Patuxent River, Setterly Point to God Point.	641	1-20,000	W. T. Muse, U. S. N.	1857.
Do	Chesapeake Bay, west shore, Patuxent River, Holland Point to Jones Point.	704	1-20,000	....do	1859.
Maryland and Virginia.	Chesapeake Bay, Potomac River, Cornfield Point to Piney Point.	701	1-20,000	....do	1859-60.
Maryland	Chesapeake Bay, Potomac River, St. Marys River, Cornfield Point to St. Marys City.	640	1-21,408	....do	1857.
Do	Chesapeake Bay, Potomac River, St. Marys River, Kit Point to head of navigation.	695	1-20,000	....do	1859.
Virginia	Chesapeake Bay, Potomac River, Yeocomico and Cone rivers.	968	1-20,000	J. W. Donn	1868.
Do	....do	794	1-20,000	W. T. Muse, U. S. N	1860.
Maryland	Chesapeake Bay, Potomac River, Yeocomico and St. Georges rivers and St. Clement and Breton bays.	769	1-20,000	W. T. Muse, U. S. N., and J. W. Donn.	1860-68.
Maryland and Virginia.	Chesapeake Bay, Potomac River, Piney Point to Blakistone Island.	793	1-20,000	W. T. Muse, U. S. N.	1860.
Virginia	Chesapeake Bay, Potomac River, Nomine Bay, Lower Machod and Mattox creeks.	967	1-20,000	J. W. Donn	1868.
Do	Chesapeake Bay, Potomac River, Blakistone Island to Cobb Point.	827	1-20,000	T. S. Phelps, U. S. N	1862.
Do	Chesapeake Bay, Potomac River, Cobb Point to Mathias.	778	1-20,000	....do	1862.
Do	Chesapeake Bay, Potomac River, Lower Cedar Point and Mathias Point.	738	1-10,000	W. R. Palmer, U. S. A.	1861.
Do	Chesapeake Bay, Potomac River, Mathias Point to Metompkin Point and Port Tobacco River.	813	1-20,000	E. S. Phelps, U. S. N	1862.
Do	Chesapeake Bay, Potomac River, Metompkin Point to Shipping Point.	812	1-20,000	....do	1862.
Do	Chesapeake Bay, Potomac River, Shipping Point to Hallowing Point.	814	1-20,000	....do	1862-63.
Do	Chesapeake Bay, Potomac River, Hallowing Point to Fort Washington.	815	1-20,000	....do	1863.
Do	Chesapeake Bay, Potomac River, Fort Washington to Alexandria.	816	1-10,000	....do	1863.
Maryland, Virginia, and District of Columbia.	Chesapeake Bay, Potomac River, Alexandria to Hunter Point.	766	1-10,000	C. P. Patterson	1862.

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District of Columbia.	Chesapeake Bay, Potomac River, end of Washington Channel.	2100	1-1,600	E. E. Haskell	1891.
Maryland, Virginia, and District of Columbia.	Chesapeake Bay, Potomac River, Hunter Point to Long Bridge.	764	1-5,000	C. P. Patterson	1862.
District of Columbia.	Chesapeake Bay, Potomac River, Anacostia River, Anacostia Bridge to Bennings Bridge.	863	1-5,000	A. Balbach	1865.
District of Columbia and Maryland.	Chesapeake Bay, Potomac River, Anacostia River, Bennings Bridge to Bladensburg.	864	1-5,000	....do	1865.
District of Columbia and Virginia.	Chesapeake Bay, Potomac River, Long Bridge to Aqueduct Bridge.	765	1-5,000	C. P. Patterson	1862.
Do	Chesapeake Bay, Potomac River, Long Bridge to lower end of Analostan Island.	1082	1-5,000	C. Fendall	1867.
District of Columbia.	Chesapeake Bay, Potomac River, reported rock off Easby Point.	2004	1-5,000	H. L. Marindin	1890.
District of Columbia and Virginia.	Chesapeake Bay, Potomac River, Giesboro Point to the Sister Islands.	2042	880 feet to 1 inch.	M. C. Ewing	1837.
Do	Chesapeake Bay, Potomac River, Georgetown to foot of Little Falls.	*1340	1-2,500	C. Junken	1872.
Virginia	Chesapeake Bay, west shore, Great Wicomico River.	1003	1-20,000	J. W. Donn	1869.
Do	Chesapeake Bay, west shore, creeks from Ingram Bay to Rappahannock River.	1005	1-20,000	....do	1869.
Do	Chesapeake Bay, Rappahannock River, Stingray Point to Mosquito Point.	610	1-10,000	R. W. Wainwright, U. S. N.	1857.
Do	Chesapeake Bay, Mosquito Point to Grey Point	609	1-10,000	....do	1857.
Do	Chesapeake Bay, Rappahannock River, Grey Point to Robinson Creek.	608	1-10,000	....do	1857.
Do	Chesapeake Bay, Rappahannock River, Corratoman River and tributaries.	1001	1-10,000 1-20,000	J. W. Donn	1869.
Do	Chesapeake Bay, Rappahannock River, Le Grange Creek to Parrott Creek.	607	1-10,000	R. Wainwright, U. S. N.	1856.
Do	Chesapeake Bay, Rappahannock River, Corratoman River.	611	1-10,000	....do	1857.
Do	Chesapeake Bay, Rappahannock River, Corratoman River tributaries.	1002	1-10,000	J. W. Donn	1869.
Do	Chesapeake Bay, Rappahannock River, Punch Bowl to Jones Point.	606	1-10,000	R. Wainwright, U. S. N.	1868.
Do	Chesapeake Bay, Rappahannock River, Jones Point to Accokeek Point.	605	1-10,000	....do	1856.
Do	Chesapeake Bay, Rappahannock River, Bowls and Corner Rocks.	937	1-2,500	J. W. Donn	1867.
Do	Chesapeake Bay, Rappahannock River, Accokeek Point to Tappahannock.	523	1-10,000	R. Wainwright, U. S. N.	1855.
Do	Chesapeake Bay, Rappahannock River, Tappahannock to Occupacia Creek.	522	1-10,000	....do	1855.
Do	Chesapeake Bay, Rappahannock River, Occupacia Creek, Leedstown.	521	1-10,000	....do	1855.
Do	Chesapeake Bay, Rappahannock River, Leedstown to Northbend.	454	1-10,000	....do	1854.
Do	Chesapeake Bay, Rappahannock River, Northbend, Gincatic Creek.	453	1-10,000	....do	1854.
Do	Chesapeake Bay, Rappahannock River, Gincatic Creek, Millbank Creek.	452	1-5,000	....do	1854.
Do	Chesapeake Bay, Rappahannock River, Millbank Creek to Skinner Creek.	451	1-5,000	....do	1854.
Do	Chesapeake Bay, Rappahannock River, Skinner Neck to Moss Neck.	450	1-5,000	....do	1854.
Do	Chesapeake Bay, Rappahannock River, Moss Neck to Hollywood.	400	1-5,000	....do	1853-54.
Do	Chesapeake Bay, Rappahannock River, Hollywood to Belvidere.	399	1-5,000	....do	1853-54.

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Virginia	Chesapeake Bay, Rappahannock River, Belvidere to Fredericksburg.	398	1-5,000	R. Wainwright, U. S. N.	1853-54.
Do	Chesapeake Bay, west shore, Piankatank River	988	1-20,000	J. W. Donn	1869.
Do	Chesapeake Bay, west shore, Hill Bay and Milford Haven.	987	1-20,000	do	1868-69.
Do	Chesapeake Bay, west shore, Mobjack Bay to Cape Henry.	446	1-40,000	J. J. Almy, U. S. N	1854.
Do	Chesapeake Bay, west shore, Mobjack estuaries	984	1-20,000	J. W. Donn	1868.
Do	Chesapeake Bay, west shore, York River, Clockston Creek to Baglers Mill.	583	1-20,000	J. J. Almy, U. S. N	1857.
Do	Chesapeake Bay, west shore, York River, Baglers Mill to West Point.	584	1-20,000	R. D. Miner, U. S. N.	1857.
Do	Chesapeake Bay, Poquosin and Back rivers	977	1-20,000	C. Fendall and W. W. Harding.	1868.
Do	Chesapeake Bay, west shore, Horseshoe Shoal	1876	1-20,000	M. S. Wood, U. S. N	1888.
Do	Chesapeake Bay, Hampton Roads, Thimble Shoal Light to Newport News and Craney Island Light.	1188	1-20,000	R. Platt, U. S. N.	1873.
Do	Chesapeake Bay, Hampton Roads to Newport News and Norfolk.	447	1-20,000	J. J. Almy, U. S. N.	1854.
Do	Chesapeake Bay, James River entrance and Nansemond River to Suffolk.	1213	1-10,000	R. Platt, U. S. N.	1874.
Do	Chesapeake Bay, James River, Newport News Point.	877	1-10,000	E. Hergesheimer	1865.
Do	Chesapeake Bay, James River, Craney Island to Mulberry Island.	529	1-20,000	J. N. Moffitt, U. S. N.	1854-55.
Do	Chesapeake Bay, James River, Newport News to Point of Shoals Light.	1179 *a*	1-20,000	J. W. Donn	1871-72.
Do	Chesapeake Bay, James River, Point of Shoals Light to Cobham Bay.	1179 *b*	1-20,000	do	1873.
Do	Chesapeake Bay, James River, Mulberry Island to Jamestown Island.	530	1-20,000	J. N. Moffitt, U. S. N.	1855.
Do	Chesapeake Bay, James River, Jamestown Island to Dancing Point.	615	1-20,000	do	1855.
Do	Chesapeake Bay, James River, Jamestown Island to Sandy Point.	1229	1-20,000	J. W. Donn	1874.
Do	Chesapeake Bay, James River, Chickahominy River mouth to Shipyard Landing.	1225 *a*	1-20,000	do	1873-74.
Do	Chesapeake Bay, James River, Chickahominy River, Shipyard Landing to Forge Bridge.	1225 *b*	1-20,000	do	1875.
Do	Chesapeake Bay, James River, Dancing Point to Dunmon.	616	1-10,000	J. N. Moffitt, U. S. N.	1857.
Do	Chesapeake Bay, James River, Sandy Point to City Point.	1269	1-20,000	J. W. Donn	1875.
Do	Chesapeake Bay, James River, Little Brandon to Wyanoke Wharf.	634	1-10,000	J. N. Moffitt, U. S. N.	1857.
Do	Chesapeake Bay, James River, Wyanoke Wharf, Coggins Point.	705	1-10,000	W. T. Muse, U. S. N.	1859.
Do	Chesapeake Bay, James River, Harrison Bar	331	1-10,000	R. Wainwright, U. S. N.	1852.
Do	Chesapeake Bay, James River, Coggins Point to Bermuda Hundred.	395	1-10,000	do	1853.
Do	Chesapeake Bay, James River, Appomattox River, City Point upward.	2147	1-10,000	C. H. Boyd	1892.
Do	Chesapeake Bay, James River, Appomattox River, City Point to Broadway.	316	1-5,000	R. Wainwright, U. S. N.	1852.
Do	Chesapeake Bay, James River, Appomattox River to Petersburg.	2126	1-10,000	C. H. Boyd	1892.
Do	Chesapeake Bay, James River, Appomattox River, Broadway to Hares Bar.	315	1-5,000	R. Wainwright, U. S. N.	1852.
Do	Chesapeake Bay, James River, Appomattox River, Hares Bar to Petersburg.	314	1-5,000	do	1852.
Do	Chesapeake Bay, James River, Appomattox River, near Petersburg.	279	1-10,000	do	1851.
Do	Chesapeake Bay, James River, City Point to Curl Wharf.	1466 *a*	1-10,000	J. W. Donn	1880.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
Virginia	Chesapeake Bay, James River, Bermuda Hundred to Turkey Island.	394	1-5,000	R. Wainwright, U. S. N.	1853.
Do	Chesapeake Bay, James River, Turkey Island to Curl Wharf.	393	1-5,000	....do	1853.
Do	Chesapeake Bay, James River, Curl Wharf to Drury Bluff.	1466 *b*	1-10,000	J. W. Donn	1880.
Do	Chesapeake Bay, James River, Curl Wharf to near Dutch Gap.	392	1-5,000	R. Wainwright, U. S. N.	1853.
Do	Chesapeake Bay, James River, vicinity of Dutch Gap.	391	1-5,000	....do	1853.
Do	Chesapeake Bay, James River, Trent Reach Bar	340	1-5,000	....do	1853.
Do	Chesapeake Bay, James River (*same as No. 340*)	343			
Do	Chesapeake Bay, James River, near Dutch Gap to Warwick Bar.	390	1-5,000	R. Wainwright, U. S. N.	1853.
Do	Chesapeake Bay, James River, Drury Bluff to Mayo Bridge.	1467	1-10,000	J. W. Donn and U. S. Engineers.	1879-80.
Do	Chesapeake Bay, James River, Warwick Bar to Albro Creek.	341	1-5,000	R. Wainwright, U. S. N.	1852-53.
Do	Chesapeake Bay, James River, Albro Creek to Mayo Bridge.	342	1-5,000	....do	1852-53.
Do	Chesapeake Bay, Elizabeth River, Craney Island and vicinity.	1220	1-5,000	J. B. Baylor	1874.
Do	Chesapeake Bay, Elizabeth River, Tanner Creek to Fort Norfolk.	1515 *a*	1-10,000	E. B. Thomas, U. S. N	1882.
Do	Chesapeake Bay, Elizabeth River, Tanner Creek	1187 *a*	1-10,000	R. Platt, U. S. N.	1873.
Do	Chesapeake Bay, Elizabeth River, Craney Island to Norfolk.	1186 *b*	1-10,000	....do	1872-73.
Do	Chesapeake Bay, Elizabeth River, West Branch	1187 *b*	1-10,000	....do	1873.
Do	Chesapeake Bay, Elizabeth River, Fort Norfolk to navy-yard.	1515 *b*	1-10,000	C. M. Chester and E. Thomas, U. S. N.	1882.
Do	....do	448	1-10,000	J. J. Almy, U. S. N	1854.
Do	Chesapeake Bay, Elizabeth River, Norfolk to navy-yard.	1186 *a*	1-5,000	R. Platt, U. S. N.	1872-73.
Do	Chesapeake Bay, Elizabeth River, Washington Point to navy-yard.	894	1-2,500	....do	1866.
Do	Chesapeake Bay, Elizabeth River, navy-yard to base line.	1185 *b*	1-5,000	....do	1872-73.
Do	Chesapeake Bay, Elizabeth River, navy-yard to Chesapeake and Albemarle Canal.	1579 *a*	1-20,000	G. C. Hanus, U. S. N.	1884.
Do	Chesapeake Bay, Elizabeth River, base line to Chesapeake and Albemarle Canal.	1185 *a*	1-10,000	R. Platt, U. S. N.	1873.
Do	Chesapeake Bay, Elizabeth River, Chesapeake and Albemarle Canal and head of North Landing River.	1579 *b*	1-20,000	G. C. Hanus, U. S. N.	1884.
Do	Chesapeake Bay, Lynn Haven Bay, and Tail of Horseshoe.	2064	1-20,000	L. K. Reynolds, U. S. N.	1891.
Do	Chesapeake Bay, Lynn Haven Inlet	449	1-10,000	J. J. Almy, U. S. N.	1854.
Do	Chesapeake Bay, Oyster Beds, vicinity Onancock Creek.	1963	1-20,000	G. Bradford	1881.
Do	Chesapeake Bay, Oyster Beds, vicinity Pungoteague Creek.	1964	1-4,000	....do	1881.
Do	Chesapeake Bay, Oyster Beds, Tangier Sound	1441 *a*	1-40,000	F. Winslow, U. S. N.	1879.
Do	....do	1441 *b*	1-40,000	....do	1879.
Do	....do	1447 *a*	1-40,000	....do	1878.
Do	....do	1447 *b*	1-40,000	....do	1878.
Maryland	Chesapeake Bay and estuaries, densities of waters	1367 *a*	1-80,000	F. Collins, U. S. N.	1877.
Do	....do	1367 *b*	1-80,000	....do	1877.
Do	....do	1367 *c*	1-80,000	....do	1877.
Maryland and Virginia.	Boundary line between Maryland and Virginia (not a hydrographic sheet).	1319	1-80,000	W. J. Twining and U. S. Engineers.	1877.
	OUTSIDE WATERS FROM CAPE HENRY TO CAPE LOOKOUT.				
Virginia	Cape Henry to Sheep House Hill	520	1-40,000	J. J. Almy, U. S. N.	1855.
Do	Simmon Shoal, off False Cape	750	1-40,000	T. S. Phelps, U. S. N.	1861.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	OUTSIDE WATERS FROM CAPE HENRY TO CAPE LOOKOUT—continued.				
Virginia and North Carolina.	Sheephouse Hill to Kill Devil Hills	965	1-40,000	R. Platt, U. S. N.	1868.
North Carolina	Kill Devil Head to Loggerhead Inlet	1053	1-40,000	....do	1870.
Do	From Loggerhead Inlet to Cape Hatteras	1056	1-40,000	....do	1869-70.
Do	Cape Hatteras Shoals	244	1-20,000	T. A. Jenkins, U. S. N.	1850.
Do	....do	1135	1-20,000	R. Platt, U. S. N.	1871-72.
Do	....do	1136	1-40,000	....do	1872.
Do	Cape Hatteras Shoals, Outer Diamond Shoals	2092	1-20,000	C. E. Vreeland, U. S. N.	1891.
Do	....do	2184	1-20,000	L. M. Garrett, U. S. N.	1894.
Do	Offshore soundings near Cape Hatteras	2127	1-40,000	C. E. Vreeland, U. S. N.	1892.
Do	Cape Hatteras to Whale Bone Inlet	538	1-40,000	J. J. Almy, U. S. N.	1856.
Do	Ocracoke Inlet to Cape Lookout	1457	1-40,000	E. B. Thomas, U. S. N.	1880.
Do	Cape Lookout Shoals	885	1-40,000	R. Platt, U. S. N.	1865-66.
Do	....do	849	1-40,000	T. S. Phelps, U. S. N.	1864.
	INSIDE WATERS FROM CHESAPEAKE AND ALBEMARLE CANAL AND BACK BAY TO CAPE LOOKOUT.				
Virginia and North Carolina.	Back Bay, Sheep Marsh Island to North Bay	1583	1-20,000	G. C. Hanus, U. S. N.	1884.
North Carolina	North Landing River, Black Water to Halfway Point.	703	1-20,000	J. Mechan	1859.
Virginia and North Carolina.	Currituck Sound, near head (reconnaissance)	702	1-10,000	....do	1859.
Do	Currituck Sound, North Landing River to Lone Oak Channel.	1360	1-20,000	R. Wainwright, U. S. N.	1877.
North Carolina	Currituck Sound, Lone Oak Channel to Thoroughfare Channel.	258	1-20,000	....do	1851.
Do	Currituck, Albemarle, Roanoke, and Croatan sounds.	257	1-20,000	....do	1850-51.
Do	Albemarle Sound, Haulover to Wade Point	220	1-20,000	J. Alden	1849.
Do	Albemarle Sound, North River entrance to Beacon No. 10.	230	1-20,000	R. Wainwright, U. S. N.	1850.
Do	Albemarle Sound, Coanjock Cut from Coanjock Bay to North River.	1579 *c*	1-20,000	G. C. Hanus, U. S. N.	1884.
Do	Albemarle Sound, Pasquotank River entrance to bridge above Elizabeth City.	195	1-20,000	W. P. McArthur, U. S. N.	1847.
Do	Albemarle Sound, Wade Point to Scuppernong River.	198	1-20,000	....do	1848.
Do	Albemarle Sound, Little River entrance to Creek Point.	197	1-20,000	....do	1848.
Do	Albemarle Sound, Perquimans River entrance to Hertford.	196	1-20,000	....do	1848.
Do	Albemarle Sound, Scuppernong River to Edenton Bay.	219	1-20,000	T. A. Jenkins, U. S. N.	1849.
Do	Albemarle Sound, Hornblower Point to Black Walnut Point.	216	1-20,000	....do	1849.
Do	Albemarle Sound, Chowan River, Black Walnut Point to Coleran Wharf.	1230 *a*	1-20,000	R. E. Halter	1874.
Do	Albemarle Sound, Chowan River, Coleran Wharf, Herrell Landing.	1230 *b*	1-20,000	....do	1874.
Do	Albemarle Sound, Batchelor Bay, Roanoke River entrance.	828	1-10,000	J. S. Bradford	1864.
Do	Albemarle Sound, Roanoke River delta	822	1-10,000	....do	1864.
Do	Albemarle Sound, Bull Bay, Scuppernong River	217	1-20,000	T. A. Jenkins, U. S. N.	1849.
Do	Albemarle Sound, Alligator River entrance to Bear Point.	218	1-20,000	J. Olden, U. S. N.	1849.
Do	Albemarle Sound, Alligator River, Bear Point to Blunts Canal.	1315	1-20,000	R. Wainwright, U. S. N.	1876.
Do	Albemarle Sound, East, South, and Alligator lakes	1361	1-20,000	....do	1877.
Do	Croatan Sound, Caroon Point to Benton Islands	1180 *b*	1-20,000	F. F. Nes	1873.
Do	Croatan Sound, Croatan Light to Roanoke Marshes Light.	1540	1-20,000	F. A. Wilner, U. S. N.	1883.
Do	Croatan Sound, channel from Croatan Light to Fulker Island.	836 *b*	1-20,000	J. S. Bradford	1864.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	INSIDE WATERS FROM CHESAPEAKE AND ALBEMARLE CANAL AND BACK BAY TO CAPE LOOKOUT—continued.				
North Carolina....	Croatan Sound, Ashby Harbor to Roanoke Marshes Light.	836 *a*	1-20,000	J. S. Bradford............	1864.
Do............	Pamplico Sound, northern part, Roanoke Sound to Loggerhead Inlet.	1180 *a*	1-20,000	F. F. Nes..................	1873.
Do............	Pamplico Sound, Oregon Inlet......................	762	1-10,000	H. Mitchell................	1862.
Do............	Pamplico Sound, Oregon Inlet to Gibbs Shoal........	1363 *a*	1-40,000	R. Wainwright, U. S. N....	1875-76-77.
Do............	Pamplico Sound, Stumpy Bay to Long Shoal.........	1362 *b*	1-20,000	.....do.....................	1876-77.
Do............	Pamplico Sound, outer end Long Shoal (reconnaissance).	887	1-10,000	J. S. Bradford.............	1866.
Do............	Pamplico Sound, Gull Island and vicinity...........	1363 *b*	1-40,000	R. Wainwright, U. S. N...	1877.
Do............	Pamplico Sound, vicinity of Cape Hatteras..........	672	1-40,000	W. T. Muse, U. S. N........	1858.
Do............	Pamplico Sound, Hatteras Inlet......................	1565	1-10,000	J. E. Pillsbury, U. S. N.....	1884.
Do............	.....do..	235	1-50,000	T. A. Jenkins, U. S. N.....	1850.
Do............	.....do..	322	1-10,000	R. Wainwright, U. S. N....	1852.
Do............	.....do..	612	1-10,000	W. T. Muse, U. S. N........	1857.
Do............	Pamplico Sound, Hatteras Inlet, inner bulkhead (reconnaissance).	612 *bis*	1-10,000	G. A. Fairfield and A. Strausz.	1864.
Do............	Pamplico Sound, Hatteras Inlet......................	763	1-10,000	T. S. Phelps, U. S. N.......	1861.
Do............	Pamplico Sound, Long Shore Point to Middleton Anchorage.	1362 *a*	1-20,000	R. Wainwright, U. S. N....	1875-76.
Do............	Pamplico Sound, Gibbs Point to Bluff Shoal..........	1254	1-20,000	H. O. Handy, U. S. N......	1875.
Do............	Pamplico Sound, vicinity of Ocracoke Inlet..........	661	1-20,000	W. T. Muse, U. S. N........	1857-58.
Do............	Pamplico Sound, Ocracoke Inlet......................	1364	1-20,000	R. Wainwright, U. S. N....	1877.
Do............	.....do..	321	1-10,000	.....do.....................	1852.
Do............	.....do..	613	1-20,000	W. T. Muse, U. S. N........	1857.
Do............	Pamplico Sound, Hog Island to Juniper Point........	1226 *b*	1-20,000	F. F. Nes..................	1874.
Do............	Pamplico Sound, Middle Ground, Bluff Shoal to Brant Shoal.	1227	1-40,000	.....do.....................	1874.
Do............	Pamplico Sound, Juniper Bay Point to Rose Bay.....	1226 *a*	1-20,000	.....do.....................	1874.
Do............	Pamplico Sound, Brant Island to Neuse River Light..	1010	1-20,000	.....do.....................	1869.
Do............	Pamplico Sound, Pamplico River, entrance to Indian.	1088	1-20,000	.....do.....................	1870.
Do............	Pamplico Sound, Pungo River, Wade Point, Duran Point.	1140 *a*	1-20,000	.....do.....................	1872.
Do............	Pamplico Sound, Pungo River, Duran Point to head of river.	1140 *b*	1-20,000	.....do.....................	1872-74.
Do............	Pamplico Sound, Pamplico River, Adams Point to Rumley Marsh.	1099	1-20,000	.....do.....................	1871.
Do............	Pamplico Sound, Pamplico River, Rumley Marsh, Maul Point.	1100	1-20,000	.....do.....................	1871.
Do............	Pamplico Sound, Pamplico River, Maul Point to Rodman Point.	1101	1-20,000	.....do.....................	1871.
Do............	Pamplico Sound, Pamplico River, Cedar Grove to Tar River.	1132	1-10,000	.....do.....................	1872.
Do............	Pamplico Sound, Bay River, Ball Island to Mill Pond.	1011	1-20,000	.....do.....................	1869.
Do............	Pamplico Sound, Neuse River Light to Gasbacon Shoal.	974	1-20,000	J. S. Bradford.............	1868.
Do............	Pamplico Sound, Neuse River, South River, Turnagain and Rattan Bay.	975	1-20,000	J. S. Bradford and F. F. Ness.	1868-69.
Do............	Pamplico Sound, Neuse River, Cedar Point to Cherry Point.	963	1-20,000	J. S. Bradford.............	1868.
Do............	Pamplico Sound, Neuse River, Cherry Point to Johnson Point.	956	1-20,000	.....do.....................	1867-68.
Do............	Pamplico Sound, Neuse River, Johnson Point to Fort Anderson.	892	1-10,000	.....do.....................	1866.
Do............	Pamplico Sound, Neuse River, Quarantine Station to Fort Anderson.	845	1-20,000	A. Strausz.................	1863-64.
Do............	Pamplico Sound, Royal Shoal Light to Brant Shoal and Core Sound.	1083	1-40,000	J. S. Bradford.............	1866-69-70.
Do............	Pamplico Sound, Core Sound and Cedar Island Bay..	1079	1-20,000	F. F. Nes..................	1870.
Do............	Core Sound, Harbor Bar Light to White Point........	1347	1-20,000	J. F. Moser, U. S. N.......	1877.

