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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
E. LESTER JONES, DIRECTOR

C. & G. SURVEY
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UNITED STATES COAST PILOT

ALASKA

PART II

YAKUTAT BAY TO ARCTIC OCEAN

SECOND EDITION

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PRICE, 75 CENTS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

National Oceanic and Atmospheric Administration

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DEPARTMENT OF COMMERCE,
UNITED STATES COAST AND GEODETIC SURVEY,
Washington, October 1, 1926.

This publication covers the coast of Alaska from Yakutat Bay to the Arctic Ocean, including the Aleutian Islands. In the surveyed areas it is based mainly upon the work of the United States Coast and Geodetic Survey. In the unsurveyed areas it is a compilation of information gathered from a wide variety of sources.

The first edition of this volume was prepared by Commander R. S. Patton and Lieut. A. L. Giacomini, United States Coast and Geodetic Survey, and published in 1916.

The present (second) edition was prepared by Lieut. R. R. Lukens, United States Coast and Geodetic Survey. The compilation was supervised by Lieut. Commander J. H. Hawley, chief, coast pilot section.

Great courtesy has been shown by the Lighthouse Service, the United States Coast Guard, masters of vessels navigating in Alaskan waters, and local authorities in furnishing information for use in this publication.

The aids to navigation are corrected to October 1, 1926.

Navigators are requested to notify the Director of the Coast and Geodetic Survey of any errors or omissions they may find in this publication or of additional matter which they think should be inserted for the information of mariners.

E. LESTER JONES,
Director.

NOAA
U.S. Dept. of Commerce

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NOTE

The courses and bearings given in degrees are *true*, reading clockwise from 0° at north to 359°, and are followed by the equivalent *magnetic* value in points in parentheses. General directions, such as northeastward, west-southwestward, etc., and all courses given in points, are magnetic, unless otherwise noted.

Distances are in *nautical miles* and may be converted approximately to statute miles by adding 15 per cent to the distances given.

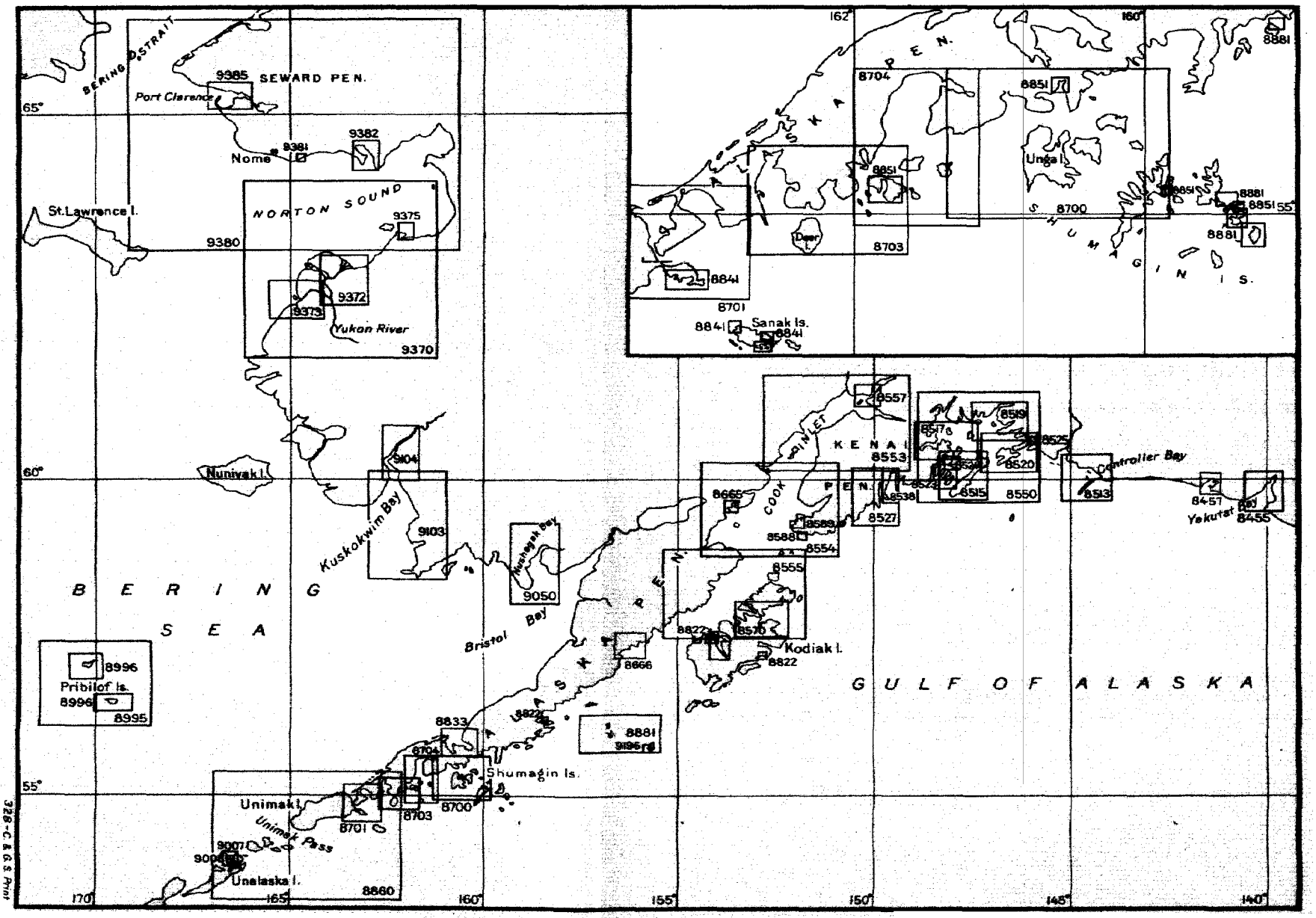
Currents are expressed in knots, which are nautical miles per hour.

All depths, except where otherwise stated, are at *mean lower low water*. In accordance with the desire of the International Hydrographic Conference, the equivalent expressed in meters follows in parentheses.

Heights are given in feet followed by the metric equivalent in parentheses.

Changes and other corrections affecting all coast pilot volumes are included in the Notice to Mariners, published weekly by the United States Department of Commerce. About one year after a Coast Pilot is published, and at approximately yearly intervals thereafter until a new edition is brought out, a supplement, giving the more important corrections and additions to its text since the date of its publication, is issued. The date of the latest supplement to each Coast Pilot, for which a supplement has been issued, is shown in the list of Coast Pilots published each week in the Notice to Mariners. Any supplement may be obtained, free of charge, upon application to the Coast and Geodetic Survey, Washington, D. C., or any of its field stations. Each supplement is complete in itself and cancels all previous supplements.

Do not use this Coast Pilot except with reference to the latest supplement that may have been published and Notices to Mariners issued after the date of the supplement.



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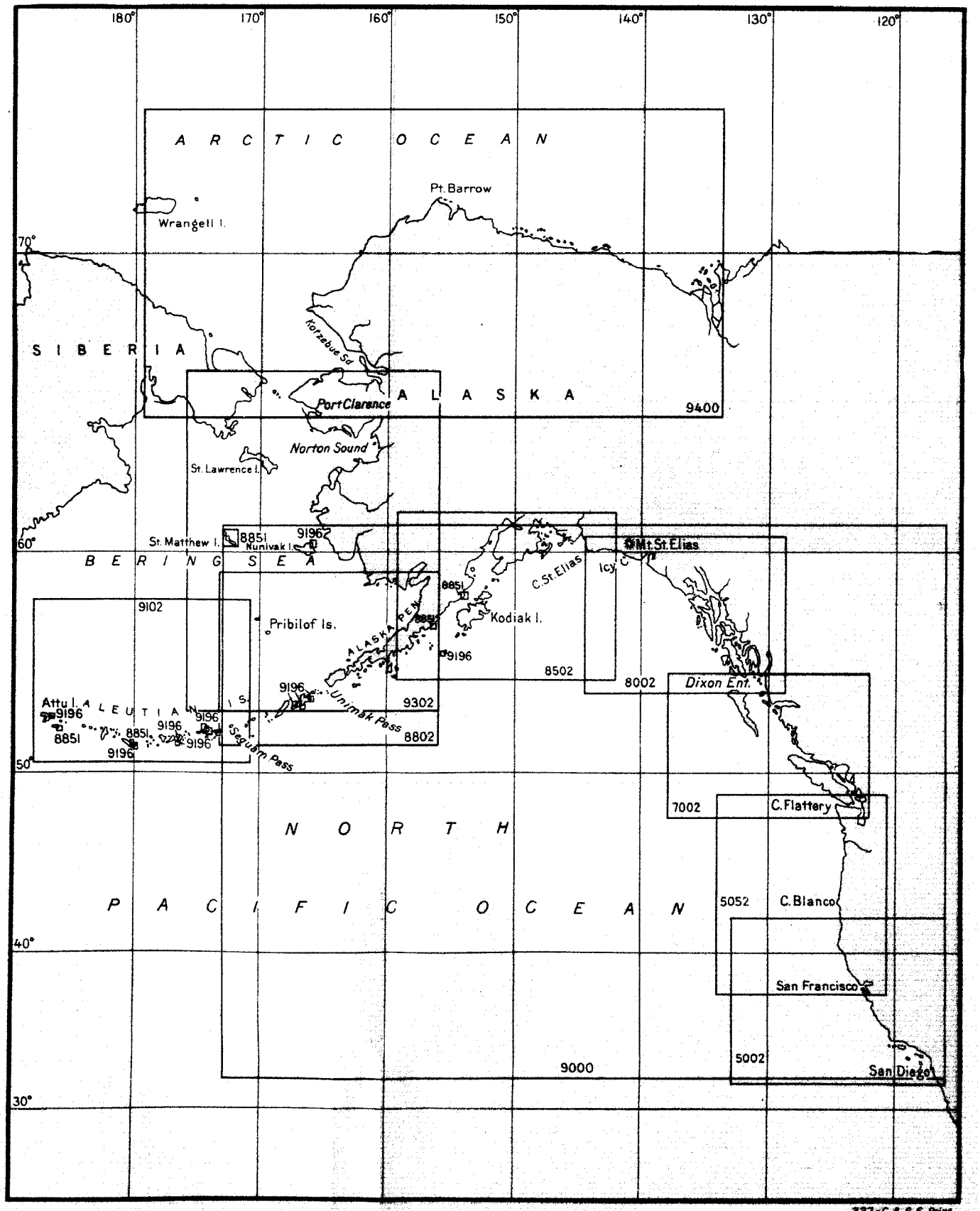

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INDEX OF SAILING CHARTS

UNITED STATES COAST PILOT

ALASKA—PART II—YAKUTAT BAY TO ARCTIC OCEAN

GENERAL INFORMATION

The information contained in this volume relates to the coast waters from Yakutat Bay to the Arctic Ocean, including the various groups of islands along the south side of the Alaska Peninsula, the Aleutian Islands, Prince William Sound, Cook Inlet, Bristol Bay, and the various other indentations.

