Serial No. 241

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

E. LESTER JONES, DIRECTOR

HYDROGRAPHY

DEEP-SEA SOUNDINGS ATLANTIC AND PACIFIC OCEANS AND CARIBBEAN SEA

1919 and 1922

LIBRARY
AUG 1 1 1992
N.O.A.A.
U.S. Dept. of Commerce

Special Publication No. 97

QB
275
.U35
no. 97
(1923)

PRICE, 15 CENTS

Sold by the Superintendent of Documents, Government Printing Office
Washington, D. C.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1923

National Oceanic and Atmospheric Administration

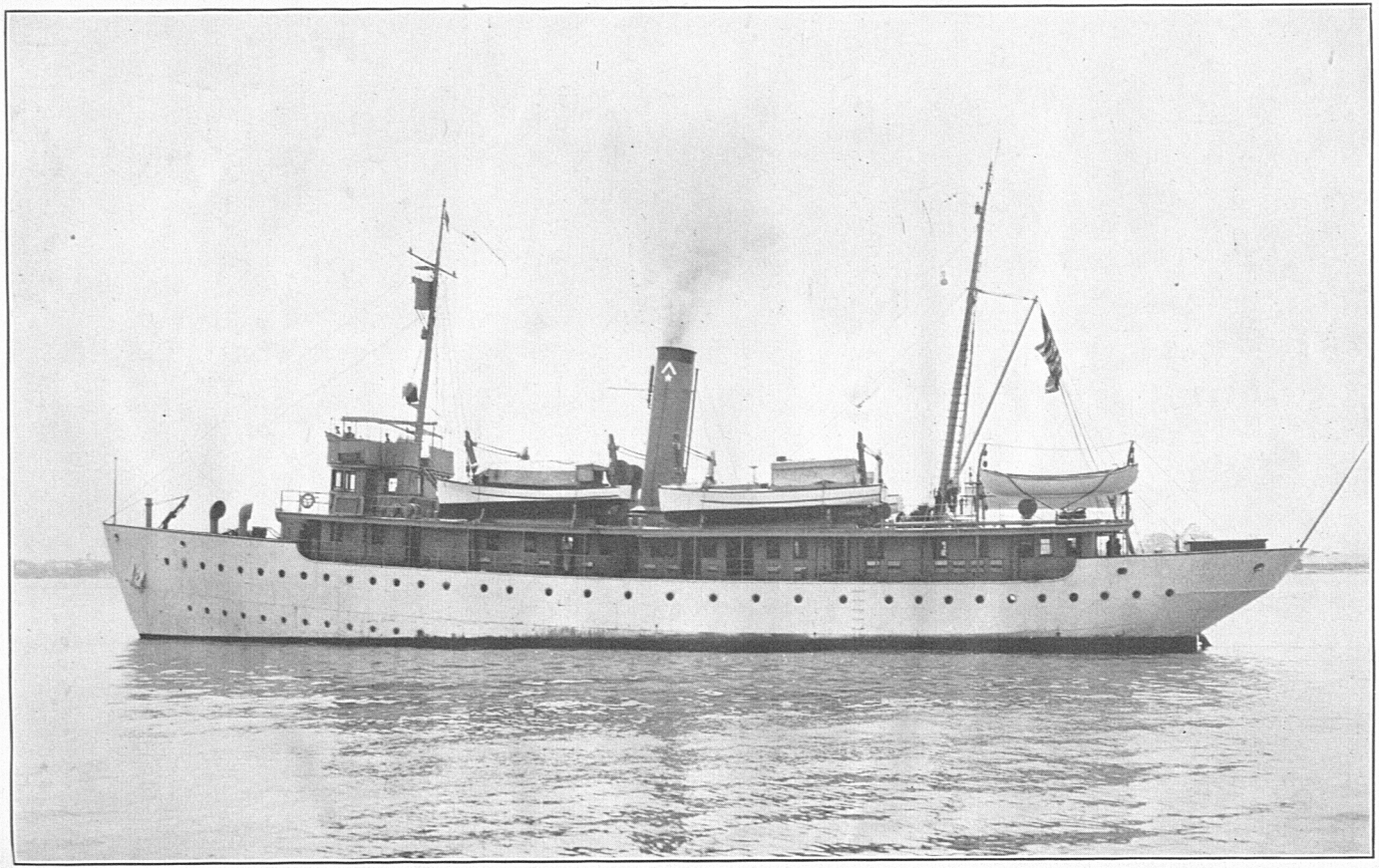
ERRATA NOTICE

One or more conditions of the original document may affect the quality of the image, such as:

Discolored pages
Faded or light ink
Binding intrudes into the text

This has been a co-operative project between the NOAA Central Library and the Climate Database Modernization Program, National Climate Data Center (NCDC). To view the original document, please contact the NOAA Central Library in Silver Spring, MD at (301) 713-2607 x124 or www.reference@nodc.noaa.gov.

LASON
Imaging Contractor
12200 Kiln Court
Beltsville, MD 20704-1387
January 1, 2006



"SURVEYOR."

Blank page retained for pagination

CONTENTS.

	Page.
Circumstances of the work	1
Instrumental equipment	2
General results	2
Notes on the tabulated data	4
Tabulated data	6
Hydrographic work accomplished	26
U. S. C. and G. S. Deep Sea Sounding Machine and Attachments	27

ILLUSTRATIONS.

U. S. C. and G. S. S. *Surveyor*	Frontispiece.
U. S. C. and G. S. S. *Wenonah*	2
U. S. C. and G. S. S. *Lydonia*	3
U. S. C. and G. S. S. *Sialia*	2
U. S. C. and G. S. S. *Discoverer*	3
U. S. C. and G. S. S. *Pioneer*	3
Chart showing region surveyed	3
Navigational sounding machine	4
U. S. C. and G. S. Deep Sea Sounding Machine:	
General view of assembled machine	28
Side view, with gear cover removed	28
General assembly; vertical section through shaft	28
Details of installation on deck	29
General view of installation; ready to sound	29
Attachments; ready to sound	29
Attachments; after sounding	29

INTRODUCTORY.

DEPARTMENT OF COMMERCE,
U. S. COAST AND GEODETIC SURVEY,
Washington, June 20, 1923.

This publication contains the results of hydrographic work accomplished by vessels of the U. S. Coast and Geodetic Survey while cruising between the Atlantic and Pacific coasts of the United States. It has been compiled by Commander J. T. Watkins, hydrographic and geodetic engineer, U. S. Coast and Geodetic Survey. The several vessels employed on this work were in command of the following officers of this service: *Surveyor*, Lieut. Commander F. H. Hardy; *Lydonia*, Commander E. H. Pagenhart (1919), and Lieut. Commander R. F. Luce (1922); *Discoverer*, Lieut. Commander H. A. Seran; *Sialia*, Lieut. Commander T. J. Maher; *Pioneer*, Lieut. R. R. Lukens; and *Wenonah*, Lieut. R. R. Lukens.

E. LESTER JONES, *Director*.

DEEP-SEA SOUNDINGS, ATLANTIC AND PACIFIC OCEANS AND CARIBBEAN SEA, 1919 AND 1922.

CIRCUMSTANCES OF THE WORK.

When the United States entered the World War in 1917 the vessels of the Coast and Geodetic Survey were transferred to the Navy Department for service with that arm of the national defense. Soon after the cessation of hostilities they were returned to the bureau for use as survey vessels, and about the same time, in the spring of 1919, several converted yachts and other craft previously operated as naval auxiliaries were made part of the permanent equipment of the survey.

Among the vessels thus transferred were the Coast and Geodetic Survey steamer *Surveyor* and the naval auxiliaries *Wenonah*, *Lydonia*, and *Sialia;* which were thereupon assigned to survey operations on the Pacific coast. The transfer of these vessels from the Department of the Navy to the Department of Commerce having been effected at points on the Atlantic coast, it was necessary for them to make the passage from the Atlantic to the Pacific, through the Panama Canal, in order to reach their working grounds.

The direct route from Norfolk, Va., where they repaired and outfitted, is from Chesapeake entrance to the Bahamas, through Windward Passage, across the Caribbean to the Panama Canal, and thence along the Pacific coasts of Central America and Mexico to San Diego, Calif.

As this track lies along one of the principal ocean highways through the Panama Canal, particularly important to the coastwise traffic of the United States, and traverses areas where little hydrographic data had been collected, these vessels were directed to take soundings over those portions of the route where the charts were deficient or defective. For this purpose they were assigned courses which were approximately parallel, spaced about 60 miles apart, on which soundings were to be taken at intervals of 30 to 60 miles. This plan was followed generally, though conditions encountered in the execution of the work required that it be modified or abandoned at times.

The vessels were all new to the service and were manned by untrained crews; however, after a comparatively brief period, in some cases before the vessels reached the Canal Zone, a goodly proportion of the men attained a gratifying degree of proficiency in their various duties connected with deep-sea sounding, as is evidenced by the improved character of the results and the relatively few or no casualties noted in the records of the vessels for the latter half of the trip between Norfolk and San Diego.

Of the four vessels taking part in the 1919 work, the *Surveyor*, which was designed and built for the Coast and Geodetic Survey

service, was the only one well suited to the work. The others were small yachts of light construction and did not meet the requirements for ocean survey work; one of them, the *Sialia*, while approaching the Bahamas from Norfolk, developed boiler and condenser troubles of such a serious character that she was recalled from the cruise and subsequently returned to the Naval Establishment as unfit for service. The others made the trip successfully, under exceptionally favorable conditions, and completed the incidental hydrographic work assigned them in a highly satisfactory manner.

INSTRUMENTAL EQUIPMENT.

The sounding outfit was made up of standard equipment, the principal items being the Sigsbee sounding machines, which were obtained promptly through the hearty cooperation of the Department of the Navy and hurriedly installed a short time before the vessels sailed from Norfolk. These steam-driven sounding machines were of the original type developed from Lord Kelvin's excellent device and used with notable success in the Coast Survey's early deep-sea explorations.

The data collected in 1919 consisted of depths, specimens of bottom material, temperature of air and of water at surface and bottom, and samples of water at the surface and bottom.

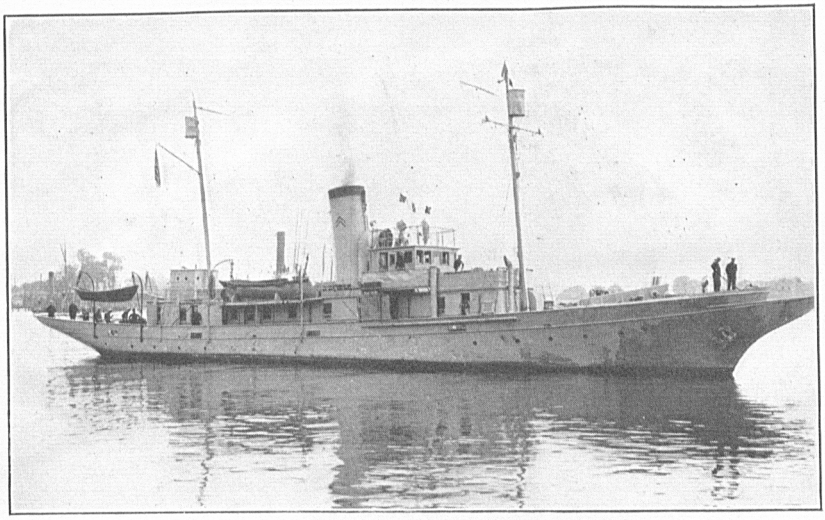
The second installment of this recent offshore work by vessels of the Coast and Geodetic Survey was executed in 1922 and, as in 1919, when opportunity offered in connection with the required movements of the survey's vessels: The *Lydonia*, then on the Pacific coast, was assigned to duty in the Atlantic; and the two new survey vessels, *Discoverer* and *Pioneer*, converted mine sweepers transferred from the Navy in 1922 and outfitted at Norfolk, were sent to the Pacific for work on the west coast. The contributions of these three vessels are merely extensions of the work of 1919. The equipment differed only in the deep-sea sounding machines used by the *Discoverer* and *Pioneer*, which were a new type designed and constructed by the survey in 1922. On her return trip the *Lydonia* had a well-trained crew familiar with the ship, which was an advantage not possessed by the other vessels.

The data collected in this later work included water specimens and temperature at 200 fathoms depth, for the special use of the Bureau of Fisheries.

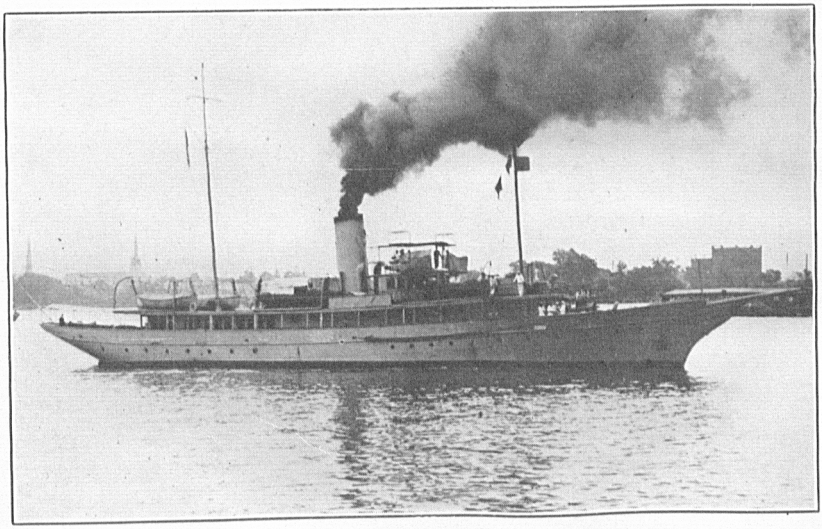
GENERAL RESULTS.

The locality and extent of the work are shown on the following chart, on which the tracks of the different vessels are indicated by distinctive symbols. The distance from Norfolk to the Canal Zone was approximately 2,200 miles and thence to San Diego, 3,100 miles.

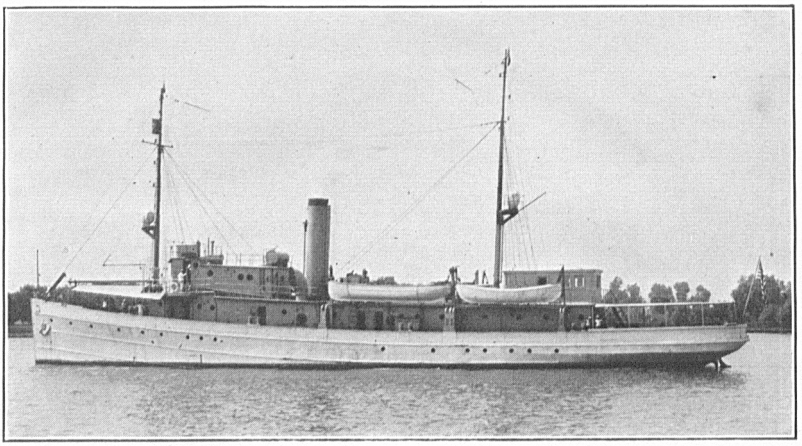
The area covered totaled about 1,000,000 square statute miles; made up of 240,000 square miles in the Atlantic, 135,000 in the Caribbean, and 630,000 in the Pacific. If we consider the resulting development as equivalent to soundings at intervals of d miles on parallel lines spaced d miles apart, then for the work in the Atlantic, d is 35 nautical miles; for the Caribbean, d is 27 nautical miles; and for the Pacific, d is 39 nautical miles.



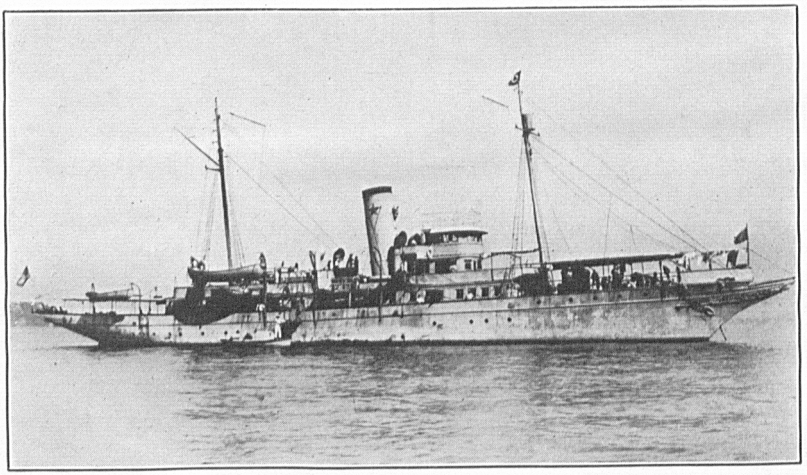
"WENONAH."



"SIALIA."



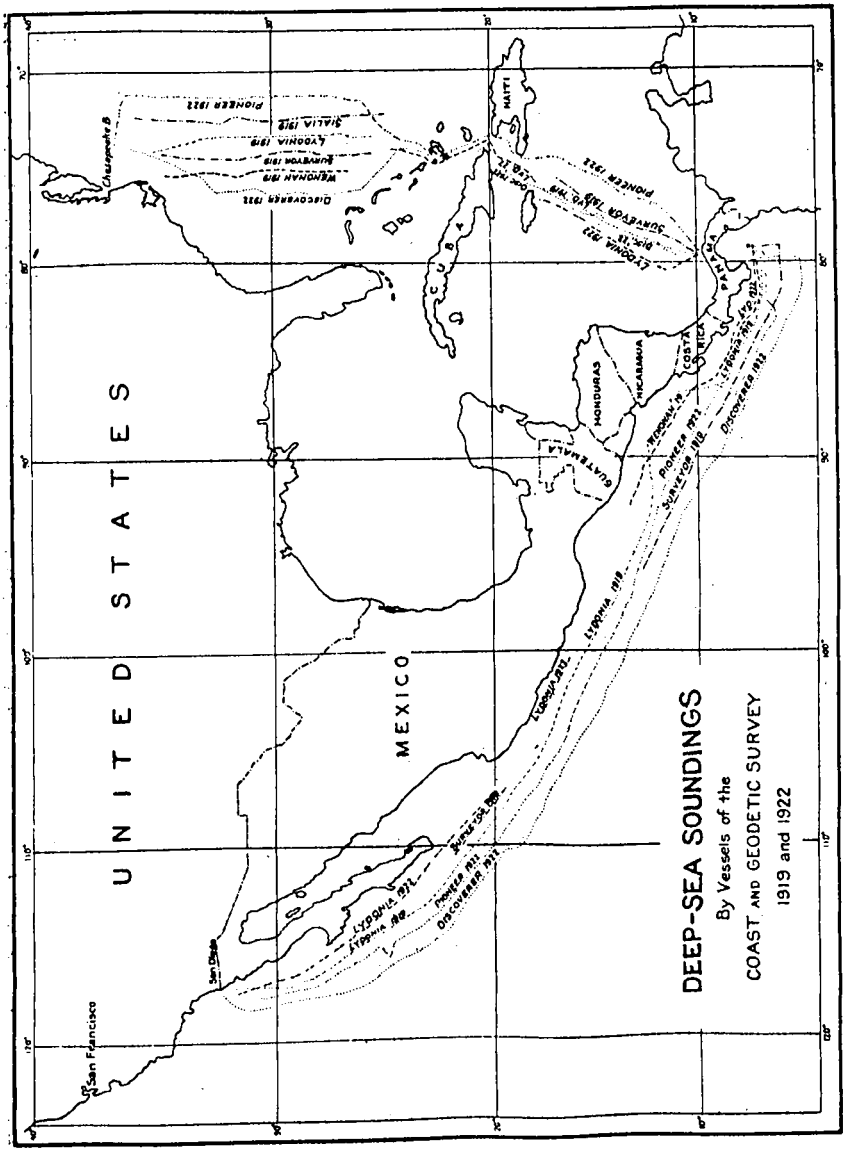
"DISCOVERER" AND "PIONEER" (Sister Ships).