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	INSIDE WATERS FROM CHESAPEAKE AND ALBEMARLE CANAL AND BACK BAY TO CAPE LOOKOUT—continued.				
North Carolina....	Core Sound, Pamplico Sound to Davis Island.........	855	1-40,000	E. Cordell.................	1864.
Do............	Core Sound, White Point to Bell Point...............	1316 *b*	1-20,000	J. M. Grimes..............	1876.
Do............	Core Sound, Davis Island to Beaufort................	854	1-20,000	E. Cordell..................	1864.
Do............	Core Sound, Bell Point to Middle Marshes...........	1316 *a*	1-20,000	J. M. Grimes, U. S. N.......	1876.
	CAPE LOOKOUT TO CAPE FEAR.				
North Carolina....	Cape Lookout to Rock Point, Bogue Sound..........	577	1-40,000	C. R. P. Rodgers, U. S. N...	1857.
Do	Cape Lookout to Beaufort	419	1-10,000	J. N. Maffitt, U. S. N.......	1854.
Do............	Lookout Bight	1391	1-5,000	F. Collins, U. S. N..........	1878.
Do............	Beaufort Bar..	576	1-10,000	C. R. P. Rodgers, U. S. N...	1857.
Do............	Beaufort Harbor	259	1-10,000	J. N. Maffitt, U. S. N........	1850.
Do............	.....do	856	1-10,000	E. Cordell	1864.
Do............	Beaufort Harbor entrance............................	246	1-10,000	J. N. Maffitt, U. S. N	1850.
Do............	Beaufort Harbor	789	1-10,000	A. Boschke	1862.
Do............	Beaufort Harbor, vicinity Fort Macon (special survey)	789 *bis*	1-2,400	A. Strausz	1863.
Do............	Beaufort Harbor and adjacent waters................	1219	1-20,000	W. I. Vinal..................	1874.
Do............	Beaufort Harbor and Bogue Sound to Carolina City..	418	1-10,000	J. N. Maffitt, U. S. N........	1854.
Do............	Newport River and estuaries........................	1203	1-20,000	W. I. Vinal..................	1874.
Do............	Bogue Sound, Carolina City to Hunting Island.......	1348	1-20,000	J. F. Moser, U. S. N	1877.
Do............	Rocky Point (Bogue Sound) to New River Inlet......	644	1-40,000	A. Murray, U. S. N..........	1858-59.
Do............	Bogue Inlet...	2066	1-10,000	W. C. Hodgkins	1888.
Do............	Bear and Brown Inlet	2065	1-10,000	.....do	1888.
Do............	New River Inlet to Queen Inlet....	1456	1-40,000	E. B. Thomas, U. S. N......	1880.
Do........	New River Inlet and Bar	280	1-10,000	J. N. Maffitt, U. S. N........	1851.
Do............	New River Inlet (reconnaissance)	1841	1-10,000	W. C. Hodgkins	1888.
Do............	Topsail Sound, Sloop Point to Topsail Inlet and Old Topsail Inlet.	*711	1-20,000	J. Mecham	1857-58.
Do	Queen Inlet to Federal Point, Wrightsville and Masonboro inlets.	1423	1-40,000 1-10,000	J. F. Moser and R. Wainwright, U. S. N.	1879-87.
Do............	Frying Pan Shoals....................................	277	1-20,000	T. A. Jenkins, U. S. N......	1851.
Do............	Frying Pan Shoals (duplicate of No. 277)............	306	....	....	
Do............	Frying Pan Shoal......................................	1517	1-40,000	W. H. Brownson, U. S. N..	1882.
Do............	Cape Fear to Tubbs Inlet.............................	685	1-40,000	J. P. Bankhead, U. S. N....	1859.
Do............	Cape Fear River entrance, New Inlet................	1769	1-10,000	J. E. Pillsbury, U. S. N....	1887.
Do............	.....do	278	1-10,000	J. N. Maffitt, U. S. N.......	1851.
Do............	Cape Fear River entrance, New Inlet Bar...........	370	1-10,000	.....do	1852.
Do............	.....do	618	1-10,000	.....do	1856.
Do............	.....do	621	1-10,000	.....do	1857.
Do............	Cape Fear River entrance, New Inlet................	643	1-10,000	T. B. Huger, U. S. N........	1858.
Do............	.....do	875	1-10,000	J. S. Bradford.............	1865.
Do............	.....do	1134	1-10,000	W. I. Vinal................	1872.
Do............	Cape Fear River entrance...........................	372	1-10,000	J. N. Maffitt, U. S. N.......	1852.
Do............	.....do	619	1-10,000	.....do	1856.
Do............	Cape Fear River entrance, Bar......................	642	1-10,000	T. B. Huger, U. S. N	1858.
Do............	.....do	624	1-10,000	J. N. Maffitt, U. S. N.......	1857.
Do............	Cape Fear River entrance...........................	870	1-10,000	J. S. Bradford.............	1865.
Do............	Cape Fear River entrance, Inner Bar................	1014	1-5,000	F. F. Nes...................	1870.
Do............	Cape Fear River entrance...........................	1089	1-5,000	R. Platt, U. S. N............	1869.
Do............	.... do	1128 *a*	1-10,000	W. I. Vinal................	1872.
Do............	.....do	1128 *b*	1-10,000	.....do	1874.
Do.	Cape Fear River entrance, Swash Channel.........	1190 *a*	1-10,000	.....do	1873.
Do............	Cape Fear River entrance...........................	1547	1-10,000	F. A. Wilner, U. S. N......	1883.
Do............	Cape Fear River, channel from Fort Caswell to Battery Island.	876	1-10,000	J. S. Bradford	1866.
Do............	Cape Fear River, Zekes Island to Campbell Island...	374	1-10,000	J. N. Maffitt, U. S. N.......	1853.
Do............	Cape Fear River, plan of final attack on Fort Fisher.	* 1995	1-5,000	.....do	1865.
Do............	Cape Fear River, Peters Point to Ballast Rock........	1190 *b*	1-10,000	W. I. Vinal	1873.
Do............	Cape Fear River, Ballast Rock to Redmon Creek....	1191 *a*	1-10,000	.....do	1873.
Do............	Cape Fear River, Campbell Island to Brunswick River entrance.	416	1-10,000	J. N. Maffitt, U. S. N.......	1853.

* Topographic number.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	CAPE LOOKOUT TO CAPE FEAR—continued.				
North Carolina....	Cape Fear River, Brunswick River entrance to railroad bridge.	375	1-5,000	J. N. Maffitt, U. S. N.......	1853.
Do............	Cape Fear River, Redmon Creek to Wilmington......	1191 *b*	1-10,000	W. I. Vinal................	1873.
	OYSTER INVESTIGATION SHEETS, CAROLINA SOUNDS.				
North Carolina....	Pamplico Sound..................................	1856	1-10,000	F. Winslow, U. S. N.......	1886.
Do............	Pamplico Sound, northern part.....................	1862	1-10,000	.....do....................	1886.
Do............	.....do..	1863	1-10,000	.....do....................	1886.
Do............	.....do..	1864	1-10,000	.....do....................	1886.
Do............	Pamplico Sound, eastern part......................	1865	1-10,000	.....do....................	1886.
Do............	Pamplico Sound, Hatteras Inlet and vicinity.........	1866	1-20,000	.....do....................	1877-78.
Do............	Pamplico Sound, Long Shoal Point to Middletown...	1867	1-20,000	.....do....................	1887.
Do............	Pamplico Sound, Middletown to Juniper Bay Point..	1868	1-20,000	.....do....................	1887.
Do............	Pamplico Sound, Juniper Bay Point to Bell Bay......	1869	1-20,000	.....do....................	1887.
Do............	Pamplico Sound, Hatteras Inlet to Fishammock △...	1870	1-20,000	.....do....................	1887-88.
Do............	Pamplico Sound, Ocracoke Inlet and vicinity.........	1871	1-20,000	.....do....................	1887-88.
Do............	Pamplico Sound, Pamplico Light to Neuse River Light.	1872	1-20,000	.....do....................	1888.
Do............	Cedar Island Bay..................................	1857	1-10,000	.....do....................	1886.
Do............	.....do..	1858	1-10,000	.....do....................	1886.
Do............	.....do..	1859	1-10,000	.....do....................	1886.
Do............	Thoroughfare Bay..................................	1854	1-10,000	.....do....................	1886.
Do............	Core Sound..	1851	1-10,000	.....do....................	1886.
Do............	.....do..	1853	1-10,000	.....do....................	1886.
Do............	.....do..	1855	1-10,000	.....do....................	1886.
Do............	Nelson Bay..	1852	1-10,000	.....do....................	1886.
Do............	Back Sound..	1849	1-10,000	.....do....................	1886.
Do............	The Straits.......................................	1850	1-10,000	.....do....................	1886.
Do............	North River.......................................	1848	1-10,000	.....do....................	1886.
Do............	Newport River, lower part.........................	1847	1-10,000	.....do....................	1886.
Do............	Newport River, upper part.........................	1846	1-10,000	.....do....................	1886.
Do............	White Oak River...................................	1860	1-10,000	.....do....................	1886.
Do............	New River...	1861	1-10,000	.....do....................	1886.
	CAPE FEAR TO MOSQUITO INLET.				
North Carolina and South Carolina.	Tubb Inlet to Eight Mile Swash.....................	1393 *a*	1-40,000	J. F. Moser, U. S. N........	1878.
Do............	Little River Inlet and River to Calabash Creek.......	1393 *b*	1-20,000	.....do....................	1878.
South Carolina....	Eight Mile Swash to Winyah entrance...............	1419	1-40,000	.....do....................	1878-79.
Do............	Georgetown Light to Cape Romain...................	350	1-20,000	T. A. Craven, U. S. N.......	1852.
Do............	Georgetown Bar....................................	533	1-20,000	J. N. Maffitt, U. S. N.......	1856.
Do............	Georgetown Bar and Harbor.........................	371	1-10,000	.....do....................	1853.
Do............	Winyah Bay entrance...............................	1318	1-20,000	C. F. Hutchins, U. S. N.....	1876.
Do............	Winyah Bay and Georgetown Harbor..................	373	1-10,000	J. N. Maffitt, U. S. N.......	1853.
Do............	Sampit River......................................	1412	1-5,000	J. F. Moser, U. S. N........	1879.
Do............	Santee River entrance.............................	1675	1-10,000	G. C. Hanus, U. S. N.......	1886.
Do............	Santee River entrance up 3 miles..................	1194	1-10,000	W. H. Dennis...............	1873.
Do............	Santee River, Little Crow and Cedar islands, up about 4 miles.	1193 *b*	1-10,000	.....do....................	1873.
Do............	Santee River, upper part to Causeway Canal........	1193 *a*	1-10,000	.....do....................	1873.
Do............	Cape Romain and vicinity..........................	1551	1-10,000	J. T. Sullivan, U. S. N......	1883.
Do............	Romain River, creeks and bays in vicinity of Cape Romain.	1238 *b*	1-10,000	W. H. Dennis...............	1874.
Do............	.....do..	1238 *a*	1-10,000	.....do....................	1874.
Do............	Cape Romain to Charleston entrance................	626	1-40,000	J. N. Maffitt, U. S. N.......	1857.
Do............	Bull Bay..	683	1-20,000	J. P. Bankhead, U. S. N....	1859.
Do............	.....do..	1674	1-20,000	G. C. Hanus, U. S. N.......	1886.
Do............	Bull Bay, inland waters...........................	1276 *a*	1-10,000	W. H. Dennis...............	1875.
Do............	.....do..	1276 *b*	1-10,000	.....do....................	1875.
Do............	Bull Bay and Caper Inlet, inland waters............	1277 *a*	1-10,000	.....do....................	1875.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	CAPE FEAR TO MOSQUITO INLET—continued.				
South Carolina....	Pricer, Caper, and Dewee inlets	1680	1-10,000	G. C. Hanus, U. S. N	1886.
Do	Caper Inlet to Beach Inlet, inland waters	1277 *b*	1-10,000	W. H. Dennis	1875.
Do	Charleston to Savannah River (compiled)	649	1-40,000	J. N. Maffitt, U. S. N	1853-57.
Do	Charleston Bar	874	1-20,000	C. O. Boutelle	1865.
Do	Charleston entrance and harbor	254	1-10,000	J. N. Maffitt, U. S. N	1851.
Do	Charleston entrance, Pumpkin Hill Channel	625	1-10,000	....do	1857.
Do	Charleston entrance and bar to harbor	536	1-5,000	....do	1852.
Do	Charleston Bar	852	1-20,000	W. S. Edwards and F. P. Webber.	1863-64.
Do	....do	2221	1-20,000	L. M. Garrett, U. S. N	1895.
Do	Charleston Bar, main channel	981	1-20,000	R. E. Halter	1869.
Do	Charleston Bar	1656	1-20,000	G. C. Hanus, U. S. N	1886.
Do	Charleston entrance, Beach Channel	411	1-10,000	J. N. Maffitt, U. S. N	1854.
Do	....do	476	1-5,000	....do	1855.
Do	....do	532	1-5,000	....do	1856.
Do	....do	623	1-5,000	....do	1857.
Do	....do	718	1-10,000	J. P. Bankhead, U. S. N	1860.
Do	Charleston Harbor	2222	1-10,000	L. M. Garrett, U. S. N	1895.
Do	....do	881	1-10,000	C. O. Boutelle	1865.
Do	Wando River mouth to half a mile above Ralston Creek.	2190	1-10,000	R. G. Peck, U. S. N	1894.
Do	Cooper River, Shipyard Creek to Woods Point	2189	1-10,000	....do	1894.
Do	Ashley River, near bridge to narrows above Bull Creek.	2187	1-10,000	....do	1894.
Do	Ashley River, narrows above Bull Creek to Lambs	2188	1-10,000	....do	1895.
Do	Light-House Inlet and inland passage to Folly River.	853	1-10,000	F. P. Webber	1864.
Do	Stone Inlet, Kiawah and Folly rivers	803	1-20,000	C. O. Boutelle	1862.
Do	North Edisto Harbor, Bar, and River	272	1-20,000	J. N. Maffitt, U. S. N	1851.
Do	North Edisto River approaches	534	1-20,000	....do	1855-56.
Do	Wadmalaw and Stono rivers	1639	1-20,000	G. C. Hanus, U. S. N	1885.
Do	St. Helena Sound and Bar, South Edisto River and Bar.	620	1-15,000	J. N. Maffitt, U. S. N	1856-57.
Do	St. Helena Sound, vicinity Hunting Island	1349 *b*	1-20,000	J. F. Moser, U. S. N	1876.
Do	South Edisto River and adjacent waters	1349 *a*	1-20,000	....do	1875-76.
Do	Combahee and Ashepoo rivers and estuaries	1206	1-10,000	C. Hosmer	1873.
Do	Coosaw River, St. Helena Sound to Brickyard Creek	742	1-10,000	J. P. Bankhead, U. S. N	1860.
Do	Parrot Creek, Morgan River to Coosaw River, and part of Morgan River.	744	1-10,000	....do	1860.
Do	Bull and Combahee rivers and North Winbee Creek	1084	1-10,000 1-2,000	C. Hosmer and J. N. McClintock.	1871.
Do	Coosaw River	1155 *b*	1-10,000	C. Hosmer	1873.
Do	Inland passage, Coosaw River to Beaufort River	1155 *a*	1-20,000	....do	1872.
Do	Inland passage, Port Royal Bay and St. Helena Sound, Fripp Inlet Harbor and Stono River.	833	....	....	
South Carolina and Georgia.	Port Royal Sound to Wassaw Sound	966	1-40,000	C. O. Boutelle	1866.
South Carolina....	Port Royal Sound, entrance and bay	535	1-20,000	J. N. Maffitt, U. S. N	1855-56.
Do	Port Royal Sound, entrance	830	1-20,000	C. O. Boutelle	1863.
Do	....do	677	1-20,000	C. M. Fauntleroy, U. S. N	1859.
Do	Inland passage between Port Royal Sound and St. Helena Sound, Trenchard Inlet and Stono Creek.	832	1-10,000	W. S. Edwards	1863.
Do	Port Royal Sound and Broad River to Eutaw Creek	831	1-20,000	C. O. Boutelle	1862-63.
Do	Port Royal Sound and Beaufort River, Bay Point to Battery Creek.	2119	1-10,000	C. E. Vreeland, U. S. N	1892.
Do	Beaufort River, entrance to Beaufort	633	1-10,000	J. N. Maffitt, U. S. N	1855.
Do	Beaufort River, mouth to Little Marsh Island, on Perry Island shore.	802	1-10,000	W. S. Edwards	1862.
Do	Beaufort River, Paris Spit to Battery Creek	1521	1-10,000	W. H. Brownson, U. S. N	1882.
Do	Beaufort River, opposite Upper Beacon Light to Beaufort, Arches, Battery, and part of Chowan Creek.	834	1-10,000	W. S. Edwards	1862.
Do	Chowan, Jericho, and Ballast creeks	962	1-10,000	C. Hosmer	1868.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	CAPE FEAR TO MOSQUITO INLET—continued.				
South Carolina....	Beaufort River, Battery Creek to Old Fort, and including lower part of Battery Creek.	2120	1-10,000	C. E. Vreeland, U. S. N....	1892.
Do............	Brickyard Creek, Coosaw River to Beaufort..........	743	1-10,000	J. P. Bankhead, U. S. N....	1860.
Do............	Broad River, Eutaw Creek to Whale Island...........	869	1-10,000	R. E. Halter..............	1865.
Do............	Broad and Coosaw rivers............................	868	1-10,000	.....do..................	1865.
Do............	Checkessee River and Colleton River................	679	1-10,000	T. M. Fauntleroy, U. S. N..	1859.
Do............	Eutaw Creek, Checkeesee and Colleton rivers, Mackay Creek, and May River.	*1195	1-20,000	C. Hosmer................	1870-71.
Do............	Skull Creek, Claibogue Sound to Port Royal Sound...	805	1-10,000	C. O. Boutelle.............	1861-62.
South Carolina and Georgia.	Savannah River entrance and bar....................	439	1-20,000	J. N. Maffitt, U. S. N.......	1854.
Do............	Savannah River entrance............................	944	1-20,000	C. O. Boutelle.............	1866.
Do............	Savannah River entrance, Tybee Roads and Bar.....	269	1-20,000	J. N. Maffitt, U. S. N.......	1851.
Do............	Savannah River, entrance to upper end of Elba Island.	317	1-10,000	.....do....................	1852.
Do............	Savannah River entrance, Tybee Roads and Lazaretto Creek.	842	1-10,000	W. S. Edwards...........	1863.
Do............	Savannah River entrance, Claibogue Sound and part of Broad Creek.	804	1-10,000	.....do....................	1862.
Do............	Savannah River entrance, Cooper, New, Back, and Wright rivers.	*1196	1-20,000	C. Hosmer................	1870-71.
Do............	Savannah River entrance, Tybee Island Light to Oyster Beds Light.	2194	1-10,000	L. M. Garrett, U. S. N......	1894.
Do............	Savannah River entrance, Tybee Roads and Bar and channel to Savannah.	1264	1-5,000	J. M. Hawley, U. S. N., and U. S. Engineers.	1875-89.
Georgia..........	Savannah River entrance (dynamic chart)..........	1970	1-10,000	H. L. Marindin...........	1874.
South Carolina and Georgia.	Savannah River, Tybee Light to Elba Island........	945	1-10,000	C. O. Boutelle.............	1866.
Do............	Savannah River, Tybee Island to upper end of Elba Island.	267	1-10,000	J. N. Maffitt, U. S. N.......	1850.
Do............	Savannah River, opposite Fort Pulaski..............	807	1-10,000	C. O. Boutelle.............	1862.
Do............	Savannah River, Oyster Beds Light to Jones Island Beacon.	2195	1-10,000	L. M. Garrett, U. S. N......	1894.
Do............	Savannah River, Turtle Island to Duck Island........	1263 *b*	1-5,000	J. M. Hawley, U. S. N......	1875.
Do............	Savannah River, entrance east end Elba Island to Fig Island.	946	1-10,000	C. O. Boutelle.............	1865-66.
Do............	Savannah River, Jones Island Beacon to Savannah...	2196	1-10,000	L. M. Garrett.............	1894.
Do............	Savannah River, Elba Island and vicinity...........	1263 *a*	1-5,000	J. M. Hawley, U. S. N......	1875.
Do............	Savannah River, Elba Island to middle of Hutchins Island.	318	1-5,000	J. N. Maffitt, U. S. N.......	1851.
Do............	Savannah River, Elba Island to Onslow Island, Foure and Back rivers.	266	1-10,000	.....do....................	1851.
Do............	Savannah River, Fort Jackson and vicinity..........	1223 *b*	1-2,400	C. Hosmer................	1874.
Georgia..........	Savannah River, city front..........................	947	1-5,000	C. O. Boutelle.............	1865-66.
Do............	Savannah River, Savannah and vicinity..............	1223 *a*	1-2,400	C. Hosmer................	1874.
Do............	.....do..	1222 *b*	1-2,400	.....do....................	1874.
South Carolina and Georgia.	Savannah River, middle of Hutchins Island to Onslow Island.	319	1-5,000	J. N. Maffitt, U. S. N.......	1852.
Georgia..........	Savannah River, Cross Tides and vicinity............	1222 *a*	1-2,400	C. Hosmer................	1874.
South Carolina and Georgia.	Savannah River, Hutchins Island to upper end of Isla Island.	320	1-5,000	J. N. Maffitt, U. S. N.......	1852.
Georgia..........	Wassaw Sound entrance..............................	904 *a*	1-20,000	C. O. Boutelle.............	1864-66.
Do............	Wassaw Sound, confluence to Tybee and Wilmington rivers.	904 *b*	1-20,000	W. S. Edwards...........	1863.
Do............	Wilmington River and creeks in Romney Marshes...	617	1-5,000	J. N. Maffitt, U. S. N.......	1856.
Do............	Wilmington River and estuaries.....................	866	1-20,000	C. Fendall................	1866.
Do............	Ossabaw Sound, Ogeechee and Vernon rivers.........	733	1-20,000	T. S. Phelps, U. S. N.......	1860.
Do............	Ogeechee, Vernon, and Burnside rivers..............	867	1-20,000	C. Fendall................	1865.
Do............	St. Catherines Sound entrance......................	928	1-20,000	C. Junken................	1867.
Do............	St. Catherines Sound and estuaries..................	916	1-20,000	.....do....................	1867.
Do............	Sapelo approaches and bar..........................	691	1-20,000	C. M. Fauntleroy, U. S. N...	1859.
Do............	Sapelo Sound.......................................	659	1-10,000	J. H. Moore, U. S. N.......	1858.

