2081

2081

Diag. Cht. Nos. 1107 & 1209-2.

NOAA FORM 76-35

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

DESCRIPTIVE REPORT

Type of Survey .... Hydrographic [redacted]

[redacted] Hydro. No. 2081, 2089, 2095, 2101a & b.

[redacted]

LOCALITY

State ...... Massachusett

General Locality . Nantucket Shoals

Locality South of Nantucket Island

1891

REGISTRY IN ARCHIVES

DATE 1-18-92

☆ U.S. GOVERNMENT PRINTING OFFICE: 1973-761-775

2081

Diag. Cht. No. 1107 & 1209-2

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC

Field No. ..... *Office No.* H-2081

LOCALITY

State MASS.

General locality NANTUCKET SHOALS

Locality .....

~~1891~~ 1891

CHIEF OF PARTY

E. M. Hughes

LIBRARY & ARCHIVES

DATE JANUARY 19, 1892

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2081

2089

Acc. No.

Diag. Cht. No 1107 & 1209-2

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: Mass.

DESCRIPTIVE REPORT.

Hyd C *Sheet No* 2089

LOCALITY:

Nantucket Shoals

See SHA 2081

1891
~~1900~~

CHIEF OF PARTY:

E. M. Hughes

2089

2095
2101

2095

Diag. Cht. No. 1107 & Acc. No. 1209-2

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

T C Mendenhall
Superintendent.

State: Mass

DESCRIPTIVE REPORT.

Hyd C *Sheet No.* 2095

LOCALITY:

Nantucket Shoals

See SHA 2081

~~1890~~ 1891

CHIEF OF PARTY:

E M Hughes

Acc. No:

Diag. Cht. No. 1209-2

Department of Commerce and Labor

COAST AND GEODETIC SURVEY

T C Mendenhall

Superintendent.

State: Mass

DESCRIPTIVE REPORT.

Hydc *Sheet No:* 2101a&b

LOCALITY:

Nantucket Shoals

See SHA 2081

1891

~~190~~

CHIEF OF PARTY:

E M Hughes

H-2081

JAN 18 1892 000916

Write me at: Hydrographic Inspector Assistant in Charge

Telegraph me at:

My Express Office is:

U. S. COAST & GEODETIC SURVEY OFFICE OF JAN 18 1892 HYDROGRAPHIC INSPECTOR

U. S. Coast and Geodetic Survey, Str. A. D. Bache,
Navy Yard, New York,
December 31st, 1891.

Dr. T. C. Mendenhall,
Superintendent U. S. Coast and Geodetic Survey,
Washington, D.C.

Sir;

In compliance with the requirements of your circular letter of July 3d., 1890, I have the honor to submit the following report of the hydrographic work, etc., on Nantucket Shoals, executed during the Summer and Autumn of the present year by the party attached to this vessel under my command.

Forwarded
L. M. Sellers
Lt Com'd'r, U. S. N.;
Hydrographic Inspector C. & G. Survey.

General Description of Season's Operations.

The work assigned to me was the continuation of the resurvey of Nantucket Shoals, begun in August, 1890. In the prosecution of this work I was assisted by the parties of Lieutenants C. E. Vreeland, U.S.N., and L. K. Reynolds, U.S.N., commanding respectively the Steamer Blake and Endeavor.

Copies of Instructions under which the three parties worked are appended, marked as follows:—

Mark	Instructions	Date	Addressed to
A	Superintendent's Instructions	Mch. 31. 1891	Lieut. E. M. Hughes, U.S.N.
B	Detailed do.	May 15. 1891	Same.
C	do. do.	" 15. 1891	Lieut. C.E. Vreeland, U.S.N.
D	do. do.	" 14. 1891	Lieut. L. K. Reynolds, U.S.N.
E	Supplementary Detailed do.	Aug. 1. 1891	Lieut. E. M. Hughes, U.S.N.

Large buoys were used as floating signals in the prosecution of the work; these were fifteen in number — nine first-class can buoys, and six first-class spars — and were to have been put in position by June 1. 1891, by the new tender Azalea, of the Second Light-House District, under the supervision of the officer in charge of the survey.

The Bache, having been engaged during the winter and spring on the coasts of Texas and Louisiana, reached New York on May 11. 1891, and was at once put in readiness for work on Nantucket Shoals. Being fully prepared, she left New York on May 31. 1891, and proceeded to Newport, R.I., where she remained ten days awaiting the appearance of the tender Azalea

to place the buoys. Owing to the tardiness of the builders in completing the Azalea, her acceptance by the Light-House Establishment, was greatly delayed, and the month of June lost to the Survey. As a matter of fact, the Azalea did not leave New York on her outside trial-trip until June 23d. 1891, and the buoys were not planted until after the first of July.

The Bache, from Newport, and the Endeavor, from New Bedford, arrived at Nantucket on June 12. 1891, and found the Blake at anchor off the entrance to the Harbor.

Such preliminary work as could be done pending the placing of the buoys was at once got underway — including signal-building, the establishment of a tide-gauge at Great Point, etc.

On June 24th, while engaged in sounding on the head of Old Man Shoal, the Crown-sheets of the Bache's boiler collapsed. This accident completely disabled the vessel, and lost her services to the Survey for a period of four

weeks. She was towed to New Bedford by the Endeavor, and from New Bedford to New York by the Blake. It was found necessary to put in entirely new furnaces, besides resetting the boiler-tubes, replacing a number of stay-bolts, etc.; these repairs were begun at the Morgan Iron Works on July 1st., 1891, and completed on the last day of the same month, at an expense of $2015.37. The circumstances attending the collapse of the crown-sheets was fully reported on June 25. 1891.

The Bache having returned to Nantucket on August 2d., 1891, her work was at once resumed and continued without interruption, save that due to bad weather, until November 9th., 1891, when it was closed for the season, and the Bache and Endeavor quitted the vicinity of the working-ground. The Blake was withdrawn on September 28.

The Bache arrived at the New York navy-yard on November 11th., 1891, where she now lies preparing for work in the Gulf of Mexico.

General Description of Work done.

Appended to this report (marked F.) is a portion of Coast Survey Chart No. 7, exhibiting the Scheme of the summer's work on Nantucket Shoals, as outlined by the Hydrographic Inspector. It will be seen that the limits of the areas assigned to the different vessels were clearly defined, and that the projections issued to the Bache, Blake and Endeavor covered no more ground in common than was necessary to prevent undeveloped gaps in the survey. The Bache's work included the completion of the unfinished sheet No. 11, which was begun in 1890, and which covers the greater part of the Shoals proper. The Blake's sheets, numbered 14 and 15, cover areas lying just east and west of sheet No. 11. And the work of the Endeavor, on sheet No. 16, fell in the vicinity of Pollock Rip, and Stone Horse and Great Round Shoals.

Separate and distinct areas having been assigned to each of the parties

for development, this report will deal at length with the work of the Bache only, and reference is respectfully asked to the reports of the commanding officers of the Blake and Endeavor for a detailed account of the operations of their respective parties. The Blake finished sheet No. 14 and a portion of sheet No. 15, and the Endeavor completed the work to be done on sheet No. 16.