"LYDONIA."

The data collected consists of:

Soundings	587
Specimens of bottom material	353
Temperatures of air	563
Temperatures of water at the surface	377
Temperatures of water at 200 fathoms depth	311
Temperatures of water at the bottom	296
Specimens of water at the bottom	391
Specimens of water at 200 fathoms depth	298
Specimens of water at the surface	447



NOTES ON THE TABULATED DATA.

The results for all the vessels are given in detail in the subjoined tables, which cover the following items of information:

1. The date gives the instant of time the sinker reached bottom.

2. The geographic coordinates are expressed in degrees and minutes of latitude and longitude, and are derived from numerous lines of position determined at short intervals throughout the 24 hours. Generally the time used in the reduction of observations was corrected daily by radio time signals.

3. The depths are expressed in fathoms and have been corrected for all known errors.

4. The brief preliminary description of the material of the bottom is given in abbreviated form as follows: M, mud; S, sand; G, gravel; Sh, shells; P, pebbles; Sp, specks; Cl, clay; St, stones; Co, coral; Oz, ooze; Wd, weed; bk, black; wh, white; yl, yellow; gy, gray; bu, blue; gn, green; br, brown; dk, dark; lt, light; hrd, hard; sft, soft; fne, fine; crs, coarse; rky, rocky; stk, sticky; brk, broken; lrg, large; sml, small; stf, stiff. Technical descriptions of the bottom materials may be obtained from the U. S. National Museum, Division of Marine Invertebrates, where the specimens have been deposited for examination and report. As part of the permanent collection they are there available for the use of interested specialists.

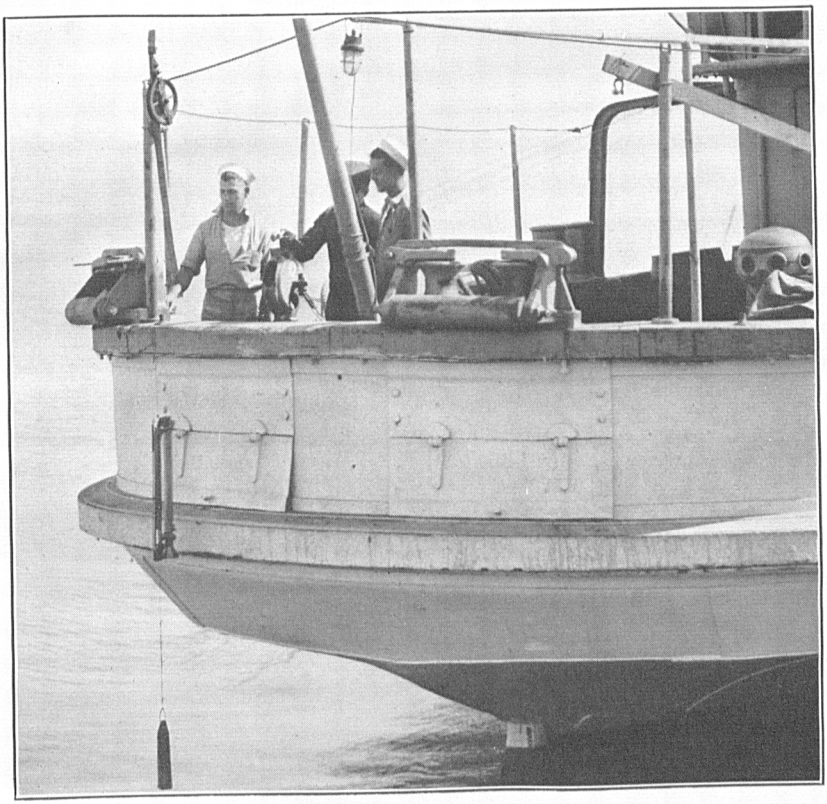
5. Temperatures are expressed in degrees Fahrenheit. The surface temperatures and water specimens were obtained at a depth of about 15 feet. The numerous specimens of sea water collected have been forwarded to the Bureau of Fisheries for the determination of salinity and other studies.

6. The rate of reeling out the wire with sinker attached, and the rate at which the wire is reeled in after shot is detached are expressed in fathoms per minute. These rates of descent and ascent are the mean velocity of the wire through the water and include all minor stops and delays incident to its passage from surface to bottom and return.

7. The rate at which the sounding is taken is likewise expressed in fathoms per minute, and is the quotient of the depth in fathoms divided by the number of minutes required to obtain the sounding. This time interval for a given sounding is the total elapsed time between the signal to stop the ship for the sounding and the following signal for full speed ahead on course after the completion of the sounding. It includes all time lost from course on account of accidents or other delays directly connected with the sounding operation, as well as that required to measure the depth.

8. As bearing directly upon the probable precision of the determination of depth, the state of the sea and the nature and magnitude of the motion of the ship are given in abbreviated form as follows:

B, broken or irregular sea.
C, chopping, short, or cross sea.
G, ground swell.
H, heavy sea.
L, long rolling sea.
M, moderate sea or swell.
R, rough sea.
S, smooth sea.
T, tide-rips.
Rl, roll.
Pt, pitch.
Slt, slight.
Mod, moderate.
Hvy, heavy.
NM, no motion.



NAVIGATIONAL SOUNDING MACHINE.

Used to obtain water specimens and temperatures at intermediate depths.

9. The direction of the wind prevailing at the time of sounding is given according to the usual compass abbreviations. The force of the wind, or its approximate velocity, conforms to the arbitrary Beaufort scale:

Force of wind:	Velocity, statute miles per hour.
0, calm	0 to 3
1, light air	8
2, light breeze	13
3, gentle breeze	18
4, moderate breeze	23
5, fresh breeze	28
6, strong breeze	34
7, moderate gale	40
8, fresh gale	48

The weather conditions are entered in terms of the usual Beaufort symbols:

b, clear blue sky.
c, clouds.
d, drizzling or light rain.
f, fog or foggy weather.
g, gloomy, or dark stormy-looking weather.
h, hail.
l, lightning.
m, misty weather.
o, overcast.
p, passing showers of rain.
q, squally weather.
r, rainy weather or continuous rain.
s, snow, snowy weather, or snow falling.
t, thunder.
u, ugly appearance or threatening weather.
v, variable weather.
w, wet, or heavy dew.
z, hazy weather.

10. The incompleteness of the results at some stations is due largely to lack of equipment. The inadequate supply of instruments hurriedly collected for the work in 1919 was, in the case of some items, quickly exhausted through the excessive losses due to the inexperience of the crews in the early stages of the work. In some instances all thermometers, water-cups, and detaching rods were lost and recourse was had to improvised detaching rods and other makeshift devices.

No note of casualties has been entered in the table of results, for the reason that averages deduced from the entire work would prove misleading. While the crews were new to the work and strangers to the vessel the losses averaged over 10 per cent of the depth sounded. Later, with training and experience, casualties almost ceased to occur. In one case 75 consecutive soundings were taken on a run of 3,200 miles without accident or loss of any kind. In estimating the quantity of wire required, it appears that provisions should be made to cover the loss of a length of wire equal to 2 to 3 per cent of the aggregate depth sounded, where the conditions, of course, are comparable with those prevailing during the execution of this work.

53439—23——2

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Surveyor," Atlantic and Pacific Oceans and Caribbean Sea, April and May, 1919.

[Soundings obtained with a Sigsbee steam-driven sounding machine.]

Number of soundings.	1919 Day.	1919 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Temperature, Fahrenheit. Water. Surface.	Temperature, Fahrenheit. Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°						
1	Apr. 22	6.13 P	34 36	74 18	1,925	fne gy S.	60				167	61	32	Rl Pt.	NNE-2, b.
3	Apr. 23	4.12 P	31 25	74 40	2,104		88	68.9		80	127	48	44	M, Slt Rl.	SE x S-1, b.
4	...do.....	10.54 P	30 20	74 21	2,297	gy M Grit.	62	68	36.9	73	102	70	33	S, Slt Rl.	Calm, b.
5	Apr. 24	5.50 A	29 35	74 12	2,624		64	65		71		72	36	M, Slt Rl.	SW-0, b.
6	...do.....	12.20 P	28 27	74 14	2,534		72		37.0	60	68	88	29	S, Slt Rl.	SW x S-2, bc.
7	...do.....	7.25 P	27 39	74 29	2,758		68	70	36.9	53	63	111	25	M, Slt Rl.	S-0, bc.
8	Apr. 25	6.31 A	26 07	74 31	2,655	lt gy M Grit.	76	71	37.0	75	57	95	28	S.	b.
9	...do.....	1.38 P	25 18	74 29	2,595	lt gy M.	75	72	35.6	83	59	90	29	Slt Rl.	Calm, b.
10	Apr. 29	2.24 A	16 48	75 51	1,005	br gy fne S Grit.	76	75	40.6	84	67	55	18	S, NM.	NE-2, bc.
11	...do.....	5.40 A	16 27	76 04	959	lt br gy Co S Grit.	76	78	40.5	59	81	36	27	S.	SE-1, oc.
12	...do.....	8.55 A	16 02	76 19	1,269	lt br gy Co S Grit.	78		40.5	92	90	36	35	NM.	NE-2, c.
13	...do.....	11.53 A	15 42	76 31	1,727	br gy M Grit.	81	75	40.6	90	82	52	33	S, NM.	NE-2, c.
14	...do.....	3.37 P	15 16	76 47	1,977	lt br gy M Grit.	86	76	40.6	69	76	67	30	C, NM.	NE x N-2, bc.
15	...do.....	7.08 P	14 55	77 00	2,156	lt br gy M Grit.	80	76	40.5	62	73	83	26	C, NM.	ENE-1, bc.
16	...do.....	11.14 P	14 33	77 17	2,297	br M Grit.	75	75	40.5	65	61	102	22	C, NM.	E-2, c.
17	Apr. 30	3.12 A	14 11	77 31	1,563	lt br gy M.	78	75	40.3	68	64	74	20	M, Slt Rl.	WNW-2, oc.
18	...do.....	7.37 A	13 49	77 45	2,328	lt br Oz wh Grit.	78	78	40.6	68	70	108	22	C, NM.	E-2, bc.
19	...do.....	11.28 A	13 27	77 59	2,227	lt br M wh Grit.	82	77	40.5	75	80	77	29	C.	ENE-3, c.
20	...do.....	3.14 P	13 07	78 12	2,100	lt br M wh Grit.	83	77	40.5	87	66	68	31	C.	ESE-2, bc.
21	...do.....	6.51 P	12 44	78 19	2,080	lt br gy M S.	78	77.5	40.5	87	66	65	32	M, Slt Pt.	E-2, bc.
22	...do.....	10.34 P	12 20	78 24	2,066	lt br gy M wh Grit.	79	76	40.6	80	71	75	28	M, Mod Rl.	E-2, bc.
23	May 1	2.17 A	11 57	78 33	2,262	lt br stk M Grit.	80	78		80	74	70	32	M, Slt Pt.	E-2, bc.
24	...do.....	5.59 A	11 35	78 42	2,075	lt br M Grit.	79	79		80	72	65	32	C, NM.	E-3, c.
25	...do.....	9.20 A	11 14	78 50	1,971		85	78		99		40	49	C, Slt Rl Pt.	NE-2, bc.
26	...do.....	12.17 P	10 52	78 59	1,966	Upper: br Oz. Lower: bu M.	94	80	39.6	99	84	50	39	M, Slt Pt.	ENE-1, bc.
27	...do.....	3.40 P	10 34	79 13	1,884	Upper: dk br M. Lower: bu M.	96	80	39.4	92	87	50	38	S.	WNW-1, bc.
28	...do.....	7.02 P	10 16	79 27	1,561	br M.	86	80	39.2	95	71	57	27	S, NM.	W-1, bc.

29	May 2	12.39 A	9	54	79	42	1,165	gy bu M	80	79	39.2	91	82	44	26	S, NM	SW-1, b.
30	May 8	12.28 A	7	24	79	14	1,176	dk gn M	78		35.6	75	71	85	21	NM	0-0, bc.
31	...do	5.19 A	6	59	79	15	1,906	stk bu M	78	78		78	73	120	16	S, NM	NW-1, bc.
32	...do	8.54 A	6	37	79	16	1,978	stk gn M	84	80	36.5	82	61	61	32	M, Slt Pt	NW-1, b.
33	...do	12.38 P	6	11	79	16	2,038	fne gn M	84	79	36.5	88	67	75	27	S, NM	SW-1, bc.
34	...do	4.29 P	5	48	79	14	1,838	stk gn M	80	79	36.5	73	68	75	24	S, NM	W-2, c.
35	...do	7.57 P	5	48	79	39	1,539	dk gn M	75	78	36.3	76	84	55	28	S, NM	0-0, c.
36	May 9	12.33 A	5	48	80	05	1,694	gn M	76	77		80	78	125	14	S, NM	0-0, oc.
37	...do	4.05 A	5	47	80	31	1,714	gn M	75	78		69	60	60	29	C, NM	SW-2, c.
38	...do	7.24 A	5	47	80	56	1,708		81	78		98		45	38	C, NM	SW-2, c.
39	...do	10.54 A	5	47	81	23	877	dk gn M Grit	74	79		96	116	28	31	S, NM	NW-1, c.
40	...do	2.01 P	5	58	81	46	444	crs gy S	76	79		70	90	20	22	S, NM	NW-1, r.
41	...do	3.27 P	6	03	81	56	931	S dk br R	76	79		63	85	35	27	S, NM	SW-1, oc.
42	...do	5.02 P	6	07	82	05	1,671	dk gn M	81	79		78	75	55	30	S, NM	0-0, bc.
43	...do	9.51 P	6	25	82	42	1,237	gn gy M bk Oz	80	78		90	88	35	35	S, NM	SW x W-1, c.
44	May 10	2.09 A	6	44	83	20	1,098	dk gn M Grit	77	78		68	65	46	24	S, NM	NW-2, c.
45	...do	7.11 A	7	02	83	56	948	stk gn M	78	79		94	94	30	32	C, Slt Pt	WNW-4, c.
46	...do	9.09 A	7	11	84	15	635	S				122	70	25	25	M, Slt Pt	NW-2, c.
47	...do	12.08 P	7	18	84	29	832	gn gy M Grit				85	97	25	33	S, Slt Pt	NW-2, c.
48	...do	1.11 P	7	25	84	43	938	dk gn M Grit				75	78	32	29	S, NM	NW-1, c.
49	...do	2.46 P	7	29	84	52	972	dk gn M				76	79	35	28	C, NM	WNW-1, c.
50	...do	4.48 P	7	36	85	06	1,042	gn M				73	82	37	28	M, Slt Pt	WSW-3, c.
51	...do	8.29 P	7	47	85	28	1,582	dk gn M				68	63	56	28	M, NM	WNW-4, c.
52	May 11	5.22 A	8	23	86	39	1,853	dk br gn Oz				87	63	65	28	M, NM	NW-2, c.
53	...do	3.36 P	9	02	87	51	1,803	dk gn M br Oz				63	57	135	13	S, NM	NE-1, bc.
54	May 12	2.29 A	9	46	89	17	1,957	dk gn M				67	47	76	26	S, NM	0-0, bc.
55	...do	4.04 P	10	31	91	07	2,929					67	34	228	13	S, NM	0-0, bc.
56	May 13	12.32 P	12	07	94	06	2,201	Upper: br Oz. Lower: dk gn M			36.5	81	68	78	28	S, NM	NNE-1, bc.
57	...do	11.47 P	12	52	95	46	2,325	dk gn M			36.5	77	60	80	29	S, NM	W-0, bc.
58	May 17	8.23 A	19	29	107	06	1,733	dk gn br M Grit			36.1	78	80	53	33	C, NM	NW-1, bc.
59	...do	3.21 P	20	04	107	59	1,807	br Oz gy S			36.1	93	88	47	38	S, NM	W-1, bc.
60	...do	10.03 P	20	43	108	46	1,594	stk gn M br Oz			36.1	92	72	50	32	S, NM	NW-1, bc.
61	May 18	4.48 A	21	16	109	39	1,680	br Oz			36.0	89	84	48	35	M, Slt Rl	NW-1, bc.
62	...do	12.41 P	21	55	110	40	1,845	dk gn M			35.8	99	94	45	41	M, Slt Rl	NW-1, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Wenonah," Atlantic and Pacific Oceans and Caribbean Sea, June and July, 1919.

[Soundings obtained with a Sigsbee Steam-driven sounding machine.]