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	CAPE FEAR TO MOSQUITO INLET—continued.				
Georgia	Sapelo Sound and adjacent waters	660	1-10,000	J. H. Moore, U. S. N.	1858.
Do	Doboy approaches	957	1-20,000	C. Junken	1868.
Do	Doboy Sound and bar (reconnaissance)	461	1-20,000	T. A. Craven, U. S. N	1854.
Do	Doboy Sound, part of Darien and North rivers and adjacent creeks.	964	1-10,000	C. Junken	1868.
Do	Inland passages between Sapelo and Doboy Sound	959	1-10,000	....do	1868.
Do	Altamaha Sound to St. Simon Sound	810	1-20,000	J. P. Bankhead, U. S. N.	1860.
Do	Inland passage between Doboy and St. Simon sounds.	1146	1-20,000	F. P. Webber	1872.
Do	St. Simon Sound entrance, bar, and harbor	537	1-10,000	S. D. Trenchard, U. S. N.	1856.
Do	St. Simon Sound entrance and bar	590	1-10,000	....do	1856-57.
Do	St. Simon Sound entrance	1775	1-10,000	J. E. Pillsbury, U. S. N.	1887.
Do	....do	1830	1-20,000	....do	1888.
Do	St. Simon Sound entrance, examination of outer bar.	2122	1-20,000	E. M. Hughes, U. S. N.	1892.
Do	....do	2178	1-20,000	L. M. Garrett, U. S. A.	1894.
Do	St. Simon Sound and Brunswick River to Brunswick Point.	548	1-10,000	S. D. Trenchard	1856.
Do	Brunswick River and Turtle River	575	1-10,000	....do	1856.
Do	Turtle River	587	1-10,000	....do	1857.
Do	St. Andrew Sound entrance	1333	1-20,000	R. E. Halter and F. P. Webber.	1869-72.
Do	....do	231	1-20,000	J. Rodgers, U. S. N.	1850.
Do	St. Andrew Sound and Jekyl Sound and vicinity	1020	1-20,000	R. E. Halter	1869.
Georgia and Florida.	St. Andrew Sound to Cumberland Sound	1062	1-20,000	C. Junken	1870.
Do	St. Mary River entrance and bar	591	1-10,000	S. D. Trenchard, U. S. N.	1855-57.
Do	St. Mary River Bar and Fernandina Harbor	479	1-20,000	R. Wainwright, U. S. N.	1855.
Do	St. Mary River entrance and bar	571	1-10,000	S. D. Trenchard, U. S. N.	1857.
Do	St. Mary River, Main Ship Channel	980	1-20,000	R. E. Halter	1869.
Do	St. Mary River entrance, river and bar (condemned, see No. 591).	550	1-10,000	S. D. Trenchard, U. S. N.	1857.
Do	St. Mary River Bar	1218 *b*	1-10,000	F. D. Granger	1874.
Do	....do	1218 *a*	1-10,000	....do	1874.
Do	St. Mary River Bar and Cumberland Channel	1218 *c*	1-10,000	J. C. Kennett, U. S. N.	1875-76.
Do	St. Mary River entrance and Fernandina Harbor	579	1-10,000	S. D. Trenchard, U. S. N.	1855-57.
Do	St. Mary River, Cumberland Sound to St. Marys	592	1-10,000	....do	1856.
Do	St. Mary River and estuaries	1112	1-10,000	F. P. Webber	1871.
Florida	Amelia River and tributaries	1111	1-10,000	....do	1871.
Do	Cumberland Sound, River, and tributaries	1063	1-20,000	C. Junken	1870.
Do	St. Mary River Bar to St. Johns River Bar	1110	1-20,000	F. P. Webber	1871.
Do	Nassau Sound, River, and tributaries	1113 *a*	1-10,000	....do	1871.
Do	Nassau River above Pumpkin Hill Creek	1113 *b*	1-10,000	....do	1871.
Do	St. Johns River Bar to Diego Plains	1224	1-20,000	F. D. Granger	1874.
Do	St. Johns River entrance and Fort George Inlet	351	1-10,000	T. A. Craven, U. S. N.	1853.
Do	St. Johns River Bar and Fort George Inlet	586	1-10,000	S. D. Trenchard, U. S. N.	1857.
Do	St. Johns River Bar (current chart)	511	1-10,000	....do	1855.
Do	St. Johns River Bar, entrance to Pablo Creek	1541	1-10,000	E. D. F. Heald, U. S. N., and U. S. Engineers.	1883-89.
Do	St. Johns River Bar to Nassau River, inland passage.	1147	1-10,000	F. P. Webber	1872.
Do	St. Johns River Bar, Mayport Mills to Brown Creek.	481	1-10,000	R. Wainwright, U. S. N.	1855.
Do	St. Johns River Bar, Pablo Creek to New Castle Island.	1542 *a*	1-10,000	E. D. F. Heald, U. S. N.	1883.
Do	St. Johns River Bar, Brown Creek to Point Suarrez.	482	1-10,000	R. Wainwright, U. S. N.	1855.
Do	St. Johns River Bar, Castle Island to Jacksonville.	1542 *b*	1-10,000	E. D. F. Heald, U. S. N.	1883.
Do	St. Johns River Bar, Point Suarrez to Winter Point.	484	1-10,000	R. Wainwright, U. S. N.	1855.
Do	St. Johns River Bar, Jacksonville to Lake Monroe	*2027	1-80,000	H. G. Ogden	1875.
Do	St. Johns River Bar, Jacksonville to Mandarin Point.	1384 *a*	1-20,000	....do	1876-77.
Do	St. Johns River Bar, Mandarin Point to St. Patricio.	1384 *b*	1-20,000	....do	1877.
Do	St. Johns River Bar, St. Patricio Point to Racey Point.	1389	1-20,000	W. I. Vinal	1878.
Do	St. Johns River Bar, Racey Point to San Mateo	1636	1-20,000	G. C. Hanus, U. S. N.	1885.
Do	St. Johns River Bar, Lake Monroe to Lake Washington.	*1512	1-80,000	E. Ellicott	1883.

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	CAPE FEAR TO MOSQUITO INLET—continued.				
Florida	Diego Plains to Matanzas Inlet	1266	1-40,000	R. D. Hitchcock, U. S. N	1875.
Do	St. Augustine Harbor and approaches	712	1-10,000	A. Murray, U. S. N.	1860.
Do	....do	711	1-10,000	....do	1860.
Do	St. Augustine and vicinity	1036	1-10,000	H. Anderson	1870.
Do	North and Guano rivers	1046	1-10,000	....do	1870.
Do	Spring off Matanzas Inlet	1267 *a*	1-5,000	R. D. Hitchcock, U. S. N	1875.
Do	....do	1267 *b*	1-10,000	....do	1875.
Do	Matanzas Inlet and River	1148 *b*	1-5,000	A. M. Harrison	1872.
Do	Matanzas River	1047	1-10,000	H. Anderson	1870.
Do	....do	1148 *a*	1-5,000	A. M. Harrison	1872.
Do	Matanzas Inlet to Mosquito Inlet	1365	1-40,000	J. C. Kennett, U. S. N	1876-77.
Do	Mosquito Inlet	260	1-20,000	J. Rodgers, U. S. N	1851.
Do	Mosquito Inlet and part of Hillsboro and Halifax rivers.	1289 *a*	1-5,000	L. B. Wright	1874.
Do	Halifax River and Rose Bay	1289 *b*	1-5,000	....do	1874.
Do	Spruce Creek and Strickland and Turnbull bays	1289 *c*	1-5,000	....do	1874.
Do	Halifax River	1232 *a*	1-5,000	A. M. Harrison	1874.
Do	....do	1232 *b*	1-5,000	....do	1874.
Do	....do	1232 *c*	1-5,000	....do	1874.
Do	....do	1233 *a*	1-5,000	....do	1874.
Do	Halifax River, part of Tomoka Creek	1233 *b*	1-5,000	....do	1874.
Do	Halifax River, head and tributaries	1234 *a*	1-5,000	....do	1874.
Do	Bulow Creek	1234 *b*	1-5,000	....do	1874.
	OUTSIDE WATERS FROM MOSQUITO INLET TO VIRGINIA KEY.				
Florida	Mosquito Inlet to False Cape	1409	1-40,000	C. M. Chester, U. S. N	1878.
Do	False Cape to Cape Canaveral	1410	1-20,000	....do	1878.
Do	Cape Canaveral Shoals (reconnaissance)	234	1-20,000	J. Rodgers, U. S. N	1850.
Do	Cape Canaveral Shoals	1411 *a*	1-20,000	C. M. Chester, U. S. N	1877.
Do	....do	1411 *b*	1-20,000	E. B. Thomas, U. S. N	1881.
Do	Cape Canaveral Shoals to Gibson Cut	1488 *a*	1-40,000	....do	1881.
Do	Gibson Cut to La Roche	1488 *b*	1-40,000	....do	1881.
Do	La Roche to St. Lucie Shoal	1523 *a*	1-40,000	....do	1882-83.
Do	St. Lucie Shoal to Jupiter Inlet	1523 *b*	1-40,000	....do	1882-83.
Do	Jupiter Inlet to abreast north end Hypoluxo Island	1552	1-40,000	H. B. Mansfield, U. S. N	1883.
Do	Abreast north end Hypoluxo Island to Hillsboro Inlet.	1553	1-40,000	....do	1883.
Do	Hillsboro Inlet to Virginia Key	1554	1-40,000	....do	1883.
	INSIDE WATERS FROM MOSQUITO INLET TO VIRGINIA KEY.				
Florida	Mosquito Inlet	260	1-20,000	J. Rodgers, U. S. N	1851.
Do	Mosquito Inlet and part of Hillsboro and Halifax rivers.	1289 *a*	1-5,000	L. B. Wright	1874.
Do	Hillsboro River and Mosquito Lagoon	1290	1-10,000	....do	1874-75.
Do	Mosquito Lagoon	1291	1-20,000	....do	1875.
Do	Haulover Canal between Indian River and Mosquito Lagoon.	*1415 *b*	1-5,000	T. A. Harrison	1875.
Do	Indian River, Addison Point to head of river, and Banana Creek.	1292	1-20,000	C. Hosmer	1875-76.
Do	Banana River, Duck Point to head, and part of Banana Creek.	1415 *a*	1-20,000	R. M. Bache	1878.
Do	Banana River, Duck Point to Mangrove Island	1415 *b*	1-20,000	....do	1878.
Do	Indian River, Addison Point to Oleander Point	1293	1-20,000	C. Hosmer	1876.
Do	Banana and Indian rivers and New Found Harbor	1380	1-20,000	....do	1876-77.
Do	Indian River, Banana River entrance to Rock Point	1416	1-20,000	R. M. Bache	1878.
Do	Rock Point to Duck Point	1491 *a*	1-20,000	W. I. Vinal	1881.
Do	Indian River, Duck Point to La Roche	1491 *b*	1-20,000	....do	1881.
Do	Indian River, La Roche to Indian River Inlet	1513 *a*	1-20,000	C. H. Boyd	1882.
Do	Indian River, Isle No. 1 to Fort Capron	1513 *b*	1-20,000	B. A. Colonna	1883.