The work of the Bache, sheet No. 11, was finished, with the exception of a small incompletely developed area lying south of the Rose and Crown and east of Old South Shoal. Included in this space are the southern extremity of the Rose and Crown, and an extension of Old South Shoal to the northward of the position of that shoal as shown on Coast Survey chart No. 7. Lines were run to fully develop the Rose and Crown, but one of the signals used (Buoy No. 13) was afterward found to be out of place, having dragged nearly a half mile to the southward, in consequence of which some of the lines which were supposed to cross the lower

end of the Shoal, fell in between the Rose and Crown and Great Rip. The new position of Buoy No. 13 was determined as soon as possible, and the affected lines were plotted afresh, with the result of leaving the southern end of the shoal imperfectly developed, while soundings were unwittingly multiplied in the 'Blue' lying just to the southward. The work on this part of the sheet was executed so late in the season that no opportunity was afforded for filling in the gap left as above described. The extension of Old South Shoal to the northward is clearly indicated by the curves drawn in on the progress sheet which was forwarded to the Coast Survey Office in October last. The uneven nature of the bottom and abrupt changes of depth in the vicinity of the northern end of the Shoal, render necessary the use of boats for the proper development of the 18-ft. curve; three attempts were made by the Bache, assisted by the Endeavor, to develop this part of the ground more fully, but all failed in consequence of the impossibility of working boats in the heavy breakers encoun-

tered. These breakers are found on Old South Shoal at all times save when, at slack water, the sea is smooth and there is little or no swell prevailing, conditions which seldom prevail on Nantucket Shoals after the middle of September.

In addition to the foregoing, a small space lying between Great Rip and Davis' New South Shoal remains imperfectly developed, in consequence of lack of signals from which accurately to determine positions. The line of buoys near the eastern limit of sheet no. 11. not extending so far south as was originally intended. Experience gained with the buoys on the western side of the sheet, led, on their being shifted, to a decrease in the distances by which they were separated one from another, and a resultant shortening of the new line itself.

The following is a brief exhibit of the work executed during the season, on Sheet no. 11.-

Area sounded in square Geographical miles,	700
No. miles (Geog.) run while sounding,	1,225
" Angles measured,	4,317

No. soundings taken,	20,382
" Specimens of bottom obtained,	60
" Signals used,	79
" do. established,	66
" do. occupied,	68 .

The work on Sheet No. 11. was done by The Bache, with the exception of seventy-five miles by The Endeavor, just South of Bass Rip, and one hundred and sixty-one miles by The Blake, over The shoal lying to the Sd. and Wd. of Davis' South Shoal Light-Vessel. A copy of the instructions under which The Blake's work above referred to was executed is appended, marked G.

Detailed Statistics of work on Sheet No. 11, season of 1891, are appended, marked as follows:-

H. Statistics of Field-Work (Form 11.)
I. do. " daily Field-Work, Bache.
J. do. " " do., Blake and Endeavor.
K. do. " Signals, etc. etc.
L. Memorandum of Specimens of bottom.

In the execution of the Hydrography within the limits of Sheet No. 11, during the seasons of 1890 and 1891, the general method of

procedure has differed somewhat from that of the original survey of Nantucket Shoals. In the later work the aim has been to develop first the general features of the shoals as a whole, by a fairly regular system of lines, and afterward make a more careful examination of the channels, rips and shoal spots thus found. In the original survey it would seem that the rips and shoal spots were first developed.

Signals.

For off-shore signals the Coast Survey Schooner Scoresby, Davis' South Shoal Light-Vessel and a number of buoys furnished by the Light-House Establishment were used.

The Scoresby was anchored about two and one half miles to the northward of Old South Shoal, in 8 fathoms of water, with 55 fathoms of 7/8" chain. While she lasted, she proved a valuable signal, as her position was easily and repeatedly verified by angles on objects on shore. But she was old and leaky, making about six inches of water daily, and requiring frequent pumping. On the night of September 11th., 1891, she foundered, nothing afterward being seen of her but a little recognizable wreckage. A detailed report of her loss and the circumstances attending it was submitted on September 26th., 1891.

The position of Davis' South Shoal Light-Vessel was accurately determined during the Summer of 1890, since which time she has not moved. This light-vessel is anchored in about sixteen fathoms of water, with an extremely

heavy mushroom and one hundred and five fathoms of chain; this scope remains the same in both summer and winter, and the anchor is never sighted, save for cause. At intervals the chain is hove short for the purpose of clearing it of turns. Thus the only element of unreliability in the determination of positions depending on this signal, is that due to its radius of swing.

During the month of July, nine first-class can and six large spar buoys were placed on the shoals, within the limits of the western half of sheet no. 11, for use as water-signals, and, upon the completion of the hydrography in their vicinity, eight of the can and two of the spar buoys were, early in September, shifted to positions in which they formed a line of signals extending nearly north and south along the eastern edge of the same sheet. The can-buoy signals were designated 'Buoys', and, with one exception, (that of Buoy 2½, falling between buoys 2 and 3,) were numbered in regular succession from 1 to 16. The spar-buoy signals were designated as 'Spars', and were numbered from 1 to 8, in regular order.

The appended sheet, marked F, exhibits the positions of the water-signals. The can-buoys, regardless of depth of water, were anchored with thirty fathoms of chain, and heavy granite sinkers weighing from 2,000 to 3,000 pounds each. The spar-buoys were anchored with sinkers somewhat lighter, and length of wire rope so cut, with reference to the depth of water, that the spars would 'watch' properly.

In the system of signals on the western half of the sheet the buoys were separated by a mean distance of 2.2 geographic miles, but experience proved this to be a trifle too great, and in placing the second system this (mean) distance was reduced to 2 geographic miles. In the first set, parti-colored flags, eight feet square, were shown from the can-buoys, the flagstaves being supported by light iron tripods; the flags were little or no use, however, and in the second set they were displaced by evergreen boughs, which better answered the intended purpose.

As signals, the buoys answered fairly well, but they could be carried for comparatively short distances only, as they were low in the water, and the exposed surfaces were not large. With favorable conditions as to visibility, smoothness of water, et cetera, positions could be satisfactorily determined within a belt six miles wide, extending about three miles on each side of the lines of buoys, placed as in the work in question. With the surface of the water at all broken, it was hard to distinguish the buoys, and long swells (even with a perfectly smooth sea) rendered it extremely difficult to obtain positions, in consequence of one or more of the three signals in use being nearly always shut out by the tops of the swells.

Wherever practicable, the positions of floating signals were verified as often as opportunity offered, and, with the exceptions of Buoys Nos 12 and 13, it is believed that none dragged.

On September 9, 1891, the Steamer Blake picked up Buoy No. 13 adrift, about three miles to the southward of its proper position, its chain having parted at the 15-fathom shackle. On the fol-

lowing day The Blake towed The buoy back on the line, and anchored it about a half mile South of its original place, with 30 fathoms of chain, and a 350-pound anchor. Shortly afterward the new position of this buoy was determined by The Bache, and it was called Buoy 13b. Its anchor, however, proved too light, and in the heavy N.E. gale of Oct. 12-13 it again dragged, bringing up in 4½ fathoms water, four miles to the Sd. and Wd. of its place, and two miles W. by S. ½ S. (mag.) from Buoy no. 14, where it remained until the end of the season.

Buoy no. 12 disappeared in one of the N.W. gales of October, but was afterward sighted about seven miles to the Sd. and Ed. of its original position and three miles E. ¼ S. (mag.) from Buoy no. 15, where it had probably brought up on Davis' Bank, and where it was allowed to remain.

Upon the receipt of instructions to close the season's work, I, on Nov. 6. 1891, notified the Inspector of the Second Light-House District That the buoys would no longer be required, and informed him of the positions of all the buoys when last

used or sighted.

As regards what may be termed the primary water-signals — i.e., buoys, etc., whose positions were determined directly from fixed objects on shore — the coefficient of error, due to radius of swing round their anchors, was so slight as not materially to affect the accuracy of the lines of off-shore soundings depending on such buoys, but in the case of secondary water-signals, (buoys depending for position on other buoys) this coefficient was naturally increased. The greatest discrepancy between different determinations of the position of the same secondary signal was one sixth ($\frac{1}{6}$) of a (geog.) mile, the position of Spar no. 3 on Aug. 14, differing by this distance from its position as determined when originally planted.
The general results obtained by the use of buoys as signals on Nantucket Shoals, may, I think be concidered as satisfactory.