Number of sounding.	1919 Day.	1919 Hour.	Latitude, north.	Longitude, west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Temperature, Fahrenheit. Water bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°						
A 11	June 9	6.20 A	34 36	75 26	1,200	gy Cl	77		81	105	30	40	M, Slt Rl	SE-2, bc.
A 12	...do....	8.52 A	34 29	75 29	1,657	gy Oz	78		90	95	58	29	S, Slt Rl	SE-1, bc.
A 13	...do....	11.55 A	34 18	75 29	1,838	gy M	80		94	98	49	38	S, NM	SW-1, bc.
A 14	...do....	2.46 P	24 03	75 29	1,577	gy M	81		97	73	58	27	S, NM	0-0, bc.
A 15	...do....	6.25 P	33 52	75 28	2,022	sft gy Oz	80	37.5	82	77	87	23	M, Slt Rl	0-0, bc.
A 16	...do....	9.22 P	33 37	75 24	1,800	sft gy Oz	78		92	92	45	40	S, Slt Rl	SSE-1, bc.
A 17	June 10	12.08 A	33 24	75 21	1,883	bu M Cl Grit	76		99	93	50	38	S, Slt Rl	S-1, bc.
A 18	...do....	6.03 A	33 13	75 18	2,047	br gy Cl Grit	80	37.0	101	103	55	37	S, Slt Rl	ENE-1, bc.
A 19	...do....	8.57 A	33 00	75 18	2,167		80		94	94	57	38	S, NM	NE-1, bc.
A 20	...do....	11.58 A	32 45	75 20	2,125		78		86	91	57	37	S, Slt Rl	SE-1, bc.
A 21	...do....	3.51 P	32 32	75 26	1,979	stk gy Cl	79		99	98	49	40	S, Slt Rl	E-1, bc.
A 22	...do....	5.11 P	32 22	75 28	1,939	stk gy Cl	77	37.0	89	87	52	37	M, Slt Rl	ESE-2, bc.
A 23	...do....	8.03 P	32 13	75 28	1,957	br M Grit	77		83	68	85	22	S, Slt Rl	E-1, bc.
A 24	...do....	10.55 P	32 01	75 30	1,661		77		75		50	33	M, Slt Pt	E-1, bc.
A 25	June 11	12.50 A	31 54	75 31	1,557	sft bu gy M	78		102	110	40	39	M, Slt Rl	0-0, cp.
A 26	...do....	2.33 A	31 47	75 33	1,542	sft bu gy M	75		90	109	41	38	S, Slt Rl Pt	SE-1, bc.
A 27	...do....	4.22 A	31 40	75 34	1,683	gy M Grit	77		81	76	66	25	M, Slt Rl Pt	SE-2, bc.
A 28	...do....	6.39 A	31 31	75 35	1,741	sft gy M Grit	78		90	78	51	34	M, Slt Rl Pt	E-1, bc.
A 29	...do....	8.31 A	31 22	75 37	1,755		79		88		34	52	Slt Rl	E-1, bc.
A 30	June 12	12.22 A	31 11	75 26	1,930	gy Cl	77		84	61	72	27	M, Slt Pt	E-2, bc.
A 31	...do....	4.48 A	30 46	75 20	2,074	br Cl Grit	76		96	105	56	37	M, Slt Rl Pt	E-2, bc.
A 32	...do....	12.04 P	29 55	75 10	2,500	br M Cl Grit	79		87	85	68	37	M, Mod Rl Pt	ESE-2, bc.
A 33	...do....	7.08 P	29 06	75 16	2,749	br Cl Grit	79	37.0	88	71	82	34	M, Mod Rl Pt	ENE-3, bc.
A 34	June 13	12.09 A	28 36	75 18	2,755	br Cl Grit	78		83	71	82	34	M, Mod Rl Pt	E-1, bc.
A 35	...do....	4.51 A	28 10	75 20	2,743		77		88	82	77	36	M, Mod Rl Pt	E-1, bc.
A 36	...do....	12.18 P	27 23	75 20	2,634	lt br Cl	82		83	80	90	29	M, Mod Rl Pt	E-2, bc.
A 37	...do....	6.48 P	26 41	75 30	2,617	br M Cl	81	36.9	90	67	80	33	H, Rl	ENE-2, bc.
B 2	June 21	7.00 P	16 29	77 17	1,084		83		77		25	43	H, Hvy Rl Pt	E-3, bc.
B 3	June 23	5.24 A	11 45	79 50	1,380		82		66	71	48	29	H, Hvy Rl	ESE-2, bc.
B 4	...do....	11.21 A	11 04	80 04	1,942	br M fne S	87		66	70	75	26	M, Rl	E-1, bc.

C 13	July 2	5.47 A	7	14	79	58	666	gn Cl	80	.....	76	70	25	27	M, NM	S-0, cp.
C 14	...do....	7.20 A	7	07	80	00	1,543	gn bn M	78	.....	77	95	41	38	M, NM	NW-1, cb.
C 15	...do....	9.33 A	6	56	80	01	1,767	sft gn M	77	.....	76	79	46	38	S, NM	0-0, cb.
C 16	...do....	11.31 A	6	56	80	16	1,533	sft dk gn M	78	.....	81	70	50	31	M, Slt Rl	0-0, cp.
C 17	...do....	1.55 P	6	56	80	32	1,429	.....	78	.....	79	88	41	35	M, NM	NNW-1, cp.
C 18	...do....	4.22 P	6	56	80	48	1,451	sft gn M	79	.....	78	98	37	39	C, NM	NW-1, cp.
C 19	...do....	6.54 P	6	57	81	04	1,290	gn M	79	.....	94	94	39	33	M, NM	NNW-1, bc.
C 20	...do....	9.17 P	6	57	81	30	806	sft gn M	78	.....	90	98	21	38	M, Slt Rl	W-1, bc.
C 21	July 3	12.08 A	6	58	81	45	548	bu Cl	78	.....	90	105	18	30	S, NM	WSW-1, bc.
C 22	...do....	5.30 A	7	13	82	27	1,818	gn M	78	.....	87	74	60	30	NM	W-1, bc.
C 23	...do....	10.46 A	7	36	83	05	951	.....	82	.....	91	100	25	38	M, NM	0-0, bc.
C 24	...do....	3.29 P	7	51	83	43	867	sft gn M	83	.....	106	111	24	36	M, Slt Rl Pt	W-1, bc.
C 25	...do....	6.57 P	8	02	84	06	854	gn M	83	.....	66	94	30	28	M, Slt Rl Pt	S-1, bc.
C 26	July 4	12.05 A	8	20	84	44	1,352	.....	80	.....	88	99	80	17	S, NM	WxS-1, bc.
C 27	...do....	5.42 A	8	40	85	24	1,537	gn M	80	.....	83	98	44	35	M, Slt Rl	SW-1, bc.
C 28	...do....	10.51 A	9	02	85	57	1,781	sft gn M	87	.....	68	100	48	37	S, Slt Rl	SW-1, bc.
C 29	...do....	4.20 P	9	34	86	17	2,090	gn M	82	.....	86	104	48	44	M, NM	Var-1, bcr.
C 30	...do....	9.54 P	10	16	86	36	2,059	sft gn M Grit	80	.....	82	95	52	40	S, Slt Rl	NNW-1, bc
C 31	July 5	5.58 A	10	48	87	26	2,267	.....	82	.....	73	.....	90	25	M, Slt Rl	E-1, bc.
C 32	...do....	11.24 A	11	14	88	04	1,991	sft gn M	86	.....	84	89	53	38	S, NM	NNE-1, bc.
C 33	...do....	5.00 P	11	38	88	47	2,220	sft gn M	83	.....	74	75	63	35	NM	NNE-1, bc.
C 34	...do....	11.08 P	12	04	89	31	2,976	gn M Grit	75	.....	70	66	128	23	S, NM	NW-1, rl.
C 35	July 6	5.28 A	12	26	90	08	2,590	gn M	80	.....	74	69	75	35	M, NM	N-1, bc.
C 36	...do....	10.48 A	12	48	90	49	2,356	sft gn M	86	.....	78	74	68	35	S, NM	N-1, bc.
C 37	...do....	4.24 P	13	05	91	38	2,739	gn M	84	.....	70	77	82	33	M, NM	Var-1, bc.
C 38	...do....	10.05 P	13	20	92	30	.....	.....	85	.....	67	.....	53	57	S, NM	WSW-1, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Lydonia," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1919.

[Soundings obtained with a Sigsbee steam-driven sounding machine.]

Number of soundings.	1919 Day.	1919 Hour.	Latitude, north.	Longitude, west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Temperature, Fahrenheit. Water. Surface.	Temperature, Fahrenheit. Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°						
1	Sept. 2	8.43 P	32 54	73 30	2,746		77			67		195	14	S	SE-2, cqr.
2	Sept. 3	3.24 A	32 18	73 32	2,856	gy Oz	80			58	40	147	19		SxW-2, bc.
3	...do	9.39 A	31 38	73 33	2,756		81			77	46	186	15		SW-3, bc.
4	...do	5.15 P	30 57	73 28	2,846		80			57	47	110	26		W-1, bc.
5	...do	11.01 P	30 13	73 27	2,723		80			88	57	101	27		S-1, bc.
6	Sept. 4	8.19 A	29 40	73 28	2,109		80			57		281	8		SW-1, bc.
7	...do	3.32 P	29 00	73 28	2,430		84			36	87	173	14		E-1, bc.
8	...do	9.22 P	28 20	73 28	2,553		78			61		88	29		NE-1, bc.
9	Sept. 5	7.25 A	27 03	73 27	2,498		82			71	38	110	23		E-1, bc.
10	...do	2.47 P	26 26	73 39	2,737		83			68		68	40		E-2-3, bc.
11	...do	10.40 P	25 41	73 39	2,943		83			42		86	34		E-3, bc.
1	Sept. 13	3.35 P	17 30	76 13	785		72			52	21	60	13		E-6, ocq.
2	...do	8.20 P	17 08	76 26	1,302		81			30	52	97	13		ExN-2, oc.
3	Sept. 14	12.40 A	16 46	76 38	1,366		83			55		85	16		E-1, c.
4	...do	5.10 A	16 24	76 50	1,069		83			43		150	7		E-1, c.
5	...do	10.40 A	16 01	77 02	1,381	yl gy M fne S	81			69	28	75	18	S	SE-2, ocp.
6	...do	5.07 P	15 20	77 22	1,364		83			51	49	55	25	S	E-2, bc.
7	Sept. 15	7.00 A	13 42	78 12	2,100		78					67	31	S	SE-2-3, bc.
8	...do	11.15 A	13 22	78 29	2,078		85					67	31	M, Mod Rl	SE-2, bc.
9	...do	3.13 P	13 02	78 44	1,608		85				50	70	23	S	E-2, bc.
10	...do	7.14 P	12 40	78 55	1,865		83			55	35	87	21	S	E-2, cu.
11	...do	11.35 P	12 16	79 04	1,875		82			46		79	24		ESE-2, bc.
12	Sept. 16	3.45 A	11 53	79 14	1,610		81			62	52	76	21		SE-2, bc.
13	...do	7.45 A	11 29	79 25	1,657		80					78	21	S	ESE-1, bc.
14	...do	11.33 A	11 06	79 35	1,946		83					46	42		SE-2, bc.
15	...do	3.17 P	10 45	79 50	2,030		84			48	53	80	25		SW-1, bc.
14	Sept. 24	5.30 A	6 45	80 45	1,846		80					90	21	C	SW-4, bc.
15	...do	9.30 A	6 45	81 05	1,790		88					102	18		SW-3, bc.

16	...do.....	1.00 P	6	42	81	12	1,575	gn Oz	82			28		73	22		SW-2, bc.
17	...do.....	3.00 P	6	40	81	22	1,269	gn Oz	78			42		41	31		SW-3, bc.
18	...do.....	4.24 P	6	40	81	27	1,176	gn oz	76			53	91	35	34		SW-2, bc.
19	...do.....	5.47 P	6	40	81	32	1,104	gn Oz bk S	77			65					SW-2, c.
20	...do.....	7.20 P	6	41	81	38	1,003	gn Oz	79					50	20		W-3, c.
21	...do.....	8.59 P	6	42	81	42	874	gn Oz	78			46	79	30	29		W-3, c.
22	...do.....	10.02 P	6	42	81	46	743	gn Oz	78			53	74	24	31		NW-3, bc.
23	...do.....	11.02 P	6	44	81	50	789	gn Oz	78			61	66	25	32		NW-3, bc.
24	Sept. 25	5.45 A	7	00	82	23	1,220	rky	74					54	23	S	WNW-2, c.
25	...do.....	11.00 A	7	01	82	49	1,890	gy gn Oz	80					56	34		W-3, bc.
26	...do.....	5.41 P	7	21	83	33	874	gn Oz M	78			73	97	21	42	S	W-3, bcrq.
27	Sept. 26	12.03 A	7	40	84	15	752	gn gy Oz	80					24	31		W-3, bcpl.
28	...do.....	6.30 A	7	58	84	57	1,347	gn Oz	80					30	45	M	W-3, bc.
29	...do.....	12.57 P	8	17	85	40	1,581	gy gn Oz	81			72	88	40	40		NW-2, bc.
30	...do.....	7.33 P	8	38	86	26	1,729	rky	79			67	75	49	35		NW-3, bcp.
31	Sept. 27	3.30 A	9	38	86	33	1,908	gy gn Oz	81			64	95	50	38	S	NW-4, bc.
32	...do.....	9.45 A	10	27	86	40	1,700	gn Oz	82					36	47		NW-2, bc.
33	...do.....	1.32 P	10	54	86	50	599	gn Oz S	82					11	54		NW-1, bc.
34	Oct. 1	7.25 A	12	26	89	37	1,900		81					50	38		SE-2, bc.
35	...do.....	3.30 P	12	23	90	31	2,973	gy gn Oz	83					105	28		SE-0, bc.
36	...do.....	11.00 P	12	19	91	23	1,984	gy gn Oz	80					78	25		SE-0, bc.
37	Oct. 2	8.40 A	12	18	92	27	2,098	br gn Oz	83					62	34		NW-1, bc.
38	...do.....	5.00 P	12	38	93	19	2,280	gy gn Oz	80			65	65	70	33		NW-1, bcp.
39	Oct. 3	1.30 A	12	57	94	09	2,226	gy gn Oz	83			53	50	87	26	S	W-2, bc.
40	...do.....	10.00 A	13	16	94	59	2,261	br gn Oz	82					63	36		W-1, bc.
41	...do.....	6.15 P	13	36	95	55	2,518	gn Oz	85					70	36		W-2, b.
42	Oct. 4	2.40 A	14	00	96	51	2,051	gn M Oz	81					60	34	S	NW-2, bc.
43	...do.....	8.15 P	15	03	98	59	1,315		84			88	38	50	26	S	W-3, bc.
44	Oct. 5	1.00 A	15	14	99	22	1,909	gy gn Oz	82					130	15	S	WNW-0-1, bc.
45	...do.....	9.30 A	15	40	100	14	1,951	br M Oz	84					46	42	S	WNW-0-1, bc.
46	...do.....	5.17 P	16	06	101	08	1,995		86			87	153	36	55		SE-1, bc.
47	Oct. 6	1.14 A	16	36	102	05	1,670	br M bk S	83			52	70	56	30		0-0, bcl.
48	...do.....	4.40 P	17	11	104	03	1,829	gy M	83					39	47		W-1, bc.
49	Oct. 7	2.50 A	17	46	105	03	1,461		81					58	25	S	N NW-3, c.
50	...do.....	10.44 A	18	22	106	04	1,575		85	81	35			48	33		NExN-2, bc.
51	...do.....	6.21 P	19	01	107	01	1,783		82	81	36	69	111	42	42	S	NW-1, bc.
52	Oct. 8	2.18 A	19	35	107	55	1,747		81	79	36	42	60	71	25	S	N-1, c.
53	...do.....	10.40 A	20	08	108	48	1,623		82	79	35.5			40	41	S	NNW-2, bc.
54	...do.....	6.22 P	20	49	109	43	1,429		79	81				42	34		NNW-2, bc.
55	Oct. 9	2.45 A	21	24	110	37	1,694		76	84	38.2	56	63	57	30	S	0-0, bc.
56	...do.....	10.30 A	21	59	111	30	1,672		76	78	37.5			48	35	S	NW-2, bc.
57	...do.....	6.30 P	22	36	112	22	1,826		76	76	37.0	63	83	51	36		WNW-0-1, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Lydonia," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1919—Continued.

Number of soundings.	1919		Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit.			Fathoms per minute.		Time of sounding.		State of sea and motion of ship.	Wind and weather.
	Day.	Hour.					Air.	Water.		Reeling out.	Reeling in.	Minutes.	Fathoms per minute.		
								Surface.	Bottom.						
			° ′	° ′			°	°	°						
58	Oct. 10	1.55 A	23 18	113 06	1,971		72	71				60	33	S.	NNW-3, bc.
59	...do.....	9.27 A	24 05	113 41	1,690		71	71.8	36.2			48	35	S.	NNW-2, bc.
60	...do.....	4.54 P	24 56	114 14	1,705		68	67.6	35.8	71	81	45	38	S.	NNW-2, bc.
61	Oct. 11	12.40 A	25 45	114 49	1,947		67	68.0	35.8	59	57	67	29	S.	WNW-2, c.
62	...do.....	8.25 A	26 32	115 25	2,101		66	64.0	35.4			50	42	S.	NW x N-2, oc.
63	...do.....	4.15 P	27 22	116 03	2,306		68	68.9	36.0			63	37		N-2, bc.
64	Oct. 12	12.07 A	28 12	116 40	1,904		65	64.4	35.7	60	79	56	34		NW x W-2, bc.
65	...do.....	10.25 A	29 29	117 14	176		64		47.0			38	5		NW-2, bc.
66	...do.....	11.08 A	29 31	117 14	358		65					15	24		NW-2, bc.
67	...do.....	11.53 A	29 36	117 14	1,018	yl Cl bk S.	66	67	36.5			23	44		NW-2, bc.
68	...do.....	5.15 P	30 21	117 15	1,413	gy M.	65	66.2	36.0			33	43		W-2, bc.
69	...do.....	11.24 P	31 12	117 16	1,009	gy bu M.	64	66.0	37.0			29	35		NW-1, bc.
70	Oct. 13	2.06 A	31 34	117 16	457	gy M S.	64	64.4	41			22	21	S.	NW-1, oc.
71	...do.....	4.45 A	31 54	117 17	648	gy M.	64	65.7	37			33	20		NW-2, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Sialia," Atlantic Ocean, October, 1919.

[Soundings obtained with a Sigsbee steam-driven sounding machine.]