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	INSIDE WATERS FROM MOSQUITO INLET TO VIRGINIA KEY—continued.				
Florida	Indian River Inlet	*785	1-10,041	C. Ferguson and J. S. Bradford.	1860-61.
Do	Indian River Inlet to Eden post-office	1570	1-20,000	B. A. Colonna	1883.
Do	Indian River and St. Lucie River to South Jupiter Narrows.	1571 *a*	1-20,000	....do	1883.
Do	Indian River, Prospect Inlet	1571 *b*	1-20,000	A. Mertz, U. S. N.	1894.
Do	Hobes Sound, Jupiter Sound, River, and Inlet, from South Jupiter Narrows to head of Lake Worth Creek.	1604 *a*	1-20,000	B. A. Colonna	1884.
Do	Lake Worth, from Little Lake Worth to Haulover	1604 *b*	1-40,000	....do	1884.
Do	Lakes Wyman and Boca Ratan, Hillsboro River and Inlet, and north part New River.	1605 *a*	1-10,000	....do	1884.
Do	New River and Inlet, and north end Biscayne Bay	1605 *b*	1-20,000	....do	1884.
Do	New River and mouth of Miami River	1545	1-20,000	O. H. Tittmann	1883.
Do	Key Biscayne Bay, Arch Creek to Bears Cut	1329	1-20,000	C. A. Bradbury, U. S. N.	1876.
	OUTSIDE WATERS FROM KEY BISCAYNE TO KEY WEST.				
Florida	Norris Cut to Sands Cut and upper part Key Biscayne Bay.	407	1-20,000	J. Rodgers, U. S. N	1852.
Do	Key Biscayne Bay and Florida Reefs, Sands Cut to Old Rhodes Bank.	369	1-20,000	T. A. Craven, U. S. N.	1853.
Do	Key Biscayne Bay and Card Sound	444	1-20,000	....do	1854.
Do	Pacific Reef to Carysfort Reef	443	1-20,000	....do	1854.
Do	Carysfort Reef to Grecian Shoal	568	1-20,000	....do	1855.
Do	Grecian Shoal to French Reef	553	1-20,000	....do	1856.
Do	Point Charles to middle of Upper Matecumbe Key	777	1-40,000	E. Cordell	1863.
Do	Middle of Upper Matecumbe Key to south end of Lower Matecumbe Key.	774	1-20,000	G. Davidson	1862.
Do	Tennessee Reef to Coffins Patches	773	1-20,000	J. Wilkinson, U. S. N.	1860.
Do	Coffins Patches to Boot Key	714	1-20,000	T. A. Craven, U. S. N.	1859.
Do	Coffins Patches	417	1-20,000	....do	1854.
Do	Boot Key to Bahia Honda	663	1-20,000	W. G. Temple, U. S. N.	1858.
Do	Bahia Honda to Sugar Loaf Key	669	1-20,000	T. A. Craven, U. S. N.	1857.
Do	Loggerhead Key to Eastern Sambo	650	1-20,000	....do	1856.
Do	Key West Harbor and approaches	281	1-20,000	J. Rodgers, U. S. N	1851.
Do	....do	248	1-20,000	....do	1850.
	FLORIDA KEYS TO THE RIO GRANDE.				
Florida	Florida Bay, Bond Sound, Card Sound to Upper Matecumbe Key.	2007	1-40,000	J. F. Moser, U. S. N	1890.
Do	Florida Bay, Bond Sound	*1154	1-40,000	T. G. Oltmans	1870.
Do	....do	*1071	1-30,000	C. T. Iardella	1868.
Do	Florida Bay, Upper Matecumbe Key to Vaca Keys and Cape Sable.	1927	1-40,000	J. F. Moser, U. S. N.	1859.
Do	Florida Bay, north of Rabbit Key	2008	1-40,000	....do	1890.
Do	Florida Bay approaches to Big Spanish and Knight Key channels.	1926	1-20,000	....do	1889-90.
Do	Florida Bay, Content Key to Northwest Cape	1827	1-40,000	....do	1888.
Do	Florida Bay, Content Key to Northwest Passage Light.	1828	1-40,000	....do	1888-89.
Do	Florida Bay, offshore soundings, Key West to Cape Romano Shoals.	1825	1-80,000	....do	1888.
Do	Florida Bay and Keys, Big Pine Key to Key West	2006	1-40,000	....do	1890.
Do	Boca Chica Key (additional lines)	779	1-20,000	E. Cordell	1863.
Do	Key West Harbor and Northwest Channel Bar	1518	1-10,000	W. H. Brownson, U. S. N.	1882.
Do	Key West Harbor	338	1-5,000	J. Rodgers, U. S. N.	1850-51-52.
Do	....do	287	1-5,000	....do	1850-51.
Do	Key West Harbor, Northwest Channel Bar	1925	1-10,000	J. F. Moser, U. S. N.	1889.
Do	Key West Harbor, northwest approaches	1131	1-80,000	R. Platt, U. S. N.	1872.
Do	Boca Grande Channel, Marquesas Keys and vicinity.	359	1-20,000	J. Rodgers, U. S. N.	1852.
Do	Boca Grande Channel, Marquesas Keys	282	1-20,000	....do	1851-52.

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	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Florida	Boca Grande Channel and approaches	912	1-40,000	R. Platt, E. D. F. Heald, and J. M. Hawley, U.S.N.	1876-85-86.
Do.	Marquesas Keys to Dry Tortugas Keys	954	1-80,000	R. Platt, U. S. N.	1867-68.
Do.	do	1076	1-80,000	do	1871.
Do.	Marquesas Keys to Rebecca Shoal	1052	1-40,000	do	1870.
Do.	Rebecca Shoal and line of soundings to Dry Tortugas.	313	1-30,000	J. Rodgers, U. S. N	1852.
Do.	Dry Tortugas Keys and approaches	955	1-40,000	R. Platt, U. S. N.	1867-68.
Do.	Dry Tortugas Keys	1271	1-20,000	do	1875.
Do.	Dry Tortugas Harbor	1199 *a*	1-5,000	J. A. Howell, U. S. N	1873.
Do.	do	1199 *b*	1-5,000	do	1873.
Do.	Northwest Cape to Pavilion Key	1826	1-40,000	J. F. Moser, U. S. N	1888.
Do.	Shark River to Lossmans River	2009	1-20,000	do	1890.
Do.	Lossmans River to Pavilion Key	2010	1-20,000	do	1890.
Do.	Pavilion Key to Sand Fly Pass	1774	1-40,000	do	1887.
Do.	Sand Fly Pass to Cape Romano	1773	1-40,000	do	1887.
Do.	Pavilion Key to Tiger Key	2011	1-20,000	do	1890.
Do.	Cape Romano to Gordens Pass	1642	1-40,000	E. D. F. Heald, U. S. N	1885.
Do.	Tiger Key to Cape Romano	2012	1-20,000	J. F. Moser, U. S. N.	1890.
Do.	Caximbas Pass and Bay, lower entrance Big Marco River.	2037	1-10,000	J. Hergesheimer	1890.
Do.	Big Marco Pass and River	2038	1-10,000	do	1890.
Do.	Gordens Pass to San Carlos Bay entrance	1592 *a*, *b*	1-40,000	H. B. Mansfield, U. S. N.	1889.
Do.	Sanibel Island, off shore	1478 *a*, *b*	1-40,000	C. M. Chester, U. S. N.	1879-80.
Do.	San Carlos Bay approaches	1479	1-20,000	do	1879-80.
Do.	San Carlos Bay and Caloosa entrance	917	1-20,000	W. S. Edwards	1866-67.
Do.	Pine Island Sound and Caloosahatchee approaches	908	1-20,000	C. T. Iardella	1866.
Do.	Caloosa River entrance	2153	1-10,000	W. I. Vinal	1893.
Do.	Caloosa River	2154	1-10,000	do	1893.
Do.	do	2155	1-10,000	do	1893.
Do.	Charlotte Harbor, Matlacha Pass	1480 *b*	1-20,000	C. M. Chester, U. S. N.	1879-80.
Do.	Charlotte Harbor, Pine Island Sound	1480 *a*	1-20,000	do	1879-80.
Do.	Charlotte Harbor, off shore	1477 *a*	1-40,000	do	1879-80.
Do.	Charlotte Harbor, off shore (outside of 1477 *a*)	1477 *b*	1-40,000	do	1879-80.
Do.	Charlotte Harbor approaches	1479 *b*	1-20,000	do	1879-80.
Do.	Charlotte Harbor, Boca Grande entrance	797 *a*	1-40,000	E. Cordell	1863.
Do.	Charlotte Harbor, Boca Grande entrance, inside	797 *b*	1-20,000	W. S. Edwards	1867.
Do.	Charlotte Harbor, Pine Island to Punta Gorda	1388 *a*	1-20,000	J. M. Hawley, U. S. N.	1878.
Do.	Charlotte Harbor, upper part, and Pea Creek	1388 *b*	1-20,000	do	1878.
Do.	Bocilla Pass to New Pass	1557 *b*	1-40,000	H. B. Mansfield, U. S. N	1883.
Do.	Lemon Bay, Bocilla Inlet to Stump Pass	1595 *a*	1-80,000	do	1884.
Do.	Lemon Bay, Stump Pass to head of bay	1595 *b*	1-20,000	do	1884.
Do.	New Pass to Longboat Inlet	1314 *a*	1-40,000	J. M. Hawley, U. S. N.	1886.
Do.	Little Sarasota Bay	1559 *b*	1-20,000	J. Hergesheimer	1883.
Do.	Sarasota Bay	1559 *a*	1-20,000	do	1883.
Do.	New Pass to Longboat Inlet	1314 *a*	1-40,000	J. M. Hawley, U. S. N.	1876.
Do.	Longboat Inlet and Bar	1314 *b*	1-40,000	do	1876.
Do.	Anna Maria Key, off shore, south of Tampa Bay	1486 *b*	1-40,000	E. B. Thomas, U. S. N.	1881.
Do.	Tampa Bay, off shore	1486 *a*	1-40,000	do	1881.
Do.	Tampa Bay approaches	1262	1-20,000	R. Platt, U. S. N.	1874-75.
Do.	Tampa Bay (reconnaissance)	478	1-60,000	O. H. Berryman, U. S. N.	1855.
Do.	Tampa Bay, Passage Key to Beacon No. 5	1235 *a*	1-20,000	Andrew Braid	1874.
Do.	Tampa Bay, Beacon No. 5 to Papys Bayou	1235 *b*	1-20,000	Andrew Braid and H. B. Mansfield, U. S. N.	1874-83.
Do.	Old Tampa Bay, Hillsboro Bay approaches, and Little Manatee and Big and Little bays.	1273	1-20,000	J. Hergesheimer and H. G. Ogden.	1875.
Do.	Hillsboro Bay	1313	1-20,000	J. M. Hawley, U. S. N.	1876.
Do.	Manatee River Bar	1555	1-10,000	H. B. Mansfield, U. S. N.	1883.
Do.	Manatee River, Palmasola Bay and Pass, Terra Ceia and McGill Bay and Bishop Harbor.	1272	1-20,000	Andrew Braid and J. Hergesheimer.	1874-75.
Do.	Boca Ceiga Bay, Tampa Bay to Johns Pass	1178 *a*	1-20,000	Andrew Braid	1873.
Do.	Boca Ceiga Bay, Johns Pass to Indian Pass	1178 *b*	1-20,000	do	1873.
Do.	Blind Pass to Big Pass	1557 *a*	1-40,000	H. B. Mansfield, U. S. N.	1883.

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	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Florida	Big Pass to Deer Island	1593 a, b	1-40,000	H. B. Mansfield, U. S. N.	1883.
Do	Clearwater Harbor	1174	1-20,000	H. G. Ogden	1873.
Do	Anclote River	1594	1-10,000	H. B. Mansfield, U. S. N.	1884.
Do	Deer Island to Rainbow Point	1760	1-40,000	J. M. Hawley, U. S. N.	1886.
Do	Rainbow Point to Chassahowitzka Bay	1761	1-40,000	do	1886.
Do	Chassahowitzka Bay, Crystal River	1770	1-40,000	J. F. Moser, U. S. N.	1887.
Do	Crystal River to Cedar Keys	1771	1-40,000	do	1887.
Do	Cedar Keys to Steinhatchee River	1928	1-80,000	do	1889.
Do	Waccasasa Bay	531	1-20,000	J. K. Duer, U. S. N.	1856.
Do	do	581	1-20,000	do	1857.
Do	Waccasasa Bay (compiled)	1641	1-20,000	O. H. Berryman and J. K. Duer, U. S. N., and F. W. Perkins.	1854-55-56-57-77.
Do	Cedar Keys	424	1-20,000	O. H. Berryman, U. S. N.	1854.
Do	do	512	1-20,000	do	1855.
Do	do	513	1-20,000	do	1855.
Do	Cedar Keys, channel near North Key	304	1-10,000	F. H. Gerdes	1852.
Do	Cedar Keys, Main, North Key, and West channels	668	1-10,000	T. B. Huger, U. S. N.	1858-59.
Do	Cedar Keys	713	1-10,000	J. J. Guthrie, U. S. N.	1860.
Do	Cedar Keys, Northwest and Sea-Horse channels (replotting of No. 713).	716	1-10,000	do	1860.
Do	Cedar Keys, Main Channel	1080	1-10,000	F. P. Webber	1871.
Do	Cedar Keys Harbor, examination of entrance bar	1772 a	1-20,000	J. F. Moser, U. S. N.	1887.
Do	Cedar Keys Harbor, examination of Middleground Cut.	1772 b	1-10,000	do	1887.
Do	Derrick Bay to Big Pine Island	1377 ab	1-20,000	F. W. Perkins	1877.
Do	Big Pine Island to Pepperfish Key	1376	1-20,000	do	1877.
Do	Pepperfish Key to Deadmans Bay	1280 b	1-20,000	do	1874-75.
Do	Deadmans Bay to Live Oak Point	1280 a	1-20,000	do	1875.
Do	Steinhatchee River to Dog Island	1929	1-80,000	J. F. Moser, U. S. N.	1889.
Do	Live Oak Point to Fenholloway River	1279 b	1-20,000	F. W. Perkins	1875.
Do	Fenholloway River to Ancilla River	1279 a	1-20,000	do	1875.
Do	Appalachee Bay, off shore	1332	1-40,000	K. Niles, U. S. N.	1876.
Do	Appalachee Bay, off Light-House Point	1489	1-40,000	E. B. Thomas, U. S. N.	1881.
Do	Appalachee Bay and Ancilla River approaches	517	1-10,000	O. H. Berryman, U. S. N.	1855.
Do	Appalachee Bay and Ancilla River to St. Mark River	1330 b	1-20,000	K. Niles, U. S. N.	1876.
Do	Appalachee Bay, St. Mark River to Ocklockonee Bay	1331 a	1-20,000	do	1876.
Do	Appalachee Bay, St. Mark River approaches	540	1-20,000	O. H. Berryman, U. S. N.	1856.
Do	Appalachee Bay, St. Mark River and Channel to railroad depot.	305	1-20,000	F. H. Gerdes	1852.
Do	Appalachee Bay, St. Mark River	541	1-10,000	O. H. Berryman, U. S. N.	1856.
Do	do	1330 a	1-10,000	K. Niles, U. S. N.	1875.
Do	Appalachee Bay, Ocklockonee Bay, Ocklockonee Point to Dog Island Reef.	1331 b	1-20,000	do	1876.
Do	Appalachee Bay, Ocklockonee Bay, Crooked River	1390	1-20,000	J. Hergesheimer	1878.
Do	St. Georges Sound, off shore, Southwest Cape to East Pass.	1156	1-20,000	H. Anderson	1872.
Do	St. Georges Sound, off shore, south end of St. George Island to Cape St. George.	1184	1-40,000	do	1873.
Do	Cape St. George to Cape San Blas	1265 b	1-40,000	H. Anderson and K. Niles, U. S. N.	1874-75.
Do	St. Georges Sound, Alligator Harbor to Dog Island	734	1-20,000	T. S. Phelps, U. S. N.	1860.
Do	St. Georges Sound, south of Dog Island, approaches	688	1-20,000	J. K. Duer, U. S. N.	1858-59.
Do	St. Georges Sound, East Pass	655	1-20,000	do	1858.
Do	St. Georges Sound, East Pass approaches	1509	1-20,000 1-10,000	W. H. Brownson, U. S. N.	1882.
Do	St. Georges Sound and Appalachicola Bay and East Bay (compiled).	1092 307	1-20,000 1-200,000	H. Anderson F. H. Gerdes	1871. 1862.
Do	Appalachicola Bay, West Pass	654	1-20,000	J. K. Duer, U. S. N.	1858.
Do	Appalachicola Bay	747	1-20,000	T. S. Phelps, U. S. N.	1860.
Do	Appalachicola Bay, Appalachicola River entrance	*601	1-20,000	G. D. Wise	1857.

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Florida	Appalachicola Bay, Appalachicola River entrance	687	1-20,000	J. K. Duer, U. S. N	1859.
Do	Appalachicola Bay, St. Vincent Sound	1241	1-20,000	H. Anderson	1874.
Do	Cape St. George to Cape San Blas	1511 *a*	1-40,000	W. H. Brownson, U. S. N.	1882.
Do	Cape St. George to Cape San Blas, off shore	1265 *b*	1-40,000	H. Anderson and K. Niles, U. S. N.	1874-75.
Do	Cape San Blas to St. Andrew Bay	1511 *b*	1-40,000	W. H. Brownson, U. S. N.	1881-82.
Do	Cape San Blas to St. Andrew Sound	1265 *a*	1-20,000	K. Niles, U. S. N	1875.
Do	St. Andrew Bay to Phillips Inlet	1373 *b*	1-40,000	R. D. Hitchcock, U. S. N	1877.
Do	St. Andrew Bay	514	1-20,000	O. H. Berryman, U. S. N	1855.
Do	St. Andrew Bay (additional soundings)	518	1-20,000	do	1856.
Do	St. Andrew Bay and entrance	1375	1-20,000	R. D. Hitchcock, U. S. N	1877.
Do	St. Andrew Bay, North and West arms	1374 *a*	1-20,000	do	1877.
Do	St. Andrew Bay, East Bay and Sound	1374 *b*	1-20,000	do	1877.
Do	Phillips Inlet to Santa Rosa Island	1373 *a*	1-40,000	do	1877.
Do	Choctawhatchee Bay, West End Narrows and Santa Rosa Sound.	1107	1-20,000	H. G. Ogden	1871.
Do	Choctawhatchee Bay	1141	1-20,000	do	1871.
Do	Choctawhatchee Bay to 15 miles east of Pensacola entrance.	1309	1-40,000	R. D. Hitchcock, U. S. N	1875-76.
Do	15 miles east of Pensacola entrance to Perdido River entrance.	1308	1-40,000	do	1875-76.
Do	Pensacola, entrance and bay	585	1-20,000	J. K. Duer, U. S. N	1856.
Do	Pensacola Bay entrance	1497	1-10,000	W. H. Brownson, U. S. N	1881.
Do	Pensacola Bay, near entrance	719	1-10,000	T. A. Craven, U. S. N	1860.
Do	Pensacola Bay, Santa Rosa Sound, Deer Point to Pritchard Long Point.	1108	1-20,000	H. G. Ogden	1871.
Do	Pensacola Bay	2186	1-10,000	A. Mertz	1894.
Do	do	2217	1-10,000	R. Peck, U. S. N.	1895.
Do	Pensacola Bay, Escambia Bay	732	1-20,000	T. S. Phelps, U. S. N	1860.
Do	do	2180	1-10,000	F. J. Swift, U. S. N.	1894.
Do	Pensacola Bay, Escambia Bay, proposed site for navy-yard.	1932	1-5,000	P. A. Walker	1889.
Do	Pensacola Bay, Escambia Bay, upper part	2013	1-10,000	do	1891.
Do	Pensacola Bay, East Bay	731	1-20,000	T. S. Phelps, U. S. N.	1860.
Do	do	2218	1-10,000	R. Peck, U. S. N.	1895.
Do	Pensacola Bay, East Bay, upper part	2219	1-10,000	do	1895.
Do	Pensacola Bay, Blackwater Bay, Blackwater River	2117	1-10,000	P. A. Walker	1892.
Do	Pensacola Bay	2135	1-10,000	do	1893.
Do	Pensacola Bay, East River	2182	1-10,000	F. J. Swift, U. S. N	1894.
Do	Pensacola Bay, bayous Texar and Chico	2088	1-10,000	P. A. Walker	1890.
Do	Pensacola Bay	2026	1-10,000	do	1889.
Do	Pensacola Bay, Big Lagoon	2181	1-10,000	F. J. Swift, U. S. N	1894.
Alabama	Perdido Bay, entrance to Little Lagoon	1310	1-40,000	R. D. Hitchcock	1875-76.
Florida and Alabama.	Perdido Bay entrance and Bayou St. John and Bay La Launch.	2017	1-10,000	S. Forney	1890.
Do	Perdido Bay	2018	1-10,000	do	1890.
Do	Perdido Bay, Bayou Garcon to head of bay	2074	1-10,000	do	1891.
Do	Perdido Bay and River to Blackwater River	2075	1-10,000	do	1891.
Alabama	Perdido Bay, Wolf Bay and tributaries	2073	1-10,000	do	1891.
Do	Little Lagoon to St. Andrew Bay	262	1-20,000	B. F. Sands, U. S. N	1851.
Do	Mobile Bay, approaches and entrance	192	1-20,000	C. P. Patterson, U. S. N	1847-48
Do	Mobile Bay entrance	2124	1-20,000	E. M. Hughes, U. S. N.	1892.
Do	Mobile Bay, entrance between Dauphin and Pelican islands.	361	1-20,000	B. Sands, U. S. N	1853.
Do	Mobile Bay entrance, Pelican Channel	467	1-20,000	do	1855.
Do	Mobile Bay, lower part	193	1-20,000	C. P. Patterson, U. S. N	1848.
Do	Mobile Bay, lower part, Grants Pass and entrance to Dredged Channel.	2125	1-20,000	E. M. Hughes, U. S. N.	1892.
Do	Mobile Bay, Bon Secour Bay	263	1-20,000	J. Alden, U. S. N	1851.
Do	Mobile Bay, Alabama Port to Great Point Clear	215	1-20,000	C. P. Patterson, U. S. N	1849.
Do	Mobile Bay, Great Point Clear to Dog River Point.	227	1-20,000	J. Alden, U. S. N	1850.
Do	Mobile Bay, upper part	214	1-10,000	C. P. Patterson, U. S. N	1849.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Alabama	Mobile Bay, Tensaw, Spanish, and Dog rivers	737	1-10,000	J. Wilkinson, U. S. N	1860.
Do	Mobile Bay, Dredged Channel, lower part	1613 *b*	1-20,000	E. D. F. Heald, U. S. N	1885.
Do	Mobile Bay, Dredged Channel, upper part	1613 *a*	1-20,000	.....do	1885.
Do	Mobile Bay, Dredged Channel	2128	1-20,000	E. M. Hughes, U. S. N	1892.
Do	Mobile Bay, upper part	228	1-10,000	J. Alden, U. S. N	1850.
Do	.....do	229	1-10,000	.....do	1850.
Do	Mobile Bay (current chart)	1969	{1-20,000 1-40,000}	H. Mitchell	1860.
Do	Mobile Bay, Mobile River, Spanish River to Bayou Carnot.	1909	1-5,000	J. H. Turner	1888.
Do	Mobile Bay, Mobile River, Bayou Carnot, Louisville and Nashville Railroad.	1910	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, Louisville and Nashville Railroad Bridge to 1½ miles below Lizard Creek.	1911	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, 1½ miles below Lizard Creek to 1 mile above Bayou Carnot.	1912	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, 1 mile above Bayou Carnot to one-half mile above White House Bend.	1913	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, one-half mile above White House Bend to 2 miles below Cedar Creek.	1914	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, 2 miles below Cedar Creek to Tensaw River.	1915	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, Tensaw River to 1½ miles above Barrow Lake entrance.	1916	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, 1½ miles above Barrow Lake entrance to Alabama River.	1917	1-5,000	.....do	1888.
Do	Mobile Bay, Mobile River, Spanish River to Alabama River (diagram sheet).	1918	1-40,000	.....do	1888.
Do	Mobile Bay oyster beds	2220	1-40,000	H. P. Ritter	1895.
Do	Dauphin Island and Petit Bois Island, outside	261	1-20,000	B. F. Sands, U. S. N	1851.
Alabama and Mississippi.	Horn Island Pass, approaches	327	1-20,000	.....do	1852.
Mississippi	Horn and Ship islands, south shore	430	1-20,000	.....do	1854.
Alabama	Mississippi Sound, Grant Pass to west end of Dauphin Island.	191	1 20,000	C. P. Patterson, U. S. N	1847.
Do	Mississippi Sound, Dauphin Island to Grand Bay	329	1-20,000	B. F. Sands, U. S. N	1852.
Alabama and Mississippi.	Mississippi Sound, Grand Bay to Round Island,	328	1-20,000	.....do	1853.
Mississippi	Mississippi Sound, Horn Island Pass	1666	1-20,000	J. M. Hawley, U. S. N	1886.
Do	.....do	362	1-20,000	B. F. Sands, U. S. N	1853.
Do	Mississippi Sound, Horn Island, north shore	190	1-20,000	C. P. Patterson, U. S. N	1846.
Do	Mississippi Sound, Round Island to east end Horn Island and Pascagoula River.	365	1-20,000	B. F. Sands, U. S. N. and U. S. Engineers.	1855-59.
Do	Mississippi Sound, West Point to Mississippi City	489	1-20,000	.....do	1855.
Do	Mississippi Sound, Biloxi Bay	485	1-10,000	B. F. Sands, U. S. N	1855.
Do	Mississippi Sound and Cat Island and Ship Island harbors.	194	1-20,000	C. P. Patterson, U. S. N	1884.
Do	Mississippi Sound, Mississippi City to Cat Island Light.	488	1-20,000	B. F. Sands, U. S. N	1855.
Do	Mississippi Sound, Cat Island Light to Grand Island and St. Louis Bay.	546	1-20,000	.....do	1856.
Do	Mississippi Sound, southwest part, and Pass Christian.	589	1-20,000	.....do	1857.
Do	Mississippi Sound, Pass Christian	256	1-10,000	.....do	1851.
Louisiana	Lake Borgne	1055 *a*	1-40,000	F. P. Webber	1870.
Mississippi and Louisiana.	Grand Island Pass and Pearl River entrance	545	1-20,000	B. F. Sands, U. S. N	1856.
Louisiana	Lake Borgne (part of 1055 *a* enlarged)	1055 *c*	1-20,000	F. P. Webber	1870.
Do	The Rigolets, Pearl River, and Little Lake	671	1-10,000	W. S. Gilbert	1876.
Do	The Rigolets, Pearl River, and Little and St. Catherine lakes, Chef Menteur Pass.	1054	1-20,000	F. P. Webber	1870.
Do	Lake Pontchartrain, eastern part	1053 *b*	1-40,000	.....do	1870.
Do	Lake Pontchartrain	1115	1-40,000	J. S. Bradford	1871.