Westward to Cook Inlet the characteristic formation is rocky; the waters in general are deep, but there are also great variations in depth. The visible topographic features, characterized by mountainous areas, numerous rugged islands, rocks and reefs, are undoubtedly duplicated beneath the surface of the water. A safe rule to follow in the navigation of these waters is to avoid all areas where the chart shows great irregularities in depth.

In Cook Inlet the characteristic formation is the result of glacial action. At low water the shores will be seen strewn with bowlders, some of them of great size, and the soundings indicate that these bowlders also occur in the deeper waters, particularly in areas of hard bottom, where they have not been buried by the subsequent deposit of silt.

Westward from Cook Inlet, along the south side of the peninsula, throughout the offlying islands, and throughout the entire extent of the Aleutian Islands, the rocky formation above described is again found.

Bering Sea is characterized in general by shoal waters, with extensive sand or mud flats along the shores, particularly in the approaches to the various bays and rivers. There is little rocky formation, and its occurrence, where found, is limited in area.

Weather.—The weather in general is misty or rainy, with fog and frequent blows. It will usually be found that an on-shore wind brings misty weather, and an offshore wind, clearing weather. It will also be found that the weather noticeably improves as one proceeds toward the head of the various inlets. Thus, at the head of Prince William Sound, Cook Inlet, Nushagak Bay, or Kuskokwim Bay, bright clear weather will occur when there is wind and rain at the entrances. The weather is discussed in greater detail under the heading of the various localities. (See also meteorological tables in appendix.)

Harbors and ports.—From Yakutat Bay to Cape St. Elias the coast, with the exception of Icy Bay, is open and unbroken, affording no shelter. From this point westward to the end of the Aleutian Islands, there are numerous good harbors where vessels may find shelter from any weather. In Bering Sea, northward and eastward of Unimak Pass, the harbors are few and are characterized by shoals in the approaches, so that in the absence of detailed surveys local knowledge is necessary to enter.

The principal ports are Cordova and Valdez in Prince William Sound, Seward in Resurrection Bay, Anchorage at the head of Cook Inlet, Kodiak on Kodiak Island, Unga and Unalaska to the westward, and Nome and St. Michael in the Bering Sea. At each of these places there are blacksmith and machine shops where repairs to machinery may be made, and carpenters available for woodwork above water. Similar facilities are available at Nome, but the anchorage is in an open roadstead.

There are no dry docks or marine railways, but the great range of tide makes it an easy matter to choose a spot at low water for beaching a vessel at high water where she will be high and dry at low tide.

At any of the canneries there are facilities for making minor repairs to machinery.

Ice will seldom be encountered south of Unimak Pass. It occurs locally where discharged from glaciers, and in winter is formed at the head of the various inlets, but never gets far from its source. Its occurrence, and also the ice in Bering Sea, are discussed in detail under the headings of the various localities.

Kelp grows on nearly every danger having a rocky bottom, and will be seen on the surface of the water during the summer and autumn months; during the winter and spring it is not always to be seen, especially where it is exposed to a heavy sea. Kelp should always be considered a sign of danger, and no vessel should pass through it unless the spot has been carefully sounded. There are however, many rocks not marked by it; a heavy sea will occasionally tear the kelp away from rocks; and a moderate current will ride it under water so that it will not be seen. It is well to note that dead, detached kelp floats on the water in masses, while live kelp attached to rocks streams away level with the surface.

Pilotage is not compulsory for Alaska except as provided in the United States laws governing the Steamboat Inspection Service. Vessels making canneries, mines, and other settlements in unsurveyed areas can usually obtain the services of some one with local knowledge, athough not a licensed pilot.

Aids to navigation.—Of recent years a large number of aids to navigation have been established in the locality covered by this volume. Most of the lights established are of the unwatched acetylene blinker type, and as the lighthouse tender is able to make but one trip per year to the westward these lights can not be relied upon as would be the case with watched lights.

Supplies.—Vessels usually obtain their supply of provisions and ship-chandler's stores at California, Washington, and British Columbia ports. The principal towns and settlements in western Alaska

can furnish provisions and a limited supply of ship-chandler's stores. Nearly all the canneries and mining settlements carry a limited supply of provisions for sale. (For supplies see also the different headings.)

Regular stocks of fuel oil are kept on hand at Seward and Dutch Harbor. Coal can be obtained at Cordova, Valdez, Seward, Kodiak, and Unalaska. At times it may be obtained at other places but this should not be depended upon without prior arrangement.

RADIO SERVICE

The supervision of radio communication in the United States including the Hawaiian Islands, is controlled by the Bureau of Navigation, Department of Commerce. A list of the radio stations of the United States, including shore stations, merchant vessels, and Government vessels; Radio Communication Laws and Regulations of the United States; and Amateur Radio Stations of the United States, are published by the bureau. Either of the first two publications can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.; price, 15 cents each; the last one, 25 cents. Changes or additions to the stations and to the laws and regulations are published in bulletins issued monthly; price, 5 cents per copy or 25 cents per year.

The International List of Radio Stations of the World (edition in English) can be procured from the International Bureau of the Telegraphic Union (Radiotelegraphic Service), Berne, Switzerland. In addtion to the information contained in the list of the United States stations published by the Bureau of Navigation, the international list shows geographic locations, normal ranges in nautical miles, radio systems, and rates. Supplements to the international list will be issued monthly and will contain new stations and tables of alterations. Inquiries as to the subscription prices of these lists should be made direct to the Berne bureau at the address given above. Remittances to Berne should be made by international postal money orders.

Naval radio stations are operated at Cordova, Seward, Dutch Harbor, and St. Paul Island. The United States Army has radio stations at St. Michael, Nome, and Kotzebue. Practically all the salmon canneries operate radio stations during the summer season, and there are several stations operated by other Government bureaus.

Radiocompass bearings.—The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply radio bearings taken on shipboard or sent out by the shore stations directly to the nautical chart. These radio bearings are the bearings of the great circles passing through the radio stations and the ship, and unless in the plane of the Equator or of a meridian, would be represented on a Mercator chart as curved lines. Obviously it is impracticable for a navigator to plot such lines on his chart, so it is necessary to apply a correction to a radiocompass bearing to convert it into a Mercator bearing; that is, the bearing of a straight

line on a Mercator chart laid off from the sending station and passing through the receiving station.

On page 6 is given a table of corrections for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiocompass stations or radio beacons and of the ship by dead reckoning. The latter is scaled from the chart and the former either scaled from the chart or taken from the list of radiocompass stations and radio beacons printed in the Coast Pilots, in the light and buoy lists published by the Lighthouse Service, or in the publication Radio Aids to Navigation (H. O. No. 205), issued by the Hydrographic Office, United States Navy. The largest scale chart available should be used for this purpose.

The table is entered with the difference in longitude in minutes between the ship and shore station (the nearest tabulated value being used), and opposite the middle latitude between the ship and shore station (to the nearest tabulated value) the correction to be applied is read.

The sign of the **correction,** when bearings are read clockwise from north, will be as follows: In **north latitude,** the plus sign is used when the ship is **east** of the compass station; the minus sign is used when the ship is **west** of the compass station; in **south latitude,** the minus sign is used when the ship is **east** of the compass station; the plus sign is used when the ship is **west** of the compass station. If the radio bearings are observed on the ship, the signs will be reversed. The corrected bearing is then the Mercator bearing from ship to the sending station, and to facilitate plotting 180° should be added to it and the result plotted from the sending station.

Should the position by dead reckoning differ greatly from the true position of ship as determined by plotting the corrected radio bearings, a retrial should be made, using the new value as the position of the ship.

Example.—A ship in latitude 37° 20′ N., longitude 69° 20′ W., by dead reckoning receives a radio bearing of 64° from a radiocompass station located in latitude 35° 14′ N., longitude 75° 32′ W. Find the Mercator bearing of the ship from the station—

Radiocompass station latitude	35°	14′ N.,	long.	75°	32′ W.
Dead reckoning position of ship	37	20		69	20
Middle latitude	36	17	Diff.		372′

Entering table with difference of longitude=360′, which is the nearest tabulated value to 372′ and opposite 36° middle latitude (the nearest tabulated value to 36° 17′) the correction 106′ is read. The ship being east of the station the correction is plus. The Mercator bearing will then be the radio bearing received plus the correction from the table, 64° 00′+106′=64°+1° 46′=65° 46′.

For more accurate determinations the following formula should be used and on which the table of corrections is based.