Number of sounding.	1919		Latitude, north.	Longitude, west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit.		Fathoms per minute.		Time of sounding.		State of sea and motion of ship.	Wind and weather.
	Day.	Hour.					Air.	Water surface.	Reeling out.	Reeling in.	Minutes.	Fathoms per minute.		
			° ′	° ′			°	°						
A 1	Oct. 10	12.54 P	35 48	72 25	2,013	.....	79	80	67	.....	130	16	CM.....	SSE-3, bc.
A 2	Oct. 11	1.55 A	33 58	72 30	2,795	.....	75	79	68	.....	135	21	M, Slt Rl.....	S-2, b.
A 3	...do.....	2.55 P	32 17	72 28	3,008	gy br Oz Grit.....	79	80	30	101	195	15	S, NM.....	SE-2, b.
A 4	...do.....	8.56 P	31 34	72 20	3,000	gy br Oz Grit.....	76	80	90	117	116	26	S.....	ESE-2, bc.
A 5	Oct. 12	11.57 A	29 52	72 37	2,877	gy br Oz Grit.....	81	80	89	103	77	37	M, Slt Rl.....	SE-3, bc.
A 6	...do.....	9.30 P	28 55	72 26	2,696	.....	82	80	84	.....	104	26	M.....	SE-4, bc.
A 7	Oct. 13	10.53 A	27 14	72 19	2,837	gy br Oz Grit.....	79	80	71	113	160	18	M.....	SE-2, oc.
A 8	...do.....	8.12 P	26 11	72 19	3,228	.....	82	81	68	.....	90	36	M.....	ExS-5, bc.
A 9	Oct. 14	5.46 A	25 03	72 15	[illegible]	.....	82	81	78	.....	105	25	M, Mod Rl.....	SE-4, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Pioneer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922.

[Soundings obtained with a Coast and Geodetic Survey electric-drive sounding machine.]

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°	°						
A 1	Sept. 23	6.21 P	36 51	74 00	1,276		74				102	67	43	30	HC	NNE-5, c.
A 2	Sept. 24	6.34 A	36 43	71 58	2,362		74	84.6	62.4		70		64	37	R, Hvy Rl	NW-4, o.
A 3	...do	10.45 A	36 27	71 20			78	84.9	63.9				22		C, Rl	N-4, bc.
A 4	...do	2.50 P	36 00	71 14	2,401	lt gy M	77	75.9			97	68	70	34	C, Slt Rl	WNW-3, bc.
A 5	...do	8.55 P	35 20	71 24	2,388	br M	77	75.6	64.4		82	72	70	34	C, Slt Rl	WNW-3-4, b.
A 6	Sept. 25	3.00 A	34 40	71 23	2,752	lt br M	77				110	49	120	23	S, NM	W-3, c.
A 7	...do	9.21 A	34 40	71 24	3,020		81				92		90	34	S, NM	WSW-3, b.
A 8	...do	3.59 P	33 10	71 24	2,988	stk gy M	81	78.4	64.2		107	55	85	35	S, NM	SW-3, bc.
A 9	...do	7.10 P	32 48	71 25			79	77.5	64.9				24		S, NM	SSW-1, bc.
A 10	Sept. 26	1.40 A	31 52	71 29			78	77.9	61.7				25		S, NM	SxW-2, o.
A 11	...do	4.01 A	31 33	71 30	2,978	stk gy M	78	80.6			111	36	117	25	S, NM	NE-1, o.
A 12	...do	9.20 A	30 54	71 32			79	78.4	63.5				32		S, NM	ESE-3, bc.
A 13	...do	2.02 P	30 19	71 30	3,016		82	80.6	62.6		110	59	83	36	S, NM	0-0, c.
A 14	...do	11.26 P	29 05	71 26	2,972	gy M	77	79.5	64.0	36.3	108	38	111	27	S, NM	SE-0-1, r.
A 15	Sept. 27	5.49 A	28 24	71 24	2,922	lt gy M	78	79.7	65.3		106	57	95	31	M, Slt Rl	S-2, bc.
A 16	...do	10.26 P	26 15	71 35	3,026	lt gy M	81	81.5	63.5	36.7	104	53	119	25	M, Slt. Rl	E-3, bc.
A 17	Sept. 28	5.32 A	25 38	72 20	3,041	lt gy M	81				94	55	93	33	CL, Slt Rl Pt	ESE-3, b.
A 18	...do	2.53 P	24 44	73 14	2,999	gy M S	83	81.5	62.6	36.9	89	50	99	30	M, Mod Rl Slt Pt.	SE-2, bc.
A 19	...do	9.23 P	24 08	73 51	2,665	lt br M	81	81.9		39.9	102	56	82	33	M, Slt Rl	E-2, bc.
A 20	Sept. 29	12.10 A	23 55	73 50	2,803	gy M S	82	81.5	63.5		108	51	91	31	M, Slt Rl	SW-2, bc.
A 21	...do	3.12 A	23 40	73 49	2,762	lt br M	81			39.2	99	55	88	31	M, Mod Rl	E-2, bc.
A 22	...do	6.28 A	23 28	73 48	2,672	lt br M	82				106	54	78	34	L, Slt Pt	ESE-2, bc.
A 23	...do	9.06 A	23 19	73 58	2,660	wh S	84				91	60	80	33	M, Slt Rl	ENE-2, bc.
A 24	...do	Noon.	23 08	74 13	1,638	lt br M S	84				120	81	39	42	M, Slt Rl	SExE-2, bc.
A 25	...do	1.50 P	23 03	74 22	1,385	gy S M Wd	83			45.3	115	79	34	41	S, Slt Rl	ESE-2, bc.
A 26	...do	5.04 P	22 40	74 33	1,079	wh S	84				154	92	23	47	S, NM	SE-2, bc.
A 27	...do	6.36 P	22 30	74 30	977	wh S	83	81.5	59.0		127	95	25	39	S, NM	ESE-2, c.

A 28	...do.....	8.12 P	22	20	74	28	1,174	wh Co S	83	.....	.....	39.4	132	90	26	45	S, NM	ENE-3, c.
A 29	...do.....	11.07 P	21	58	74	21	1,215	wh S	82	82.9	62.6	39.4	132	81	25	49	C, NM	SE-4, bc.
A 30	Sept. 30	12.47 A	21	47	74	17	1,348	S	82	.....	.....	38.5	133	85	33	41	S, NM	SSE-4, bc.
A 31	...do.....	2.33 A	21	35	74	14	1,016	sft wh S	82	80.6	63.5	.....	139	100	28	36	S, NM	ESE-3, bc.
A 32	...do.....	4.39 A	21	21	74	10	1,597	hrd	82	.....	.....	38.1	126	82	42	36	S, NM	SE-3, bc.
A 33	...do.....	6.13 A	21	13	74	07	1,447	hrd	82	81.1	63.7	.....	121	65	42	34	S, NM	ESE-2, c.
A 34	...do.....	7.52 A	21	05	74	05	1,546	wh S M	82	81.5	63.7	38.1	110	81	38	41	S, NM	ESE-2, c.
A 35	...do.....	10.21 A	20	47	73	56	725		82	.....	.....	41.0	137	95	14	52	S, NM	SE-1, bc.
A 36	...do.....	12.45 P	20	32	73	48	1,846	S	83	80.6	62.2	.....	108	72	49	38	S, NM	SE-1, bc.
A 37	...do.....	3.11 P	20	16	73	41	825	br S bk wh Sp	83	.....	.....	39.6	145	101	22	37	S, NM	SE-1, bc.
A 38	...do.....	4.37 P	20	07	73	36	1,491	hrd	85	82.0	63.1	40.1	129	82	30	50	S, NM	SSE-0-1, bc.
A 39	...do.....	7.27 P	19	44	73	42	1,300	sft gy M sft wh S	84	81.5	59.9	40.1	141	84	29	45	S, NM	SSE-1, bc.
A 40	...do.....	9.39 P	19	27	73	47	570	Co S Sh	84	.....	.....	42.3	146	107	12	47	S, NM	ESE-1, bc.
A 41	...do.....	11.33 P	19	12	73	51	1,195	lt br M S	84	84.2	61.2	40.1	130	104	25	48	S, NM	S-1, bc.
A 42	Oct. 1	2.01 A	19	06	74	12	1,074	gy Cl	84	.....	.....	40.1	154	90	25	43	S, NM	SE-1, bc.
A 43	...do.....	4.01 A	18	46	74	20	1,476	br M Grit	84	80.6	62.6	40.3	146	82	35	42	S, NM	SE-1, bc.
A 44	...do.....	6.31 A	18	42	74	34	1,107	lt br M	83	81.3	61.3	40.3	135	83	30	37	S, NM	E-2, bc.
A 45	...do.....	8.26 A	18	30	74	45	654	lt br Co S	83	.....	.....	.....	163	88	15	44	S, NM	S-1, bc.
A 46	...do.....	1.19 P	17	53	74	41	882	lt br M S	84	81.5	63.5	40.5	140	87	27	33	C, Slt Rl	ExS-3, bc.
A 47	...do.....	3.27 P	17	37	74	40	1,071	lt br M	86	.....	.....	40.3	137	82	24	45	C, Slt Rl	ExS-3, bc.
A 48	...do.....	6.06 P	17	15	74	39	1,367	br S Cl	85	83.3	61.3	40.1	128	77	35	39	C, Slt Rl	SE-3, bc.
A 49	...do.....	8.18 P	17	00	74	42	1,480	lt br S	83	.....	.....	40.1	123	81	33	45	S, NM	E-2, bc.
A 50	...do.....	11.42 P	16	36	74	51	1,690	gy S M	83	80.6	64.4	40.3	107	76	46	37	S, NM	ESE-2, bc.
A 51	Oct. 2	3.52 A	16	08	75	08	1,648	br S Cl	83	81.5	63.5	40.1	106	76	43	38	C, NM	ESE-2, bc.
A 52	...do.....	12.01 P	15	07	75	34	2,322	br S wh Sp	85	.....	.....	40.3	100	63	66	35	M, Slt Pt	SExE-2, bc.
A 53	...do.....	4.37 P	14	39	75	52	2,331	br S	85	82.4	60.8	40.5	98	59	65	36	L, Slt Pt	ESE-2-3, bc.
A 54	...do.....	8.24 P	14	16	76	06	2,329	lt br S	83	82.4	.....	40.6	108	54	72	32	C, Slt Rl	E-2, bc.
A 55	Oct. 3	12.10 A	13	56	76	22	2,290	lt yl M	83	82.2	59.0	40.5	100	61	61	38	S, NM	ENE-2, bc.
A 56	...do.....	3.58 A	13	35	76	38	2,298	lt br M	83	80.6	57.2	40.5	79	58	74	31	L, Slt Rl	NNE-2, bc.
A 57	...do.....	9.30 A	13	09	76	40	2,208	lt br S	84	82.9	56.1	40.5	90	51	71	31	C, Slt Pt	ESE-3, bc.
A 58	...do.....	1.45 P	12	43	76	49	2,161	lt br M	85	82.4	59.0	40.5	103	58	70	31	C, Slt Pt	E-2, bc.
A 59	...do.....	5.29 P	12	21	77	00	2,090	br M	86	82.8	59.9	40.3	100	58	70	30	L, Slt Pt Rl	E-2, bc.
A 60	...do.....	8.57 P	12	00	77	16	2,064	br M	82	82.8	53.6	40.3	104	68	57	36	S, NM	E-1, c.
A 61	Oct. 4	12.27 A	11	35	77	24	2,011	br M	82	82.4	54.5	40.3	117	67	53	38	S, NM	WNW-1, bc.
A 62	...do.....	3.53 A	11	18	77	46	2,014	br M	81	80.2	57.7	40.3	108	61	58	35	S, NM	W-1, b.
A 63	...do.....	7.04 A	11	02	78	06	1,931	br M	82	81.3	52.7	40.3	107	74	52	37	S, NM	NE-1, b.
A 64	...do.....	9.38 A	10	49	78	22	1,920	dk br M lt Sp	84	83.3	54.7	40.3	122	67	49	39	S, NM	SE-1, bc.
A 65	...do.....	12.44 P	10	32	78	41	1,729	gy M	83	83.3	52.5	40.3	110	77	43	40	S, NM	S-2, bc.
A 66	...do.....	4.01 P	10	16	79	02	1,452	br gy M	83	82.0	54.5	40.1	122	80	35	42	S, NM	E-1, bc.
A 67	...do.....	6.10 P	10	06	79	14	1,162	dk br M	83	82.4	53.6	39.9	134	80	31	38	S, NM	S-1, bc.
A 68	...do.....	7.49 P	9	59	79	22	1,209	dk br M	83	.....	.....	39.9	117	92	32	38	S, NM	S-1, bc.
A 69	...do.....	8.59 P	9	57	79	29	1,189	dk br M	82	.....	.....	39.9	126	83	32	37	S, NM	WSW-1, bc.
A 70	...do.....	10.00 P	9	56	79	32	1,192	dk br M	81	.....	.....	39.9	145	98	27	44	S, NM	SSW-1, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Pioneer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922—Continued.

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°	°						
A 71	...do.....	10.50 P	9 56	79 35	1,158	dk bu gy M	82			39.9	136	93	31	37	S, NM	SSW-1, bc.
A 72	...do.....	11.38 P	9 55	79 38	1,151	dk bu br M	82			40.1	151	96	27	43	S, NM	SSW-1, bc.
A 73	Oct. 5	12.31 A	9 54	79 42	1,153		81				128	84	29	40	S, NM	SW-1, bc.
A 74	...do.....	5.54 A	9 44	79 34	135		80				104		11	12	S, NM	NW-1, bc.
A 75	...do.....	6.21 A	9 46	79 34	538		80				108				S, NM	NW-1, bc.
A 76	...do.....	6.43 A	9 48	79 35	699		82				116				S, NM	ExN-1, bc.
A 77	...do.....	7.12 A	9 49	79 35	867	dk bu M	82				144	75			S, NM	ExN-1, bc.
A 78	...do.....	7.54 A	9 52	79 35	1,061	stf bu M	82				133	94	24	44	S, NM	NE-2, bc.
A 79	...do.....	8.45 A	9 56	79 34	1,174	gy M	82				153	99	24	49	S, NM	NNE-1, bc.
A 80	...do.....	9.48 A	10 02	79 35	1,151	gy & br M	82				151	98	24	48	S, NM	E-1, bc.
A 81	...do.....	11.25 A	9 52	79 39	888		83				164	52	29	31	S, NM	E-1, bc.
B 32	Oct. 14	4.23 A	7 31	79 27	297	crs gy S	79				142	87	10	30	C, Slt Rl Pt	SW-3, bc.
B 33	...do.....	5.28 A	7 23	79 27	895		79				112	92	18	50	C, Slt Rl Pt	SW-3, o.
B 34	...do.....	7.01 A	7 13	79 28	1,089	gn Cl S	79	77.7	58.8		82	85	35	31	C, Slt Rl Pt	WSW-3, c.
B 35	...do.....	8.42 A	7 03	79 29	1,560	gn M	77	78.8	50.4	36.3	108	92	36	44	C, Slt Pt	SW-2, c.
B 36	...do.....	10.33 A	6 53	79 30	1,839	gn M	78	76.8	50.0	36.5	99	86	41	45	C, Slt Rl	SW-2, bc.
B 37	...do.....	12.21 P	6 43	79 33	1,831	gn M	78	77.9	50.9	36.5	96	79	43	43	C, Slt Rl	SSW-2, bc.
B 38	...do.....	3.15 P	6 28	79 46	1,784	gn M	76	77.0	51.8	36.3	109	94	39	46	C, Slt Rl	SSW-2, r.
B 39	...do.....	5.50 P	6 28	80 02	1,811	gn M	79	77.0	51.1	36.3	105	65	49	37	C, Slt Rl Pt	WSW-3, c.
B 40	...do.....	8.38 P	6 29	80 19	1,889	gn M	78	78.8	50.7	36.3	112	82	47	40	C, Slt Rl Pt	SW-3, bc.
B 41	...do.....	11.26 P	6 30	80 36	1,722	gn M	79	78.8	48.9	36.3	106	76	45	38	C, Slt Rl Pt	SW-3, bc.
B 42	Oct. 15	2.01 A	6 31	80 53	1,662	gn M	79	78.8	50.0	36.5	116	82	44	38	C, Slt Pt	SW-4, c.
B 43	...do.....	4.40 A	6 31	81 10	1,336	gh M	77	76.3	50.5	36.5	116	72	36	37	C, Slt Rl Pt	SW-3, o.
B 44	...do.....	7.07 A	6 31	81 27	984	gn M	79	76.1	50.9	37.2	137	83	28	35	C, Slt Rl Pt	SW-3, c.
B 45	...do.....	9.33 A	6 31	81 44	772	gn M	80				151	88	28	28	C, Slt Rl Pt	SW-3, c.
B 46	...do.....	10.47 A	6 31	81 52	554	gn S	79	77.0	52.2	41.5	150	104	24	23	C, Slt Rl	SW-3, c.
B 47	...do.....	12.30 P	6 31	82 00	1,303	gn M	79				49	80	49	27	C, Mod Pt	SSW-3, bc.