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	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Louisiana	Chandeleur Island, east coast, and Chandeleur Sound.	1654	1-80,000	E. D. F. Heald, U. S. N., and J. M. Hawley, U.S.N.	1885-86.
Do.	Mississippi River approaches	1152	1-40,000	F. D. Granger	1872.
Do.	Chandeleur Sound and Nassau Roads	598	1-20,000	B. F. Sands, U. S. N	1857.
Do.	Chandeleur Sound, Nassau Roads, and Quarantine Anchorage.	363	1-10,000	....do	1852-53.
Do.	Chandeleur Sound, west of Chandeleur Island	1171	1-40,000	F. D. Granger	1873.
Do.	Breton Sound	1000	1-40,000	F. P. Webber	1869.
Do.	Mississippi River approaches	1116	1-40,000	J. S. Bradford	1871.
Do.	....do	1965	1-40,000	C. D. Sigsbee, U. S. N	1874-75.
Do.	Mississippi River approaches, Southwest Pass to Ship Jack Bay.	1765	1-40,000	F. H. Crosby, U. S. N.	1886.
Do.	Mississippi River approaches, Ship Jack Bay to Barataria Bay.	1766	1-40,000	....do	1886.
Do.	Mississippi River approaches, Pass à Loutre	715	1-20,000	J. J. Guthrie, U. S. N.	1860.
Do.	Mississippi River approaches, Main Pass	1386 *b*	1-4,800	H. L. Marindin	1877.
Do.	....do	1386 *a*	1-4,800	....do	1877.
Do.	Mississippi River approaches, Cubits Gap	1325	1-4,800	....do	1876.
Do.	Mississippi River approaches, Cubits Gap, The Jump, South Pass, Bayou Grande, and South Pass Bar.	1251 *b*	1-4,800	....do	1875.
Do.	Mississippi River approaches, Pass à Loutre	927	1-10,000	F. H. Gerdes	1877.
Do.	Mississippi River approaches, Pass à Loutre, Northeast and Southeast passes.	255	1-20,000	B. F. Sands, U. S. N.	1851.
Do.	Mississippi River approaches, Northeast and Southeast passes.	926	1-10,000	F. H. Gerdes	1867.
Do.	Mississippi River approaches, Pass à Loutre and Southeast Pass.	989	1-20,000	....do	1867.
Do.	Mississippi River approaches, Garden Island Bay, East and West bays.	991	1-40,000	F. P. Webber	1868.
Do.	Mississippi River approaches, South Pass, outside of bar.	1251 *d*	1-20,000	H. L. Marindin	1875.
Do.	Mississippi River approaches, South Pass, off jetties.	1320	1-4,800 1-7,684	H. L. Marindin and U. S. Engineers.	1876-78.
Do.	Mississippi River approaches, South Pass Bar	1252	1-2,400	H. L. Marindin	1875.
Do.	....do	925	1-10,000	F. H. Gerdes	1867.
Do.	Mississippi River approaches, South and Southwest passes.	330	1-20,000	B. F. Sands, U. S. N.	1852.
Do.	Mississippi River approaches, South Pass, East Point to Bayou Grande.	1250 *b*	1-4,800	H. L. Marindin	1875.
Do.	Mississippi River approaches, South Pass	990	1-20,000	F. H. Gerdes	1867.
Do.	....do	1251 *c*	1-4,800	H. L. Marindin	1875.
Do.	Mississippi River approaches, Southwest Pass	923	1-20,000	F. H. Gerdes	1867.
Do.	Mississippi River approaches, South Pass, Bayou Grande to Head of Passes.	1250 *a*	1-4,800	H. L. Marindin	1875.
Do.	Mississippi River approaches, Southwest Pass and bar.	924	1-10,000	F. H. Gerdes	1867.
Do.	Mississippi River approaches, Southwest and South passes.	330	1-20,000	B. F. Sands, U. S. N.	1852.
Do.	Mississippi River approaches, Southwest Pass, The Cut to three-fourths of a mile below Double Bayou.	1387 *ab*	1-4,800	H. L. Marindin	1877.
Do.	Mississippi River approaches, Southwest Pass, near Double Bayou (current chart).	1991	1-4,800	....do	1876.
Do.	Mississippi River approaches, Southwest Pass, Scotts House to Double Bayou (current chart).	1990	1-4,800	....do	1876.
Do.	Mississippi River approaches, Southwest Pass, Head of Passes to Scotts House (current chart).	1989	1-4,800	....do	1876.
Do.	Mississippi River approaches, Southwest Pass, Cutoff to Head of Passes.	1385 *b*	1-4,800	....do	1877.
Do.	Mississippi River approaches, Grand Pass	1585	1-30,000	C. Hosmer	1884.
Do.	Mississippi River approaches, Grand Pass, The Jump.	1251 *a*	1-4,800	H. L. Marindin	1875.
Do.	Mississippi River, Head of Passes to Cubits Gap	922	1-10,000	F. H. Gerdes	1866.
Do.	Mississippi River, Head of Passes	1253	1-2,400	H. L. Marindin	1875.
Do.	Mississippi River, Head of Passes to Cubits Gap	1385 *a*	1-4,800	....do	1877.

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	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Louisiana	Mississippi River, cross section near Cubits Gap	1992	1-2,400	H. L. Marindin	1877.
Do	do	1993	1-2,400	do	1877.
Do	Mississippi River, Cubits Gap to Point Pleasant	1153	1-20,000	F. G. Granger	1872.
Do	Mississippi River, Point Pleasant to Bohemia	1093	1,20,000	C. H. Boyd	1871.
Do	Mississippi River, Bohemia to Poverty Point	1154	1-20,000	do	1872.
Do	Mississippi River, Poverty Point to Scarsdale	1192	1-20,000	do	1873.
Do	Mississippi River, Scarsdale to New Orleans	1274	1-20,000	do	1873-74.
Do	Mississippi River, New Orleans to Soniat Rice Mills.	1307 *a*	1-20,000	do	1875-76.
Do	Mississippi River, Soniat Rice Mills to Belle Point	1443 *a*	1-20,000	do	1876-77.
Do	Mississippi River, Bonnet Carré Crevasse	1307 *b*	1-20,000	do	1875-76.
Do	do	1442 *a*	1-5,000	C. M. Chester, U. S. N.	1879.
Do	Mississippi River, Belle Point to Grandview Reach	1343 *b*	1-20,000	C. H. Boyd	1876-77.
Do	Mississippi River, Grandview Reach to Donaldsonville.	1408	1-20,000	C. M. Chester, U. S. N.	1879.
Do	Mississippi River, Merchants Estate to Donaldsonville.	1492 *a*	1-5,000	U. Sebree, U. S. N.	1881.
Do	Mississippi River, Donaldsonville to Dicharys Plantation.	1492 *b*	1-5,000	do	1881.
Do	Mississippi River, Dicharys Plantation to Houmas House.	1493 *a*	1-5,000	do	1881.
Do	Mississippi River, Houmas House to Rescue Plantation.	1493 *b*	1-5,000	do	1881.
Do	Mississippi River, Rescue Plantation to Belle Grove	1494 *a*	1-5,000	do	1881.
Do	Mississippi River, Belle Grove to Randolphs House	1494 *b*	1-5,000	do	1881.
Do	Mississippi River, Randolphs House to Palo Alto	1495 *a*	1-5,000	do	1881.
Do	Mississippi River, Palo Alto to Ventress	1495 *b*	1-5,000	do	1881.
Do	Mississippi River, Ventress to Battine	1496	1-5,000	do	1881.
Mississippi	Mississippi River, Morganza Crevasse	1442 *b*	1-5,000	C. M. Chester, U. S. N.	1879.
Do	Mississippi River, Cornpen Bend	1442 *c*	1-5,000	do	1879.
Do	Mississippi River, Grand Gulf and vicinity	846	1-5,000	F. H. Gerdes	1864.
Do	Mississippi River, Diamond Island Crevasse	1442 *d*	1-5,000	C. M. Chester, U. S. N.	1879.
Illinois and Kentucky.	Ohio River, Cairo to Mound City	851	1-10,000	F. H. Gerdes	1864.
Louisiana	Shell Bay to Ronquille Bay	1546	1-30,000	C. H. Boyd	1883.
Do	Barataria Bay approaches	1383 *a*	1-20,000	W. I. Moore, U. S. N.	1878.
Do	Barataria Bay entrance	1383 *b*	1-10,000	do	1878.
Do	Barataria Bay, bar and harbor	441	1-10,000	F. H. Gerdes	1853.
Do	Barataria Bay	1382	1-20,000	W. I. Moore, U. S. N.	1878.
Do	Barataria Bay, Timbalier, Terrebonne, and Caillou bays.	442	1-20,000	F. H. Gerdes	1853.
Do	Barataria Bay, Wilkins Bayou and tributaries	2091	1-20,000	W. H. Dennis	1878.
Do	Barataria Bay to Isle Derniere	2069	1-80,000	E. M. Hughes, U. S. N.	1891.
Do	Camida Pass to Raccoon Pass	2072	1-20,000	do	1891.
Do	Isle Derniere, south shore	2014	1-80,000	A. L. Hall, U. S. N.	1889-90.
Do	Ship Shoal Light to Marsh Island	1831	1-80,000	F. H. Crosby and L. M. Garrett, U. S. N.	1888-89.
Do	Timbalier Bay and approaches	2071	1-20,000	E. M. Hughes, U. S. N.	1891.
Do	Terrebonne Bay and approaches	2070	1-20,000	do	1891.
Do	Ship Island Shoal, off Isle Derniere	360	1-20,000	B. F. Sands, U. S. N.	1853.
Do	Isle Derniere, south shore	2015	1-20,000	A. L. Hall, U. S. N.	1889-90.
Do	Caillou Bay and approaches	2016	1-20,000	do	1890.
Do	Atchafalaya Bay, approaches	1933	1-20,000	L. M. Garrett, U. S. N.	1889.
Do	Atchafalaya Bay	658	1-20,000	B. F. Sands, U. S. N.	1858.
Do	Atchafalaya Bay, approaches	680	1-20,000	T. B. Huger, U. S. N.	1859.
Do	Atchafalaya Bay, Dredged Channel	1763	1-10,000	D. D. V. Stewart, U. S. N.	1887.
Do	do	1762	1-10,000	do	1887.
Do	Atchafalaya Bay and River to Sword Point	1823	1-10,000	C. H. Sinclair	1888.
Do	Atchafalaya Bay and River to Morgan City	1824	1-10,000	do	1888.
Do	East Coté Blanche Bay	682	1-20,000	T. B. Huger, U. S. N.	1859.
Do	West Coté Blanche Bay	1767	1-20,000	F. H. Crosby, U. S. N.	1886.
Do	Marsh Island to Joseph Harbor Bayou	1776	1-80,000	D. D. V. Stewart and F. H. Crosby, U. S. N.	1887-88.

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	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Louisiana	Trinity and Tiger shoals	1139 *a,b*	1-40,000	F. D. Granger	1872.
Do	Vermilion Bay entrance	486	1-20,000	B. F. Sands, U. S. N.	1855.
Do	Vermilion Bay, Southwest Pass to Point Gracious	1777	1-20,000	D. D. V. Stewart and F. H. Crosby, U. S. N.	1887-88.
Do	Vermilion Bay, middle part	1821	1-20,000	F. H. Crosby, U. S. N.	1888.
Do	Vermilion Bay, upper part, Wicks Bay, Petite Anse Bayou.	1819	1-20,000	do	1888.
Do	Vermilion Bay, western part	1822	1-20,000	do	1888.
Do	Joseph Harbor Bayou to Johnsons Bayou	1645	1-80,000	do	1885.
Do	Calcasieu Pass to the High Islands	1596 *a*	1-80,000	E. D. F. Heald, U. S. N.	1884.
Do	Mermentau River	1647	1-20,000	F. H. Crosby, U. S. N.	1885.
Do	Calcasieu River	487	1-20,000	B. F. Sands, U. S. N.	1855.
Do	Calcasieu Pass	1648	1-20,000	F. H. Crosby, U. S. N.	1885.
Do	Calcasieu Pass to Leesburg	1572	1-10,000	L. Flynne, U. S. N.	1883.
Louisiana and Texas.	Sabine Pass	1596 *b*	1-20,000	G. C. Hanus, U. S. N	1884.
Do	do	1646 *b*	1-20,000	F. H. Crosby, U. S. N.	1885.
Do	Sabine Pass and Lake	1646 *a*	1-20,000	do	1885.
Texas	Coast of Texas, High Islands to Galveston entrance.	1556 *a,b*	1-80,000	E. M. Hughes, U. S. N.	1883.
Do	Galveston approaches	471	1-20,000	E. J. De Haven, U. S. N.	1855.
Do	Galveston Bar and Harbor	247	1-20,000	A. S. Baldwin, U. S. N	1850.
Do	Galveston entrance	265	1-20,000	T. A. Craven, U. S. N.	1851-52.
Do	do	906 *a*	1-10,000	F. F. Nes	1867.
Do	Galveston entrance and Bay (reduction of Nos. 906 and 919).	906 *b*	1-20,000	F. F. Nes and C. H. Boyd	1867.
Do	Galveston entrance and Bay	264	1-20,000	T. A. Craven, U. S. N.	1851.
Do	Galveston entrance	1530	1-10,000	E. M. Hughes, U. S. N.	1883.
Do	Galveston entrance, outer bar to southward and westward.	1597 *a*	1-20,000 1-80,000	E. D. F. Heald, U. S. N., and G. C. Hanus, U. S. N.	1884.
Do	Galveston entrance and Harbor	919	1-10,000	C. H. Boyd	1867.
Do	Galveston Bay, lower part	918 *a*	1-20,000	F. F. Nes	1867.
Do	Galveston Bay (comparative chart)	918 *b*	1-10,000	T. A. Craven, U. S. N., and F. F. Nes.	1851-67.
Do	Galveston Bay, lower part	323	1-20,000	T. A. Craven, U. S. N.	1852.
Do	Galveston Bay to Red Fish Bar	324	1-20,000	do	1852.
Do	Galveston Bay, East Bay	425	1-20,000	E. J. De Haven, U. S. N	1854.
Do	Galveston Bay, Smith Point to San Juncite Bay	414	1-20,000	H. S. Stellwagen, U. S. N.	1853.
Do	Galveston Bay, Smith Point, Turtle Bay	470	1-20,000	E. J. De Haven, U. S. N.	1855.
Do	Galveston Island, south shore	472	1-20,000	do	1855.
Do	San Luis Pass to Oyster Creek	473	1-20,000	do	1855.
Do	San Luis Pass	389	1-10,000	H. S. Stellwagen, U. S. N.	1853.
Do	West Bay, San Luis Bay to Hall Lake	931	1-20,000	F. F. Nes	1867.
Do	West Bay, Hall Lake to railroad bridge	932	1-20,000	do	1867.
Do	Brazos River entrance	474	1-20,000	E. J. De Haven, U. S. N.	1855.
Do	do	2102	1-10,000	H. G. Ogden	1891.
Do	do	656	1-10,000	J. K. Duer, U. S. N.	1858.
Do	Brazos River to Smith Landing	539	1-20,000	E. J. De Haven, U. S. N	1856.
Do	Matagorda Peninsula, south shore	1427 *a*	1-40,000	T. F. Jewell, U. S. N.	1879.
Do	Matagorda Peninsula and Island, south shore, and Pass Cavallo.	1427 *b*	1-40,000	do	1879.
Do	Matagorda Bay entrance, Pass Cavallo	635	1-20,000	J. C. Febiger, U. S. N.	1858.
Do	do	1231	1-10,000	L. B. Wright	1874.
Do	do	1097	1-20,000	F. D. Granger	1871.
Do	do	588	1-20,000	J. C. Febiger, U. S. N.	1856.
Do	Matagorda Bay to Oyster Lake	1031	1-20,000	F. P. Webber and F. D. Granger.	1866-71.
Do	Matagorda Bay, Oyster Lake to Matagorda	689	1-20,000	J. K. Duer, U. S. N	1859.
Do	Matagorda Bay, Matagorda to Cany Creek Canal	1161	1-20,000	L. B. Wright	1871-72.
Do	Matagorda Bay, Tres Palacios and Turtle bays	1094	1-20,000	F. D. Granger	1871.
Do	Matagorda Bay, western part	727	1-20,000	W. Ronckendorff, U. S. N.	1860.
Do	Matagorda Bay, Carankaway Bay	1095	1-20,000	F. D. Granger	1871.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	FLORIDA KEYS TO THE RIO GRANDE—continued.				
Texas	Matagorda Bay, Laroca Bay	1098	1-20,000	R. E. Halter and F. D. Granger.	1868-71.
Do	Espiritu Santo, San Antonio, Aransas and Capano bays.	*720	1-50,000	S. A. Gilbert	1858.
Do	Espiritu Santo Bay	1096	1-20,000	L. B. Wright	1873.
Do	San Antonio Bay	1268	1-20,000	L. B. Wright and W. I. Vinal.	1873-74-75.
Do	Matagorda and St. Joseph islands, southeast shores	1464	1-40,000	U. Sebree, U. S. N	1880.
Do	St. Joseph Island to Mustang Island, southeast shores	1465	1-40,000	do	1880.
Do	Mezquit and Aransas bays	1286	1-20,000	R. Wainwright, U. S. N., and W. I. Vinal.	1875.
Do	Capano and St. Charles bays	1287	1-20,000	R. Wainwright, U. S. N	1875.
Do	Aransas Pass	2054	1-10,000	E. M. Hughes, U. S. N	1891.
Do	Aransas Pass and Steamboat Channel between Aransas and Corpus Christi bays.	1288 *a*	1-10,000 1-20,000	R. Wainwright, U. S. N	1875.
Do	Aransas Pass	996	1-10,000	F. F. Nes	1868.
Do	Aransas Pass (reconnaissance)	386	1-9,585	H. S. Stellwagen, U. S. N	1854.
Do	Aransas Bay and Corpus Christi Bayou	995	1-20,000	H. Anderson	1869.
Do	Corpus Christi Pass	994	1-10,000	do	1869.
Do	do	1288 *b*	1-10,000 1-20,000	R. Wainwright, U. S. N	1875.
Do	Corpus Christi Bay	958	1-20,000	F. F. Nes	1868.
Do	Corpus Christi Bay, Nueces Bay	*1513	1-20,000	R. E. Halter	1882.
Do	Padre Island, east shore	1484 *a*	1-40,000	U. Sebree, U. S. N	1881.
Do	do	1484 *b*	1-40,000	do	1881.
Do	do	1485 *a*	1-40,000	do	1881.
Do	do	1485 *b*	1-40,000	do	1881.
Do	Brazos Santiago, Laguna Madre, south end	909	1-20,000	C. H. Boyd	1867.
Do	Rio Grande entrance	377	1-10,000	J. Wilkinson, U. S. N	1853.
Cuba	El Morro to Playa de Mariano	900	1-10,000	W. S. Edwards	1867.
Nicaragua	Grey Town Harbor	1890	1-5,000	A. Strausz	1865.
	PANAMA TO POINT CONCEPTION, CALIFORNIA.				
United States of Colombia to California.	Panama to San Diego	1202 *a*	1-400,000	P. C. Johnson, U. S. N	1873.
Do	do	1202 *b*	1-400,000	do	1873.
Do	do	1202 *c*	1-400,000	do	1873.
Mexico	Tartar Shoal	1966	1-12,272	do	1872.
Lower California	Magdalena Bay, Man-of-War Cove to The Narrows	1124	1-40,000	G. Bradford	1871.
Do	Magdalena Bay, The Narrows to Cayuco Cove	1123	1-20,000	do	1871.
Do	Guadalupe Island	1598	1-40,000	H. E. Nichols, U. S. N	1881.
California	San Diego to San Francisco (reconnaissance)	289	1-380,000	J. Alden, U. S. N	1851.
Do	do	290	1-375,000	do	1851.
Do	Boundary Monument to Sand Ridge △	1888	1-20,000	H. B. Mansfield, U. S. N	1888-89.
Do	do	1889	1-20,000	do	1888-89.
Do	San Diego Bay and vicinity	564	1-10,000	J. Alden, U. S. N	1856.
Do	do	565	1-10,000	do	1856.
Do	do	566	1-10,000	do	1856.
Do	do	567	1-10,000	do	1856.
Do	San Diego Bay, entrance and lower part	1420	1-10,000	G. W. Coffin, U. S. N	1878.
Do	San Diego Bay and Harbor	268	1-10,000	R. D. Cutts, U. S. N	1851.
Do	San Diego Bay, near Point Loma	2185	1-10,000	F. H. Crosby, U. S. N	1894.
Do	Sand Ridge △ to Leucadia △	1905	1-20,000	H. B. Mansfield, U. S. N	1889.
Do	Leucadia △ to Barranca Bluff △	1906	1-20,000	do	1889.
Do	Barranca Bluff △ to San Juan Rock	1907	1-20,000	D. Delehanty, U. S. N	1889.
Do	San Juan by the Sea and vicinity	1783	1-10,000	G. Davidson	1887.
Do	San Juan Rock to Newport Landing	1908	1-20,000	D. Delehanty, U. S. N	1889.
Do	Newport Bay to San Pedro Bay	1418	1-20,000	E. H. C. Leutze, U. S. N	1878.
Do	Newport Bay	1256	1-10,000	A. W. Chase	1875.
Do	Newport Creek and vicinity, head of Submarine Valley.	1786	1-10,000	F. Westdahl	1887.