Tides, Currents, Reduction of Soundings, etc.

During the season just ended, under verbal instructions from the Office, the tide was, in general, disregarded on that part of the Shoals lying South of parallel 41°10' N.

All boat soundings were reduced for the stage of tide prevailing when they were taken.

Tidal corrections were applied to soundings made from the Steamer Bache on the following days:- I, K, L, M, N, O, P, Q, R, S, U, X, and part of E.— These soundings falling, mainly, east of 69°50' and north of 41°10', and in shoal water to the southward of parallel 41°10'-

Soundings made from the Bache on the following days were not reduced:- A, B, C, D, F, G, H, T, V, W and part of E— This work lying to the southward of parallel 41°10' or to the westward of meridian 69°50'.

The tidal curves for reduction of soundings on U day (Oct. 2.), and X day (Nov. 4.), were constructed from data obtained from the Atlantic Coast Tide Tables, U.S.C. and G. Survey, 1891. An unusually full tide prevailed on November 4. 1891.

In all other cases where soundings were reduced, the applied corrections were obtained directly from the readings of the gauge maintained at Great Point, Nantucket, by the party in charge of Lieutenant L. K. Reynolds, U. S. N., Comdg. Coast Survey Str. Endeavor, to whose records reference is asked for a complete description of gauges, data, etc. From August 4 to Aug. 17, 1891, an ordinary box-gauge was used — From Aug. 17 to September 22, 1891, a siphon gauge was used. Neither of these gauges was self-registering. The plane of reference for the box-gauge is 3.9 feet — The plane of reference for the siphon gauge is 3.7 feet.

Reductions obtained from readings at Great Point are not, in strictness, applicable to soundings on the outlying parts of Nantucket Shoals, but have nevertheless been employed as before noted, the plane of reference thus obtained being an approach to a correct one, with the result — especially desirable in very shoal water — that the error, if any, in shown depths, is on the side of safety.

On a number of days when The Bache was anchored near Davis' New and The Old South Shoals, an approximation to the times of high and low water, for the positions and dates in question, was obtained inferentially from observations of the set and strength of the tidal currents, it being assumed that the time of high or low water was coincident with that of slack water. The following table exhibits the relative times of high and low water at Great Point and on the Shoals, on the dates referred to; it should be borne in mind that, while the times quoted for Great Point are those corresponding to actual readings of the tide gauge, those for the Shoals are approximate only, and were obtained as above described.

(See following sheet for table)

Comparative Times of High and Low Water at Great Point and Old and Davis' South Shoals.

Date 1891.	Stage of Tide.	At Great Point		At	Time.	
Aug. 14	H.W.	6:30	P.M.	Davis' South Shoal	6:30	P.M.
" 15	H.W.	7:30	A.M.	Same	7:20	A.M.
" "	L.W.	1:00	P.M.	Same	12:30	P.M.
" 18	H.W.	11:00	A.M.	Old South Shoal	9:30	A.M.
" 19	H.W.	11:15	A.M.	Same	10:00	A.M.
" "	L.W.	5:00	P.M.	Same	4:50	P.M.
" 20	H.W.	12:15	P.M.	Same	11:30	A.M.
" "	L.W.	6:00	P.M.	Same	6:00	P.M.
Sept. 11	H.W.	5:30	P.M.	same	5:00	P.M.
" 12	H.W.	—	—	Same	5:00	A.M.
" "	L.W.	12:00	M.	Davis' South Shoal.	11:00	A.M.
" 21	H.W.	2:30	P.M.	Old South Shoal.	12:00	M.
" "	L.W.	—	—	Davis' South Shoal.	6:00	P.M.
" 22	L.W.	9:00	A.M.	Same.	8:00	A.M.

From the foregoing table, it would appear that the times of both high and low water on the Shoals to the southward, are somewhat earlier than those for corresponding stages of the tide at Great Point. The differences being as follows:-

Old South Shoal, H.W. about 90m earlier.
do. L.W. " 5m "
Davis' New South Shoal, H.W. " 5m "
do. L.W. " 50m "

The conditions under which the Survey was prosecuted did not permit a more complete investigation in this direction.

As is well known, the set of the tidal currents on Nantucket Shoals shifts 'with the sun', and slack water seldom prevails. At the strength of the flood or Easterly tide, the current sets generally to the Nd. and Ed., running in a contrary direction with the ebb or Westerly tide. At about the time when slack-water should prevail, the current becomes comparatively weak, and sets to the Nd. and Wd. or Sd. and Ed., at the end of ebb or flood tides respectively. The following observations, made on Old South Shoal on Aug. 19, 1891, will illustrate the usual change

of direction of current on the Shoals.

Time	Stage	Current setting to	Strength
10 " 00 A.M.	H.W.	Ed.	Light
11 " 30 "		S.S.W.	Medium
2 " 15 p.m.		W.S.W.	Strong
4 " 10 "		W. x S.	Light
5 " 00 "	L.W.	N. ÷ W.	Light
5 " 30 "		N. E.	Medium
5 " 50 "		E.N.E.	Strong

The currents encountered on Nantucket Shoals were, at times, very unreliable, frequently changing direction materially, and varying in strength, upon crossing or coming from under a shoal, with a corresponding change in direction of the line of soundings being run at the time. If practicable, the deviation of the compass was verified whenever lines of soundings showed eccentric changes of direction.

Changes

The changes observed are all indicated on the progress sheet of Reason's work, forwarded to the Office in October, 1891. The principal of these are the extension to the northward from Old South Shoal, the growing of the Rose and Crown to the northward, the deepening of the water on Davis' South Shoal, the disappearance of lumps on McBlair Shoal, and the disappearance of the shoal lumps to the southward of Bass Rip. In this connection, attention is called to the fact that the soundings appearing on the progress sheet were not reduced.

The least water found on Davis' South Shoal was 2 fms. 3½ ft. The master of the tender Azalea, of the 2d. Light-House District, informed me in 1890 that it has been his practice for years to cross Davis' South Shoal freely in all parts, on his way to and from the South Shoal light-vessel. The soundings obtained fully cover the shoal. In addition to the boat work, the Bache ran a number of lines across the shoal, and one along its backbone.

The shoal patch with 12-17 feet of water on it, lying about 2,500 yards to the Southward of the E. end of McBlair Shoal, and shown on Chart no. 111. as lying nearly east and west, was found nearly in the spot indicated, but lying about north and south.

The alleged 4½ fathom spot shown on chart no. 7 as lying to the Sd and Wd from Davis' South Shoal light-vessel, was not found. From the light-vessel, a breaker in the direction of the shoal referred to is seen at times, in heavy but clear weather — particularly when the wind comes out strong from the Nd and Wd, after a South Easter. In case the light-vessel is moved to the Sd and Wd, outside of the shoal in question (as is, I believe, contemplated) it is recommended that at the time of determining the new position of the light-vessel, a further search be made for the 4½ fathom patch. After considerable inquiry, on board the light-vessel and among Nantucket men, I have found none who had any knowledge of so little water as 4½ fathoms on this shoal.

Weather.

The weather experienced during the Summer of 1891, in marked contrast to that of the corresponding season of the previous year, was extremely unfavorable for work in the vicinity of Nantucket.

The month of August was unusually hazy and foggy — September was fair — And October and November were very stormy. In 49 days immediately following September 22d., only 71 miles of soundings were done, and but 36 miles were done during the month of October.