B 48	...do.....	7.27 P	5	57	82	37	1,925	gn M.....	79	75.7	50.9	.....	117	80	42	46	C, Slt Rl Pt.....	SSW-3, c.
B 49	Oct. 16	1.39 A	6	17	83	19	1,579	gn M.....	79	77.9	52.7	36.3	136	100	34	46	C, Mod Pt.....	SW-4, c.
B 50	...do.....	6.31 A	6	34	82	52	1,047	gn M.....	78	76.6	51.8	37.0	143	99	24	44	C, Slt Rl Pt.....	SW-3-4, c.
B 51	...do.....	9.26 A	6	44	84	12	786	gn M S.....	78	.....	.....	38.8	158	108	17	46	C, Slt Rl.....	SSW-3, c.
B 52	...do.....	12.12 P	6	54	84	33	989	gn M.....	80	76.1	51.3	38.1	145	80	26	38	C, Mod Pt.....	SW-3, c.
B 53	...do.....	3.13 P	7	04	84	52	976	gn M.....	80	.....	.....	37.2	139	111	22	44	C, Slt Pt.....	SSW-3, bc.
B 54	...do.....	6.14 P	7	14	85	11	1,225	gn M.....	78	76.6	50.5	36.3	133	97	25	49	C, Slt Pt.....	S-3, bc.
B 55	...do.....	11.39 P	7	33	85	49	1,616	gn & bk M.....	76	77.0	54.7	36.0	128	87	38	43	C, Slt Rl.....	SW-4, bc.
B 56	Oct. 17	4.19 A	7	50	86	23	1,816	br & gn M.....	76	.....	.....	.....	132	89	37	49	C, Slt Rl.....	SW-3, c.
B 57	...do.....	9.03 A	8	09	86	58	1,821	br & gn M.....	77	75.2	54.5	.....	130	82	47	39	M, Slt Pt.....	SW-2, bc.
B 58	...do.....	2.11 P	8	58	86	29	1,770	br & gn M.....	82	76.6	50.9	.....	127	84	43	41	LT.....	SW-2, bc.
B 59	...do.....	4.03 P	9	01	86	39	1,789	br & gn M.....	79	.....	.....	.....	124	93	37	48	C, Slt Rl Pt.....	SW-2, r.
B 60	...do.....	5.56 P	9	05	86	50	1,738	gn M.....	78	77.0	48.9	.....	113	99	39	45	M, Slt Rl Pt.....	SSW-2, bc.
B 61	...do.....	7.50 P	9	07	87	00	1,765	gn M.....	79	.....	.....	.....	125	98	36	49	M, Slt Rl.....	SSW-1, dc.
B 62	...do.....	10.53 P	9	16	87	22	1,782	gn M bk Sp.....	77	79.3	49.3	.....	133	100	41	43	M, Slt Rl.....	W-2, bc.
B 63	Oct. 18	3.13 A	9	32	87	55	1,844	gn M.....	77	76.2	50.7	.....	130	93	36	51	M.....	W-2, bc.
B 64	...do.....	7.26 A	9	49	88	26	1,887	gn M.....	78	77.4	.....	.....	130	79	40	47	M, Slt Rl.....	SW-2, bc.
B 65	...do.....	Noon.	10	16	88	52	1,861	gn M.....	78	76.6	55.4	.....	121	105	38	49	M, Slt Rl.....	SW-2, bc.
B 66	...do.....	5.21 P	10	37	89	35	2,044	gn M.....	80	78.4	.....	.....	120	90	45	45	M, Mod Rl.....	WSW-3, bc.
B 67	Oct. 19	4.36 A	11	22	91	06	2,066	gn M.....	78	77.2	.....	.....	114	81	49	42	M, Mod Rl.....	WSW-4, bc.
B 68	...do.....	2.30 P	11	55	92	24	2,102	gn M.....	79	77.0	49.1	.....	120	85	45	47	C, Mod Rl Pt.....	WSW-3, r.
B 69	Oct. 20	10.04 P	13	22	96	55	2,056	gn M.....	80	79.3	51.4	.....	94	80	52	40	M, Mod Rl.....	SSW-3, bc.
B 70	Oct. 21	3.53 A	13	42	97	46	1,825	gn M.....	79	77.0	50.4	.....	130	93	37	49	L, Slt Rl.....	SSW-3, r.
B 71	...do.....	9.12 A	14	02	98	35	1,888	gn M.....	81	81.5	51.3	.....	137	92	38	50	S, Slt Rl.....	WSW-2, or.
B 72	...do.....	2.37 P	14	24	99	24	1,992	gn M.....	81	80.6	50.0	.....	131	61	70	28	L, Slt Pt.....	W-3, r.
B 73	Oct. 22	1.41 A	15	08	101	02	.....	.....	81	.....	51.8	.....	.....	.....	.....	.....	C.....	WxN-3, o.
B 74	...do.....	7.12 A	15	29	101	51	.....	.....	74	78.1	50.7	.....	.....	.....	.....	.....	C.....	SE-2, o.
B 75	...do.....	12.59 P	15	51	102	42	1,727	.....	79	82.4	50.5	.....	122	96	36	48	L, Slt Rl.....	N-1, c.
B 76	...do.....	6.50 P	16	11	103	32	1,997	dk br M.....	80	80.4	50.5	.....	139	82	43	46	C, Slt Rl.....	N-1, r.
B 77	Oct. 23	12.42 A	16	31	104	21	1,667	.....	82	82.0	51.1	.....	130	95	34	49	M.....	NW-2, bc.
B 78	...do.....	6.24 A	16	52	105	11	1,674	br M.....	81	80.6	50.5	.....	136	105	33	51	C, Slt Rl.....	WNW-2, c.
B 79	...do.....	11.17 A	17	21	105	47	1,701	br M wh Sp.....	81	79.7	50.9	.....	137	102	32	53	S, NM.....	NWxW-1, bc.
B 80	...do.....	4.46 P	17	42	106	33	1,981	br M.....	83	81.0	51.4	.....	135	95	40	50	C, Slt Rl.....	NW-2, bc.
B 81	...do.....	10.58 P	18	16	107	24	2,123	br M.....	80	80.4	51.8	.....	122	84	49	43	S, NM.....	W-1, bc.
B 82	Oct. 24	4.36 A	18	50	108	50	1,872	br M.....	79	80.6	50.9	.....	127	96	37	51	S, NM.....	NW-2, c.
B 83	...do.....	10.02 A	19	23	108	56	1,073	rky.....	78	79.7	51.8	.....	158	110	17	63	M, NM.....	W-1, bc.
B 84	...do.....	1.12 P	19	39	109	20	1,616	yl M.....	78	78.5	52.0	.....	127	96	30	64	S, NM.....	0-0, b.
B 85	...do.....	7.39 P	20	16	110	18	1,577	.....	77	.....	50.7	.....	147	98	29	55	S, NM.....	WNW-1, bc.
B 86	Oct. 25	1.44 A	20	54	111	08	1,755	dk br M.....	77	.....	.....	.....	128	104	33	53	S, NM.....	WNW-1, b.
B 87	...do.....	7.55 A	21	32	111	58	1,903	dk br M.....	78	.....	.....	.....	132	102	36	53	M, Slt Rl.....	WNW-1, bc.
B 88	...do.....	2.10 P	22	11	112	48	1,932	dk br M.....	79	74.3	49.5	.....	126	103	36	54	S, NM.....	0-0, b.
B 89	...do.....	8.08 P	22	48	113	40	2,033	dk br M.....	77	77.0	51.3	.....	127	96	38	54	S, NM.....	0-0, b.
B 90	Oct. 26	1.53 A	23	32	114	09	2,088	br M.....	77	85.8	50.2	.....	135	96	44	47	S, NM.....	WNW-1, b.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Pioneer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922—Continued.

Number of sounding.	1922		Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit.				Fathoms per minute.		Time of sounding.		State of sea and motion of ship.	Wind and weather.
	Day.	Hour.					Air.	Water.			Reeling out.	Reeling in.	Minutes.	Fathoms per minute.		
								Surface.	200 fathoms.	Bottom.						
			° ′	° ′			°	°	°	°						
B 91	...do.....	7.33 A	24 20	114 40	2,139	dk br M	75	72.9	48.2	.....	132	85	41	52	S, NM	SE-1, b.
B 92	...do.....	11.12 A	24 49	114 58	2,152	dk br M	76	77.0	48.9	.....	132	89	41	52	S, NM	SSW-1, b.
B 93	...do.....	3.22 P	24 55	115 41	1,458	gy M	76	.....	.....	.....	134	110	28	52	S, NM	W-1, b.
B 94	...do.....	4.31 P	25 02	115 41	1,757	lt br M	77	74.8	47.8	.....	134	110	37	48	S, NM	W-1, b.
B 95	...do.....	7.40 P	25 19	115 18	2,115	dk br M	75	73.8	46.9	.....	128	89	46	46	S, NM	W-1, bc.
B 96	Oct. 27	12.23 A	25 55	115 41	2,091	dk br M	70	69.8	50.2	.....	112	86	48	44	S, NM	W-1, f.
B 97	...do.....	6.06 A	26 42	116 10	2,087	br M	67	67.6	47.3	.....	129	91	45	46	S, Slt Rl	NW-1, b.
B 98	...do.....	3.56 P	28 11	117 20	2,057	dk br M	72	69.8	46.9	.....	132	94	39	53	M, Slt Rl	NW-2, b.
B 99	...do.....	6.56 P	28 36	117 25	1,969	dk br M	69	66.6	.....	.....	124	100	38	52	M, Slt Rl	NW-3, b.
B 100	...do.....	11.52 P	29 20	117 30	2,256	br M	67	65.1	.....	.....	110	78	53	43	M, Slt Rl	NW-4, bc.
B 101	Oct. 28	2.37 A	29 36	117 33	1,787	br M	65	.....	.....	.....	130	102	34	53	M, Mod Rl Pt	WxN-4, bc.
B 102	...do.....	7.56 A	30 12	117 41	1,064	br M bk S P	64	61.2	.....	.....	128	106	22	48	R, Rl Pt	NW-4, bc.
B 103	...do.....	11.44 A	30 38	117 48	1,088	.....	67	60.8	.....	.....	143	116	23	47	H, Rl Pt	WNW-4, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Discoverer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922.

[Soundings obtained with a Coast and Geodetic Survey electric-drive sounding machine.]

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°	°						
A 1	Sept. 26	7.02 A	36 10	74 34	845	fne gy S	66.2	68	.....	38.8	126	78	75	11	C, Slt Rl Pt	NE-3-4, o.
A 2	...do	9.38 A	36 05	74 17	1,252	bu M wh S	67.1	69	46.4	38.3	108	73	45	28	C, Slt Pt	NE-3, bc.
A 3	...do	11.23 A	36 00	73 57	1,580		67.6	69	47.3	.....	118	.....	40	40	C, Slt Rl Pt	NE-4, bc.
A 4	...do	10.35 P	34 43	74 42	1,860		73.4	79	.....	36.5	90	67	74	25	M, Slt Rl	NE-3, c.
A 5	Sept. 27	5.54 A	33 51	75 06	1,897		75.2	77	.....	36.9	89	48	92	21	M, Rl	E-3, bc.
A 6	...do	12.19 P	33 06	75 29	2,055	M Cl	77.0	79	64.4	36.5	98	66	70	29	C, NM	NE-1, c.
A 7	...do	7.08 P	32 31	76 24	890		77.0	80	50.9	39.2	82	87	60	15	M, Rl	NE-4, c.
A 8	Sept. 28	6.21 A	31 06	76 10	1,814		75.7	80	64.4	37.4	92	80	55	33	L, Rl	NE-2, c.
A 9	...do	9.26 A	30 46	76 07	2,075		77.9	79	65.3	36.5	98	78	59	35	M, Slt Rl Pt	E-1, bc.
A 10	...do	3.16 P	30 12	76 28	2,260		76.6	81	65.3	34.0	102	76	60	38	C, Slt Rl	SE-4, bc.
A 11	...do	6.45 P	29 48	76 26	1,301	fne gy S	77.0	80	65.3	.....	87	80	42	31	C, Rl	SE-4, c.
A 12	Sept. 29	9.32 A	29 08	76 22	2,809		79.7	80	65.3	.....	94	76	67	42	M, Slt Pt	SE-2, bc.
A 13	...do	5.04 P	28 22	76 27	2,819		77.0	81	64.4	.....	108	60	90	31	M, Slt Rl	SE-1, oc.
A 14	...do	9.04 P	28 10	76 28	2,877		78.8	80	64.8	.....	95	72	153	19	M, Slt Rl	SE-1-2, o.
A 15	...do	11.29 P	27 58	76 28	2,781		78.8	81	65.3	.....	100	76	70	40	M, Slt Pt	E-1, c.
A 16	Sept. 30	2.10 A	27 44	76 29	2,820		79.5	83	65.1	.....	106	85	100	28	M, Slt Rl Pt	E-2, bc.
A 17	...do	5.12 A	27 33	76 30	2,520		79.9	82	63.9	.....	104	80	90	28	M, Slt Rl	S-1, bc.
A 18	...do	10.42 A	26 44	76 32	2,849		81.5	83	65.3	.....	81	70	83	34	S, NM	SSE-1, bc.
A 19	...do	3.19 P	26 07	76 26	2,656		86.7	85	63.5	.....	103	.....	60	44	S, Slt Rl	S-2, bc.
A 20	...do	9.28 P	25 30	75 38	2,658		81.5	84	64.4	.....	95	85	70	38	C, NM	SE-4, bc.
A 21	Oct. 1	1.36 A	25 09	75 12	2,574		81.7	84	65.5	.....	103	61	79	33	S, Slt Rl Pt	SE-5, bc.
A 22	...do	7.12 A	24 40	74 36	2,912		78.3	83	66.2	.....	103	63	85	34	M, Slt Rl	SE-3, bc.
A 23	...do	10.01 A	24 20	74 13	2,856		83.8	83	.....	.....	101	79	67	43	S, NM	SE-1, bc.
A 24	...do	3.08 P	23 52	74 15	2,639		83.5	84	.....	.....	99	75	66	40	S, Slt Rl Pt	SE-2, bc.
A 25	...do	6.22 P	23 27	74 16	420		82.4	83	67.1	.....	131	135	22	19	M, Slt Rl	SE-2, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Discoverer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922—Continued.

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°	°						
A 26	Oct. 1	7.38 P	23 23	74 17	1,519		82.0				129	80	37	41	M, Slt Rl	SE-2, bc.
A 27	...do	9.37 P	23 08	74 20	1,442		81.5	83	66.2		116	102	33	44	S, NM	SSE-1, bc.
A 28	...do	11.56 P	22 58	74 38	1,318		83	83	66.9		140	92	24	55	M, Slt Rl	SE-2, bc.
A 29	Oct. 2	2.00 A	22 44	74 33	1,165		81.5	84	66.9		120	93	28	42	S, NM	SE-1, bc.
A 30	...do	4.02 A	22 28	74 28	937		81.7	83	66.2		127	98	22	43	S, NM	SE-1, bc.
A 31	...do	5.54 A	22 14	74 24	1,058		81.3	84	73.9		103	81	30	35	S, NM	ESE-1, bc.
A 32	...do	8.01 A	21 57	74 21	1,114		81.0	83.5	66.2		111	96	27	41	S, NM	E-1, bc.
A 33	...do	9.36 A	21 52	74 32	1,521		83.3	84.0	66.2		119	91	34	45	S, NM	SE-1, bc.
A 34	...do	11.19 A	21 44	74 43	1,543		84.2	83.0	66.2		117	85	36	43	S, NM	SE-2, bc.
A 35	...do	1.20 P	21 30	74 44	402		84.2	84.0			109	100	9	45	S, NM	SE-2, bc.
A 36	...do	1.39 P	21 29	74 44	762		84.2				136	106	12	63	S, NM	SE-2, bc.
A 37	...do	3.18 P	21 17	74 46	1,575		83.8	85	68.0		118	97	35	45	S, NM	SE-2, bc.
A 38	...do	6.07 P	20 58	74 31	1,582		82.4	84	65.3		105	100	34	47	S, NM	SE-3, bc.
A 39	...do	8.32 P	20 43	74 17	1,582		82.4	82	66.2		95	100	34	47	S, NM	SE-2, bc.
A 40	...do	10.16 P	20 32	74 07	1,584		81.5	83	66.2		147	114			M, Slt Rl	SE-2, bc.
A 41	...do	11.48 P	20 23	73 59	791		83.3	84	67.1		168	122			M, NM	SE-2, bc.
A 42	Oct. 3	2.25 A	20 02	74 10	568		82.4	84	64.6		118	69	28	20	M, NM	NE-3, bc.
A 43	...do	4.56 A	19 53	74 26	782		80.2	83	64.9		148	104	34	45	M, NM	ESE-2, bc.
A 44	...do	7.02 A	19 46	74 43	1,887		80.6	84.5	64.9		118	94	35	54	C, NM	ENE-2, bc.
A 45	...do	8.46 A	19 40	74 54	1,945		83.1	85.0	66.2		107	93	40	49	S, NM	E-1, bc.
A 46	...do	11.22 A	19 38	75 14	2,507		86.0	85.0			107		98	25	S, NM	E-1, bc.
A 47	...do	1.48 P	19 32	75 20	2,843		86.9	86.0	65.7		109	71	78	36	S, NM	E-1, bc.
A 48	...do	3.59 P	19 22	75 26	2,553		86.0	86.0	64.9		118	82	57	45	S, NM	E-1, bc.
A 49	...do	5.56 P	19 12	75 32	1,949		81.5	85.0	62.1		131	96	32	61	S, NM	0-0, bc.
A 50	...do	7.55 P	18 59	75 38	1,572		83.3	84.5	60.8		147	96	51	31	S, NM	0-0, bc.
A 51	...do	10.06 P	18 47	75 45	1,196		83.7	85.0	62.6		136	98	32	37	M, NM	SSE-1, bc.
A 52	...do	11.39 P	18 36	75 51	1,071		82.8	85.0	67.1		122	96	25	43	M, NM	SSE-1, bc.
A 53	Oct. 4	1.36 A	18 28	76 02	1,275		82.9	85.0	64.4		124	84	36	35	M, NM	SE-2, bc.