*Topographic number.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale	Hydrographer.	Date.
	PANAMA TO POINT CONCEPTION, CALIFORNIA—cont'd.				
California	San Pedro Bay, off shore	1904	1-40,000	D. Delehanty, U. S. N	1889.
Do	San Pedro Bay and Harbor approaches	706 *a*, *b*	1-10,000	J. Alden, U. S. N	1859.
Do	San Pedro Bay and Wilmington Lagoon	1797	1-10,000	F. Westdahl	1887.
Do	San Pedro Bay, anchorage	437	1-10,000	T. H. Stevens, U. S. N	1854.
Do	San Pedro Bay, part of Los Angeles	310	1-10,000	J. Alden, U. S. N	1852.
Do	Point Firmin to Point Vincente	1417	1-20,000	E. H. C. Leutze, U. S. N	1878.
Do	Monica Bay	1341 *a*	1-40,000	H. C. Taylor, U. S. N	1875-76.
Do	Monica Bay, along shore, Point Vincente to Port Ballona.	1340 *b*	1-20,000	....do	1876.
Do	Monica Bay, at and near Santa Monica	1341 *b*	1-10,000	....do	1875.
Do	Monica Bay, Shoo Fly Landing	1211	1-10,000	P. C. Johnson, U. S. N	1873.
Do	....do	2125	1-10,000	F. Westdahl	1893.
Do	Monica Bay, along shore, Santa Monica to Point Dume.	1340 *a*	1-20,000	H. C. Taylor, U. S. N	1876.
Do	Santa Barbara Channel, eastern end	1403	1-40,000	E. H. C. Leutze, U. S. N	1878.
Do	Santa Barbara Channel, projection for speed trial, U. S. S. San Francisco.	2029	1-80,000	D. Delehanty, U. S. N	1890.
Do	West of Point Dume	1405	1-10,000	E. H. C. Leutze, U. S. N	1878.
Do	East of Point Mugu	1404	1-10,000	....do	1878.
Do	Point Mugu to Point Hueneme	554	1-10,000	J. Alden, U. S. N	1856.
Do	San Buenaventura and vicinity	503	1-10,000	....do	1855.
Do	Santa Barbara Channel, inshore hydrography, Point Los Pitas.	1038	1-10,000	E. Cordell	1869.
Do	Santa Barbara Channel, San Buenaventura and vicinity.	1081	1-10,000	W. A. Greenwell	1870.
Do	Santa Barbara Channel, San Buenaventura to Cape Quemada.	1045	1-100,000	E. Cordell	1869.
Do	Santa Barbara Channel, inshore hydrography, Point Los Pitas to Rincon Point.	1039	1-10,000	....do	1869.
Do	Santa Barbara Channel, inshore hydrography, Carpenteria and vicinity.	1040	1-10,000	....do	1869.
Do	Santa Barbara Channel, inshore hydrography, Santa Barbara and vicinity.	1041	1-10,000	....do	1869.
Do	....do	311	1-10,000	J. Alden, U. S. N	1852.
Do	Santa Barbara Channel, inshore hydrography, Santa Barbara and vicinity (proposed light).	436	1-10,000	T. H. Stevens, U. S. N	1854.
Do	Santa Barbara Channel, inshore hydrography, Santa Barbara Light to Goleta Point.	1042	1-10,000	E. Cordell	1869.
Do	Santa Barbara Channel, inshore hydrography, west of Goleta Point.	1043	1-10,000	....do	1869.
Do	Santa Barbara Channel, inshore hydrography, vicinity Cañada del Capitan.	1044	1-10,000	....do	1869.
Do	Santa Barbara Channel, inshore hydrography, east of Gaviota Wharf.	1342 *b*	1-10,000	F. Curtis, U. S. N	1877.
Do	Santa Barbara Channel, inshore hydrography, Gaviota Wharf to Coxo Anchorage.	1342 *a*	1-10,000	....do	1877.
Do	Santa Barbara Channel, inshore hydrography, Point Conception and Coxo Anchorage.	1037	1-10,000	E. Cordell	1869.
Do	....do	295	1-20,000	J. Alden, U. S. N	1862.
Do	Santa Barbara Channel, western part, Santa Cruz Island to Point Conception.	1370	1-100,000	F. Curtis, U. S. N	1877.
	ISLANDS OFF COAST OF SOUTHERN CALIFORNIA.				
California	Cortez Bank	355	1-5,000	T. H. Stevens, U. S. N	1853.
Do	....do	542	1-40,000	J. Alden, U. S. N	1856.
Do	San Clemente Island	1429	1-20,000	G. W. Coffin, U. S. N	1879.
Do	San Clemente Island, northeast shore	1430	1-20,000	E. H. C. Leutze, U. S. N	1879.
Do	San Clemente Island Anchorage, southeast end	543	1-10,000	J. Alden, U. S. N	1856.
Do	San Clemente Island Anchorage, northwest end	312	1-10,000	....do	1852.
Do	Santa Catalina Island, northeast side	1414 *a*	1-20,000	G. W. Coffin, U. S. N	1878.
Do	Santa Catalina Island, southeast side	1414 *b*	1-20,000	....do	1878.
Do	Santa Catalina Island, west end	1413	1-20,000	....do	1877-78.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	ISLANDS OFF COAST OF SOUTHERN CALIFORNIA—continued.				
California	Santa Catalina Island, Isthmus Cove and Catalina Harbor.	1210	1-10,000	P. C. Johnson, U. S. N.	1873.
Do.	Santa Catalina Island, Catalina Harbor	291	1-5,000	J. Alden, U. S. N.	1851.
Do.	Santa Catalina Island, Isthmus Cove	308	1-5,000	....do	1852.
Do.	Santa Barbara Island	1459 *a*	1-10,000	E. H. C. Leutze, U. S. N.	1879.
Do.	San Nicolas Island	1459 *b*	1-20,000	....do	1879.
Do.	Santa Cruz Island, northern side, Smugglers Cove to Diablo Point.	1324 *a*	1-20,000	H. C. Taylor, U. S. N.	1875.
Do.	Santa Cruz Island, Prisoners and Chinese harbors	1324 *b*	1-10,000	....do	1875.
Do.	Santa Cruz Island, Prisoners Harbor	303	1-10,000	J. Alden, U. S. N.	1852.
Do.	Santa Cruz Island, east end, and Anacopa Island	501	1-10,000	....do	1855.
Do.	Santa Cruz Island, south shore, San Pedro Point to Albert Anchorage.	1323 *b*	1-20,000	H. C. Taylor, U. S. N.	1875.
Do.	Santa Cruz Island, south shore, Albert Anchorage to Cape Cervada.	1323 *a*	1-20,000	....do	1875.
Do.	Santa Cruz Island, west and north shores, Cape Cervada to Diablo Point.	1221 *b*	1-20,000	....do	1874.
Do.	Santa Cruz Channel	1221 *a*	1-20,000	P. C. Johnson, U. S. N.	1873-74.
Do.	Santa Rosa Island, south side	1334 *b*	1-20,000	H. C. Taylor, U. S. N.	1875-76.
Do.	Santa Rosa Island, north side	1334 *a*	1-20,000	....do	1875-76.
Do.	San Miguel Passage	1333 *a*	1-20,000	....do	1876.
Do.	San Miguel Island, west end	1333 *b*	1-20,000	....do	1875-76.
Do.	San Miguel Island, Cuylers Harbor	309	1-10,000	J. Alden, U. S. N.	1852.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON.				
California	Point Conception, western approaches	1371 *a*	1-10,000	F. Courtis, U. S. N.	1877.
Do.	Point Arguello and vicinity	1371 *b*	1-10,000	....do	1877.
Do.	Point Arguello to Point Sal	1470	1-20,000	E. H. C. Leutze, U. S. N.	1880.
Do.	Lompoc Landing	1676	1-10,000	G. Davidson	1876.
Do.	Point Sal Roadstead	921	1-5,000	E. Cordell	1867.
Do.	Point Sal to Oso Flaco	1460	1-10,000	E. H. C. Leutze, U. S. N.	1879-80.
Do.	Oso Flaco to San Luis Obispo Bay	1461	1-10,000	....do	1879.
Do.	San Luis Obispo Bay, off shore	1447	1-100,000	....do	1879-80.
Do.	San Luis Obispo Bay and approaches	1270	1-10,000	L. A. Sengteller	1875.
Do.	San Luis Obispo Bay and vicinity	302	1-10,000	J. Alden, U. S. N.	1852.
Do.	Pecho Rock to Point Buchon	1606 *a*	1-10,000	E. D. Taussig, U. S. N.	1884.
Do.	Point Buchon to Morro Bay	1606 *b*	1-10,000	....do	1884.
Do.	Esteros and Morro bays	1607 *a*	1-10,000	....do	1884.
Do.	Esteros Bay, El Morro to Cayucas Point	1607 *b*	1-10,000	....do	1884.
Do.	Cayucas Point, Pico Creek	2022	1-20,000	D. Delehanty, U. S. N.	1890.
Do.	San Simeon Bay	1611 *a*	1-10,000	E. D. Taussig, U. S. N.	1884.
Do.	....do	301	1-10,000	J. Alden, U. S. N.	1852.
Do.	Piedras Blancas and vicinity to Breakers Point	1611 *b*	1-10,000	E. D. Taussig, U. S. N.	1884.
Do.	Ragged Point and vicinity	1612	1-10,000	....do	1884.
Do.	Ragged Point to Tide Rock	2076	1-20,000	D. Delehanty, U. S. N.	1890-91.
Do.	Tide Rock to Andersons Landing	2077	1-20,000	....do	1890-91.
Do.	Andersons Landing to Cooper Point	2078	1-20,000	....do	1891.
Do.	Cooper Point to Point Sur	1550	1-10,000	W. S. Swinburne, U. S. N.	1883.
Do.	Point Sur to Kaslers Point	1549 *b*	1-10,000	....do	1883.
Do.	Kaslers Point to Point Carmel	1549 *a*	1-10,000	....do	1883.
Do.	Point Carmel to Pascadero Point	1548 *b*	1-10,000	....do	1883.
Do.	Pascadero Point to Point Pinos	1548 *a*	1-10,000	....do	1883.
Do.	Point Pinos to Cape Mendocino (reconnaissance)	241	1-1,000,000	W. P. McArthur, U. S. N.	1851.
Do.	Monterey Bay	558	1-40,000	J. Alden, U. S. N.	1856.
Do.	Monterey Bay, Monterey Harbor	296	1-10,000	....do	1851.
Do.	Monterey Bay, southeast part	559	1-10,000	....do	1856.
Do.	Monterey Bay, middle part	560	1-10,000	....do	1856.
Do.	Monterey Bay, northeast part	561	1-10,000	....do	1856.
Do.	Monterey Bay, Sanquel Cove to Santa Cruz	504	1-10,000	....do	1855.
Do.	Monterey Bay, Santa Cruz Harbor (reconnaissance).	300	1-10,000	....do	1852.
Do.	Monterey Bay, Santa Cruz Harbor to Table Rock	379	1-10,000	T. H. Stevens, U. S. N.	1853.
Do.	Santa Cruz to Point San Pedro	871	1-100,000	E. Cordell	1865.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
California	Table Rock to Scotts Creek	505	1-10,000	A. MacRae, U. S. N	1855.
Do	Scotts Creek to Point Año Nuevo	506	1-10,000	J. Alden, U. S. N	1855.
Do	Big Gulch to Point Año Nuevo	380	1-10,000	T. H. Stevens, U. S. N	1853.
Do	Point Año Nuevo to Pescadero Creek	555	1-10,000	J. Alden, U. S. N	1856.
Do	Pescadero Creek to Tunitas Creek	556	1-10,000	....do	1856.
Do	Tunitas Creek to Point Miramontes	825	1-10,000	A. F. Rodgers	1863.
Do	Half Moon Bay	821	1-10,000	....do	1863.
Do	Pillar Point to Point San Pedro	835	1-10,000	....do	1863.
Do	San Francisco entrance and approaches	721	1-100,000	J. Alden, U. S. N	1858-59-60.
Do	San Francisco entrance and bar	1201	1-20,000	G. Bradford	1873.
Do	San Francisco entrance	1628	1-20,000	E. D. Taussig, U. S. N	1884.
Do	....do	562	1-80,000	J. Alden, U. S. N	1857.
Do	San Francisco entrance, shoal near Middle Farallon	1298 *b*	1-20,000	G. Bradford	1874.
Do	San Francisco entrance, Hurst Shoal, off South Farallon.	1298 *c*	1-5,000	H. C. Taylor, U. S. N	1876.
Do	San Francisco entrance, North Farallon (examination).	*1831	1-5,000	G. Davidson	1885.
Do	San Francisco entrance and bar	456	1-20,000	J. Alden, U. S. N	1855.
Do	San Francisco Bay, Point Bonita to Angel Island	462	1-10,000	....do	1855.
Do	San Francisco Bay, Golden Gate	*359	1-10,000	R. D. Cutts	1852.
Do	San Francisco Bay, Golden Gate to Hunters Point and Oakland.	1214 *a*	1-20,000	G. Bradford	1871-73.
Do	San Francisco Bay, Presidio to Angel Island	1297	1-10,000	....do	1874.
Do	San Francisco Bay, Angel Island to Berkeley and Hunters Point.	464	1-20,000	J. Alden, U. S. N	1855.
Do	San Francisco Bay and vicinity of the city	347	1-10,000	....do	1853.
Do	....do	604	1-10,000	R. M. Cuyler, U. S. N	1857.
Do	San Francisco Bay, city front and Oakland Creek and approaches.	1522	1-10,000	L. A. Sengteller	1882.
Do	San Francisco Bay, Mission Bay Rock	1883	1-120,000	H. B. Mansfield, U. S. N	1888.
Do	San Francisco Bay, Speed Course	2115	1-10,000	D. Delehanty, U. S. N	1892.
Do	San Francisco Bay, Point Avisadera to Coyote Hill Creek.	628	1-20,000	J. Alden, U. S. N	1857-58.
Do	San Francisco Bay, Point Avisadera to Point San Bruno.	421	1-10,000	....do	1854.
Do	San Francisco Bay, Steinbergen and Redwood City creeks.	637	1-10,000	R. M. Cuyler, U. S. N	1858.
Do	San Francisco Bay, southern part	629	1-10,000	J. Alden, U. S. N	1858.
Do	San Francisco Bay, Coyote Hill and Union City creeks.	638	1-10,000	R. M. Cuyler, U. S. N	1858.
Do	San Francisco Bay, Ravenswood to Coyote Creek	636	1-10,000	J. Alden, U. S. N	1858.
Do	San Francisco Bay, Oakland water front and creek	573	1-10,000	....do	1857.
Do	San Francisco Bay, north of Yerba Buena Island	1214 *b*	1-20,000	G. Bradford	1874.
Do	San Francisco Bay, Angel Island to Castro Rocks	465	1-10,000	J. Alden, U. S. N	1855.
Do	San Francisco Bay, Richmond Bay and Raccoon Strait.	463	1-10,000	....do	1855.
Do	San Francisco Bay, Hospital Cove, Angel Island	1882	1-10,000	L. A. Sengteller	1888.
Do	San Francisco Bay, Castro Rocks to Point San Pedro.	466	1-10,000	J. Alden, U. S. N	1855.
Do	San Pablo Bay	524	1-20,000	R. M. Cuyler, U. S. N	1856.
Do	....do	1801	1-20,000	C. M. Thomas, U. S. N	1887.
Do	San Pablo Bay, Point Wilson and vicinity	1444	1-20,000	G. Bradford	1878-79.
Do	....do	758	1-20,000	B. F. Sands, U. S. N	1862.
Do	....do	781	1-20,000	A. F. Rodgers	1863.
Do	San Pablo Bay, Petaluma Creek, entrance to Lakeville Landing.	724	1-10,000	J. Alden, U. S. N	1860.
Do	San Pablo Bay, Petaluma Creek, Lakeville Landing to Petaluma.	725	1-10,000	....do	1860.
Do	Karquines Strait and Mare Island Navy-Yard approaches.	759	1-10,000	B. F. Sands, U. S. N	1862.
Do	....do	1322	1-5,000	H. C. Taylor, U. S. N	1878.
Do	Mare Island Strait	544	1-10,000	J. Alden, U. S. N	1856.