Formula for the conversion of radio bearings into Mercator bearings.—The Mercator bearing is equal to the radio bearing received,

plus or minus one-half the convergence of the meridians in minutes, which expressed as a formula is

$$M=R\pm\frac{D}{2}\sin\left(\frac{B+B'}{2}\right) \text{ in which}$$

M=Mercator bearing required.
R=radio bearing received from the radiocompass station.
D=difference in longitude, in minutes, between the radiocompass station and the ship's position by dead reckoning.
B=latitude of the radiocompass station.
B'=latitude of the ship's position by dead reckoning.

Example.—A ship in latitude 37° 20′ north, longitude 69° 20′ west by dead reckoning receives a radio bearing of 64° from a radiocompass station located in latitude 35° 14′ north, longitude 75° 32′ west. Find the Mercator bearing of the ship from the station.

By the formula—

$R=64°$
$D=75°\ 32'-69°\ 20'=6°\ 12'=372'$
$\frac{D}{2}=186'$

$B=37°\ 20'$
$B'=35°\ 14'$
$B+B'=72°\ 34'$
$\frac{B+B'}{2}=36°\ 17'$
sin 36° 17′=.59176 (from the table of natural sines below).

Substituting these values in the formula, and observing that since the ship is in north latitude and east of the radiocompass station, the + sign is used (see p. 4 for determination of signs), we have—

$$M=64°+186'\times0.59176=64°+110'=64°+1°\ 50'=65°\ 50'$$

Table of natural sines

Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine
0°	0. 00000	17°	0. 29237	34°	0. 55919	50°	0. 76604
1°	. 01745	18°	. 30902	35°	. 57358	51°	. 77715
2°	. 03490	19°	. 32557	36°	. 58779	52°	. 78801
3°	. 05234	20°	. 34202	37°	. 60182	53°	. 79864
4°	. 06976	21°	. 35837	38°	. 61566	54°	. 80902
5°	. 08716	22°	. 37461	39°	. 62932	55°	. 81915
6°	. 10453	23°	. 39073	40°	. 64279	56°	. 82904
7°	. 12187	24°	. 40674	41°	. 65606	57°	. 83867
8°	. 13917	25°	. 42262	42°	. 66913	58°	. 84805
9°	. 15643	26°	. 43837	43°	. 68200	59°	. 85717
10°	. 17365	27°	. 45399	44°	. 69466	60°	. 86603
11°	. 19081	28°	. 46947	45°	. 70711	61°	. 87462
12°	. 20791	29°	. 48481	46°	. 71934	62°	. 88295
13°	. 22495	30°	. 50000	47°	. 73135	63°	. 89101
14°	. 24192	31°	. 51504	48°	. 74314	64°	. 89879
15°	. 25882	32°	. 52992	49°	. 75471	65°	. 90631
16°	. 27564	33°	. 54464				

Table of corrections in minutes

[Difference of longitude in minutes]

Mid. L	30′	60′	90′	120′	150′	180′	210′	240′	270′	300′	330′	360′	390′	420′	450′	480′	510′	540′	570′	600′
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	147	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

Radio beacons (fog signals) are operated by the United States Lighthouse Service at various lightships and stations on the Pacific coast. At the present time no radio beacons are operated in the region covered by this volume but several are contemplated. Details regarding these radio beacons, when established, will be given in the Weekly Notice to Mariners and will be included in light and buoy lists and in future supplements to this volume.

Radio beacons are intended for the use of vessels equipped with radiocompass. By means of this radiocompass (also termed radio direction finder) the bearing of the radio beacon may be determined with an accuracy of approximately 2° and at distances considerably in excess of the range of visibility of the most powerful coast lights. The apparatus is simple and may be operated by the navigator without the assistance of a radio operator or without knowledge of the telegraph code. The radio direction-finding apparatus consists of a radio receiving set, similar in operation to those used for radiotelegraph or telephone reception, and a rotatable coil of wire in place of the usual antenna. By rotating the coil the intensity of the signal received from the transmitting station is caused to vary, and by noting the position of the coil when the signal is heard at its minimum intensity the bearing of the transmitting station is readily obtained.

It is important to note that the bearing of an incoming radio wave is subject to errors not unlike the deviation of a magnetic compass. Those using radio direction finding on shipboard are cautioned to bear these errors in mind and to keep radiocompasses calibrated at all times. This may be done during clear weather by comparing the bearing obtained with the radiocompass with the bearing as given by other methods in general use. All radiocompasses are subject to what is called "night effect," an indeterminate error sometimes experienced near nightfall and sunrise.

The signals from the lightships and stations have definite characteristics for identifying the stations, as have the flashing lights and sound fog signals, and bearing may be obtained with even greater facility than sight bearings on visible objects. The radio fog signals are transmitted on a wave length of 1,000 meters, which is exclusively reserved for this purpose to avoid interference.

A general description of this method of navigation and the instruments required is given in Lighthouse Service publication, Radio Fog Signals and their Use in Navigation, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents. The Bureau of Standards Scientific Paper No. 428, The Radio Direction Finder and Its Application to Navigation, may be obtained from the Superintendent of Documents, Washington, D. C., for 15 cents.

Accuracy of bearings.—The accuracy with which bearings can be taken by shore stations depends on the conditions outlined below; but, although in general the bearings taken by a station within the sector of calibration can generally be considered accurate to within 2°, the Government can not accept any responsibility for consequences of a bearing's inaccuracy.

In the case of bearings which cut the coast line at an oblique angle, errors of from 4° to 5° have been reported.

Bearings obtained between about half an hour before sunset and half an hour before sunrise, are generally unreliable, on account of the excessive error introduced. These errors are not so great when only an expanse of sea separates the two stations, but in the case of the bearing passing over land, particularily if it is hilly country, the amount of error is abnormal. Changes in the intensity of the signal received also occur at sunset and sunrise, and apart from the above-mentioned variations, changes in the signal strength of the transmitting station have been observed at these times.

Bearings signaled as "approximate" or "second class" must be treated with grave suspicion, as very considerable errors may exist in such bearings.

United States naval radiocompass stations will furnish radio bearings to mariners of all vessels equipped with radiotelegraph transmitters. While the use of these bearings should not lead a mariner to neglect other precautions, such as the use of the lead, etc., during a fog, these bearings will greatly reduce the dangers to navigation for mariners who are compelled for any reason to proceed during foggy or misty weather.

These radiocompass stations are provided, primarily, to assist the mariner in closing the land during fog or poor visibility, but they

may also be used to obtain the positions of vessels at sea in radiocompass range, about 150 miles, when for any reason positions can not be obtained by other means. The maximum distance for which bearings from these stations are accurate is 150 miles. (See preceding pages for reduction of observed bearings to Mercator bearings.)

Radiocompass stations are divided into two classes: (*a*) Single stations, operating independently and furnishing a single bearing; (*b*) harbor entrance groups. All stations in harbor entrance groups are connected to and controlled by the master station. All stations of the group take bearings simultaneously and these bearings are transmitted to the ship requesting them by the control station.

Where only one radiocompass station is available, the mariner may fix his position by two or more bearings from the station with the distance run between, or may use the bearings as a line of position, or as a danger bearing. Or the bearing may be crossed with a line of position obtained from an observation of an astronomical body to establish a fix.

Wave lengths.—All independent and group radiocompass stations keep watch on 375 kilocycles (800 meters). Only this wave should be used to call and work with these stations.

Hours of service.—During the first 10 minutes of each hour during clear weather radiocompass stations ordinarily will not be guarding this wave. Ships are requested to confine their requests for bearings during clear weather to the remaining 50 minutes of the hour, as far as is practicable. Should a station chance to hear a request for a bearing during the first 10 minutes of the hour, the required bearing will be given. During the remaining 50 minutes and at all times during inclement weather, all radiocompass stations will be continuously guarding the 375-kilocycle (800-meter) wave.

Calling a radiocompass station.—To obtain a bearing from independent radiocompass stations, call the station from which the bearing is desired in the usual manner and request bearings by means of the conventional signal given hereafter. Simultaneous bearings from two or more compass stations can be obtained by making the call include the other compass stations desired. To obtain bearings from the harbor entrance compass stations, carry out the procedure previously given. The compass control station only will answer.

Conventional signals.—The following abbreviated signals will be used:

Signal	Meaning
QTE?-----	What is my true bearing?
QTE------	Your true bearing from----radiocompass station was----degrees.

The following radiocompass stations will be of use for vessels navigating within the approximate limits of this volume. In plotting bearings furnished by these stations the *position of receiver* must be used. Vessels equipped with a radiocompass may also use these stations as radio beacons. For this purpose a United States naval station will transmit, upon request, its call letter for 45 seconds

on 800-meter wave. When the bearing is taken on the vessel, the *position of transmitter* must be used for plotting.

Name of station	Call letters	Position of receiver		Position of transmitter		Arc of calibration
		Latitude	Longitude	Latitude	Longitude	
		° ′ ″	° ′ ″	° ′ ″	° ′ ″	*Degrees*
St. Paul Island	NPQ	57 07 18 N.	170 13 37 W.	57 07 22 N.	170 16 06 W.	60–300
Cape Hinchinbrook [1]	NRM	60 14 00 N.	146 38 55 W.	60 14 07 N.	146 39 08 W.	112–294
Soapstone Point [1]	NUW	58 06 13 N.	136 29 51 W.	58 05 39 N.	136 29 44 W.	245–50

[1] Limited service. Standing watch during fog and when ships are in vicinity.

NOTE.—The arc of calibration is a sector of the circle of which the compass coil at the radio station is the center; the bearings are from the station (clockwise). Compass bearings are reliable only when they fall within the calibrated arcs.

Procedure in detail.—(*a*) A ship calling the radiocompass station or compass control station should make the abbreviation "QTE?" ("What is my true bearing?"). This request will be answered by the radiocompass station or control station, and when ready to observe the radio bearing it will send the signal "K," indicating to the ship to commence "testing"; that is, repeating its distinguishing signal for a period of 50 seconds. The signal should be made slowly, with the dashes considerably prolonged.