A 54	...do.....	2.53 A	18	19	76	04	432		82.0	85.0	63.1	.....	144	83	25	17	M, NM.....	SE-2, bc.
A 55	...do.....	4.26 A	18	07	76	06	712		82.4	83.5	62.6	.....	148	105	17	42	L, Slt Rl Pt.....	E-2, bc.
A 56	...do.....	5.34 A	17	58	76	06	325		81.3	83.5	63.1	.....	135	105	15	22	S, NM.....	E-1, bc.
A 57	...do.....	7.44 A	17	40	76	14	745		81.5	83.5	61.5	.....	128	111	20	37	M, Slt Rl.....	0-0, bc.
A 58	Oct. 5	5.19 P	17	22	76	24	956		83.7	84.0	61.7	40.0	119	72	25	38	C, NM.....	ENE-2, bc.
A 59	...do.....	7.39 P	17	09	76	37	1,150		83.3	83.0	60.4	40.0	126	89	23	50	MC, NM.....	E-3, bc.
A 60	...do.....	10.10 P	16	52	76	50	779		82.4	83.0	59.0	40.0	122	86	27	29	C, Slt Pt.....	E-3, bc.
A 61	Oct. 6	12.46 A	16	35	77	04	1,042		82.6	83.0	59.0	40.0	139	67	35	30	M, Slt Rl.....	E-3, bc.
A 62	...do.....	5.12 A	16	04	77	28	1,236		81.7	83.0	60.8	40.0	112	91	29	43	C, NM.....	E-3, bc.
A 63	...do.....	10.02 A	15	27	77	36	1,174		84.2	84.0	61.7	40.0	125	67	35	34	C, Slt Pt.....	E-3, bc.
A 64	...do.....	12.08 P	15	11	77	35	1,486		83.3	84.0	62.1	40.0	116	66	40	37	C, Slt Rl Pt.....	E-3, bc.
A 65	...do.....	3.23 P	14	51	77	29	2,160		83.7	85.0	61.5	40.0	117	75	68	32	C, Rl.....	E-3, bc.
A 66	...do.....	6.26 P	14	41	77	39	840		81.1	84.0	61.2	.....	97	99	25	34	C, Rl Pt.....	E-3, bc.
A 67	...do.....	7.42 P	14	49	77	51	1,086		80.6	83.8	59.5	41.0	97	63	34	32	C, Pt.....	ENE-3, bc.
A 68	...do.....	9.15 P	14	55	77	59	911		81.9	84.0	60.8	.....	89	81	30	30	C, Slt Pt.....	NE-3, bc.
A 69	...do.....	10.36 P	15	01	78	10	1,068		82.4	83.0	59.9	40.0	137	82	30	36	C, Slt Pt.....	NE-3, bc.
A 70	...do.....	11.35 P	15	05	78	15	1,203		82.4	83.0	59.0	.....	134	86	27	45	C, Slt Pt.....	NE-3, bc.
A 71	Oct. 7	1.53 A	14	53	78	29	1,326		83.5	84.0	58.6	40.0	138	87	30	44	M, Slt Rl Pt.....	NE-3, bc.
A 72	...do.....	3.18 A	14	51	78	22	1,042		82.6	84.0	59.4	.....	139	86	32	33	M, Slt Rl.....	NE-3, bc.
A 73	...do.....	5.04 A	14	47	78	13	1,111		80.8	83.8	59.7	40.0	110	90	23	48	C, Pt.....	NE-4, bc.
A 74	...do.....	7.10 A	14	44	78	05	1,157		81.1	83.8	62.1	40.0	27	95	60	19	C, Pt.....	ENE-4, bc.
A 75	...do.....	8.52 A	14	46	78	20	1,154		85.1	84.0	.....	40.0	131	89	30	38	C, NM.....	NE-2, bc.
A 76	...do.....	10.58 A	14	33	78	29	1,169		85.1	84.0	62.6	40.0	134	90	30	39	C, NM.....	NE-2, bc.
A 77	...do.....	2.48 P	14	02	78	39	1,465		82.9	84.0	57.2	40.0	138	88	36	41	C, Slt Rl.....	E-3, bc.
A 78	...do.....	5.10 P	13	34	78	47	1,506		81.5	84.0	56.3	44.0	114	94	30	50	L, Rl Pt.....	NE-2, bc.
A 79	...do.....	9.36 P	13	05	78	55	1,955		82.4	83.0	58.1	.....	116	73	51	38	M, Rl Pt.....	E-2, bc.
A 80	Oct. 8	12.21 A	12	46	79	00	1,851		82.8	84.0	56.5	40.0	125	81	47	39	M, Rl.....	E-2, bc.
A 81	...do.....	2.47 A	12	28	79	06	1,938		82.4	83.0	55.9	40.0	128	78	48	40	M, Slt Rl.....	E-2, bc.
A 82	...do.....	5.38 A	12	07	79	12	1,777		81.0	83.0	54.5	40.0	127	94	38	47	L, NM.....	SE-1, bc.
A 83	...do.....	5.20 P	10	11	79	47	1,442		81.5	84.6	55.6	40.5	119	105	31	47	S, NM.....	SE-1, rp.
B 1	Oct. 13	3.11 A	7	23	79	39	218		81.0	81	.....	53.5	136	27	45	5	H, Rl Pt.....	SW-4, bc.
B 2	...do.....	4.33 A	7	19	79	39	366		77.9	.....	.....	.....	136	122	31	12	H, Rl Pt.....	SW-5, bc.
B 3	...do.....	5.36 A	7	15	79	39	649		76.5	80.5	.....	41.0	125	105	19	34	C, Rl Pt.....	W-4, oc.
B 4	...do.....	8.52 A	6	50	79	39	1,883		79.7	79.0	52.7	36.0	98	76	48	39	MC, Rl Pt.....	SW-5, ocp.
B 5	...do.....	11.10 A	6	40	79	48	1,871		80.6	79.0	54.5	44.0	106	84	46	41	MC, Rl Pt.....	SW-5, c.
B 6	...do.....	1.56 P	6	18	79	40	1,860		80.2	80.0	54.9	36.0	122	80	47	40	M, Rl Slt Pt.....	SW-4, c.
B 7	...do.....	3.59 P	6	05	79	44	1,305		79.7	80.0	54.1	.....	130	64	35	37	M, Rl.....	SW-4, bc.
B 8	...do.....	6.11 P	5	47	79	46	1,020		77.0	79.0	53.6	40.0	136	72	28	36	C, Rl Pt.....	W-3, bc.
B 9	...do.....	7.46 P	5	36	79	46	1,973		77.7	79.5	55.4	36.0	113	91	46	43	C, Rl Pt.....	W-3-4, bc.
B 10	...do.....	10.38 P	5	13	79	45	1,794		77.0	79.0	54.5	36.0	97	94	45	40	C, Rl Pt.....	SW-3, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Discoverer," Atlantic and Pacific Oceans and Caribbean Sea, September and October, 1922—Continued.

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′			°	°	°	°						
B 11	Oct. 14	1.05 A	4 51	79 44	1,753	.....	77.7	79.5	54.5	36.0	127	87	45	39	M, Slt Rl	W-2, bc.
B 12	...do....	3.29 A	4 50	79 59	1,838	.....	77.7	80.0	54.7	36.0	127	84	44	42	M, Slt Rl	W-3, bc.
B 13	...do....	6.05 A	4 48	80 19	1,594	.....	76.6	79.0	52.7	36.5	121	98	35	46	MC, Rl	WSW-2, bc.
B 14	...do....	9.18 A	4 45	80 46	1,211	.....	81.5	79.0	52.7	36.0	132	77	30	40	M, NM	WSW-2, bc.
B 15	...do....	11.54 A	4 44	81 04	1,433	sft gy M	77.9	80.0	54.1	36.0	117	82	45	32	M, NM	W x S-2, bc.
B 16	...do....	2.36 P	4 44	81 16	2,069	.....	78.3	80.0	55.2	36.0	118	82	49	42	C, Slt Rl	SW-3, bc.
B 17	...do....	5.24 P	4 52	81 36	1,705	.....	77.0	79.5	54.0	36.0	127	87	37	46	LC, Rl	WSW-3, bc.
B 18	...do....	8.18 P	5 00	82 00	1,012	.....	77.9	79.0	59.0	.....	130	106	25	40	C, NM	SW x S-3, bc.
B 19	Oct. 15	12.55 A	5 19	82 41	1,403	.....	77.0	79.0	54.9	36.0	130	90	35	40	C, Slt Rl	SW-3, bc.
B 20	...do....	6.24 A	5 41	83 26	1,758	.....	77.7	78.5	53.1	36.2	114	94	40	44	C, Slt Rl	SW-4, oc.
B 21	...do....	Noon.	6 03	84 10	1,349	.....	79.9	78.0	55.2	36.0	123	92	32	42	M, Rl Pt	SW x W-3, bc.
B 22	...do....	4.41 P	6 21	84 44	812	.....	78.1	78.0	52.2	36.0	150	119	20	41	M, Slt Rl Pt	SSW-3, bc.
B 23	...do....	7.11 P	6 29	85 00	996	.....	76.3	79.5	.....	37.0	116	96	24	41	C, Pt	SSW-4, oc.
B 24	...do....	9.43 P	6 38	85 15	1,126	.....	76.5	78.0	.....	37.0	126	89	30	38	C, Pt	SSW-4, bc.
B 25	Oct. 16	3.07 A	6 57	85 55	1,060	.....	77.5	78.5	55.6	37.0	154	95	27	39	C, Slt Rl	SSW-3, bc.
B 26	...do....	6.05 A	7 06	86 15	1,788	.....	76.6	78.6	54.7	36.0	118	90	41	44	C, Slt Rl	SSW-3, bc.
B 27	...do....	10.35 A	7 21	86 48	1,822	.....	77.9	78.0	56.3	35.0	115	84	40	46	M, NM	SSW-3, bc.
B 28	...do....	4.02 P	7 42	87 30	1,880	.....	76.1	78.0	53.6	36.0	115	107	34	55	M, NM	S-3, c.
B 29	...do....	10.33 P	8 07	88 23	1,910	.....	77.9	76.0	52.7	36.0	118	101	35	55	M, Rl	SW x S-1, bc.
B 30	Oct. 17	4.45 A	8 32	89 14	1,916	.....	75.7	78.0	52.7	36.0	121	94	36	53	MC, Slt Rl Pt	SSW-3, bc.
B 31	...do....	10.46 A	8 56	90 04	1,942	.....	84.2	79.0	53.6	36.0	113	74	55	35	M, Rl	SW-1, bc.
B 32	...do....	7.13 P	9 41	91 07	2,106	.....	76.1	78.5	53.6	36.5	111	90	50	43	LC, Slt Pt	SSW-3, bc.
B 33	Oct. 18	1.58 A	10 15	92 04	2,163	.....	76.6	79.0	53.6	36.0	113	87	53	41	M, Slt Rl	SSW-2, cp.
B 34	...do....	8.24 A	10 46	92 56	2,186	.....	77.9	80.0	52.7	.....	103	86	50	44	M, Rl Pt	SW-2, bc.
B 35	...do....	3.14 P	11 12	93 53	2,231	.....	77.9	80.0	52.9	35.8	100	86	55	41	MC, Rl Pt	SW-4, c.
B 36	...do....	9.48 P	11 29	94 46	2,237	.....	77.9	78.0	52.7	35.6	102	81	60	37	MC, Rl Pt	SSW-3, bc.
B 37	Oct. 19	3.58 A	11 46	95 38	2,216	.....	78.4	82.0	52.0	36.1	119	92	52	43	M, Slt Rl	W-3, bc.
B 38	...do....	9.37 A	12 08	96 22	2,311	.....	82.4	83.0	51.8	35.6	106	80	50	46	M, Pt	SW-2, bc.
B 39	...do....	5.15 P	12 37	97 32	2,119	.....	78.1	81.5	54.7	.....	115	103	46	46	LC, Slt Rl Pt	W-3, bc.
B 40	...do....	11.48 P	13 00	98 32	2,011	.....	80.6	82.0	52.7	35.6	103	74	64	32	C, NM	SW-3, bc.

B 41	Oct. 20	7.40 A	13	22	99	30	1,897		79.5	82.5	51.8	.....	119	96	47	40	C, Slt Pt	W-3, bcp.
B 42	...do....	12.42 P	13	45	100	29	1,957	dk br M	81.9	83.0	52.5	35.8	129	92	44	44	M, Slt Rl	W-1, bc.
B 43	...do....	6.26 P	14	13	101	18	1,945		80.6	82.0	52.9	36.1	121	90	38	51	C, NM	W-2, bc.
B 44	Oct. 21	12.18 A	14	38	102	08	1,976	dk br M	80.8	82.0	53.1	35.8	109	89	48	41	C, Slt Pt	W-3, bc.
B 45	...do....	6.35 A	14	59	103	08	1,904		80.1	81.0	51.8	36.0	133	93	40	48	C, Slt Pt	W NW-3, bc.
B 46	...do....	12.50 P	15	30	104	01	1,827		81.1	83.5	55.8	35.8	135	93	39	47	M, Slt Pt	W x N-3, bc.
B 47	...do....	6.51 P	15	58	104	49	1,788		78.8	81.5	53.1	36.0	119	98	39	46	C, Slt Pt	WNW-5, bc.
B 48	Oct. 22	12.53 A	16	27	105	37	1,736	br M	79.9	83.0	52.7	35.8	130	88	40	43	M, Rl	WNW-4, bc.
B 49	...do....	6.52 A	16	45	106	28	1,911		78.8	.....	52.5	35.8	114	95	37	52	C, Slt Pt	WNW-3, bc.
B 50	...do....	12.47 P	17	12	107	10	2,311	dk br M	80.6	81.5	53.1	35.8	114	84	54	43	C, Slt Pt	WNW-2 bc.
B 51	...do....	6.44 P	17	39	108	03	2,037	dk br Oz	80.1	79.0	52.5	36.0	123	94	45	45	C, NM	WNW-3, bc.
B 52	Oct. 23	1.22 A	18	11	109	03	1,901	br M	80.4	83.5	52.7	35.6	123	87	41	46	M, Slt Rl	NW-2, bc.
B 53	...do....	7.24 A	18	34	109	46	1,908		79.5	79.5	52.9	36.1	129	65	47	41	M, Slt Rl	NW-2, bc.
B 54	...do....	11.52 A	19	03	110	13	1,876		79.0	81.0	51.8	36.0	114	79	43	44	S, NM	NW-1, bc.
B 55	...do....	3.16 P	19	31	110	18	1,781	sft br R or G	79.0	80.0	53.1	35.8	134	100	38	47	M, Slt Pt	NNW-1, bc.
B 56	...do....	6.33 P	19	45	110	46	2,117		77.0	79.0	54.7	35.8	120	91	40	53	M, Slt Rl	NW x W-2, bc.
B 57	Oct. 24	1.03 A	20	26	111	39	1,690	dk br M	77.9	79.0	51.4	35.8	123	93	38	44	M, Slt Rl	NW-2, bc.
B 58	...do....	7.41 A	21	06	112	32	2,076		77.0	78.0	54.0	36.5	124	84	47	44	C, NM	N x W-2, bc.
B 59	...do....	1.39 P	21	38	113	23	2,076		78.4	80.5	50.9	35.2	119	89	47	44	M, Slt Pt	N-2, bc.
B 60	...do....	7.50 P	22	13	114	22	2,176	dk br M	77.9	77.0	50.9	35.6	116	73	60	36	M, Slt Rl	N-2, bc.
B 61	Oct. 25	2.48 A	23	07	115	09	2,113	lt br M	76.5	78.0	50.0	35.2	117	94	47	45	M, Slt Pt	NW-2, bc.
B 62	...do....	10.26 A	24	13	115	50	2,162		75.9	74.0	52.7	.....	109	94	50	43	S, NM	W-1, bc.
B 63	...do....	11.58 A	24	30	116	01	2,192		78.0	76.0	59.9	35.2	114	92	45	49	S, NM	W-1, bc.
B 64	...do....	2.27 P	24	46	116	13	2,076		77.9	76.0	50.2	35.2	128	98	46	45	M, Slt Pt	SW-1, bc.
B 65	...do....	4.59 P	25	02	116	26	2,222	dk br M	77.0	74.0	50.0	35.6	126	99	45	49	S, NM	NW-1, bc.
B 66	...do....	10.02 P	25	41	116	56	2,143		72.0	71.0	50.9	34.7	110	103	40	54	M, NM	NW-2, bc.
B 67	Oct. 26	2.39 A	26	17	117	25	2,108	br M	73.9	71.0	48.4	35.2	130	98	45	47	S, NM	NxW-1, bc.
B 68	...do....	8.47 A	27	16	117	36	2,229		68.0	69.0	49.1	.....	114	86	55	41	S, NM	NE-1, bc.
B 69	...do....	2.30 P	28	14	117	48	2,041	br M	71.0	70.5	49.1	35.2	106	96	42	49	M, Rl	NW-1, bc.
B 70	...do....	5.42 P	28	44	117	54	2,000		70.0	69.5	48.4	35.1	132	94	40	50	M, Slt Rl	N-2, bc.
B 71	...do....	9.39 P	29	20	118	01	1,974		68.0	68.0	49.1	.....	125	95	35	56	S, NM	NxW-1, b.
B 72	Oct. 27	1.32 A	29	56	118	08	1,924	lt br M	69.1	68.0	48.2	35.2	130	93	43	45	M, Slt Rl	NW-3, bc.
B 73	...do....	4.48 A	30	20	118	13	1,684	lt br M	68.0	67.0	48.9	35.1	137	92	35	48	C, NM	N-1, bc.
B 74	...do....	10.51 A	31	25	118	26	1,284		71.1	60.0	49.1	35.2	140	103	30	43	S, NM	W-1, bc.
B 75	...do....	12.14 P	31	33	118	18	773	gy M Shale	71.1	.....	.....	35.2	140	86	23	34	M, Slt Rl Pt	NW-3, bc.
B 76	...do....	1.32 P	31	41	118	10	756	gy Oz	68.5	.....	.....	.....	148	84	20	38	M, Slt Rl Pt	NW-4, q.
B 77	...do....	2.49 P	31	49	118	03	702	lt gy S dk M	68.0	.....	.....	.....	146	74	19	37	C, Slt Pt	NW-4, q.
B 78	...do....	4.10 P	31	56	117	56	1,093		66.8	.....	.....	37.2	116	81	27	40	C, Slt Pt	NW-4, c.
B 79	...do....	5.30 P	32	04	117	48	910		64.9	.....	.....	.....	132	64	23	40	M, Slt Rl	NW-4, bc.
B 80	...do....	6.53 P	32	11	117	40	1,119		64.6	.....	.....	37.2	123	64	30	37	C, Slt Rl Pt	WNW-4, bc.
B 81	...do....	8.15 P	32	18	117	33	417	dk br M	61.2	.....	.....	36.5	149	70	13	32	MC, Pt	W-3, bc.
B 82	...do....	9.30 P	32	25	117	25	606		63.9	.....	.....	.....	135	87	20	30	MC, Pt	W-3, bc.

Deep-sea work by the U. S. Coast and Geodetic Survey ship "Lydonia," Atlantic and Pacific Oceans and Carribbean Sea, October, 1922.

[Soundings obtained with a Sigsbee steam-driven sounding machine.]