In the heavy N.E. gale of Oct. 12-13 and 14. The Bache lost one of her bower anchors, which was not recovered. This was reported under date of Oct. 15, 1891.

Assistance rendered by the Bache to the Chatham life-saving crew was reported under date of Oct. 24, 1891.

It is my belief that, in general, 'outside' hydrographic work on Nantucket Shoals cannot be prosecuted with advantage or economy after the middle of October.

On September 21 and 22, in the middle

of a fortnight of fine weather, a phenome-
nally heavy swell prevailed on the shoals, in
conjunction with a glassy sea, and entire ab-
sence of wind, the barometer standing at about
30.00 inches.

Office Work.

Ensign W. B. Hoggatt performed the duties of draughtsman, and plotted the season's work to my entire satisfaction.

On September 12, all angles upon Buoy No. 8 were rejected, the floating caboose of the foundered schooner Scoresby having been mistaken for that signal.

In the records, all bearings are magnetic, and all courses are compass-courses. A table of the deviation of the Bache's compass appears in each of the sounding books containing steamer work, and a similar table accompanies this report.

5/6/92

Miscellaneous.

Standard (75°) time was used throughout the work.

Sixty specimens of the bottom were obtained.

A few smacks were engaged, late in the season, in fishing in the channel lying between the Rose and Crown and Great Rip, on one side, and Fishing Rip and the rips to the northward, on the other.

It would seem that the ground to the eastward of that contained within the limits of sheet no. 11, needs careful developing. Noank fishermen report 12 to 15 feet of water east of the Rose and Crown (near the spot marked 18 ft. on chart no. 7), and 4 fathoms on Half Moon Shoal (lying to the Ed. of Great Rip and Nd. of Fishing Rip).

The original records were forwarded to the office on December 21, 1891, and the fair copies on the day following.

All of which is respectfully submitted.

Edwd. M. Hughes

Lieut. U.S. Navy, Asst. C. & G. Survey,
Comdg. Bache.

Copy.

A.

Instructions

U. S. Coast and Geodetic Survey,
Office of Superintendent,
Washington, D.C., March 31st, 1891.

Lieut. E. M. Hughes, U.S. Navy,
Comdg. C. & G. Survey Str. "Bache",
Care Woodward, Wight & Co., New Orleans, La.

Sir:-

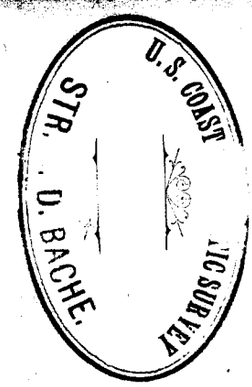
You will please close your season's work on or about April 15th. and proceed to the New York Navy Yard, where you will prepare the vessel under your command for Hydrographic work on Nantucket Shoal to be commenced about June 1st.

Any unexpended part of your estimate for Gulf work can be used for stores and coal, and an additional estimate for work on Nantucket Shoal for the month of June will be approved for a sum not exceeding $600.00.

These instructions cover any expenditure for local transportation necessary in their execution.

(Signed) Very respectfully,
T. C. Mendenhall, Superintendent,
per S. M. A.

A


U.S. COAST
STR. D. BACHE.
SURVEY

Copy

B

Detailed Instructions.

U.S. Coast and Geodetic Survey,
Office of the Hydrographic Inspector,
Washington, D.C., May 15th., 1891.

Lieut. E. M. Hughes, U.S. Navy,
Comdg. C. & G. Survey Str. "Bache,"
Navy Yard, New York.

Sir:-

Referring to the Superintendent's letter of March 31, 1891, in which you are directed to prepare your vessel for work on Nantucket Shoals about June 1, you will proceed to the vicinity of the Shoals, and continue the hydrographic work begun last season.

In this work you will be assisted by Lieut. C. E. Vreeland, U.S.N., Comdg. Str. "Blake," and Lieut. L.K. Reynolds, U.S.N., Comdg. Str. "Endeavor," copies of whose detailed instructions are herewith enclosed, and who will work under your general directions and be subject to your orders.

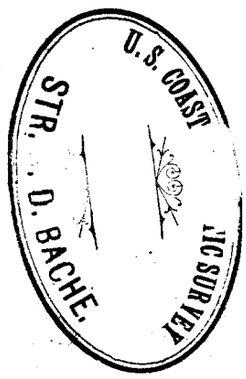
For the particular work of your own vessel, two projections, Scale 1:40,000, and one unfinished projection used last season, are furnished you. The triangulation and tidal data, used last season, are now in your possession.

Your last year's instructions, supplemented by the verbal directions given in our late interview, will be sufficient guidance in the work you are expected to perform.

Keep this Office informed of the movements of the vessels under your command, and of the progress of your work.

(Signed) Very respectfully,
S.M. Ackley, Lieut. Comdr., U.S.N.,
Hydrographic Inspector, C. & G. Survey.

B


U.S. COAST
STR. A. D. BACHE.
SURVEY

Copy for Lieut. E. M. Hughes, U.S.N., Comdg. "Bache".

Copy

C.

Detailed Instructions

U.S. Coast and Geodetic Survey,
Office of the Hydrographic Inspector,
Washington, D.C., May 15th., 1891.

Lieut. C.E. Vreeland, U.S. Navy,
Comdg. C. & G. Survey Str. "Blake",
Navy Yard, Washington, D.C.

Sir:-

Referring to the Superintendent's letter of even date in which you are charged with the execution of hydrographic work on Nantucket Shoals during the coming season, you will proceed to the vicinity of the Shoals as soon as your vessel is ready to begin work.

Two projections, Scale 1:40,000, are furnished you, together with descriptions of the necessary triangulation stations.

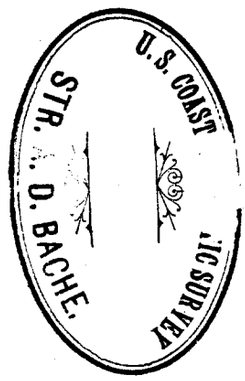
The hydrography you are called upon to perform connects, on projection No. 14, with the inshore work of Mr. Marindin, Assistant C. & G. Survey, and with that of the "Bache", while on projection No. 15 it connects with the work assigned to the "Bache" and "Endeavor."

Owing to the irregularity of the Shoals and to the advisability of giving specific directions for carrying on the work, you will in general be guided by the verbal explanations and directions given you in this Office a short time since.

The number and character of the lines to be run must be determined by circumstances as you find them, but when soundings show the existence of shoal spots, have those spots carefully developed, and in all cases the 18 foot Curve well determined.

(Signed) Very respectfully,
S.M. Ackley, Lieut. Comdr., U.S.N.,
Hydrographic Inspector,
C. & G. Survey.

C.


U.S. COAST
STR. D. BACHE.
C SURVEY

Copy for Lieut. E. M. Hughes, U.S.N. "
Comdg. "Bache."

D.

Detailed Instructions.

U.S. Coast and Geodetic Survey,
Office of the Hydrographic Inspector,
Washington, D.C., May 14th, 1891.

Lieut. L.K. Reynolds, U.S. Navy,
Comdg. C. & G. Survey Str. "Endeavor,"
Fortress Monroe, Va.

Sir:-

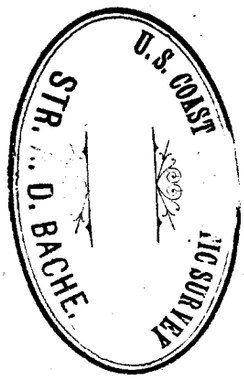
Referring to the Superintendent's letter to you of March 26-1891, in which you are directed to execute hydrography, during the coming season, on Nantucket Shoals, this Office furnishes you for that purpose one projection, scale 1:20,000, and one projection, scale 1:40,000, with all available data.