(*b*) The testing should be made on 800 meters, upon the completion of which the ship should await reply from the radiocompass station.

(*c*) The radiocompass station or control station will then reply repeating the abbreviation "QTE" ("Your true bearing from _____ was _____ degrees"), followed by the bearing in degrees given by a group of three figures 000 to 359, indicating the true bearing in degrees of the ship station from the radiocompass station, and then the time group, giving the time of observations in local standard time. In the case of more than one radiocompass connected by land line, only the station originally called will answer. This station will combine all the bearings taken by itself and associated stations into one message, which gives each bearing observed immediately after the name of the station making the observation. *All compass stations transmit on 800 meters.*

Danger from reciprocal bearings.—Attention is invited to the fact that when a single bearing is furnished there is a possibility of an error of approximately 180°, as the operator at the compass station can not always determine on which side of the station the vessel lies. Certain radiocompass stations, particularly those on islands or extended capes, are equipped to furnish two corrected true bearings for any observation. Such bearings when furnished vessels may differ by approximately 180°, and whichever bearing is suitable should be used.

Caution.—Mariners receiving bearings which are evidently the approximate reciprocal of the correct bearing should never attempt to correct these bearings by applying a correction of 180°, as such correction would not include the correction necessary on account of deviation at the compass station. An error of as large as 30° may be introduced by mariners applying an arbitrary correction of 180°

to such bearings. Vessels receiving bearings manifestly requiring an approximate 180° correction should request the other bearing from the radiocompass station if not previously furnished.

Bearings, except in the case of approximately reciprocal bearings, should be accurate within 2° of arc, provided the transmitting equipment on board vessels is tuned sharply to 800 meters. Operators should use sufficiently wide coupling to obtain low decrement. If radio transmitters are not tuned sharply, it is difficult to obtain bearings that are sufficiently accurate for navigational purposes.

When bearings from three or more compass stations are not over 2° of arc in error, but do not meet at a fixed point, the geometric center of the triangle formed by the bearings can generally be taken as the approximate position of the vessel. Mariners, until thoroughly familiar with the system, are advised to use radiocompass stations frequently, especially in clear weather, when positions of vessels can be accurately fixed in order to accustom operators to the procedure and to acquaint themselves with the degree of accuracy and dependability of bearings furnished by the radiocompass stations.

Reports.—In order that the operation of shore radiocompass stations may be checked, mariners obtaining bearings are requested to forward a brief report to the Director Naval Communications, Navy Department, Washington, D. C., containing the following particulars:

1. Name of ship.
2. Name of radiocompass station.
3. Date and local standard time at which radio bearing was taken.
4. Bearings given by radio station.
5. Estimated position of ship at above time and dates by methods other than radio.
6. The probable degree of accuracy of the estimated position.
7. Weather conditions at above time.
8. Remarks, if any.
9. Signature of master or responsible navigating officer.

There is no charge for bearings furnished by the United States naval radiocompass stations.

TIDES

Along the outer coast of Alaska between Yakutat Bay and the western end of Alaska Peninsula the tide is nearly simultaneous, high water occurring near the time of the transit of the moon. Between Yakutat Bay and Cape Whitshed mean high water rises from 9 to 10 feet (2.7 to 3.0 m.) above the plane of reference. Extreme variations from 4 feet (1.2 m.) below to 15 feet (4.6 m.) above the datum may occasionally be expected.

Throughout **Prince William Sound** the tide is practically the same in regard both to time and to height. High water occurs near the time of the transit of the moon, and the mean height of high water is about 11 feet (3.4 m.) above the plane of reference. Extreme variations from 4 feet (1.2 m.) below to 16 feet (4.9 m.) above the datum may sometimes occur.

In **Resurrection Bay** the rise of tide is about 1 foot (0.3 m.) less than in Prince William Sound.

In passing up **Cook Inlet** the time and height of the tide changes very rapidly. At Fire Island the tide is about five hours later than at Port Chatham. At Anchorage in Knik Arm it is about one-half hour later, and at Sunrise in Turnagain Arm about one hour later than at Fire Island. The height of mean high water above the plane of reference varies from about 13 feet (4.0 m.) in the vicinity of Port Chatham to 30 feet (9.1 m.) in Knik Arm and 33 feet (10.0 m.) in the eastern part of Turnagain Arm. Variations from 6 feet (1.8 m.) below the plane of reference to 6 feet (1.8 m.) above mean high water may occasionally occur. The mean range of tide on the west side of Cook Inlet is less than it is on the east coast, the difference being as great as 3 feet (0.9 m.) at the widest part of the inlet.

On the eastern side of **Kodiak Island** the height of mean high water is about 9 feet (2.7 m.) above the plane of reference, but in Shelikof Strait the mean high water rises from 13 to 14 feet (4.0 to 4.3 m.) above the datum. Extreme variations from 4 feet below to 14 feet above the datum on the eastern side and from 4 feet (1.2 m.) below to 18 feet (5.5 m.) above the datum on the western side of the island will occasionally occur. In Shelikof Strait the tide will occur about 15 minutes later than on the eastern side of the island.

From **Kodiak Island to the westward** the range of tide diminishes rapidly. In the vicinity of the Shumagin and Sanak Islands the mean high water is approximately 6 feet (1.8 m.) above the plane of reference. There is, however, very little difference in the time of the tide until the western end of the Alaska Peninsula is reached.

Around the **Aleutian Islands** the tide is very irregular and at times becomes diurnal. The mean high-water interval varies from zero to four hours, and the mean rise of tide from 2 to 6 feet (0.6 to 1.8 m.) above the datum.

At the **Pribilof Islands**, St. Matthew Island, and St. Lawrence Island, in the Bering Sea, the tide is small and irregular, the mean rise being less than 4 feet (1.2 m.) above the datum.

In **Bristol Bay** the range of tide increases very rapidly in passing toward the head of the bay. At Port Moller the mean rise is 9½ feet (2.9 m.) above the datum, and at Clark Point, Nushagak Bay, it is 18 feet (5.5 m.). At the latter place the tide occurs approximately five hours later than at Port Moller.

In **Kuskokwim Bay** the height of mean high water above the plane of reference increases from 7 feet (2.1 m.) at Goodnews Bay entrance to 10½ feet (3.1 m.) off Warehouse Creek and then diminishes to 2½ feet (0.7 m.) at Bethel. At Apokak the tide occurs nearly four hours later than at Goodnews Bay entrance, and at Bethel it is about five and one-half hours later than at Apokak. The range of tide is greater on the east side than it is on the west side of the bay, the difference being about 1 foot (0.3 m.) in the vicinity of Apokak.

In **Norton Sound** the tide is generally small and irregular and during a large part of time diurnal. The mean rise and fall is about 3 feet (0.9 m.).

In the vicinity of **Bering Strait** the tide is too small to be of practical importance.

Along the **Bering Sea** coast of Alaska extreme tides, varying from 3 feet (0.9 m.) below the plane of reference to 6 feet (1.8 m.) above mean high water, may occur occasionally.

For more detailed information concerning the tides in Alaska, the United States and Foreign Ports or the Pacific Coast Tide Tables for the current year should be consulted. These are published annually in advance by the United States Coast and Geodetic Survey, and may be obtained from the office or from any of the agencies of this bureau on receipt of the price, which is 75 cents for the United States and Foreign Ports tables and 15 cents for the Pacific coast reprint.

CURRENTS

A prevailing current sets northward and westward along the coast of British Columbia and Alaska. The distance it extends offshore is not known, but it is believed to be strongest near the coast and inside of the 100-fathom curve.

The estimated velocity of the current is 0 to 1½ knots, and is greatly affected by strong winds. In winter, with strong northerly and westerly winds prevailing in the Gulf of Alaska, it is probable that the current is stopped, and there may be a set in the reverse direction. No systematic observations have been made, but the following sample reports indicate what may be expected:

Capt. J. A. O'Brien, of the steamer *Northwestern*, reports that from February to May, 1911, during six round trips between Cape Flattery and Cape St. Elias his log showed an average of 977 miles northbound and 1,104 miles southbound, an average current of 63.5 miles for the run of about 1,040 miles. On each of the six voyages he found a strong set toward the coast between Cape Cook, Vancouver Island, and Cape St. James, Queen Charlotte Islands, and between the northwest end of Queen Charlotte Islands and Sitka. Between Cape Flattery and Cape Cook an average of over 40 voyages indicated a northwesterly current with a velocity of 1.5 knots in winter and about nil in summer.

On May 1, 1910, on a run from Ocean Cape to Cape St. Elias with light easterly winds, a vessel with a speed of 8.1 miles by log was set in 13.5 hours about 28.5 miles in a 291° true (W. ¾ S. mag.) direction by the coast current, the average velocity of which was 2.1 knots. Land was made on the eastern side of Kayak Island 7 miles northward of the projected course. This report shows the necessity for using caution in approaching Cape St. Elias from southeastward, as the prevailing northwesterly current will cause the vessel to be ahead of her reckoning.

Surveying parties report a constant set southwestward along the coast of Hinchinbrook Island.

A constant set southwestward is reported along the east coast of Montague Island and south coast of Kenia Peninsula. A whaleboat lost off Wooded Island was washed ashore on Cape Douglas and a spar lost off Point Gore was found on the northwest side of Sitkinak Island. The velocity is not known, but has been reported to be 1 knot or more at times.

Capt. W. B. Knight, of the Pacific American Fisheries, who has made many trips from Cape Ommaney to the Shumagin Islands,

says: "In crossing the Gulf of Alaska from Cape Ommaney to the meridian of Chirikof Island, vessels usually set northward, and after passing Kodiak Island should keep off soundings to avoid Chirikof Island."