* Topographic number.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
California	Mare Island Strait	838	1-5,000	A. F. Rogers	1864.
Do	Mare Island Strait (reconnaissance)	236	1-5,000	W. P. McArthur, U. S. N.	1850.
Do	do	288	1-5,000	do	1849.
Do	Napa Creek, Navy-Yard Slough to Napa	723	1-10,000	J. Alden, U. S. N.	1860.
Do	Karquines Strait, Mare Island to Army Point	563	1-10,000	do	1857.
Do	do	1779	1-10,000	D. Peacock, U. S. N	1886.
Do	Karquines Strait, Benicia and vicinity	2021	1-10,000	D. H. Mahan, U. S. N.	1890.
Do	do	782	1-10,000	A. F. Rodgers	1863.
Do	do	760	1-10,000	B. F. Sands, U. S. N	1862.
Do	do	879	1-10,000	E. Cordell	1866.
Do	Suisun Bay, Army Point to Sacramento and San Joaquin rivers.	905	1, 20,000	do	1867.
Do	Suisun Bay, Army Point to Middle Point	1780	1-10,000	D. Peacock, U. S. N	1886-87.
Do	Suisun Bay, Army Point to Honker Bay and Sacramento River mouth.	1438	1-20,000	G. Bradford	1878.
Do	Suisun Bay, Army Point to Roe Island	2025	1-10,000	D. H. Mahan, U. S. N	1890.
Do	Suisun Bay, northern part, Suisun and Montezuma creeks.	1785	1-20,000	D. Peacock, U. S. N	1885.
Do	Suisun Bay, northern part, Suisun, Cordelia, and Montezuma creeks.	948	1-20,000	E. Cordell	1867.
Do	Suisun Bay, Duck Island and vicinity	2023	1, 10,000	D. H. Mahan, U. S. N	1890.
Do	Suisun Bay, Middle Point to Chipps Island and vicinity.	1781	1-10,000	D. Peacock, U. S. N	1886.
Do	Suisun Bay, Sacramento and San Joaquin rivers, entrance.	935	1-10,000	E. Cordell	1867.
Do	do	1784	1-10,000	D. Peacock, U. S. N	1886.
Do	do	2024	1-10,000	D. H. Mahan, U. S. N.	1890.
Do	Ballenas Bay and Duxbury Reef	438	1-10,000	J. Alden, U. S. N.	1854.
Do	Duxbury Reef to Point Reyes	720	1-40,000	do	1860.
Do	Drakes Bay and Point Reyes	435	1-10,000	do	1854.
Do	San Francisco to Crescent City (reconnaissance)	401	1-375,000	do	1854.
Do	Point Reyes to Bodega Head, off shore	889	1-100,000	E. Cordell	1866.
Do	Cordell Bank, off Cape Reyes (replotted 1-20,000)	1298 *a*	1-100,000	G. Bradford	1873.
Do	Point Reyes to Tomales Point	890	1-20,000	E. Cordell	1866.
Do	Tomales Bay, entrance to Prestons Point	756	1-10,000	J. Alden	1860.
Do	Tomales Bay, Prestons Point to Head	757	1-10,000	B. F. Sands, U. S. N	1861.
Do	Bodega Bay, Tomales Point to Bodega Head	806	1-10,000	do	1862.
Do	Bodega Head to Duncans Landing	1462 *a*	1-10,000	G. W. Coffin, U. S. N	1879.
Do	Duncans Landing to Meyer Gulch	1462 *b*	1-10,000	do	1879.
Do	Meyer Gulch to Timber Cove	1463 *a*	1-10,000	do	1879.
Do	Timber Cove, Fort Ross Cove, and sunken rocks off Timber Gulch.	1463 *b*	1-5,000	G. W. Coffin and W. S. Swinburne, U. S. N.	1881.
Do	Timber Cove to Horseshoe Point	1471 *a*	1-10,000	H. E. Nichols, U. S. N.	1880.
Do	Horseshoe Point to 2 miles north of Bihler Landing.	1471 *b*	1-10,000	do	1880.
Do	2 miles north of Bihler Landing to Bowens Landing	1507 *a*	1-10,000	W. S. Swinburne, U. S. N.	1881.
Do	Bowens Landing to Schooner Gulch	1507 *b*	1-10,000	do	1881.
Do	Schooner Gulch to Point Arena	1508	1-10,000	do	1881.
Do	Point Arena to Irish Gulch	1535	1-10,000	do	1882.
Do	Irish Gulch to Elk Creek	1536	1-10,000	do	1882.
Do	Elk Creek to Whitesboro Landing	1537	1-10,000	do	1882.
Do	Whitesboro Landing to Caspar Point	1586 *a*	1-20,000	E. D. Taussig, U. S. N.	1883.
Do	Mendocino Bay	1228	1-10,000	L. A. Sengteller	1872.
Do	Mendocino Bay and Harbor	384	1-10,000	J. Alden, U. S. N.	1853.
Do	Caspar Point to Newport Landing	1586 *b*	1-20,000	E. D. Taussig, U. S. N.	1883.
Do	Newport Landing to Ussel Rock	1643 *a*	1-20,000	do	1885.
Do	Ussel Rock to Small White Rock	1643 *b*	1-20,000	do	1885.
Do	Small White Rock to Gitchell Creek	1778	1-20,000	do	1885-86.
Do	Shelter Cove and vicinity	1469	1-10,000	H. E. Nichols, U. S. N.	1880.
Do	Shelter Cove	385	1-10,000	J. Alden, U. S. N.	1853.
Do	Gitchell Creek to Punta Gorda	1681	1-20,000	E. D. Taussig, U. S. N.	1886.
Do	Punta Gorda to Cape Mendocino	1682	1-20,000	do	1885-86.

List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
California	Cape Mendocino to Cape Fortunas	1150	1-20,000	G. Bradford	1872.
California and Oregon.	Cape Mendocino to Coquille River, line of soundings.	242	1-100,000	W. P. McArthur, U. S. N	1851.
California	Cape Fortunas to Humboldt Light	1294	1-20,000	G. Bradford	1875.
Do	Eel River	*1816	1-20,000	G. Davidson	1888.
Do	do	*1136	1-10,000	A. F. Rodgers	1869.
Do	Cape Fortunas to Trinidad	1299	1-100,000	G. Bradford	1872.
Do	Table Bluff to Mad River	1295	1-20,000	do	1875.
Do	Humboldt Bay, approaches, bar, and entrance	1177 *b*	1-10,000	G. Farquhar	1870.
Do	Humboldt Bay and bar	1635	1-20,000	E. D. Taussig, U. S. N	1884.
Do	Humboldt Bay and entrance	710	1-10,000	J. Alden, U. S. N	1859.
Do	Humboldt Bay, channel across bar	1328	1-10,000	G. Bradford	1875.
Do	Humboldt Bay, lower part	270	1-10,000	J. Alden, U. S. N	1851.
Do	do	1176 *a*	1-10,000	G. Farquhar	1871.
Do	Humboldt Bay, upper part	271	1-10,000	J. Alden, U. S. N	1851.
Do	do	1176 *b*	1-10,000	G. Farquhar	1871.
Do	do	1177 *a*	1-10,000	do	1871.
Do	Mad River to Rocky Point	1296	1-20,000	G. Bradford	1875.
Do	Trinidad Bay (reconnaissance)	274	1-6,336	J. Alden, U. S. N	1851.
Do	Trinidad Bay and Harbor	1157	1-10,000	G. Bradford	1872.
Do	Rocky Point to Upper Bluff	1934	1-20,000	D. Delehanty, U. S. N	1889.
Do	Rocky Point to Upper Bluff, off shore	1935	1-20,000	do	1889.
Do	Upper Bluff to False Klamath Rock	1936	1-20,000	do	1889.
Do	Upper Bluff to False Klamath Rock, off shore	1937	1-20,000	do	1889.
Do	False Klamath Rock to Point St. George	1236	1-20,000	H. C. Taylor, U. S. N	1874.
Do	Crescent City Harbor and approaches	690	1-10,000	J. Alden, U. S. N	1859.
Do	Crescent City Harbor	383	1-10,000	do	1853.
Do	do	480	1-10,000	do	1855.
Do	Crescent City Reef	1025 *b*	1-10,000	A. W. Chase	1871.
Do	Crescent City to Smith River	1237	1-20,000	P. C. Johnson and H. C. Taylor, U. S. N.	1873-74.
Do	St. George Reef and vicinity, Point St. George	1025 *a*	1-20,000	A. W. Chase	1869.
California and Oregon.	Crescent City to Columbia River	402	1-375,000	J. Alden, U. S. N	1853.
Do	Profile lines showing general features of bottom	1967	1-60,000	H. C. Taylor, U. S. N	1874.
Do	Smith River to Cape Ferrelo	1239	1-20,000	do	1874.
Oregon	Chetka Cove	1212 *a*	1-10,000	P. C. Johnson, U. S. N	1873.
Do	Goat Island to Mack Arch	1240	1-20,000	H. C. Taylor, U. S. N	1874.
Do	Crooks Point to Euchre Creek	1945	1-20,000	J. M. Helm, U. S. N	1889.
Do	Hunter Cove	1212 *b*	1-10,000	P. C. Johnson, U. S. N	1873.
Do	Euchre Creek to Cape Blanco	1946	1-20,000	J. M. Helm, U. S. N	1889.
Do	Port Orford and vicinity	*1133	1-20,000	A. M. Chase	1869.
Do	Port Orford Harbor	381	1-10,000	J. Alden, U. S. N	1853.
Do	Orford Reef and vicinity	1300	1-20,000	G. Bradford	1871.
Do	Coquille River and entrance	722	1-10,000	J. Alden, U. S. N	1860.
Do	Coos Bay entrance	755	1-10,000	J. S. Lawson	1861.
Do	Coos Bay, Coos Head to North Slough	2047 *a*	1-10,000	E. F. Dickins	1890.
Do	Coos Bay, Fearless Rock and off Empire Mill, special examinations.	2047 *b*	1-5,000	do	1890.
Do	Coos Bay, lower part	902	1-10,000	J. S. Lawson	1865.
Do	Coos Bay, upper part	901	1-10,000	do	1865.
Do	do	2048	1-10,000	E. F. Dickins	1890.
Do	Umpqua Head to Columbia River	240	1-850,000	W. P. McArthur, U. S. N	1851.
Do	Umpqua River and entrance	1759	1-10,000	L. A. Sangteller	1886.
Do	do	382	1-10,000	J. Alden, U. S. N	1853.
Do	Umpqua River, upper part	1746	1-10,000	L. A. Sangteller	1885-86.
Do	Siuslaw River	1588	1-10,000	do	1883.
Do	Yaquina Bay, approaches and entrance	988	1-10,000	A. W. Chase and J. C. Burnett, U. S. N.	1868-88.
Do	Yaquina Bay and River	1764	1-10,000	A. W. Chase	1868.

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List of original hydrographic sheets, geographically arranged, registered in the archives of the United States Coast and Geodetic Survey, etc.—Continued.

State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
Oregon	Nestuggah Bay	1587	1-10,000	C. Rockwell	1883.
Do	Examination for reported rocks off Haystack Rock and Cape Lookout.	1995	1-40,000	D. Delehanty, U.S.N.	1889.
Do	Cape Kiwanda to Cape Meares	2080 *a*	1-20,000	J. M. Helm, U.S.N.	1891.
Do	Cape Kiwanda to Cape Meares, off shore, and Netart Bay.	2088 *b*	1-20,000	.....do	1891.
Do	Cape Meares to Cape Falcon	1722	1-40,000	A. S. Snow and J. C. Burnett, U. S. N.	1885-87.
Do	Tillamook Bay and approaches	936	1-10,000	J. Kincheloe	1866-67.
Do	.....do	1723	1-10,000	A. S. Snow and J. C. Burnett, U. S. N.	1885-87.
Do	Nehalem River	973	1-5,000	E. Cordell	1868.
Oregon and Washington.	Cape Falcon to Columbia River entrance	1378	1-40,000	G. W. Coffin, U. S. N	1877.
Do	Columbia River entrance to Willapa Bay	1379	1-40,000	.....do	1877.
Do	Columbia River entrance	336	1-20,000	J. Alden, U. S. N.	1852.
Do	.....do	250	1-20,000	W. P. McArthur, U. S. N	1850.
Do	.....do	273	1-20,000	.....do	1851.
Do	.....do	1019	1-20,000	E. Cordell	1868.
Do	.....do	428	1-20,000	J. Alden, U. S. N.	1854.
Do	Columbia River entrance, South Channel Bar	429	1-10,000	.....do	1854.
Do	Columbia River, Cape Disappointment to Tongue Point.	1018	1-20,000	E. Cordell	1868.
Oregon	Columbia River, Tansy Point to Tongue Point	1930	1-10,000	C. Rockwell	1889.
Do	Columbia River, Lewis and Clarkes and Youngs rivers.	1931	1-10,000	.....do	1889.
Oregon and Washington.	Columbia River, Tongue Point to Yellow Bluffs	1017	1-10,000	E. Cordell	1868.
Do	.....do	1725	1-10,000	A. S. Snow, U. S. N.	1885.
Do	Columbia River, Grays Bay to Three Tree Point	1015	1-10,000	E. Cordell	1868.
Oregon	Columbia River, Settlers Point to Cathlamet Head	1016	1-10,000	.....do	1868.
Oregon and Washington.	Columbia River, Welchs Island to Puget Island	1335	1-10,000	J. J. Gilbert	1875-76.
Do	Columbia River, Puget Island to Crims Island	1336	1-10,000	.....do	1876.
Do	Columbia River, Crims Island to Mount Coffin	1368	1-10,000	.....do	1877.
Do	Columbia River, Walker Island and vicinity	1724	1-10,000	A. S. Snow, U. S. N.	1885.
Do	Columbia River, Mount Coffin to Coffin Rock	1369 *a*	1-10,000	J. J. Gilbert	1877.
Do	Columbia River, Coffin Rock to Deer Island	1369 *b*	1-10,000	.....do	1870.
Do	Columbia River, Deer Island to Columbia City	1524	1-10,000	C. Rockwell	1881.
Do	Columbia River, Columbia City to Bachelor Island	1711	1-10,000	.....do	1886.
Do	Columbia River, Bachelor Island to Hewlitts Point	1671	1-10,000	.....do	1885.
Do	Columbia and Willamette rivers, Hewlitts Point to Haydens Island and St. Johns.	1673	1-10,000	.....do	1885.
Oregon	Columbia and Willamette rivers, St. Johns to Ross Island.	1672	1-10,000	.....do	1885.
Oregon and Washington.	Columbia River to Point Greenville	334	1-221,360	J. Alden, U. S. N.	1852.
Do	Columbia River to Cape Flattery	427	1-214,690	.....do	1852.
Washington	Willapa Bay approaches	1799	1-20,000	J. C. Burnett, U. S. N.	1887.
Do	.....do	335	1-20,000	J. Alden, U. S. N.	1852.
Do	.....do	2104	1-20,000	J. M. Helm, U. S. N	1891.
Do	Willapa Bay, approaches to Tokeland	2046	1-20,000	.....do	1890.
Do	Willapa Bay, Toke Point to Oysterville and Willapa River to Narrows.	2045	1-20,000	.....do	1890.
Do	Willapa Bay, Willapa River, mouth to Narrows	2106	1-10,000	.....do	1890.
Do	Willapa Bay, Willapa River, Narrows to Willapa City	2105	1-10,000	.....do	1891.
Do	Willapa Bay, Leadbetter Point to head of bay	2103	1-20,000	.....do	1891.
Do	Willapa Bay, southern part	498	1-18,818	J. Alden, U. S. N.	1855.
Do	Willapa Bay, Diamond City and vicinity	2044	1-20,000	J. M. Helm, U. S. N.	1890.
Do	Willapa Bay to Grays Harbor	1800	1-40,000	J. C. Burnett, U. S. N.	1887.
Do	Grays Harbor entrance	2085	1-20,000	J. M. Helm, U. S. N.	1891.

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	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
Washington	Grays Harbor entrance	809	1-20,000	J. S. Lawson	1862.
Do	.....do	1589 *a*	1-20,000	T. D. Bolles and J. M. Helm, U. S. N.	1883-91.
Do	Grays Harbor, North Bay to South Aberdeen	1589 *b*	1-20,000	.....do	1883-91.
Do	Point Greenville to Port Townsend (reconnaissance)	333	1-214,240	J. Alden, U. S. N.	1852.
Do	Greenville Harbor	426	1-10,000	.....do	1854.
Do	Jo Creek to Arch Island	2201	1-40,000	F. H. Crosby, U. S. N.	1894.
Do	Arch Island to Destruction Island	2202	1-40,000	.....do	1894.
Do	Destruction Island to Quillihute River	2203	1-40,000	.....do	1894.
Do	Destruction Island and vicinity	886	1-10,000	J. S. Lawson	1866.
Do	James Island to White Rock	2096	1-40,000	D. Delehanty, U. S. N.	1891.
Do	Flattery Rocks to Neah Bay	1845	1-40,000	J. C. Burnett, U. S. N.	1888.
Do	Cape Flattery to Neah Bay	1881	1-10,000	.....do	1888.
Do	Strait of Juan de Fuca, Neah Bay	337	1-10,000	J. Alden, U. S. N.	1853.
Do	Strait of Juan de Fuca, Port San Juan to Pysht River	2170	1-80,000	L. Flynne, U. S. N.	1893.
Do	Strait of Juan de Fuca, Pysht River to Whidbey Island.	1629	1-80,000	A. S. Snow, U. S. N.	1884.
Do	Strait of Juan de Fuca, False Dungeness (Port Angeles).	325	1-10,000	J. Alden, U. S. N.	1852.
Do	Strait of Juan de Fuca, Port Angeles	2148	1-10,000	A. S. Snow, U. S. N.	1884.
Do	.....do	*2110	1-4,800	J. J. Gilbert	1892.
Do	.....do	*2109	1-4,800	.....do	1892.
Do	Strait of Juan de Fuca, Port Angeles to San Juan Island.	2211	1-40,000	L. Flynne, U. S. N.	1894.
Do	Strait of Juan de Fuca, San Juan Island to Admiralty Inlet.	2212	1-40,000	.....do	1894.
Do	Strait of Juan de Fuca, Rosario and Haro straits, south entrances.	433	1-100,000	J. Alden, U. S. N.	1854.
Do	Strait of Juan de Fuca, New Dungeness	500	1-10,000	.....do	1854.
Do	Strait of Juan de Fuca and Admiralty Inlet entrance	1534	1-20,000	T. D. Bolles, U. S. N.	1882.
Do	.....do	1516 *b*	1-20,000	P. Garst, U. S. N.	1881.
Do	Strait of Juan de Fuca, Partridge Bank	1130	1-20,000	J. S. Lawson	1871.
Do	Strait of Juan de Fuca, Smith Island	431	1-10,000	J. Alden, U. S. N.	1854.
Do	Strait of Juan de Fuca, Admiralty Inlet to Rosario Strait.	1886	1-20,000	H. P. Mayo, U. S. N.	1888.
Do	Strait of Juan de Fuca, Port Discovery and Washington Harbor approaches.	1516 *a*	1-20,000	P. Garst, U. S. N.	1881.
Do	Puget Sound, Admiralty Inlet	510	1-100,000	J. Alden, U. S. N.	1855.
Do	Puget Sound, Admiralty Inlet, Admiralty Head to Foulweather Bluff.	1729	1-20,000	C. T. Forse, U. S. N.	1886.
Do	Puget Sound, Admiralty Inlet, Port Townsend	434	1-10,000	J. Alden, U. S. N.	1854.
Do	.....do	*2072	1-4,800	J. J. Gilbert	1891.
Do	.....do	*2071	1-4,800	.....do	1891.
Do	Puget Sound, Admiralty Inlet, Oak Bay, and Kilisut Harbor.	1482 *a*	1-10,000	P. Garst, U. S. N.	1880.
Do	Puget Sound, Admiralty Inlet, Port Ludlow	508	1-10,000	J. Alden, U. S. N.	1855.
Do	Puget Sound, Hoods Canal entrance	1482 *b*	1-10,000	P. Garst, U. S. N.	1880.
Do	Puget Sound, Hoods Canal, Port Gamble to Hood Point.	1483	1-20,000	.....do	1880.
Do	Puget Sound, Hoods Canal, Port Gamble	509	1-10,000	J. Alden, U. S. N.	1855.
Do	Puget Sound, Hoods Canal, Dabop Bay	1640 *b*	1-20,000	J. N. Jordan, U. S. N.	1884.
Do	Puget Sound, Hoods Canal, Quatsap Point to Lilliwaup Bay.	1640 *a*	1-20,000	C. T. Forse, U. S. N.	1885.
Do	Puget Sound, Hoods Canal, Lilliwaup Bay to head of canal.	1695	1-20,000	.....do	1885.
Do	Puget Sound, Double Bluff to Battery Point	1338 *a*	1-40,000	J. S. Lawson	1875.
Do	Puget Sound, Useless Bay, Deer Lagoon	1338 *b*	1-10,000	G. Bradford	1876.
Do	Puget Sound, Possession Sound to Meadow Point and Pilot Point to President Point.	1344	1-10,000	.....do	1876.
Do	Puget Sound, Port Madison	1102	1-10,000	J. S. Lawson	1868.