Number of sounding.	1922 Day.	1922 Hour.	Latitude north.	Longitude west.	Depth in fathoms.	Character of bottom.	Temperature, Fahrenheit. Air.	Water. Surface.	Water. 200 fathoms.	Water. Bottom.	Fathoms per minute. Reeling out.	Fathoms per minute. Reeling in.	Time of sounding. Minutes.	Time of sounding. Fathoms per minute.	State of sea and motion of ship.	Wind and weather.
			° ′	° ′	°		°	°	°	°						
A 1	Oct. 18	3.34 P	31 42	117 32	697	gn M	63	62.5	46	38	120	80	26	27	C, NM	W-3, c.
A 2	...do....	11.35 P	30 43	117 09	701	rod burred, hrd br S	63	.....	45	38	130	80	20	35	S, NM	W-2, b.
A 3	Oct. 19	6.50 A	29 42	116 49	884	gn M	62	.....	46	37	121	130	29	30	C, NM	NW-3, c.
A 4	...do....	2.16 P	28 46	116 24	1,910	gn br M	76	.....	48	35	107	109	40	48	C, NM	NWxN-3, c.
A 6	Oct. 20	2.30 A	27 26	115 26	2,370		64	.....	.....	.....	101	77	80	30	C, Slt Pt	NW-4, c.
A 7	...do....	12.04 P	26 35	114 39	2,040		72	.....	47	35.5	92	68	75	27	C, Slt Pt	NW-3, b.
A 8	Oct. 21	1.45 A	25 14	113 26	1,580	hrd gn M	71	.....	48	35.8	119	81	48	33	S, NM	NW-1, b.
A 9	...do....	5.22 A	24 52	113 06	1,105	sft gn M	72	.....	48	37.5	149	98	34	32	S, NM	NW-2, b.
A 10	...do....	7.06 A	24 46	112 59	1,216	sft gn M	73	.....	49	36.5	134	91	39	31	M, Slt. Pt	NW-2, b.
A 11	...do....	8.55 A	24 38	112 53	878	crs br S P	74	.....	49	38	129	75	27	33	S, NM	NW-2, b.
A 12	...do....	10.36 A	24 30	112 47	917	gn M wh S	80	.....	48	37.5	116	75	31	30	S, NM	NW-2, b.
A 13	...do....	12.21 P	24 24	112 42	927	S P	87	.....	48.5	38.0	127	88	26	36	S, NM	NW-1, b.
A 14	...do....	11.28 P	23 22	111 15	392		76	.....	48.0	38.0	115	77	23	17	S	NW-1, b.
A 15	Oct. 22	3.22 A	23 02	110 48	883	gn M wh S	76	.....	49.0	37.5	136	59	42	21	S, NM	NW-2, b.
A 16	...do....	10.35 A	22 26	110 03	1,723	rod badly burred, rky	83	.....	49.0	35.5	123	82	43	40	C, Slt Pt	NW-4, b.
A 17	...do....	7.09 P	21 36	109 04	1,565	sft stk gn M	81	.....	49.0	36.0	135	53	55	28	S, NM	NW-2, b.
A 18	Oct. 23	3.16 A	20 52	108 15	1,710	stk gn M	77	.....	52.0	36.0	127	77	54	32	S, NM	0-0, c.
A 19	...do....	12.01 P	20 15	107 21	1,803	br gn M	86	.....	50.0	36.0	119	71	44	41	S, NM	NW-1, b.
A 20	Oct. 26	3.34 A	17 51	103 26	1,500	br M	80	82	49.5	43.5	127	69	52	29	S, NM	NW-2, b.
A 21	...do....	12.34 P	17 18	102 25	1,697	br M	83	83	50.0	36.0	107	78	51	33	S, NM	NW-1. b.
A 22	Oct. 27	1.35 A	16 22	100 34	2,390	br M	82	80	50.0	36.0	111	74	80	30	S, NM	NW-2, b.
C 23	Nov. 7	3.00 A	8 22	84 16	1,123	gn M	77	79	40.0	36.5	112	83	49	23	S, Slt Rl	W-1, r.
C 24	...do....	5.27 A	8 12	84 01	637	br S	77	79	51.0	40.0	127	88	21	30	S, NM	0-0, b.
C 25	...do....	10.40 A	7 56	83 01	810	gn M	80	81	51.0	38.0	92	99	25	32	M, Slt. Rl	SE-2, b.
C 26	...do....	1.12 P	7 49	83 04	938	gn M	80	81	51.0	37.0	128	87	28	33	M, Slt Rl	SW-1, b.
C 27	...do....	3.01 P	7 42	82 54	938	gn M	80	81	51.0	37.2	134	99	25	38	M, Slt Rl Pt	SW-3, b.
C 28	...do....	6.51 P	7 25	82 26	1,341	gn M	79	81	51.0	36.2	130	88	35	38	M, Slt Rl	SW-2, c.
C 29	...do....	11.39 P	7 02	81 56	1,289	gn M	76	80	50.5	36.2	102	83	41	31	M, Slt Rl Pt	S-2, r.
C 30	Nov. 8	1.00 A	7 01	81 49	428	gn M	76	79	50.0	42.5	126	78	21	20	M, Slt Rl Pt	SWxW-1, d.

C 31	...do....	2.43 A	7	00	81	36	478	gn M.	78	79	50.5	41.5	106	100	23	21	M, Mod Rl.	WNW-2, d.
C 32	...do....	5.03 A	6	58	81	18	805	gn M.	78	80	50.0	39.0	164	97	26	31	M, Slt Rl.	WNW-3, c.
C 33	...do....	7.27 A	7	02	80	59	796		80	79	51.0	38.5	162	90	25	32	M, Mod Rl.	NWxN-3, b.
C 34	...do....	9.52 A	7	06	80	42	705	gn M.	82	80	51.0	39.0	128	92	20	35	M, Slt Rl.	0-0, b.
C 35	...do....	12.37 P	7	04	80	23	1,061	gn M.	80	80	51.0	37.0	107	140	25	42	M, Slt Rl.	0-0, c.
C 36	...do....	2.58 P	7	03	80	09	1,218	gn M.	81	83	51.0	36.5	134	119	27	45	M, Slt Rl.	0-0, r.
C 37	...do....	5.30 P	7	02	79	55	1,677	gn M.	79	80.5	50.5	36.0	133	87	41	41	M, Slt Rl Pt	0-0, b.
C 38	...do....	10.59 P	7	10	79	11	793	gn M.	78	80.0	50.5	39.0	137	78	27	29	S, Slt Rl Pt.	NxW-2, b.
C 39	Nov. 9	2.12 A	7	37	79	11	210	gn M Sh.	78	79.0	49.0	48.0	33	66	19	11	M, Slt Rl Pt.	NW-1, o.
D 40	Nov. 15	1.38 P	10	09	79	44	1,402	br M.	81	81.0	55.5	40.0	122	77	40	35	M, Slt Pt.	SW-2, b.
D 41	...do....	7.33 P	10	44	80	02	1,975	gn M br M.	78	81.0	55.0	40.0	118	89	53	37	M, Slt Rl Pt.	NNE-3, c.
D 42	Nov. 16	2.33 A	11	28	80	29	1,900	lt br M.	78	81.0	56.0	40.0	119	75	50	38	Slt Rl Pt.	ExN-3, c.
D 43	Nov. 18	12.09 P	16	40	77	07	775	lt br M S.	81	81.0	59.0	40.0	146	108	20	39	M, Slt Rl Mod Pt.	NE-5, b.
D 44	...do....	2.51 P	16	58	76	57	1,011	lt br M S.	80	81.0	59.5	40.0	120	87	26	39	H, Mod Rl Pt.	NE-5, b.
D 45	...do....	5.08 P	17	11	76	54	1,000	lt gn br M S.	80	81.0	60.0	40.0	145	102	22	45	H, Mod Rl Pt.	NExE-4, b.
D 46	...do....	7.19 P	17	24	76	50	668		80	81.0	61.0	40.0	128	76	31	22	M, Slt Rl Pt.	E-5, b.
D 47	...do....	10.12 P	17	48	76	43	715	lt gn br M.	80	81	61	40.0	143	76	22	32	M, Slt Rl Pt.	E-4, b.
E 48	Nov. 22	2.57 P	17	45	76	03	512	lt br M S.	81	81.0	61.0	43.5	155	83	19	27	M, Slt Rl Pt.	E-3, b.
E 49	...do....	6.00 P	18	02	75	47	1,515	lt br M S.	80	81.0	61.5	40.0	133	77	40	38	M, Slt Rl Pt.	NE-2, b.
E 50	...do....	8.20 P	18	12	75	36	881	lt br M S.	80	81.0	61.0	40.0	147	92	24	37	M, Slt Pt.	NE-2, b.
E 51	...do....	10.27 P	18	20	75	22	745		80	80.0	63.0	.....	155	.....	13	57	M, Slt Rl Pt.	NE-2, b.
E 52	Nov. 23	12.40 A	18	33	75	14	989	brk Sh.	79	80.0	61.0	40.0	141	89	31	32	M, Slt Pt.	NExE-2, b.
E 53	...do....	5.17 A	19	09	74	53	1,262		79	80.0	61.0	.....	150	.....	20	63	M, Slt Pt.	NE-4, b.
E 55	...do....	10.14 A	19	42	74	35	2,240	lt br M S.	80	81.0	62.0	40.0	117	83	55	41	S, NM.	NE-3, b.
E 56	...do....	1.32 P	19	52	74	12	1,245	lt br S.	79	80.5	64.0	40.0	140	92	32	39	S, NM.	ENE-4, b.
E 57	...do....	5.24 P	20	02	73	46	1,782	gn Cl.	79	81.0	62.0	40.5	129	86	51	35	S, NM.	NE-2, b.
E 58	...do....	8.07 P	20	18	73	57	902	lt br M S.	79	81.0	62.0	40.0	137	94	32	28	S, NM.	ENE-3, b.
E 59	...do....	11.11 P	20	38	74	10	1,595	hrd.	78	80.0	63.0	38.5	133	89	43	37	M, Slt Rl.	NExE-3, b.
E 60	Nov. 24	2.46 A	21	06	74	18	1,558	lt br M S.	77	80.0	64.0	38.5	137	83	42	37	S, NM.	NExE-2, b.
E 61	...do....	8.59 A	21	57	74	40	1,507	gy M S.	79	80.0	64.0	38.5	141	83	35	43	S, NM.	SSE-2, b.
E 62	...do....	12.45 P	22	21	74	58	1,485	wh Cl.	79	80.5	64.0	39.0	122	85	44	34	L, Slt Rl.	SWxW-1, b.
E 63	...do....	2.58 P	22	36	74	58	1,429	wh Cl S.	79	81.0	65.0	38.5	135	95	29	49	S, NM.	0-0, b.
E 64	...do....	4.57 P	22	46	74	48	1,312	rky.	79	80.0	65.0	38.5	140	96	31	42	L, Slt Rl.	S-2, b.
E 65	...do....	7.00 P	22	57	74	39	1,398	fne wh S.	79	80.0	65.0	39.0	134	89	38	37	S, Slt Rl.	SW-3, b.
E 66	...do....	9.30 P	23	14	74	32	1,510	fne wh S Cl.	78	79.0	65.0	39.0	124	77	43	35	L, Mod Rl.	SW-2, b.
E 67	Nov. 25	1.39 A	23	42	74	20	2,576	lt br M S.	78	79.0	64.0	.....	114	70	71	36	M, Slt Rl Pt.	SSW-3, c.
E 68	Nov. 26	2.13 P	24	02	74	15	2,600	crs yl S wh Sp.	76	79.0	64.0	37.0	114	78	69	38	M, Mod Rl.	NxE-2, c.
E 69	...do....	6.43 P	24	31	74	16	2,866	gy S bk Sp.	75	78.0	64.0	37.0	108	79	74	39	G, Mod Rl.	SExS-1, b.

HYDROGRAPHIC WORK ACCOMPLISHED.

The work accomplished gives the general submarine relief and other data for an area of one million square statute miles where the charts were heretofore made up largely of blank spaces; and this applies to the entire deep-water portion of the Canal Route from Norfolk to San Diego.

The result next in importance, is the evidence of the nonexistence, in its charted position, of the shoal reported in the Caribbean approach to the Panama Canal 15 miles N. by W. from Manzanillo Point. A general examination of the suspected area, based upon a seemingly adequate number of soundings, at positions fixed by angles on shore objects, failed to reveal any indication of the several shoals shown on the charts of that locality. In addition to the soundings taken, a submarine sentry was towed on the lines run and a good lookout maintained throughout the work. The bottom material is mud, covering a smooth gentle slope, apparently free from accidents of relief.

Soundings of 845, 1,252, and 1,580 fathoms were taken on a line run offshore in the general locality of the 21-fathom spot reported in latitude 35° 55′ N. and longitude 74° 07′ W. These results agree with depths previously charted and rather tend to disprove the existence of the shoal in the locality reported.

The depth on Brown Bank, or Kansas Bank, and its location in latitude 21° 30′ N. and 74° 45′ W. were verified.

A confirmatory sounding of 2,843 fathoms was obtained in the submarine fold about 20 miles off Guantanamo, Cuba.

The shoal area east of Serrana Bank, in latitude 13° 30′ N. and longitude 77° 40′ W., was confirmed and partly defined.

Shoal indications in Windward Passage, the Caribbean between Navassa and Colon, and in the Pacific approaches to the Panama Canal were developed and defined in part; and in addition a number of soundings in moderate depths gave much-needed information in the Gulf of Panama.

The general work in the vicinity of the 70-fathom shoal off the Pacific coast of Costa Rica, in latitude 9° 07′ N. and longitude 86° 58′ W., indicates that the shoal does not exist, or at least not in its charted position, as the depth obtained at that point was 1,765 fathoms.

The track of one of the vessels passed over the charted position of the rock, 10 feet high, shown about 25 miles southwest of Alijos Rocks, in latitude 24° 42′ N. and longitude 116° 10′ W. The weather conditions were exceptionally favorable and a sharp lookout was maintained while within 20 miles of the reported position; but no sign of the rock was detected.

Alijos Rocks, off the coast of Lower California, were passed close-to and the geographic position of this spectacular feature was accurately determined by locating the southern rock in latitude 24° 57′ N. and longitude 115° 45′ W. from observations made under very favorable conditions.

One line of soundings passed about 15 miles east of Guadalupe Island, but developed no indication of shoaling, or underwater extension of the island in that direction.

A shoal bank or submarine peak, on which the minimum sounding obtained is 176 fathoms, was discovered midway between Rosario Bay, Lower California, and Guadalupe Island, in latitude 29° 30′ N and longitude 117° 15′ W. The general depth in the vicinity of the shoal is about 2,000 fathoms. Further development of the feature was not attempted.

The currents encountered were generally local and irregular, with a maximum drift of 2 to 3 knots in limited areas. They appeared so uncertain in occurrence and variable in character that it does not seem worth while to report them; constant care and watchfulness are the only safeguards.

U. S. COAST AND GEODETIC SURVEY DEEP-SEA SOUNDING MACHINE AND ATTACHMENTS.

In connection with the work in 1919, it was observed that the oscillating steam engine used to drive the reel of the Sigsbee machine was occasionally slightly unsteady in action, and through the irregular impulsive strains so applied to the wire during the reeling in operation contributed in some measure toward the casualties recorded.

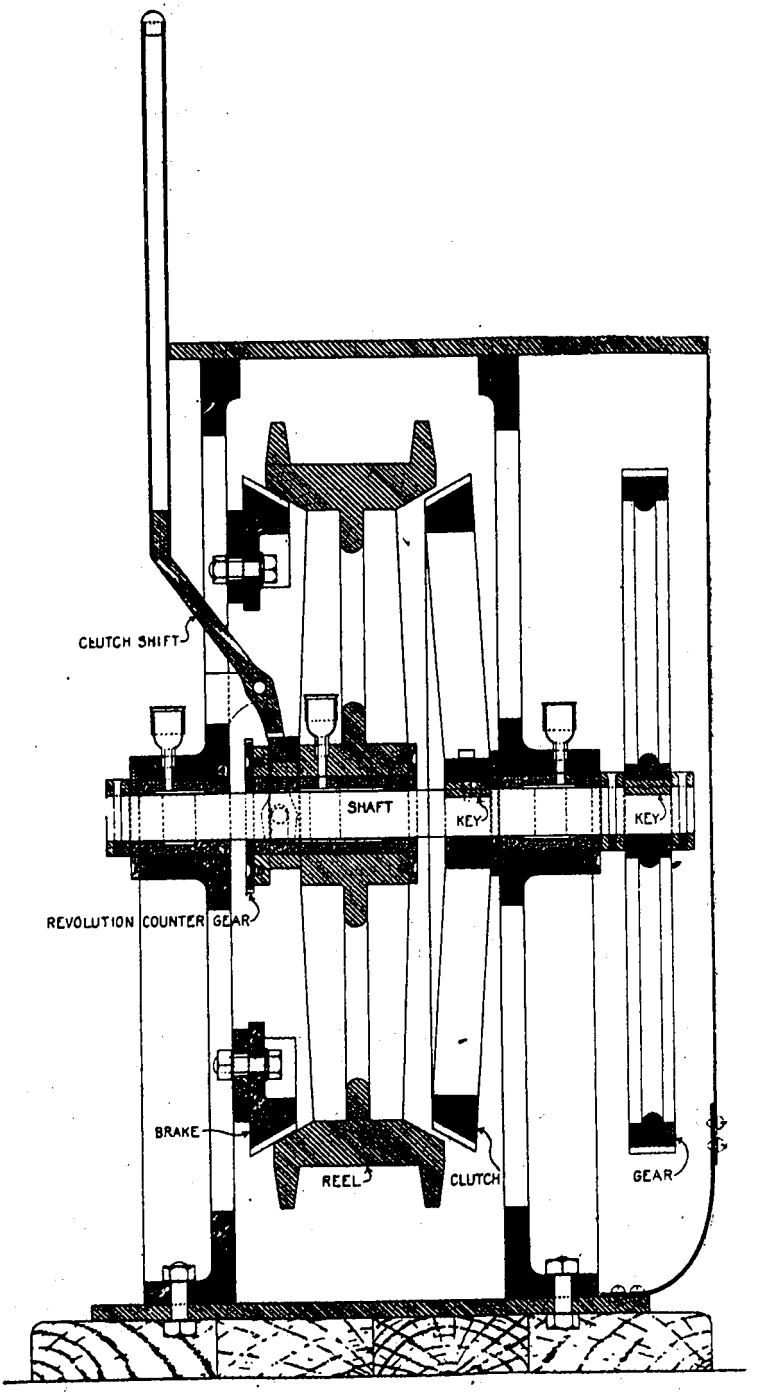
In anticipation of the return to the Department of the Navy, of the Sigsbee machines, which had been borrowed by the Survey, there was then undertaken the design of a machine embodying modernized parts to replace them. In that way a new machine was developed; simple in design, compact in form, and highly satisfactory in operation.

The mechanical principles involved in the construction of a sounding machine are practically fixed, and such differences as may be noted are largely variations in minor details and attachments.