Currents of the Alaska Peninsula Westward of Kodiak.—It seems clear from all reports that the Japan current does not touch the shores of the Alaska Peninsula; and there is doubt if it touches even the southernmost of the Aleutian Islands. It is even disputed that this current is found at all this far eastward; no such warm water can be found as that of the Gulf Stream, but a fairly definite stream of slightly warmer water can generally be found. This stream is well offshore and far out of sight of land; the current phenomena met with in the vicinity of the coast have no connection with it.

It is generally agreed that there is a continual current of considerable strength following the coast all the way from Shelikof Strait to Unalaska Island. It has been called a warm current originating in the Gulf of Alaska, and it doubtless assists in causing the southern side of the peninsula to be warmer than Bering Sea. It is well known that all the islands off this coast have a milder climate than the mainland; the inhabitants choose the islands and almost the entire population is found on them in preference to the mainland shore. This current searches out all the passages, large and small, between and around the many islands, and in some of them it becomes strong enough to be important. The tidal current has little effect upon it, for the tidal current sets generally on and offshore, while this current sets along the coast. For this reason a vessel generally finds it setting her ahead or back along the course and not to one side. An approaching northeast storm gives warning by strengthening this current; in many places the current will indicate northeast weather a day before the barometer falls. It may be that on some occasions this current turns in the other direction on its offshore side, near the 100-fathom (183 m.) curve, but this is not frequent, and there are no reports that it turns in the inshore part near the land. It has been supposed that the strong currents of Unimak, Akutan, and Unalaga Passes are due to this current deflected into the passes and strengthened by a rising tide. It is reported by all that the strongest currents are found entering Bering Sea in these passes and that the currents flowing out are always weaker.

In the Aleutian Island passages, as far as Attu, reports agree that the currents almost always flow into Bering Sea. There are many reports of strong currents in all the passages in this direction, and almost none in the opposite direction. These currents are not to be regarded as branches of the Japan stream, for the water temperatures do not show a warm current; but it is agreed that they carry much small animal and plant life to the shores of the islands and into Bering Sea. Southward of the Aleutian Islands there is often a current toward them and toward all the passes; but farther offshore, well out of sight of land, the Japan stream is found setting eastward.

Along the northern side of the islands, on a line from Unalaska to Attu, it is agreed that the current sets eastward, and is not influenced by tide. But in all this region and in Bering Sea the normal currents may be disturbed by bad weather, and will then set with the wind or

toward a low barometer; an abnormal current may often be a valuable storm warning. In all the Aleutian Islands the navigator must heed the currents carefully; a vessel is in more danger there from that cause than from any other, except the lack of surveys.

The currents of Bristol Bay are usually considered as partly tidal. Here, also, a northeast storm disguises all other effects and causes a strong current to sweep out of the bay. In normal weather the tidal currents set on and offshore and more or less in and out of the bay, and become more important as the water shoals; the local effects in places are pronounced. Beside the tidal currents, it is considered that Bristol Bay forms the eastern side of a permanent eddy which enters past Cape Newenham flowing eastward and discharges along the north shore of Unimak Island flowing westward. On the Bering Sea side of Unimak Pass it is generally found that there is a current flowing northwest.

TABLE OF DISTANCES

In nautical miles via shortest navigable routes

	Nome Via Unimak Pass	St. Paul Island Via Unimak Pass	Unalaska	False Pass	Unga	Chignik	Uyak	Kodiak	Anchorage	Seldovia	Seward	Latouche	Valdez	Cordova	Yakutat
Cape Spencer	1604+	1228+	1053+	931+	802+	726+	568+	502*	639	511	419	382‡	396	383	145
Yakutat	1530	1155	974	852	722	646	484	412	530	404	314	267‡	280	270	
Cordova	1377	1002	825	699	590	494	333	283	383	258	148	84	76		
Valdez	1376	1001	824	697	588	493	334	284	383	257	147	83			
Latouche	1293	918	741	615	506	410	250	200	300	174	64				
Seward	1266	891	710	588	480	383	225	177	275	146					
Seldovia	1179	804	624	501	392	296	137	116	157						
Anchorage	1304	932	747	626	513	423	259	241							
Kodiak	1122+	748+	568+	447+	335+	237+	78								
Uyak	1056	681	501	377	269	178									
Chignik	910	535	354	228	121										
Unga, direct	788	413	232	106											
Unga, via Popof Strait..	813	438	257	131											
False Pass, direct	622**	276**	157												
False Pass	712	337													
Unalaska	661	237													
St. Paul Island	470														

Seattle to Seward	1233
Seattle to Unalaska	1720
Juneau to Cordova	491
Juneau to Kodiak	610

* Direct
\+ Via Whale Island
‡ Via Cape Hinchinbrook
** Not via Unimak Pass

DESCRIPTIONS AND SAILING DIRECTIONS

DIRECTIONS, YAKUTAT BAY TO KODIAK

From Cape St. Elias to the head of Cook Inlet and southward to Chiniak Bay, Cape Karluk, and Takli Island, and from Cape Ikti to Unalaska, the principal points along the coast are determined by triangulation, and accurate courses and distances for coasting along those sections can be taken from charts 8502 and 8802. Some of the bays and arms are not surveyed, and their delineation on the chart is taken from the sketches of the early navigators adjusted to known points determined by later surveys.

Vessels approaching Prince William Sound from southeastward generally make Cape St. Elias and pass 1 mile or more southward of the gas and whistling buoy. On page 23 bearings and distances are given from Southeast Rock to the principal coast points of Southeast Alaska. A current, constant so far as known, sets northwestward and westward along the coast of Alaska. This current is increased by southeast winds and decreased by northwest winds, but its estimated velocity under ordinary conditions is about ¾ knot. This should be kept in mind, especially when approaching Cape St. Elias from southeastward, as a vessel will generally overrun her log when bound westward. (See also the remarks on currents preceding.)

Cape St. Elias to Cape Hinchinbrook.—From a position 1 mile southward of the gas and whistling buoy, a 295° true (W. ¼ S. mag.) course made good for 67 miles will lead to a position 1½ miles southward of Cape Hinchinbrook.

An examination of the logs of several courses between Cape St. Elias and Cape Hinchinbrook indicates that the currents are influenced by the tides, being stronger with the larger tides, and that the current on the ebb has frequently, but not always, caused a southerly set, and the current on the flood a northerly set. On some occasions when the range of the tides was small no marked set of current was noted. Results seem to point to a stronger current toward Cape St. Elias than Cape Hinchinbrook. Surveying parties report a constant set southwestward along the coast of Hinchinbrook Island, and the probability of a constant westerly set from Cape St. Elias to Cape Hinchinbrook should be kept in mind. Strong tidal currents were noticed across the reef at Cape St. Elias. At Middleton Island the tidal currents have a velocity of 2 to 3 knots, setting northward on the flood and southward on the ebb.

Prince William Sound.—Vessels from southeastward enter Prince William Sound through Hinchinbrook Entrance, and leave the sound through Elrington Passage when bound southwestward. The principal ports of call are Cordova and Valdez. Directions for Orca Bay to Cordova are given on page 38. Directions for the sound from Hinchinbrook Entrance and Latouche Passage to Valdez are given on page 45. Directions for Elrington Passage are given on page 67.

Elrington Passage to Resurrection Bay.—Having come from Elrington Passage to a position 3 miles 168° true (SE. ⅜ S. mag.)

from Cape Puget, steer 263° true (SW. by W. mag.) for 26 miles, passing 2 miles off Cape Junken. The south end of Rugged Island should be ahead, and the course and distance made good should lead to a position 1 mile 173° true (SE. by S. mag.) from Barwell Island off Cape Resurrection. Then follow the directions for entering Resurrection Bay from eastward.

Elrington Passage to Seal Rocks.—Having come from Elrington Passage to a position 3 miles 168° true (SE. ⅜ S. mag.) from Cape Puget, a 235° true (SSW. ½ W. mag.) course made good for 43 miles will lead to a position 2 miles 150° true (SE. by E. mag.) from Seal Rocks.

There is little information about the currents between Cape Cleare and Seal Rocks. When out of the bight of the coast between these points a southwesterly set may be experienced. The principal flood and ebb current to and from Prince William Sound westward of Montague Island is through Montague Strait.

The **passage between Seal Rocks and Chiswell Islands** is nearly 3 miles wide and is frequently used by vessels between Resurrection Bay and the coast southwestward. In thick weather or at night and also when vessels are standing along the coast and not entering Resurrection Bay, it is better to pass outside of Seal Rocks.

Seal Rocks to East Chugach Island.—From a position 2 miles 150° true (SE. by E. mag.) from Seal Rocks, make good a 245° true (SW. ½ S. mag.) course for 26 miles to a position 3½ miles 155° true (SE. ½ E. mag.) from the peak of the outer Pye Island; Pye Island Reef should then bear 296° true (W. mag.) distant 2½ miles. Or vessels from Resurrection Bay going inside Seal Rocks, pass 1½ to 2 miles southeastward of the easterly Chiswell Island and make good a 236° true (SSW. ⅝ W. mag.) course for 30 miles, passing 1 to 1½ miles northwestward of Seal Rocks and to a position 3½ miles 155° true (SE. ½ E. mag.) from the peak of the outer Pye Island.

From a position 3½ miles 155° true (SE. ½ E. mag.) from the peak of the outer Pye Island, make good a 246° true (SW. ⅜ S. mag.) course for 35½ miles, passing 2 miles off Point Gore, 1¾ miles off the sunken rock nearly midway between Point Gore and East Chugach Island, and to a position with East Chugach Island light bearing on the starboard beam, 336° true (NW. ⅜ W. mag.) distant 3 miles.

Under ordinary conditions the current may be expected to set southwestward along the coast, but its rate is not known. It is reported that the flood current sets strongly southwestward toward Cook Inlet, while the ebb current is almost negligible. When crossing the entrances to the larger bays, the tidal current setting to or from them will be noticed.

In 1908 a breaker in a heavy sea was reported about 9 miles 177° true (SSE. ½ E. mag.) from the southeast point of East Chugach Island.