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State.	Localities.	Registered number.	Scale.	Hydrographer.	Date.
	POINT CONCEPTION, CAL., TO NORTHWEST BOUNDARY, WASHINGTON—continued.				
Washington	Puget Sound, Port Orchard, Dyes Inlet, and Dogfish Bay.	1694	1-20,000	C. T. Forse, U. S. N.	1885.
Do	Puget Sound, Port Orchard Naval Station	*2196	1-1,000	J. J. Gilbert	1895.
Do	Puget Sound, Port Orchard Naval Station (proposed site).	*1951	1-5,000	J. F. Pratt	1889.
Do	Puget Sound, Bainbridge Island, east side	1337*a*	1-10,000	J. S. Lawson	1875.
Do	Puget Sound, Port Blakely	525	1-10,000	J. Alden, U. S. N.	1856.
Do	Puget Sound, Duwamish Bay	1337*b*	1-10,000	J. S. Lawson	1875.
Do	do	432	1-10,000	J. Alden, U. S. N.	1854.
Do	Puget Sound, Shilshole Bay	*1064	1-10,000	J. S. Lawson	1867.
Do	Puget Sound, Battery Point to Point Piner and north end Colvos Passage.	1425*a*	1-20,000	R. M. Cutts, U. S. N.	1878.
Do	Puget Sound, Point Piner to Fox Island and south end Colvos Passage.	1426*a*	1-20,000	do	1878.
Do	Puget Sound, Quartermasters Harbor	1425*b*	1-10,000	do	1878.
Do	Puget Sound, Commencement Bay	1381	1-10,000	do	1877.
Do	Puget Sound, Steilacoom Harbor and vicinity	499	1-10,000	J. Alden, U. S. N.	1855.
Do	Puget Sound, Fox Island to Hendersons Inlet	1426*b*	1-20,000	R. M. Cutts, U. S. N.	1879.
Do	Puget Sound, Carrs Inlet, Hales and Pitt passages	1445*a*	1-20,000	A. B. Wyckoff, U. S. N.	1875.
Do	Puget Sound, Cases Inlet, southern part, to head of Eld and Tottens inlets.	1446*a*	1-20,000	R. M. Cutts, U. S. N.	1879.
Do	Puget Sound, Cases Inlet, northern part	1445*b*	1-20,000	A. B. Wyckoff, U. S. N.	1875.
Do	Puget Sound, Hammersleys Inlet	1446*b*	1-10,000	do	1879.
Do	Puget Sound, Brisco Point to Olympia	1301	1-10,000	J. S. Lawson	1873-74.
Do	Puget Sound, Olympia and vicinity	507	1-10,000	J. Alden, U. S. N.	1855.
Do	do	*2073	1-4,800	J. J. Gilbert	1891.
Do	do	*2074	1-4,800	do	1891.
Do	Possession Sound	1728	1-20,000	C. T. Forse, U. S. N.	1886.
Do	Possession Sound, Port Susan	1730	1-20,000	do	1886.
Do	Saratoga Passage	1884	1-20,000	H. T. Mayo, U. S. N.	1888.
Do	Saratoga Passage to Skagit Bay	1885	1-20,000	do	1888.
Do	Skagit Bay	2050	1-20,000	J. N. Jordan, U. S. N.	1890.
Do	Skagit Bay, La Conner Harbor	*2108	1-4,800	J. J. Gilbert	1892.
Do	Padilla and Samish bays	1815	1-20,000	C. T. Forse, U. S. N.	1887.
Do	Anacortes Harbor, eastern approaches	*2111	1-4,800	J. J. Gilbert	1892.
Do	Anacortes Harbor	*2112	1-4,800	do	1892.
Do	Anacortes Harbor, western approaches	*2113	1-4,800	do	1892.
Do	Bellingham Bay	1887	1-20,000	H. T. Mayo, U. S. N.	1888.
Do	Bellingham Bay, northern part	502	1-20,000	J. Alden, U. S. N.	1855.
Do	Bellingham Bay, Fairhaven Harbor	*2070	1-5,000	J. J. Gilbert	1891.
Do	Bellingham Bay, New Whatcom Harbor	*2069	1-5,000	do	1891.
Do	Rosario and Haro straits, south entrance	405	1-200,000	J. Alden, U. S. N.	1853.
Do	Rosario Strait entrance, Lawson Reef	1129	1-10,000	J. S. Lawson	1871.
Do	Rosario Strait, southern part, and Bellingham Channel.	1814	1-20,000	C. T. Forse, U. S. N.	1887.
Do	Rosario Strait, northern part	1953	1-20,000	J. N. Jordan, U. S. N.	1889.
Do	Lopez Pass and waters between Rosario and Haro straits.	2114	1-20,000	W. P. Ray, U. S. N.	1891.
Do	San Juan Channel, Shaw Island and vicinity	2213	1-10,000	L. Flynne, U. S. N.	1894.
Do	San Juan Channel, north entrance	2214	1-10,000	do	1894.
Do	Haro Strait, Henry Island and vicinity	2216	1-10,000	do	1894.
Do	Haro Strait, Stuart Island and vicinity	2215	1-10,000	do	1894.
Do	Haro Strait, north entrance	2113	1-20,000	W. P. Ray, U. S. N.	1891.
Do	Haro and Rosario straits, north entrance	708	1-20,000	J. Alden, U. S. N.	1858.
Do	Gulf of Georgia, southern part	709	1-100,000	do	1858-59.
Do	Gulf of Georgia, Matia Islands to Birch Point	2079	1-20,000	J. N. Jordan, U. S. N.	1891.
Do	Gulf of Georgia, north of Patos Islands	2080	1-20,000	do	1891.
Do	Gulf of Georgia, Boundary Bay	2049	1-20,000	do	1890.
Do	Gulf of Georgia, Semiahmoo Bay	1954	1-10,000	do	1889.
Do	do	603	1-20,000	R. M. Cuyler, U. S. N.	1857.

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	SOUTHEAST ALASKA.				
Alaska	Port Simpson and vicinity and north part Chatham Sound (for approximation of longitude).	1617	1-80,000	H. E. Nichols, U. S. N.	1883.
Do	Portland Canal and vicinity (hydrography and topography).	1891	1-80,000	C. M. Thomas, U. S. N.	1888.
Do	Portland Inlet and vicinity	1899	1-40,000	do	1888.
Do	Portland Canal	1900	1-40,000	do	1888.
Do	Portland Canal, head of Bear and Salmon River Flats (hydrography and topography).	1893	1-20,000	do	1888.
Do Do	Portland Canal harbors Portland Canal harbors (hydrography and typography). } Wales Harbor, Winter Harbor, Somerville Bay, Hidden Inlet, Halibut Bay, Fords Cove	1895 1892	1-13,333 1-10,000 1-5,000 1-20,000 1-10,000 1-5,000	C. M. Thomas, U. S. N. do	1888. 1888.
Do	Portland Canal and vicinity, Willard Inlet	1896	1-20,000	do	1888.
Do	Portland Canal and vicinity, Willard Inlet (hydrography and topography).	1894	1-20,000	do	
Do	Portland Canal to Cape Fox	1614	1-40,000	H. E. Nichols, U. S. N.	1883.
Do	Portland Canal, Revillagigedo Channel, Felice Strait, and Nichols Passage.	1618 *a*	1-80,000	do	1883.
Do	Port Tongass	1618 *b*	1-10,000	do	1883.
Do	Revillagigedo Channel, south entrance, Dundas Island to Mary Island.	2142	1-80,000	W. P. Ray, U. S. N.	1892.
Do	Revillagigedo Channel, Duke Point to Bold Island	1619 *a*	1-40,000	H. E. Nichols, U. S. N.	1882.
Do	Revillagigedo Channel, Ray Anchorage	2143	1-10,000	W. P. Ray, U. S. N.	1892.
Do	Revillagigedo Channel, Danger Passage and vicinity	2144	1-10,000	do	1892.
Do	Revillagigedo Channel, Boca de Quadra	2149	1-20,000	W. I. Moore, U. S. N.	1892.
Do	Revillagigedo Channel and southeast entrance Behm Canal to Eddystone Rock.	2109	1-40,000	H. B. Mansfield, U. S. N.	1891.
Do	Revillagigedo Channel and Tongass Narrows	1512 *b*	1-200,000	H. E. Nichols, U. S. N.	1881.
Do	Revillagigedo Channel, Hoy Rocks to Pennock Island	1620 *a*	1-20,000	do	1882.
Do	Mary Island, custom-house and vicinity	2084	1-5,000	H. B. Mansfield, U. S. N.	1891.
Do	Mary Island, anchorage, north end	1619 *b*	1-5,000	H. E. Nichols, U. S. N.	1882.
Do	Hassler Harbor	1620 *b*	1-5,000	do	1882.
Do	Thorne Arm	* 2060	1-40,000	H. B. Mansfield, U. S. N.	1891.
Do	Carroll and George inlets	2111	1-40,000	do	1891.
Do	Carroll and George Inlets, Great Cove and Tsa Cove	* 2061	1-10,000	do	1891.
Do	Tongass Narrows, Pennock Island to Point Higgins	1621 *a*	1-20,000	H. E. Nichols, U. S. N.	1882.
Do	Tongass Narrows, Wards Cove	1512 *a*	1-4,183	T. D. Bolles, U. S. N.	1881.
Do	do	1621 *b*	1-5,000	H. E. Nichols, U. S. N.	1882.
Do	Tongass Narrows	1512 *c*	1-200,000	do	1881.
Do	Dixon entrance and south entrance Clarence Strait	1649 *a*	1-80,000	R. Clover, U. S. N.	1885.
Do	Howkan and vicinity	1525 *a*	1-10,000	H. E. Nichols, U. S. N.	1881.
Do	Sealed Passage	2145	1-20,000	W. P. Ray, U. S. N.	1892.
Do	Felice and Nichols passages, Revillagigedo Channel and adjacent waters.	1622	1-80,000	H. E. Nichols, U. S. N.	1883.
Do	Tamgas Harbor	1615 *a*	1-20,000	do	1883.
Do	Port Chester	1615 *b*	1-20,000	do	1883.
Do	Clarence Strait, Moira Sound to Union Bay	1649 *b*	1-80,000	R. Clover, U. S. N.	1885.
Do	Clarence Strait, Niblack Anchorage	1650 *a*	1-10,000	do	1885.
Do	Clarence Strait, Chasina Anchorage	1650 *b*	1-5,000	do	1885.
Do	Clarence Strait, Vallenar Bay	1651 *a*	1-20,000	do	1885.
Do	Clarence Strait, Twelve Mile Arm	1652 *a*	1-40,000	do	1885.
Do	Clarence Strait, Karta Bay	1652 *b*	1-5,000	do	1885.
Do	Clarence Strait, Tolstoi Bay	1653 *a*	1-20,000	do	1885.
Do	Clarence Strait, Union Bay	1653 *b*	1-20,000	do	1885.
Do	Behm Canal, southeast entrance to Eddystone Rock	2109	1-40,000	H. B. Mansfield, U. S. N.	1891.
Do	Behm Canal, Eddystone Rock to Burroughs Bay	2108	1-40,000	do	1891.
Do	Behm Canal, Shoalwater Pass, Paks and Fitzgibbon coves.	* 2062	1-20,000	do	1891.
Do	Behm Canal, Rudyerd Bay and Walker Cove	2112	1-20,000	do	1891.

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	SOUTHEAST ALASKA—continued.				
Alaska	Behm Canal, Smearton Bay and Traitors Cove	2110	1-20,000	H. B. Mansfield, U. S. N.	1891.
Do	Behm Canal, Behm Narrows to Point Francis	2107	1-40,000	do	1891.
Do	Behm Canal, Bell Arm, McDonald Bay, and Convenient Cove.	*2063	1-20,000	do	1891.
Do	Clarence Strait and adjacent waters, Lemesurier Point to Stikine River.	1742	1-80,000	A. S. Snow, U. S. N.	1886.
Do	Clarence Strait and adjacent waters, Triangulation, Union Bay to Wrangell.	1743	1-80,000	do	1886.
Do	Clarence Strait, Dewey Anchorage to McHenry Inlet.	1739	1-20,000	do	1886.
Do	Clarence Strait, Ratz Harbor	1744	1-10,000	do	1886.
Do	Clarence Strait, Coffman's Cove	1745	1-10,000	do	1886.
Do	Clarence Strait, Steamer Bay	1740	1-20,000	do	1886.
Do	Wrangell Island, Etolin Harbor and Highfield Anchorage.	1741	1-10,000	do	1886.
Do	Wrangell Island, Etolin Harbor	1623 *a*	1-5,000	H. E. Nichols, U. S. N.	1882.
Do	Sumner Strait, entrance to north end	1749	1-80,000	J. M. Helm, U. S. N.	1886.
Do	Sumner Strait, entrance to north end (triangulation sketch).	1749	1-80,000	do	1886.
Do	Sumner Strait (rough sheet)	1752	1-80,000	do	1886.
Do	do	1753	1-80,000	do	1886.
Do	do	1754	1-80,000	do	1886.
Do	Sumner Strait, Port McArthur	1756	1-10,000	do	1886.
Do	Sumner Strait, Shakan Strait	1757	1-20,000	do	1886.
Do	Sumner Strait, Port Protection	1755	1-10,000	do	1886.
Do	Sumner Strait, Red Bay	1758	1-10,000	do	1886.
Do	Keku Strait, Sumner Strait to Frederick Sound	2150	1-40,000	do	1892.
Do	Keku Strait, Hamilton and Chapin bays and Seclusion Harbor.	2151	1-10,000	do	1892.
Do	Keku Strait, Saginaw and Security bays	2152	1-20,000	do	1892.
Do	Frederick Sound and adjacent waters, Zarembo Island to Cape Fanshaw.	1804	1-80,000	C. M. Thomas, U. S. N.	1887.
Do	Frederick Sound and adjacent waters, Zarembo Island to Cape Fanshaw (rough sheets).	1806	1-80,000	do	1887.
Do	Frederick Sound and adjacent waters, Zarembo Island to Cape Fanshaw (triangulation sheets).	1805	1-80,000	do	1887.
Do	Duncan Canal entrance	1807	1-10,000	do	1887.
Do	Duncan Canal, middle part	1808	1-10,000	do	1887.
Do	Duncan Canal, northern part	1809	1-10,000	do	1887.
Do	Zarembo Island, St. John Harbor	1738	1-20,000	A. S. Snow, U. S. N.	1886.
Do	Wrangell Strait	1737	1-30,000	do	1886.
Do	Wrangell Strait (reconnaissance)	1616	1-20,000	J. B. Coghlan, U. S. N.	1884.
Do	Wrangell Strait	1525 *b*	1-25,550	H. E. Nichols, U. S. N.	1881.
Do	Frederick Sound, Brown Cove	1810	1-5,000	C. M. Thomas, U. S. N.	1887.
Do	Frederick Sound, Thomas Bay	1811	1-20,000	do	1887.
Do	Frederick Sound, Portage Bay	1813	1-10,000	do	1887.
Do	do	1623 *b*	1-10,000	H. E. Nichols, U. S. N.	1882.
Do	Frederick Sound, Farragut Bay	1812	1-20,000	C. M. Thomas, U. S. N.	1887.
Do	Frederick Sound, Cleveland Passage	2000	1-10,000	H. B. Mansfield, U. S. N.	1889.
Do	Frederick Sound, Fanshaw Bay	1768	1-10,000	H. E. Nichols, U. S. N.	1885.
Do	Frederick Sound and Stephens Passage	1996	1-80,000	H. B. Mansfield, U. S. N.	1889.
Do	Frederick Sound, Eliza and Woewodski harbors	1998	1-10,000	do	1889.
Do	Pybus Bay	2002	1-40,000	do	1889.
Do	Hobart and Windham bays	2002	1-20,000	do	1889.
Do	Stephens Passage, Gambier Bay	1997	1-20,000	do	1889.
Do	Stephens Passage and Seymour Canal	2001	1-80,000	do	1889.
Do	Stephens Passage and Seymour Canal, Mole and Windfall harbors.	2003	1-20,000	do	1889.
Do	Stephens Passage, Holkham Bay	1999	1-40,000	do	1889.
Do	Stephens Passage, Midway Islands to Douglas Island and Taku River.	1897	1-80,000	C. M. Thomas, U. S. N.	1888.
Do	Stephens Passage, Port Snettisham	1898 *a*	1-30,000	do	1888.

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	SOUTHEAST ALASKA—continued.				
Alaska	Stephens Passage, Port Snettisham (hydrography and topography).	1921	1-30,000	C. M. Thomas, U. S. N	1888.
Do	Stephens Passage, Limestone Inlet	1898 *e*	1-5,000	....do	1888.
Do	Stephens Passage, Limestone Inlet (hydrography and topography).	1923	1-5,000	....do	1888.
Do	Stephens Passage, Taku Harbor	1898 *d*	1-5,000	....do	1888.
Do	Stephens Passage, Taku Harbor (hydrography and topography).	1922	1-5,000	....do	1888.
Do	Stephens Passage, Slocum Inlet	1898 *c*	1-10,000	....do	1888.
Do	Stephens Passage, Oliver Inlet	1898 *b*	1-20,000	....do	1888.
Do	Stephens Passage, Oliver Inlet (hydrography and topography).	1924	1-10,000	....do	1888.
Do	Stephens Passage, southern part (hydrography and topography).	1919	1-80,000	....do	1888.
Do	Stephens Passage, northern part (hydrography and topography).	1920	1-80,000	....do	1888.
Do	Stephens Passage, Taku Inlet	2055	1-40,000	H. B. Mansfield, U. S. N	1890.
Do	Stephens Passage, Chatham Strait		1-80,000		
Do	Stephens Passage, Gastineau Channel	2058	1-20,000	....do	1890.
Do	Stephens Passage, Fritz Cove		1-40,000		
Do	Stephens Passage and Lynn Canal	2056	1-40,000	....do	1890.
Do	....do	1602 *a*	1-40,000	J. B. Coghlan, U. S. N	1884.
Do	Stephens Passage and Lynn Canal, Barlow Cove, William Henry Harbor and Taiya Shanka.	2059	1-10,000	H. B. Mansfield, U. S. N	1890.
Do	Lynn Canal, St. James Bay	2060	1-20,000	....do	1890.
Do	Lynn Canal, Berners Bay	2061	1-20,000	....do	1890.
Do	Lynn Canal, northern part	2057	1-40,000	....do	1890.
Do	Cross Sound, Bartlett Cove, and Leo Anchorage	1602 *b*	1-20,000	J. B. Coghlan, U. S. N	1884.
Do	Chatham Strait, Funter Bay and Swanson Harbor	2062	1-10,000	H. B. Mansfield, U. S. N	1890.
Do	Chatham Strait, Cube Point to Danger Point	2205	1-80,000	W. I. Moore, U. S. N	1894.
Do	Chatham Strait, Tenakee Inlet and upper end Freshwater Bay.	2206	1-40,000	....do	1894.
Do	Chatham Strait, Freshwater Bay, lower end	2207	1-20,000	....do	1894.
Do	Chatham Strait, Killisnoo and vicinity	2208	1-10,000	....do	1894.
Do	Peril Strait, Broad Island to Suloia Point	1627	1-20,000	J. B. Coghlan, U. S. N	1884.
Do	Peril Strait, Suloia Point to Sitka	1626	1-20,000	....do	1884.
Do	Sitka Sound and approaches	2175	1-40,000	W. I. Moore, U. S. N	1893.
Do	Sitka Sound, Sitka approaches	2176	1-20,000	....do	1893.
Do	Sitka Sound, Sitka and vicinity	2174	1-10,000	....do	1893.
Do	....do	1439 *a*	1-15,000	L. A. Beardslee, U. S. N	1879.
Do	....do	1449 *b*	1-15,000	....do	1879.
Do	....do	1449 *c*	1-15,000	....do	1879.
Do	Sitka Sound, Sitka and vicinity (compiled)	1449 *d*	1-15,000	....do	1879.
Do	Sitka Sound, Silver Bay	2177	1-20,000	W. I. Moore, U. S. N	1893.
Do	Sitka Sound, Symonds Bay	1440 *a*	1-5,760	L. A. Beardslee, U. S. N	1879.
Do	....do	1440 *b*	1-5,760	....do	1879.
Do	Sitka Sound, Symonds Bay (compiled)	1440 *c*	1-5,760	....do	1879.
Do	Yakutat Bay and entrance	2158	1-40,000	G. B. Harber, U. S. N	1892.
Do	Yakutat Bay, Yakutat and vicinity	2157	1-20,000	....do	1892.
Do	Yakutat Bay, northern part	2159	1-40,000	....do	1892.