In our recent personal interview I explained the character and extent of the work you are to perform, and beyond the directions given you at that time I only wish to emphasize the necessity of making your work sufficiently close and complete as to develope the numerous Shoals known to exist, and other possible shoals still uncharted, within the limits of your work. The number and character of the lines to be run will be left to your own judgment.

I am particularly desirous that the 18 foot curve be carefully determined.

(Signed) Very respectfully,
S. M. Ackley, Lieut. Comdr., U.S.N.,
Hydrographic Inspector,
C. & G. Survey.

D


U.S. COAST
STR. D. BACHE.
AND SURVEY

Copy E

"Supplementary Detailed Instructions.

U. S. Coast and Geodetic Survey,
Office of the Hydrographic Inspector,
Washington, D.C., August 1st, 1891.

Lieut. E. M. Hughes, U.S. Navy,
Comdg. C. & G. Survey Str. "Bache",
Nantucket, Mass.

Sir;

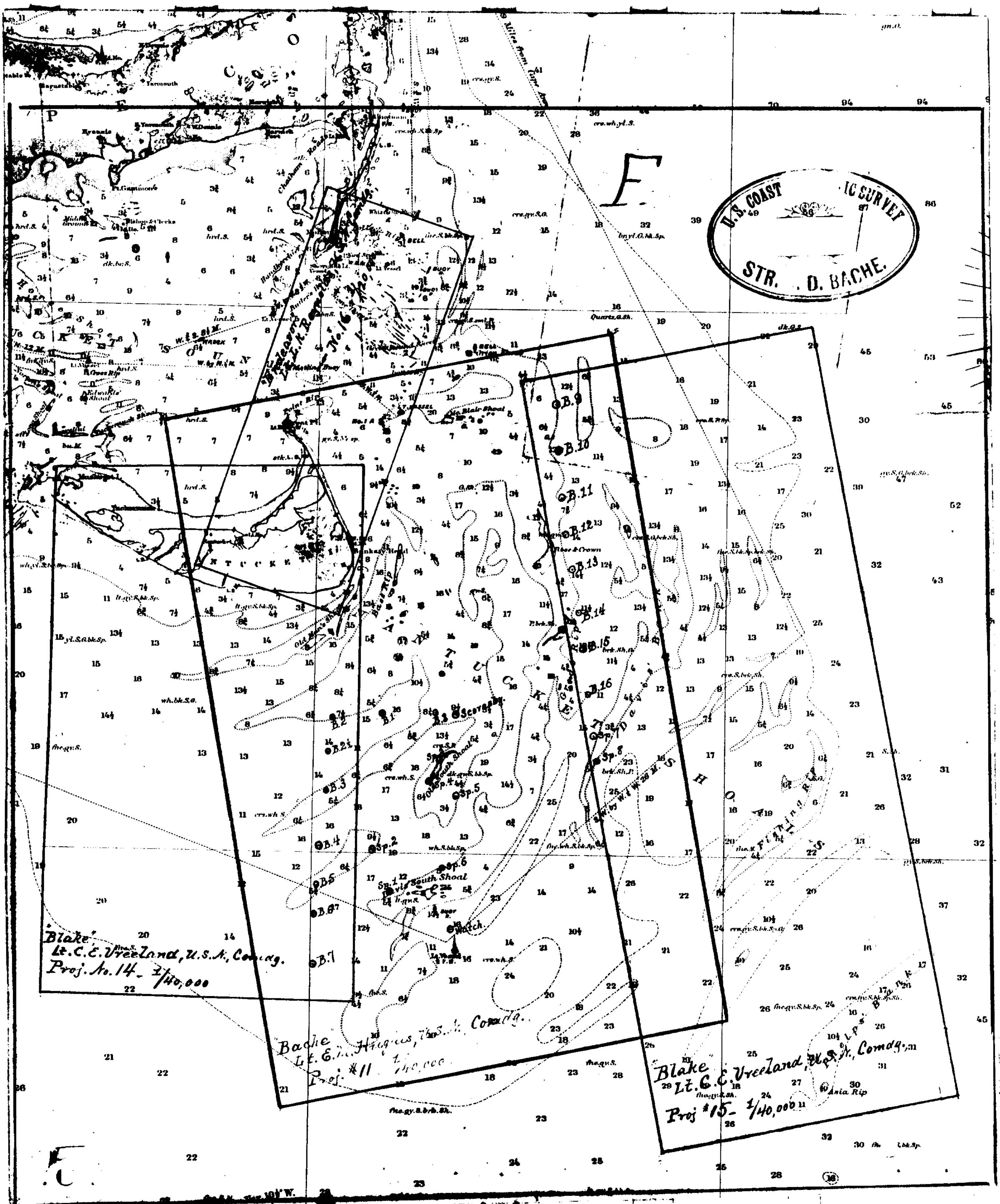
Lieut. C. E. Vreeland, U.S.N., Comdg. "Blake" has reported to this Office that he has finished the Hydrography on his Western Sheet. As he will not be able to commence work on Sheet No. 15 until the buoys have been shifted, I shall direct him to assist you in the hydrography of Sheet No. 11. If you receive this before you can communicate with Lieut. Vreeland, have prepared a working copy of Sheet No. 11 for his use, and indicate on it the limits of work for him to do, this work finally to be transferred to your smooth Sheet No. 11.

As his instructions do not cover the method of doing this work please indicate in writing how you wish it done.

(Signed) Very respectfully,
S. M. Ackley, Lieut. Comdr., U.S.N.,
Hydrographic Inspector,
C. & G. Survey.

E

U.S. COAST
STR. D. BACHE
SURVEY


U.S. COAST IC SURVEY
STR. D. BACHE.
"Blake"
Lt. C. E. Vreeland, U.S.N., Comdg.
Proj. No. 14 - 1/40,000
"Blake"
Lt. C. E. Vreeland, U.S.N., Comdg.
Proj #15 - 1/40,000
"Bache"
Nantucket Shoals
Old South Shoal
Asia Rip
Great Rip
Fishing Rip

Write me at: Nantucket, Mass. Copy G

Telegraph me at:

My Express Office is:

U. S. Coast and Geodetic Survey, Str. A.D. Bache,

Nantucket, Mass.,

August 6th., 1891

2-167

Lieut. C. E. Vreeland, U.S.N.,

Comdg. C. & G. Survey Str. Blake,

Nantucket, Mass.

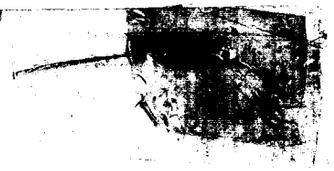
Sir;

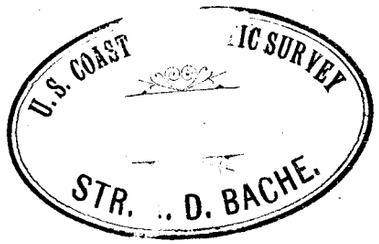
In compliance with instructions from the Hydrographic Inspector, U.S. Coast & Geodetic Survey, dated August 1st, 1891, that I indicate to you in writing the nature of the work to be done by the Blake on sheet No. 11, I would inform you that it is desired to develop the shoal making to the S$^{d}_{e}$ and W$^{d}_{e}$ from Davis' South Shoal Light-Ship, by running radial lines from the light-vessel to cover the shoal by lines to be not more than one half a mile apart at the further extremity of the shoal — These lines will be from eight to ten miles in length, and twelve to fifteen in number, depending on the outline of the shoal, and will be run on a bearing from the light-ship, the distance being determined by patent Log.