East Chugach Island to entrance of Cook Inlet.—The following is the usual route followed by large vessels. The smaller vessels, especially with local knowledge, frequently go through the passage inside Pearl and Elizabeth Islands. Directions for this passage are given on page 79.

From a position 3 miles 156° true (SE. ⅜ E. mag.) from the southeast point of East Chugach Island, make good a 269° true (SW. by W. ¾ W. mag.) course for 15 miles, passing 2 miles off the southeast bare rock near Pearl Island, the same distance southward of Dora Reef, and to a position with Cape Elizabeth bearing on the starboard beam 359° true (NNW. ¼ W. mag.), distant 5½ miles. Then follow the directions for Cook Inlet.

The **tidal currents** in the entrance of Cook Inlet have great velocity, especially among and around Chugach and Barren Islands and off the north end of Shuyak Island. With the large tides rips dangerous to small craft occur in the channels among the islands and in the wake of many projecting points. With an ebb current of the large tides and easterly winds, a very heavy sea and tide rips will be found in mid-channel on either side of Barren Islands.

From Pearl Island nearly to Seldovia and southward in the entrance of Cook Inlet the tidal currents have an estimated velocity of 3 to 5 knots at strength, and care will be required to make courses good.

Cook Inlet to Kodiak.—The usual route is through Marmot Strait. With heavy easterly weather vessels sometimes go down Shelikof Strait and pass eastward through Kupreanof Strait.

From a position 1½ miles westward of Flat Island steer 185° true (S. by E. ¾ E. mag.) for 24 miles to a mid-channel position between the northeast end of Ushagat Island and the southwest end of West Amatuli Island.

Then steer 170° true (SE. by S. mag.) for 36 miles to a position 2 miles eastward of Tonki Cape. Then steer 180° true (SSE. ⅛ E. mag.) for about 4½ miles to a position about 1¼ miles off a prominent point on the western shore; the northern end of Marmot Island should then bear about 90° true (ENE. mag.).

Then steer 203° true (S. ⅛ E. mag.) giving the western shore of Marmot Strait a berth of over 1 mile; the distance to Pillar Cape abeam is 8½ miles. Continue the course across Marmot Bay, passing 3 miles eastward of Spruce Island and the same distance westward of Williams Reef. The eastern end of Woody Island should be made ahead, and the course made good for 28 miles, or 19½ miles from Pillar Cape abeam, will lead to a position ½ mile eastward of Hutchinson Reef bell buoy. Then enter St. Paul Harbor on one of the ranges for the northern entrance.

See **tidal currents** in the entrance of Cook Inlet above. In Marmot Strait the tidal currents have an estimated velocity of 1 to 3 knots, the flood current setting northward and the ebb southward.

YAKUTAT BAY TO CAPE ST. ELIAS

Point Manby is low and wooded for about 4 miles back to Malaspina Glacier.

Sitkagi Bluffs are about 4 miles long, and are formed by Malaspina Glacier, which at the bluffs comes down to high-water mark, but does not discharge into the sea. From Sitkagi Bluffs the glacier recedes from the coast about 4 miles up the Yahtse and Yana Rivers, and then comes to the coast again at Icy Cape.

(chart 8457) has been formed by a recession of an arm of the Malaspina Glacier, which discharges into the bay. The bay is about 5 miles wide and 6 miles long, its northwest and southeast sides being nearly parallel. The head of the bay is occupied by Guyot Glacier.

The bar extends across the entrance of Icy Bay roughly in the shape of a crescent, the outer limits being about 6 miles offshore. The depths in mid-channel are 7¾ to 10 fathoms (14.2 to 18.3 m.) and the entrance course leads over a least known depth of 8 fathoms (14.6 m). Breakers extend out from each entrance point along the crest of the bar, varying with the size of the seas, but they have never been observed to encroach on the channel.

Both entrance points are low sand spits. Behind the eastern spit is **Riou Bay** which affords a protected anchorage in 6 fathoms (11 m.), hard sandy bottom. The western spit forms **Guyot** or **Mud Bay,** a shallow lagoon, the entrance to which is obstructed by a bar nearly bare at low water. The entrance can be made by launches and scows under favorable conditions at about three-quarters flood tide. The beaches and mud flats here form good places for beaching launches or scows.

Weather.—The prevailing winds are east to northeast. A breeze off the glacier usually brings rain. Winds from other quarters were seldom observed, although offshore winds are known to blow at times. Breakers on the outside coast are generally heavy and plainly audible on either side of the entrance. Within the bay, west of **Claybluff Point,** breakers are frequently heavy enough to make landing in small boats difficult. There is no surf along the eastern shore of the bay.

Currents.—Currents in the bay are not strong. The combined effect of the ebb current and the discharge from the glacial streams is most pronounced in the northwest part of the bay. In the entrance to Guyot Bay, the ebb current attains a velocity of 2 knots or more. The tidal current at the entrance to the bay sets northerly on the flood and southerly on the ebb, with a velcoity of about ½ knot.

Communication.—There are no settlements on Icy Bay. The nearest point where supplies may be had is Yakatut. There are oil prospects in the vicinity of Icy Bay.

Ice.—In the southern part of the bay ice is never thick enough to menace navigation. Large bergs either melt or ground before getting very far from the face of the glacier. The eastern shore is generally free from ice except during the spring tides. The shore north of Claybluff Point is invariably covered with stranded ice. Riou Bay is usually free from ice.

Fresh water.—Surface water suitable for drinking is not available in quantity. Small streams and ponds can be found in the northeast arm behind Moraine Island. Ice from the bergs can be taken on board and melted. This provides good potable water.

Anchorage.—A partially protected anchorage may be had in 8 fathoms (14.6 m.), about 800 yards off the western shore, about ½ mile northward of the western entrance point. Possibly the best

anchorage in the bay, but as yet unsurveyed, is that east of Moraine Island. Protection is afforded from all winds in 9 fathoms (16.5 m.) mud bottom but caution must be used in approaching the anchorage because of lack of surveys and on account of the drift ice. Do not take up anchorage between Moraine Island and the small island eastward, as bergs drift through this area, sometimes with considerable velocity. Anchorage can also be had in the entrance to Riou Bay near the entrance spit.

To enter Icy Bay bring the eastern end of Robinson Mountains, a tongue-shaped point about 800 feet (244 m.) high which projects sharply into the glacier, to bear 29½° true (N. mag.), and steer in on this bearing until Point Riou is abeam. Then if bound to an anchorage off the western shore, steer 307° true (W. ⅝ N. mag.) for 3 miles until the pyramid-shaped mound, 40 feet (12.2 m.) high, and 150 yards north of a cabin bears 284° true (WSW. ⅝ W. mag.). Then head for the mound, and anchor in 8 fathoms (14.2 m.) clay bottom about 800 yards off the beach. In northerly weather, anchor farther offshore in 11 fathoms (20.1 m.).

If bound to Riou Bay, continue the entrance course until the tangent of Point Riou bears 139° true (ESE. ¼ E. mag.), then steer 104° true (ENE. ⅝ E. mag.) giving the sand spit a berth of 300 yards. It is important to consider the stage of the tide in keeping off the spit on account of its flatness. Round the spit and anchor in 6 fathoms (11 m.) hard sand bottom, about 400 yards off the beach. Care should be taken to avoid the 3½-fathom (6.4 m.) spot lying ¾ mile northward of Point Riou Spit. Small craft may obtain better protection farther up the bay.

The shore line from Icy Bay to Cape Yakataga is backed by a continuous ridge of stratified mountains ranging from 3,000 to 6,000 feet (914 to 1,829 m.) high falling off to the westward. The shore line is traversed by streams at the foothills and there is a dense growth of alders and bushes along the coast.

Relief cabins are built along the beach west of Icy Bay in the following localities: At Cape Suckling, near the beach and visible from it; at Suju River, 1 mile above the mouth, and at Middle Timber River, 1 mile above the mouth.

Yakataga Reef extends about ½ mile from shore at Cape Yakataga, and parts of it show above high water. This is the best landing place between Icy Bay and Controller Bay, but landing is possible only under exceptional conditions of a smooth sea. There are a few houses.

Mount St. Elias is 18,024 feet (5,494 m.) high, and at the top is a massive pyramid with a shoulder on each side as seen from southward.

Cape Suckling is low and wooded. Lying 2 miles northwestward of the cape and 1 mile inland is the end of a prominent mountain ridge which extends about 8 miles in a northeasterly direction, with elevations of 1,500 to 2,500 feet (457 to 762 m.).

Three bluffs about 100 feet (30 m.) high lie 1½ to 2⅞ miles westward of Cape Suckling. From the eastern bluff a sunken reef extends ⅝ mile southwestward to three rocks, close together and bare at low water.

Southwest Breaker is on a rock bare at low water, and lies 2 miles 212° true (S. ¼ W. mag.) from the western bluff mentioned in the preceding paragraph, and 3¾ miles 260° true (SW. ½ W. mag.) from Cape Suckling.

Okalee Spit, forming the south side of Controller Bay, is low, bare sand dunes, 7 miles long in an east and west (true) direction.

The **entrance to Controller Bay** between the north end of Kayak Island and Okalee Spit is of little use except for small craft or very small vessels that can cross the flats eastward of Wingham Island.

Two prominent rocks about 75 feet (22.8 m.) high lie outside the entrance, 1½ miles northeastward of Lemesurier Point and 1¼ miles southward of Okalee Spit. They are connected by ledges bare at low water, which also extend about 300 yards eastward and westward from them. The group is prolonged by shoals, which shelve off to 18 feet (5.5 m.) in a distance of ⅞ mile 299° true (W. mag.) from the western rock and to 16 feet (4.9 m.) a little over ½ mile 82° true (NE. ¾ E. mag.) from the eastern rock.