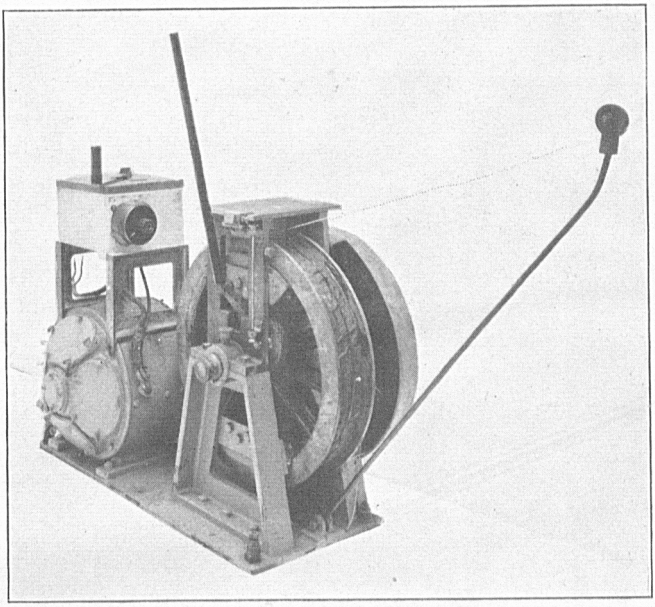
The machine recently designed and constructed in the Survey has one of its principal claims to merit in the use of an electric motor to operate the reel. The motor is about two horsepower, direct current, compound wound, and thoroughly waterproofed. The controller is a 12-step rheostat, designed to provide a smoothly varying speed of 25 to 125 revolutions per minute for the drum of the reel.

The drum is nearly 2 feet in diameter, so that the length of one turn of wire is 1 fathom; the capacity of the drum is about 6,000 fathoms. The drum is mounted on a gear-driven shaft, to which it is connected through a friction clutch; the free rotation of the drum on the loose shaft is controlled by an effective brake. A revolution counter is geared to the hub of the reel. A galvanized-iron pipe 2½ inches diameter and about 20 feet long serves as a boom to carry the fairlead and tension governor and to swing the wire clear of the ship's side while sounding. The registering sheave is attached to the inboard end of the boom. The reel is usually mounted forward on the superstructure deck and on the port side for vessels equipped with a single right-hand screw.

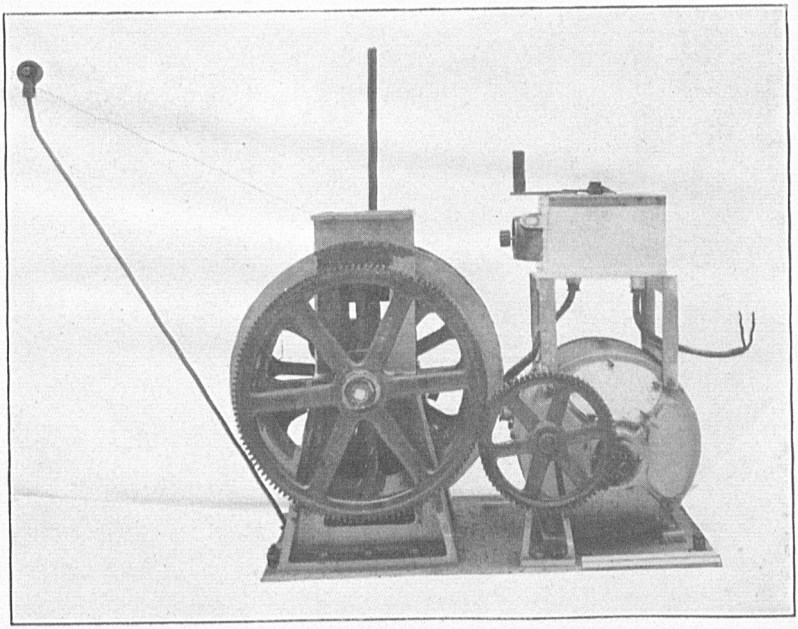
Soundings are made with standard hard-drawn steel piano wire of No. 22 American gauge. The wire is furnished in sealed metal cases, in coils of 2,000 fathoms. The weight of the wire is about 13 pounds per 1,000 fathoms or 11½ pounds per mile. A length of 20 to 30 fathoms of flexible stranded wire stray line may be spliced to the end of the piano wire in order to avoid kinks in the latter due to



Electric-drive deep-sea sounding machine. General assembly: vertical section through main shaft.

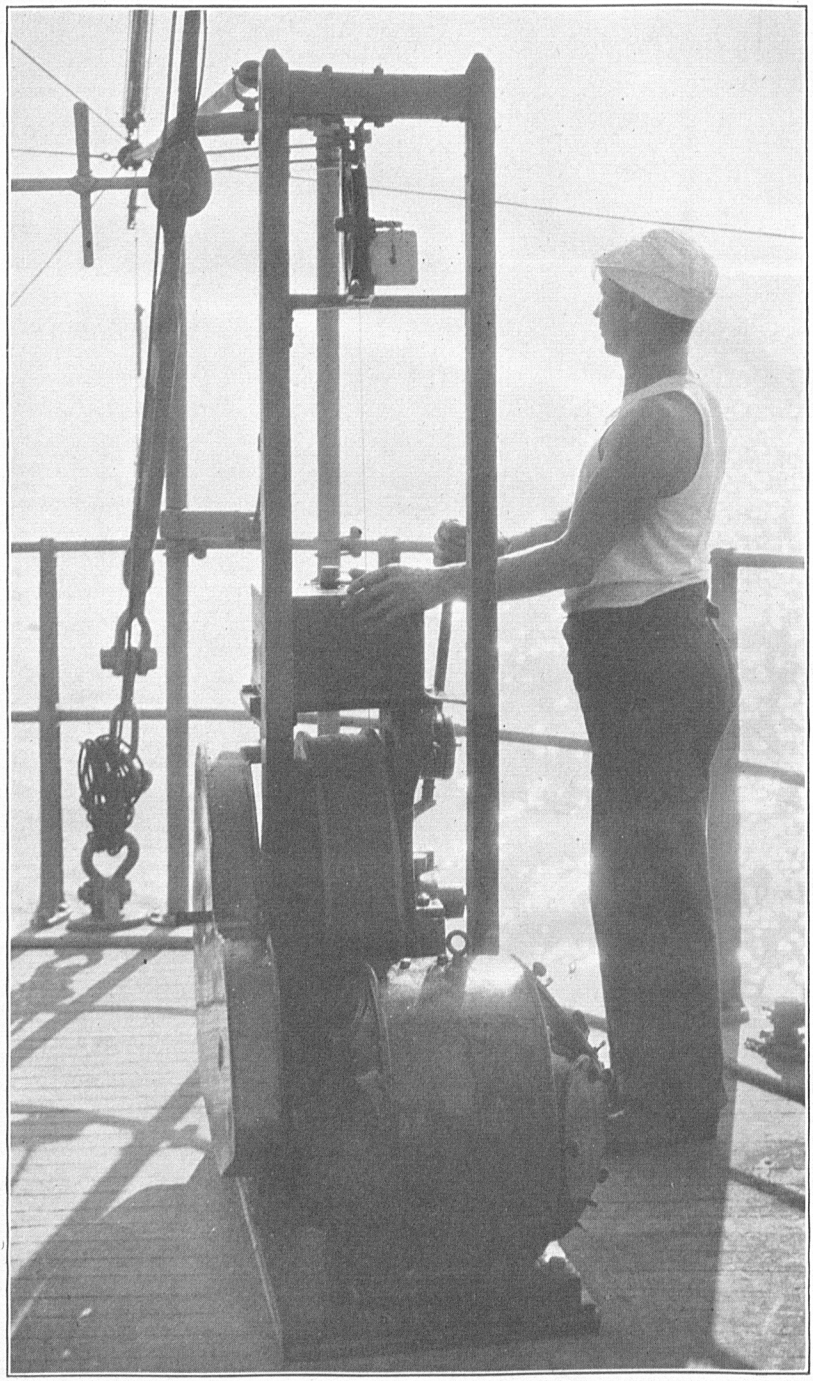


General view of assembled machine.



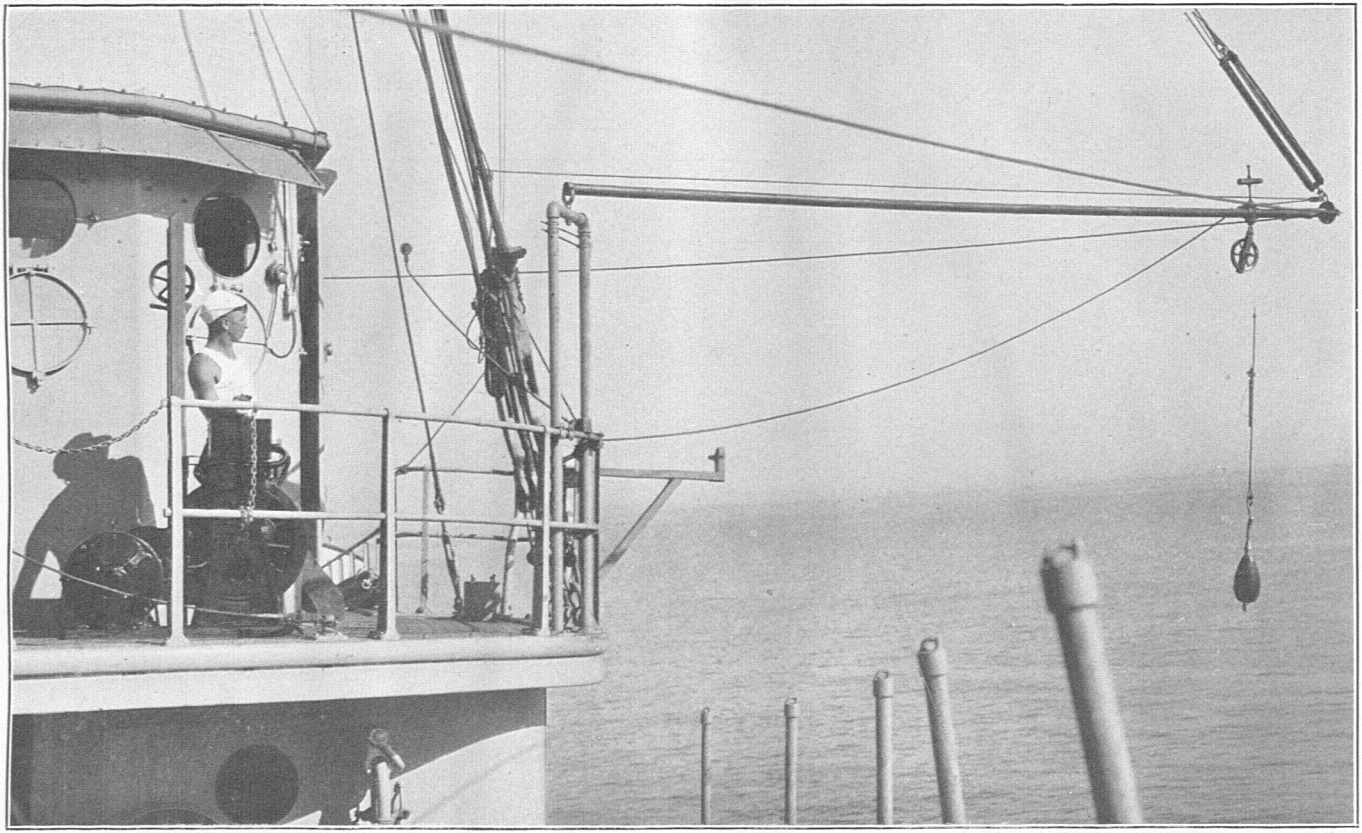
Side view; gear cover removed.

ELECTRIC-DRIVE DEEP-SEA SOUNDING MACHINE.



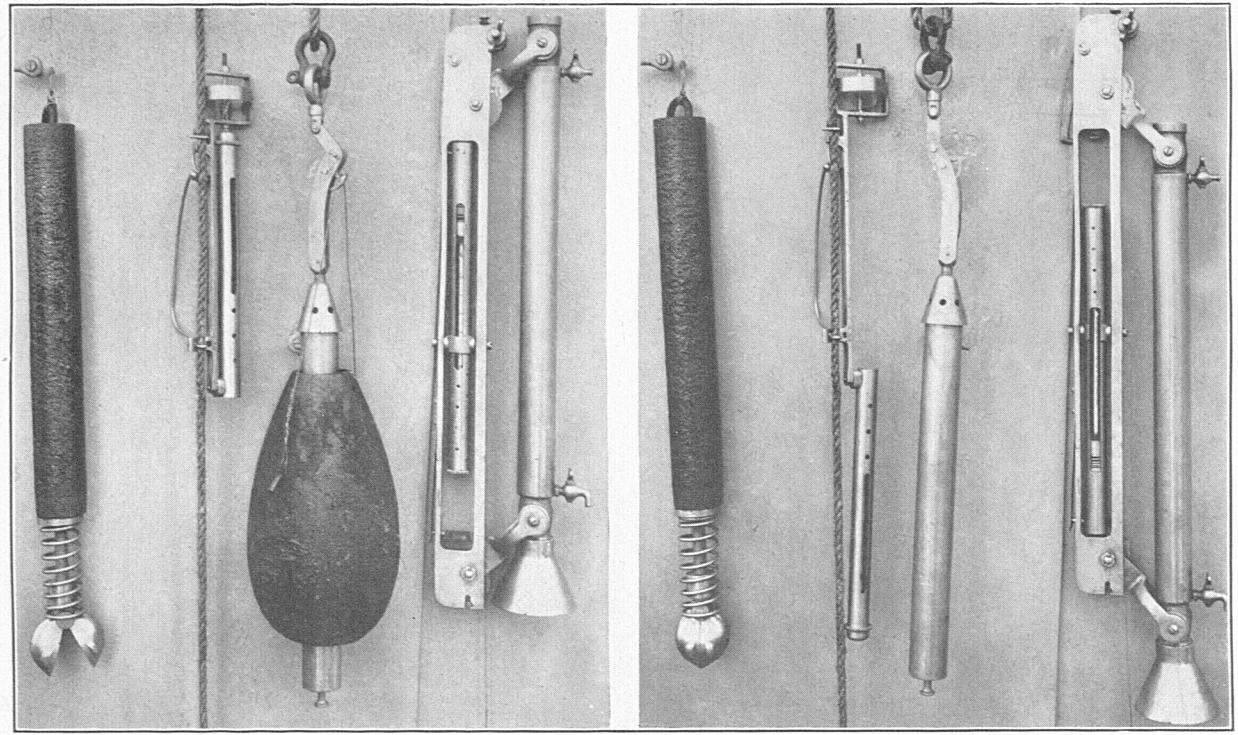
ELECTRIC-DRIVE DEEP-SEA SOUNDING MACHINE.

Details of installation on deck.



ELECTRIC-DRIVE DEEP-SEA SOUNDING MACHINE.

General view of installation; ready to sound.



(a) (b) (c) (d) (a) (b) (c) (d)

Left: Ready to sound. Right: After sounding.

APPARATUS ATTACHED TO SOUNDING LINE.

(a) Improvised sinker equipped with snapper type of bottom-specimen cup.
(b) Registering thermometer of reversing type.
(c) Sounding rod and specimen cup, with sinker suspended from detacher.
(d) Greene-Bigelow water-specimen cup; registering thermometer of reversing type attached.

coiling on the bottom; generally, however, a few fathoms of cotton line is used for this purpose.

Splices in the sounding wire are about 18 inches long and consist of five long spiral turns; the ends of the splice are served with No. 26 soft copper wire for a length of 1½ inches and for 1 inch along the single wire beyond the splice. The serving is soldered. The splice between the piano wire and the stranded flexible cable, when used as a stray line, is made by unlaying one strand of the cable and laying the piano wire in its place. Each end of the splice is served and soldered in the same manner as splices in the piano wire.

The cast-iron sinker is the ordinary detachable type, pear shaped, and weighs from 60 to 75 pounds. It is slung from the detaching rod by a wire bail attached to lugs 1½ inches long, made of ⅝-inch wrought rod, cast in place.

The other attachments are the Belknap sounding rod, which incorporates a device for obtaining a specimen of the bottom material; a registering thermometer, which records the temperature of the water at the bottom; and an automatic container, for obtaining a specimen of the water from the bottom. The sounding rod is equipped with the Sigsbee detacher.

Temperatures at the bottom and at intermediate depths were obtained with the Negretti-Zambra thermometer in Tanner-Sigsbee reversing cases. Temperatures and water specimens taken near the surface and at 200 fathoms were obtained with a navigational sounding reel mounted aft, and a Greene-Bigelow water bottle suspended on a light sounding cable of stranded wire. This water bottle has a registering thermometer in reversing case attached to its frame and is operated at any desired depth by a metal messenger sent down on the wire. It was used on the vessels that made the trip in 1922, and gave excellent results. The reel is operated by hand or by a small electric motor, and is usually mounted aft on the main deck.

Specimens of bottom material are described while in a moist condition, immediately after they are brought to the surface. They are then sealed in small glass bottles and labeled for identification. At the first opportunity they are forwarded to the National Museum for deposit in the permanent collection. Water specimens are preserved in glass bottles commonly used for vending the medicinal solution of magnesium citrate. They are sealed with a porcelain stopper and rubber gasket. Descriptive tags are wired to the stoppers.

Such operating details as the rate of reeling out and reeling in and the time of sounding or rate at which the depth is measured are included in the tabulated data for purposes of comparison and as a basis for estimates of time required for such work and the approximate cost.

The rate of sounding is a highly complex criterion and may not be applied indiscriminately. In addition to the efficiency of the sounding device, it involves such diverse factors as the ability, training, and experience of the crew, the handling of the vessel, climate, weather, and others.

In the work here reported the mean results for the *Pioneer* and *Discoverer* in 1922 are fairly comparable with those for the *Surveyor*, *Lydonia*, and *Wenonah* in 1919. In 1922 the *Lydonia* had an experienced crew which constituted quite an advantage in her favor over all the other vessels. In consideration of all the circumstances attend-

ing this work, it does appear that the rate of sounding may be accepted as a measure of the relative merit of the two types of sounding machines used.

The mean rate for the Sigsbee type steam-driven machines is about 30 fathoms per minute and for the two electric-drive machines, first used on the *Pioneer* and *Discoverer* in 1922, the rate is slightly in excess of 40 fathoms per minute. The conclusion, therefore, that the electric-drive machine has a productive capacity over 30 per cent greater than the earlier type steam-driven machine, operating under like conditions, seems not altogether unwarranted.

O