(Signed) Respectfully, Lt. Edwin M. Hughes, U.S.N.,

Comdg. "Bache."

G




U.S. COAST
IC SURVEY
STR. .. D. BACHE.

H.

U. S. Coast and Geodetic Survey [Form 11.—Statistics of Field Work.]

Statistics of Field Work executed by Lt. Edwd M. Hughes, U.S.N, Comdg. Str A.D. Bache.

Date of beginning field work	Aug. 4th, 1891
Date of closing field work	Nov. 4th, 1891
RECONNAISSANCE:	
Area of, in square statute miles	
Lines of intervisibility determined as per sketch submitted	
Number of points selected for scheme	
BASE LINES:	
Primary, length of	
Secondary, length of	
Beach measurements, length of	
Number of days employed in measurements of base	
Number of days employed in re-measurements	
TRIANGULATION:	
Area of, in square statute miles	
Signal poles erected, number of	
Observing tripods and scaffolds built, number of	
Observing tripods and scaffolds built, heights of	
Days occupied in opening and verifying lines of sight, number of	
Stations occupied for horizontal measures, number of	
Stations occupied for vertical measures, number of	
Geographical positions determined, number of	
Elevations determined trigonometrically, number of	
GEODESIC LEVELING:	
Elevations determined by spirit-leveling of precision, number of	
Lines of geodesic leveling, length of	
LATITUDE, LONGITUDE, AND AZIMUTH WORK:	
Latitude stations occupied, number of	
Pairs of stars observed for latitude, number of	
Average number of observations on a pair	
Longitude stations, telegraphic, number of	
Longitude stations, telegraphic, number of nights on which signals were exchanged	
Longitude stations, chronometric, etc., number of	
Azimuth stations, number of	
Number of nights of observations for azimuth	
Number of stars observed for azimuth	

H.

GRAVITY DETERMINATIONS:

Number of pendulum stations occupied	

MAGNETIC WORK:

Stations occupied for observations of the magnetic declination, number of	
Stations occupied for observations of the magnetic dip, number of	
Stations occupied for observations of the magnetic intensity, number of	

TOPOGRAPHY:

Area surveyed in square statute miles	
Length of general coast-line in statute miles	
Length of shore-line of rivers in statute miles	
Length of shore-line of creeks in statute miles	
Length of shore-line of ponds in statute miles	
Length of roads in statute miles	
Topographic sheets finished, number of	
Topographic sheets, scales of	

Topographic sheets, limits and localities of:

HYDROGRAPHY:

Area sounded in square geographical miles	700.00
Number of miles (geographical) run while sounding	1224.56
Number of angles measured	4317
Number of soundings	20382
Number of tidal stations established	
Number of specimens of bottom preserved	58
Current stations, number of	
Hydrographic sheets finished, number of	1
Hydrographic sheets, scales of	1/40,000

Hydrographic sheets, limits and localities of:

Nantucket Shoals, Mass., Proj. No. 11:
40° 48' to 41° 26' North and 69° 32' to 70° 10' West.

PHYSICAL HYDROGRAPHY:

Number of soundings on cross-sections	
Current stations, number of	
Deep-sea current stations, number of	
Deep-sea surface current observations, number of	
Deep-sea sub-surface current observations, number of	
Number of observations of density of water	
Number of observations of temperature of water	
Tidal stations established, number of	
Miles (geographical) run in deep-sea sounding	
Number of deep-sea soundings	
Number of specimens of bottom preserved	

Locality of work; results, how shown, etc.:

I.

Hydrography :- Nantucket Shoals, Mass. - Proj. No. 11;
Coast and Geodetic Survey Str. A. D. Bache,
Lt. Edwd M. Hughes, U.S.N., Asst. C. & G. Survey, Comdg.,
Summer Season, 1891.

Dates.	Letter.	Book.	Nautical Miles.	Soundings.	Angles.	Vessel.	Observers.
June 24	A¹	1¹	9.25	243	92	Bache	Ensigns W.W. Buchanan and W.B. Hoggatt.
Str. Bache - August.							
Aug. 4	A	1	46.20	579	147	Bache	Lt. Burdick, Ens. Buchanan & Hoggatt, & M.@R. J.L. Dunn.
" 7	B	1	48.30	591	203	"	" " , " " " & Oman, & M.@R. Dunn.
" 8	C	2	42.70	578	143	"	" " , " " & Oman, and " " .
" 13	D	1	16.60	177	56	"	" " , " " " , " " " .
" 14	E	2	87.50	1029	282	"	" " & " Oman.
" 15	F	3	3.60	31	7	"	Ens. Buchanan and M.@R. J.L. Dunn.
" 17	G	3	19.35	277	72	"	Lt. Burdick and Ens. Oman.
" 19	H	1	12.03	194	52	"	" " , Ensigns Buchanan & Oman, & M.@R. Dunn.
" 20	I	4	51.38	659	152	"	
Aug. totals - Bache.			326.56	4055	1114	"	
Bache's Whale boat - August.							
Aug. 15	a	1	7.50	865	122	Whale boat	Lt. W.L. Burdick and Ens. J.W. Oman.
" 18	b	1	4.15	336	40	"	" " " .
" 19	c	1	7.50	584	101	"	" " " .
Bache's Gig - August.							
Aug. 15	a	1	6.50	498	78	Gig	Ens. W.W. Buchanan & M.@R. J.L. Dunn.
" 18	b	1	3.30	199	32	"	" " "
" 19	c	1	10.25	525	108	"	" " "
Aug. totals W.boat & Gig			39.20	3006	481	W.boat & Gig	
Str. Bache - September.							
Sept. 5	K	3	35.20	483	64	Bache	Lt. Burdick, & Ensigns Hoggatt & Oman.
" 8	L	3	11.65	161	22	"	Ens. Buchanan & M.@R. J.L. Dunn.
" 9	M	4	73.50	1091	302	"	Lt. Burdick, Ens. Buchanan & Oman, & M.@R. J.L. Dunn.
" 10	N	3	8.85	142	46	"	" " " " " "
" 11	O	5	73.00	975	343	"	" " " " " "
" 12	P	5	59.20	807	114	"	" " " " " "
" 13	Q	3	68.00	933	326	"	" " " " " "
" 19	R	6	42.80	507	93	"	" " " " " "
" 21	S	6	51.20	446	56	"	" " " " " "
" 22	T	7	73.50	662	0	"	Lt. Burdick and Ensign Buchanan.
Sept. totals - Bache			496.90	5997	1366	"	
Bache's Whale boat and Gig - September.							
Sept. 10	a	1&2	13.00	1302	152	Whale boat	Lt. Burdick and Ensign Oman.
" 10	a	1	11.00	1001	128	Gig	Ensign Buchanan and M.@R. J.L. Dunn.
Sept. totals - W.boat & Gig			24.00	2303	280	W.boat & Gig	
Str. Bache - October.							
Oct. 2	U	7	31.00	419	102	Bache	Lt. Burdick, Ensigns Hoggatt & Oman, & M.@R.J.L. Dunn.
" 22	V	8	4.75	66	22	"	" " " " " " " " "
" 29	W	8	31.15	274	26	"	" " " " " " " " "
Oct. totals - Bache			66.90	759	149	"	
Str. Bache - November.							
Nov. 4	X	8	25.55	576	169	Bache	Lt. Burdick, Ensigns Hoggatt & Oman, & M.@R.J.L. Dunn.
Recapitulation (by months).							
June			9.25	243	92	Bache	
August			365.76	7061	1595	" & Boats	
September			520.90	8300	1646	" " "	
October			66.90	759	149	Bache	
November			25.55	576	169	"	
Totals for Season			988.36	16939	3651	Bache & Boats	
"Endeavor" and "Blake"			236.20	3443	666	"Endeavor" and "Blake" on Proj. No. 11.	
Grand total			1224.56	20382	4317	All Vessels on Proj. No. 11.	
			9.25	243	92		
			1215.31	20139	4225		

J

J

Coast and Geodetic Survey,

Nantucket Shoals, Mass.,

Summer Season, 1891.