From the shoal surrounding the rocks a rocky bar with 17 to 19 feet (5.2 to 5.8 m.) over it extends 1¼ miles eastward on the range of the two rocks, and then with 19 to 21 feet (5.8 to 6.4 m.) over it curves northeastward and joins the shoal with 16 to 18 feet (4.9 to 5.5 m.) over it that extends about 1¼ miles from Okalee Spit. This bar is open to the sea from eastward and southward. The channel to this entrance of Controller Bay is over this bar with a least depth of 17 to 19 feet (5.2 to 5.8 m.) and then passes between Okalee Spit and the two rocks.

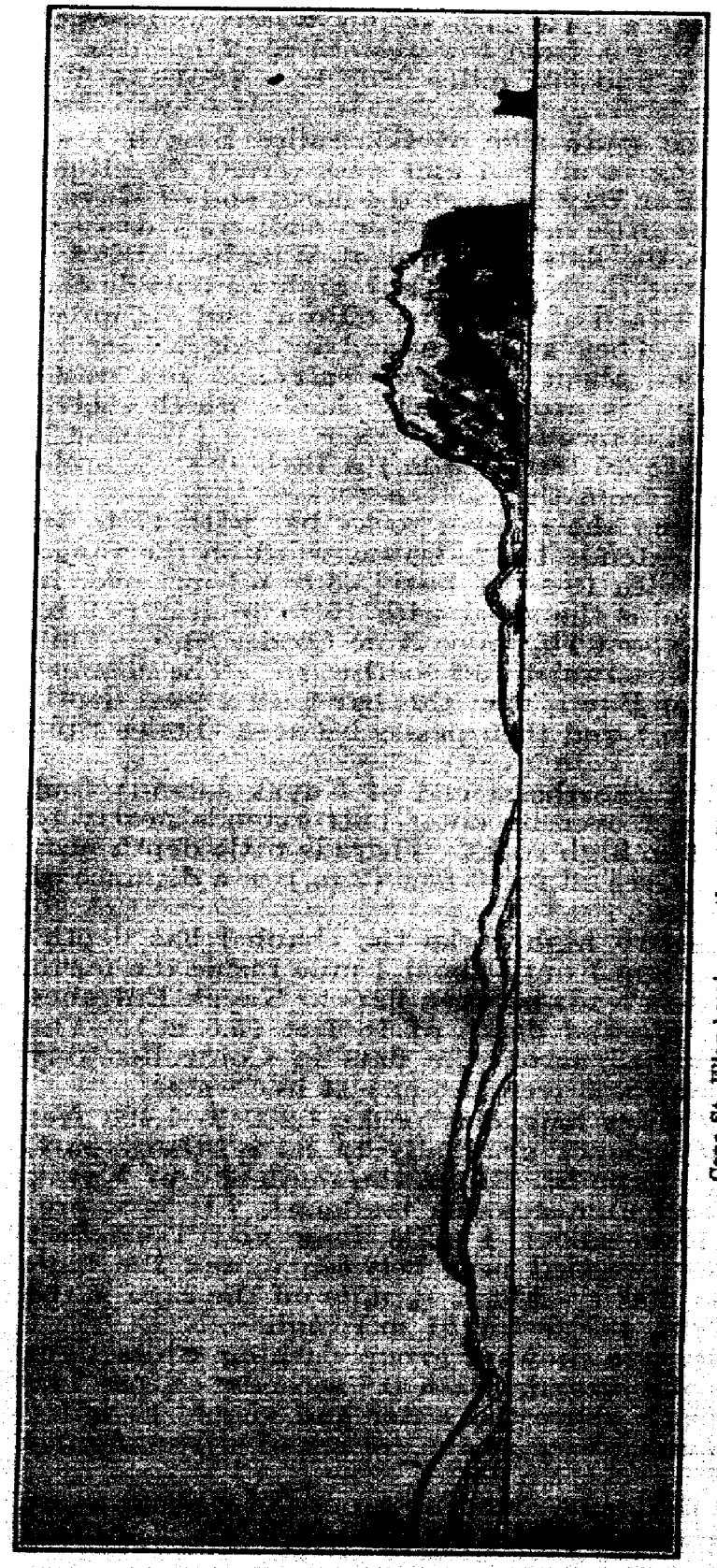
From **Lemesurier Point** (northeast end of Kayak Island) foul ground with 13 feet (4.0 m.) over its outer half extends nearly to the shoal surrounding the two high rocks. There is little depth near Lemesurier Point, and it shelves off to 10 feet (3 m.) in a distance of ½ mile toward the two rocks.

From northward of the two high rocks the channel has depths of 5 to 7 fathoms (9.1 to 12.8 m.) until about 1 mile inside the north end of Kayak Island. It then leads between flats to Kayak Entrance with a least width of ¼ mile and depth of 18 feet (5.5 m.). The best depth that can be carried across the flats in Controller Bay eastward of Wingham Island is 6 feet (1.8 m.) at low water.

Kayak Island is 17½ miles long, has peaks 1,200 to 1,400 feet (366 to 427 m.) high, and slopes gradually to its northern part, which is low and wooded. **Cape St. Elias,** the south end of Kayak Island, is an important and unmistakable landmark. It is a precipitous, sharp, rocky ridge, about 1 mile long and 1,665 feet (507 m.) high, with a low, wooded neck between it and the high parts of the island farther north. About ¼ mile off the cape is the remarkable **Pinnacle Rock,** 494 feet (151 m.) high.

Cape St. Elias Lighthouse shows a group flashing white light (flash 0.8 seconds, eclipse 4.2 seconds, flash 0.8 seconds, eclipse 14.2 seconds), is 85 feet (25.9 m.) above the water and visible 15 miles. It is a cement-colored square tower at the corner of a rectangular building.

The fog signal is an air diaphone sounding groups of 2 blasts every 60 seconds, thus: blast 4 seconds, silent 4 seconds, blast 4 seconds, silent 48 seconds.



Cape St. Elias bearing northeast by east (magnetic). Fifteen miles distant

Cape St. Elias gas and whistling buoy showing a flashing white light is located 2.9 miles 200° true (S. ¾ E. mag.) from Pinnacle Rock off the cape.

Boats can generally land on the south side of Cape St. Elias just eastward of a small point which extends toward Pinnacle Rock. The better approach is from westward, keeping close to the island to clear a ledge which extends ¼ mile northwestward from Pinnacle Rock.

The eastern coast of Kayak Island is strewn with bowlders and landing is impracticable. Rocky shoals with 11 feet (3.4 m.) over them lie 1¾ miles 172° true (SE. ¾ S. mag.) from Lemesurier Point. Lying 3¼ miles southward of the point and 1 mile offshore is a reef ½ mile long. Its northern end is a rock 10 feet (3 m.) high, and its south end is bare at half tide. For a distance of 6 miles northward of Cape St. Elias bowlders bare at low water and breakers extend ¾ mile off the eastern coast of the island.

Breakers extend 2 miles southeastward of Cape St. Elias to **Southeast Rock**, which is awash, the

breakers extending ¾ mile southwestward of the line joining them. There is a depth of 20 fathoms (37 m.) about ⅜ mile outside these breakers. A ridge with 10 to 15 fathoms (18.3 to 27.4 m.) over it, which has not been closely developed, extends 1½ miles southwestward from Southeast Rock. The 50-fathom (91 m.) curve lies about 7 miles southwestward and westward of Southeast Rock, but is only ½ mile southeastward of it. The tidal currents have considerable velocity across the reef.

Eastward of this reef another reef on which the sea breaks extends 1½ miles from Kayak Island, the end of the reef lying about 1⅝ miles northward from Southeast Rock.

The following are computed bearings and distances from Southeast Rock:

Entrance to Monti Bay, Yakutat, 94½° true (NE. by E. ¾ E. mag.), 145 miles.
Cape Spencer, 111° true (E. ⅞ N. mag.), 263 miles.
Klokachef Point, Salisbury Sound, 117½° true (E. ¼ N. mag.), 307 miles.
Cape Edgecumbe, 121° true (E. mag.), 321 miles.
Cape Ommaney, 124° true (E. ⅜ S. mag.), 383 miles.
Summit of Forrester Island, 130° true (E. by S. mag.), 467 miles.
Cape Hinchinbrook, 297° true (W. ⅛ S. mag.), 67 miles.

Sea Ranger Reef is two shoals lying off a point on the western coast of Kayak Island 3¼ miles northward of Cape St. Elias. The inner one lies ¾ to 1¼ miles from shore, has 11 feet (3.4 m.) over it, is ¾ mile long, and the sea often breaks on it. The outer shoal is small, lies 1½ miles from shore, has a least depth of 24 feet (7.3 m.), and there is seldom a break on it. Tide rips occur around it at times.

The **tidal currents** on the western side of Kayak Island set northward on the flood and southward on the ebb, with an estimated velocity at strength of ½ to ¾ mile.

From the high bluff point on Kayak Island 3½ miles south of Wingham Island a shoal with 13 feet (4 m.) near its end extends ¾ mile northward; and rocky patches on which the least depths found are 12 to 15 feet (3.7 to 4.6 m.) extend to Wingham Island. Anchorage can be made by small craft in the bight northward of the point, ¾ to 1½ miles from the point and ½ to 1 mile from shore, in 4 to 5 fathoms (7.3 to 9.1 m.), bottom soft in places, with shelter from easterly and southeasterly winds. Vessels should anchor farther out in not less than 10 fathoms (18.3 m.), with the southeast end of Wingham Island bearing about 48° true (N. by E. ¾ E. mag.).

CAPE ST. ELIAS TO PRINCE WILLIAM SOUND

Between Cape St. Elias and Cape Hinchinbrook numerous mountains and headlands are visible on a clear day but identification is difficult and they are not of much use in fixing positions.