Work done on Proj. No. 11 by Str. "Blake," Lt. C.E. Vreeland, U.S.N., Comdg., and Str. "Endeavor," Lt. L.K. Reynolds, U.S.N., Comdg., in accordance with instructions from Lt. Edwd M. Hughes, U.S.N., Comdg. Str. "A.D. Bache":

Date.	Letter	Book	Naut. Miles.	Soundgs.	Angles.	Vessel.	Observers.
Aug. 7	A	1	35.70	209	34	Str. Blake	Ens. Wright - P. Yeo. Crosby.
" 13	B	1	36.70	229	8	"	" Rohrbacher - " "
" 14	C	1	88.80	720	24	"	" " " "
Total - "Blake"			161.20	1158	66	"	
Sept. 8	D	1	30.00	743	184	"Endeavor"	Ensigns Ryan and Rodman.
" 21	K	1	29.50	1009	250	"	" " " "
Nov. 4	P	1	15.50	533	166	"	" Gibson " "
Total - "Endeavor"			75.00	2285	600		
"Endeavor" & "Blake"			236.20	3443	666	"Endeavor" and "Blake".	

U.S. COAST AND GEODETIC SURVEY
STR. A. D. BACHE.

J-5

K.

U.S. Coast and Geodetic Survey Str. A.D. Bache,
Lt. Edwd M. Hughes, U.S. Navy, Comdg.,
Survey of Nantucket Shoals, Mass.; Summer Season, 1891.

Recapitulation

Month	Naut. Miles.	Soundings.	Angles.	
June	9.25	243	92	
August	365.76	7061	1595	
September	520.90	8300	1646	
October	66.90	759	149	
November	25.55	576	169	
	988.36	16939	3651	

Signals:

Established.	Occupied	Determined	Used
66	68	67	79

Number of days on Station and how employed:-

Number of days on Station	151
" " " " which hydrographic work was done	25
" " " " " signals were built	2
" " " " " hydro. work was prevented by bad weather	78
" " " " " " " " " " " other causes	* 46

* Includes time lost by accident to boiler.

K.

L.

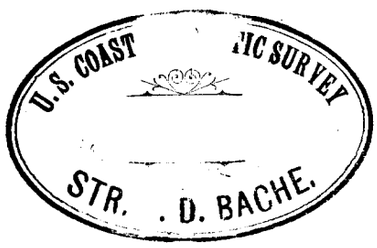
U.S. C. and G. Survey Str. A.D. Bache, - Nantucket Shoals, Mass., Proj. № 11, -

Lt. Edwd M. Hughes, U.S.N., Asst. C. & G. Survey, Chief of Party.

List of Specimens of Bottom, taken during Summer Season, 1891.

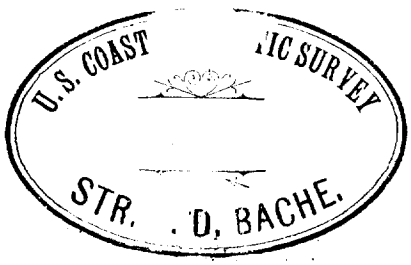
No. of Spec.	Day Letter.	Date.	Position at which taken	Character of Specimen.
1	A	Aug. 4	10	crs. gy. S., bk. sp.
2	A	" 4	34	fn. gy. S., bk. sp.
3	A	" 4	38	fn. wh. S., bk. sp.
4	A	" 4	51	crs. wh. S., bk. sp.
5	A	" 4	71	crs. wh. S., brk. Sh.
6	B	" 7	3	crs. gy. S., yl. & bk. Sp.
7	B	" 7	15	fn. gy. S., bk. sp.
* 8	B	" 7	66	dk. gy. S., bk. sp., brk. Sh.
9	C	" 8	9	crs. gy. S., brk. Sh.
10	C	" 8	43	crs. gy. S., yl. sp.
11	C	" 8	65	crs. gy. S., brk. Sh.
12	D	" 13	11	crs. wh. S., brk. Sh.
13	D	" 13	28	gy. S., bk. sp., brk. Sh.
14	E	" 14	24	gy. S., yl. sp.
* 15	E	" 14	bet. 36 & 37	gy. S., brk. Sh.
16	E	" 14	49	crs. gy. S., yl. sp., brk. Sh.
17	E	" 14	55	crs. gy. S., G., brk. Sh.
18	E	" 14	82	gy. S., bk. sp., brk. Sh.
19	E	" 14	bet. 90 & 91	crs. gy. S., yl. & bk. Sp.
20	E	" 14	101	crs. gy. S., brk. Sh.
21	E	" 14	108	crs. gy. S., bk. & yl. sp., brk. Sh.
22	E	" 14	116	fn. gy. S.
23	E	" 14	126	crs. gy. S., brk. Sh.
24	E	" 14	137	gy. S., brk. Sh.
25	G	" 17	14	crs. gy. S., yl. sp., brk. Sh.
26	H	" 19	24	crs. gy. S.
27	I	" 20	29	fn. wh. S., brk. Sh.
28	I	" 20	54	fn. G., brk. Sh.
29	K	Sept. 5	30	G., brk. Sh.
30	K	" 5	55	brk. Sh.
31	L	Sept. 8	3	brn. S., bk. & yl. sp., brk. Sh.
32	L	" 8	9	brn. S., G., brk. Sh.
33	M	" 9	3	S., G., brk. Sh.
34	M	" 9	bet. 11 & 12	brn. S., G., brk. Sh.
35	M	" 9	" 35 & 36	crs. gy. S., brk. Sh.
36	M	" 9	128	crs. brn. S., brk. Sh.
37	M	" 9	140	fn. gy. S., brk. Sh.
38	O	" 11	52	brn. S., brk. Sh.
39	O	" 11	135	crs. brn. S., fn. brk. Sh.
40	P	" 12	22	fn. gy. S., bk. sp.
41	P	" 12	56	G., P., brk. Sh.
42	P	" 12	63	crs. gy. S., fn. brk. Sh.
43	P	" 12	67	brn. S., wh. sp.
44	P	" 12	72	G., P., brk. Sh.
45	Q	" 13	26	crs. brn. S., fn. brk. Sh.
46	Q	" 13	109	fn. gy. S., brk. Sh.
47	Q	" 13	154	S., G., P., brk. Sh.
48	S	" 21	22	crs. brn. S., yl. sp., brk. Sh.
49	S	" 21	41	fn. gy. S., brk. Sh.
50	S	" 21	50	fn. gy. S., brk. Sh.
51	T	" 22	17	wh. S., brk. Sh.
52	T	" 22	near 27	wh. S., brk. Sh.
53	T	" 22	bet. 41 & 42	gy. S., bk. sp., brk. Sh.
54	T	" 22	48	crs. gy. S., yl. & bk. sp., brk. Sh.
55	T	" 22	58	gy. S., fn., brk. Sh.
56	T	" 22	bet. 70 & 71	gy. S., fn. brk. Sh.
57	T	" 22	near 76	gy. S., yl. & bk. sp., brk. Sh.
58	U	Oct. 2	7	crs. brn. S., brk. Sh., yl. sp.
59	U	" 2	29	S., G., brk. Sh.
60	W	" 29	10	G. and P.

* Specimens No's. 8 and 15 not preserved.



Northern Deviation Table: Str. A.D. Bache, 1891.

Ship's head.	Deviations	
	Degrees	Points
North		1/8 East.
N. × E.	6°-25′ East.	9/16 " .
N.N.E.	7-21 " .	5/8+ " .
N.E.×N.	8-18 " .	3/4− " .
N.E.	10-09 " .	7/8+ " .
N.E.×E.	10-16 " .	7/8+ " .
E.N.E.	9-55 " .	7/8 " .
E.×N.		7/8 " .
East		7/8 " .
E.×S.	9°-06′ East.	13/16 " .
E.S.E.	7-06 " .	5/8 " .
S.E.×E.	5-38 " .	1/2 " .
S.E.		3/8 " .
S.E.×S.	2°-23′ East.	1/4− " .
S.S.E.	0-35 " .	1/16− " .
S.×E.	0-40 West.	1/16 West.
South.	1-19 "	1/8− " .
S.×W.	3-49 .	5/16+ " .
S.S.W.		3/8 " .
S.W.×S.	4°-43′ West.	7/16− " .
S.W.	6-07 " .	9/16− " .
S.W.×W.	6-07 " .	9/16− " .
W.S.W.	7-37 " .	11/16− " .
W.×S.	7-38 " .	11/16− " .
West	7-38 " .	11/16− " .
W.×N.	7-45 " .	11/16 " .
W.N.W.	7-45 " .	11/16 " .
N.W.×W.		1/2 " .
N.W.	4°-15′ West.	3/8 " .
N.W.×N.	3°-58′ " .	3/8 " .
N.N.W.	3-45 " .	3/8− " .
N.×W.		1/4 " .



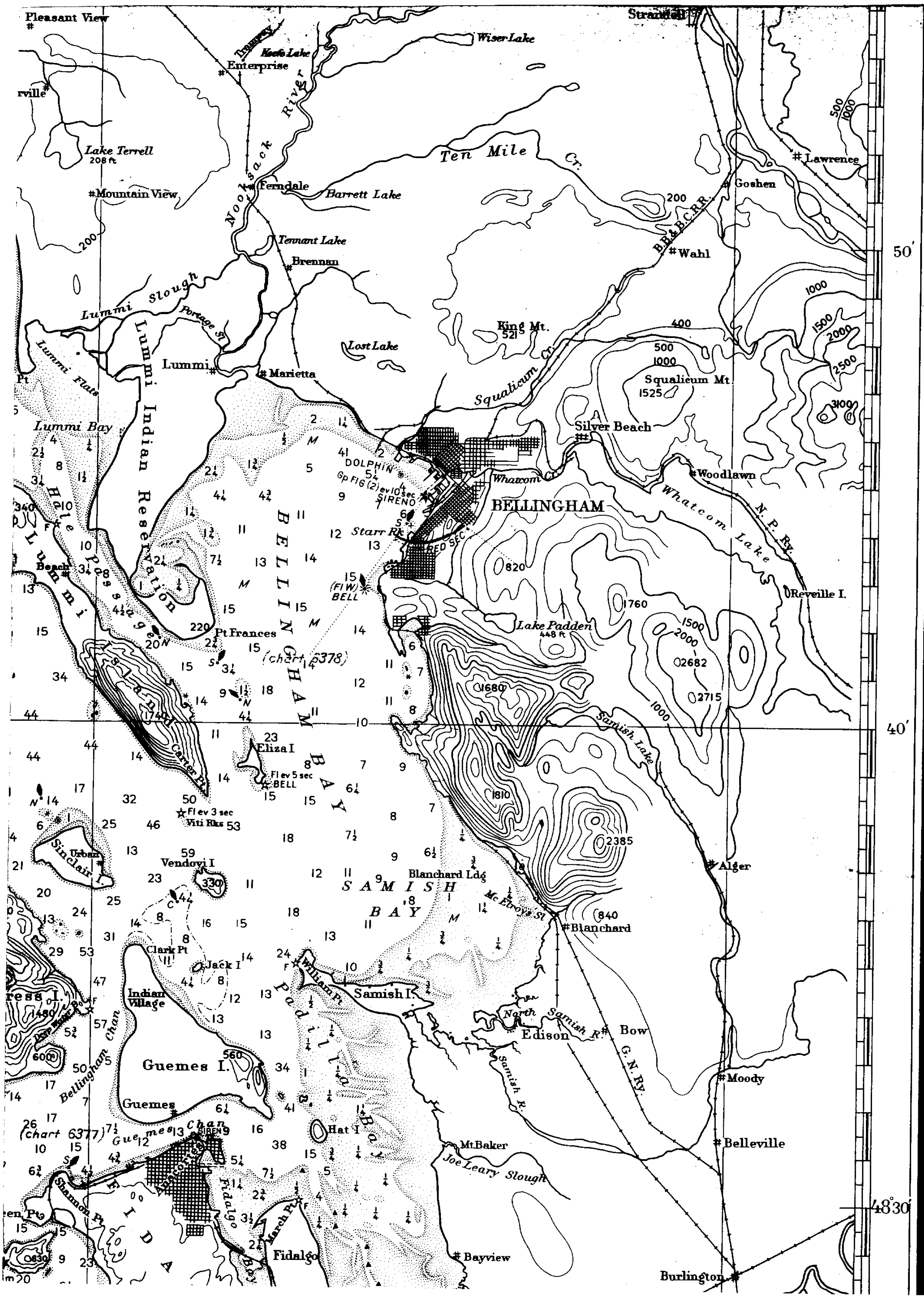
U.S. Coast and Geodetic Survey Str. A.D. Bache,

Lieut. Edwd M. Hughes, U.S.N., Comdg.

List of officers and men attached to Party.

Survey of Nantucket Shoals, Summer Season, 1891.

Lieutenants	1
Ensigns	3
Assistant Engineers	1
Apothecary	1
Master-at-arms	1
Paymaster's Yeoman	1
Machinists	3
Ship's Writer	1
Carpenter's Mate	1
Boatswain's "	1
Quartermasters	3
Ship's Cook	1
Cabin Steward	1
" Cook	1
2c Firemen	4
Seamen	12
Landsmen	3
Total	39



Pleasant View
Wiser Lake
Enterprise
Nooksack River
Lake Terrell
208 ft
Mountain View
Ferndale
Barrett Lake
Tennant Lake
Brennan
Ten Mile Cr.
Lawrence
Goshen
Wahl
50′
Lummi Slough
Portage Sl
Lummi
Marietta
Lost Lake
King Mt.
521
Squalicum Cr.
Squalicum Mt
1525
Silver Beach
Lummi Flats
Lummi Bay
Lummi Indian Reservation
Woodlawn
Whatcom Lake
N.P. Ry.
DOLPHIN
SIREN
Whatcom Cr.
BELLINGHAM
Starr Rk
RED SEC
BELL
Hale Passage
Lummi Island
Pt.Frances
BELLINGHAM BAY
(chart 6378)
Lake Padden
448 ft
Reveille I.
Samish Lake
40′
Eliza I
Fl ev 5 sec
BELL
Carter Pt
Fl ev 3 sec
Viti Rks
Sinclair I.
Urban
Vendovi I
Alger
Blanchard Ldg
SAMISH BAY
McElroys Sl
Blanchard
Clark Pt
Jack I
William Pt
Samish I.
Indian Village
North Samish R.
Edison
Bow
G. N. Ry.
Samish R.
Guemes I.
Padilla Bay
Moody
Bellingham Chan
Guemes
Hat I
Mt.Baker
Belleville
(chart 6377)
Guemes Chan
SIREN
Joe Leary Slough
Shannon Pt
Fidalgo
March Pt
Bayview
Burlington
48°30′

Applied to new Ch 265 10-16-61 RKD