CONTROLLER BAY

(chart 8513) is formed by Okalee Spit and Kayak Island on the south and Wingham and Kanak Islands on the west. For some distance back from the eastern shore the land is but slightly above high

water, and is broken by many streams. Quicksand has been found in the channel at the mouth of Edwardes River. The bay is filled by flats between which are two principal channels, one from Kayak Entrance to the northern end of Kayak Island, and Okalee Channel.

Kayak Entrance, between Kayak and Wingham Islands, is rocky and foul, there being numerous lumps on which the least depth found is about 12 feet (3.7 m.). The channel with a depth of about 12 feet (3.7 m.) is ½ mile wide between a sand spit, largely bare at low water, extending 1 mile off the southwest side of the low wooded spit on the northwest side of Kayak Island, and a reef, partly bare at low water, extending 350 yards southeastward from the southeast end of Wingham Island. The approach is lumpy, with numerous rocky spots of 2 to 3 fathoms (3.7 to 5.5 m.) inside the 5-fathom (9.1 m.) curve. The latter is about on a line from the southwest point of Wingham Island to the high bluff point on Kayak Island 3½ miles 201° true (S. ¾ E. mag.) from it. A reef, partly bare at low water, extends 600 yards southward from the southeast point of Wingham Island.

The following directions lead in the best water through Kayak Entrance, but the entrance should be used with caution and at high water only.

Steer for the end of the low wooded spit on the northwest side of Kayak Island on a 60° true (NNE. ¾ E. mag.) course until the southeast tangent of Wingham Island bears 6° true (NNW. mag.). Then steer 18° true (N. by W. mag.) and give Wingham Island a berth of 350 yards.

Anchorage can be made about 250 yards northeastward of the point of Wingham Island just southeastward of Kayak, in 3 fathoms (5.5 m.), or a short distance southeastward of this position, in depths up to 4 fathoms (7.3 m.), bottom soft in places. Good anchorage may also be selected anywhere in the channel from the southeast end of Wingham Island to the northern end of Kayak Island, for which chart 8513 and the lead are the guides. There is some local chop with strong winds, but no outside swell enters the bay either through Kayak Entrance or around the northern end of Kayak Island.

Kayak, on the east side of Wingham Island, ⅜ mile from its southeast end, is abandoned.

Wingham Island is 4 miles long and wooded, and has three hills, the highest, near its northern end, having an elevation of 832 feet (254 m.). The western shore of the island is precipitous.

With heavy easterly winds anchorage and shelter can be found in 16 to 18 fathoms (29.3 to 33 m.) ⅜ to ½ mile from the western side of Wingham Island, abreast its middle and lowest part.

Both Wingham and Kanak Islands are fox farms, the keepers living throughout the year on the eastern side of the islands.

Small vessels can anchor in the narrow channel close to the eastern side of Wingham Island. This channel is about 300 yards wide and extends nearly 2 miles southward from the northern end of the island, with depths of 7 to 12 fathoms (12.8 to 21.9 m.) for 1 mile and then shoals gradually southward. The flats on the eastern edge of the channel have depths of 7 to 11 feet (2.1 to 3.4 m.) and are generally steep-to. The mid-channel leads about 200 yards from the island. A depth of 6 feet (1.8 m.) at low water can be carried

through close to the island to Kayak Entrance. At times the tidal currents have a velocity of 3 knots or more in places in the narrow channel eastward of Wingham Island. A shoal extends about 200 yards off the middle of the northern end of the island.

Okalee Channel, between the north end of Wingham Island and Kanak Island, is 5/8 mile wide, with depths of 6 fathoms (11 m.) at the entrance, and these depths or more can be taken through the greater part of the channel. The channel is a secure harbor, and is marked by five buoys. It is reported that the buoys are hard to pick up in approaching from seaward.

The shoal on the southeast side of the channel 1½ miles northeastward from the northern end of Wingham Island is bare shortly after high water, and this shoal and the one on the opposite side of the channel are generally partly indicated by breakers, especially at low water. The shoal extending southward from Kanak Island is mostly well out at low water. Above these shoals the flats bordering Okalee Channel are partly bare at low water only, and there is nothing to indicate the channel when the flats are covered. On the edges of the channel the shoaling is abrupt except at the entrance and on the southeast side where it changes direction southeastward of Kanak Island.

Vessels sometimes anchor in Okalee Channel about 2 miles above the northern end of Wingham Island. This part of the channel is generally easy of access in clear weather. Above this point Okalee Channel should be navigated at low water only, in the absence of aids or local knowledge, and extra care is required to keep in the channel. Chart 8513 and the lead are the guides.

Kanak Island is 3¼ miles long, very low and flat, and wooded in the middle. The tank on the southern end of the island has collapsed, but pyramid-shaped ruins still show. An extensive shoal makes out southwestward from the island, about 3 miles from its southeast end and 2 miles from its northwest end. The southern edge of the shoal passes about 1 mile northwestward from the northern end of Wingham Island. When off the southwest side of Kanak Island, vessels should keep in over 5 fathoms (9.1 m.), low water. The range of the north ends of Wingham and Kayak Islands, bearing 119° true (E. mag.), leads clear southward of the shoal.

The passage between Kanak Island and Strawberry Point is used only by boats and launches at high water.

Point Hey is a projecting and prominent high, narrow point on the northwest side of Controller Bay 1 mile northward of Kanak Island.

Chilkat is on the west side and near the mouth of the **Bering River,** which flows into the northeast end of Controller Bay. There is a cannery here that is operated during the salmon season. Vessels with freight for the cannery anchor in Controller Bay, and all freight is lightered in and out over the flats with scows and launches.

Weather.—During the summer the prevailing winds are easterly with rain, and this is the direction from which the heaviest weather comes. Westerly winds are infrequent during the summer, and generally light. Fog was rare and cleared off before noon.

Tides.—High and low water occur 25 minutes later than at Sitka, and the rise and fall of tides are the same.

The tidal currents set into Controller Bay through all the entrances on the flood and out on the ebb. In Kayak Entrance the ebb has greater velocity than the flood, and it is estimated that the greatest velocity at strength does not exceed 3 knots. Tide rips occur at times in the channel abreast the southern end of Wingham Island. The velocity of the current in the channel north of Kayak Island does not exceed 2 knots.

In Okalee Channel about 3 miles southeast of Kanak Island, from observations taken, the flood current was found to attain an ordinary maximum velocity of 1.65 knots 1 hour and 45 minutes before the time of high water at Sitka, and the ebb a velocity of 1.95 knots 1 hour and 45 minutes before the time of low water at Sitka. Small tide rips occur when the wind is against the current. The tidal currents have velocities of about 1 knot around the north end of Wingham Island.

KATALLA BAY

(chart 8113) 23 miles northward from Cape St. Elias, is included between Strawberry Point on the east and Martin Islands on the west, a distance of 5 miles, and indents the coast about 2 miles to the mouth of Katalla River. The bay is a roadstead anchorage sheltered from offshore winds, but exposed to winds from southeast, south, and southwest.

Strawberry Point is low and bare at the end and wooded toward the foot of the hill. There is a prominent hill on the point with a low break between it and the higher land northward. A shoal with little water over it, and on which the sea generally breaks at low water, extends nearly 1½ miles southward from the point.

The northeastern shore of the bay from Strawberry Point to the mouth of the Katalla River is a steep sand beach. The northwestern shore from Katalla to Martin Islands is foul and should be given a berth of about ¾ mile.

Palm Point is 1½ miles southwestward of Katalla. There is an abandoned railroad camp with sheet-iron buildings just northward of the point. A bowlder reef, bare at low water, extends ⅜ mile southward from it.

Martin Islands are two in number, about 60 feet (18.3 m.) high, have steep rocky sides, and lie ½ to 1 mile from shore. The northern island is joined to the shore by a flat, bare at extreme low water. There is an abandoned radio station on the northern island.

Martin Islands Light is an unwatched flashing white light located on the southwest point of **Kiktak Island**, the outer one of the Martin group. The light is 150 feet (46 m.) high and visible 9 miles.

Katalla is a post office on the northern side of the bay and on the western side of the mouth of Katalla River. There is a landing for lighters, which can be towed over the bar except at low water. The bar at the mouth of the river has a depth of about 3 feet (0.9 m.) at low water, and the sea generally breaks on it. The entrance, which is narrow and rocky, requires local knowledge. With a smooth

sea, lighters formerly landed in the bight on the northeast side of Palm Point. There is always some surf on the beach, and with southeasterly or southwesterly winds landing is impracticable. Goods are discharged by means of a lighter. The necessary towing is done by launches.

On the east branch of Katalla River about 3 miles from Katalla there are oil works which supply local boats with oil, gasolene, and distillate. The depth in the river is ample for boats that can cross the bar.

The oil company maintains a radio station, call letters KSC, and there is telephone connection with the cannery at Chilkat and the town of Katalla. There is a weekly mail service from Cordova.

The engine of the wreck of the *Portland* can be seen at a good low water. It has not been accurately located, but it is reported to lie in the vicinity of the 5-fathom (9.1 m.) curve as shown on the chart, about 1 mile northeastward of Palm Point. Shoals make out on both sides of the river mouth to the wreck.

The railroad, a section of which was built northward from Katalla, has been abandoned.

The **anchorage** in the bay is from 1½ to 2 miles southward of Katalla in 6 to 7½ fathoms (11 to 13.7 m.), with the eastern end of the town bearing between 17° true (N. by W. mag.) and 355° true (NW. by N. mag.). The bottom is hard sand but the holding ground is generally good. There are no dangers if the shore be given a berth of over ¾ mile, but the wreck of the *Portland* and the shoal extending 1½ miles southward from Strawberry Point should be kept in mind.

There is quicksand in the Katalla Anchorage, and this has caused the loss of many anchors. Vessels should sight their anchors frequently.

Approaching from southeastward, vessels pass 1 mile or more southward of Cape St. Elias gas and whistling buoy. From a position 2½ miles west-southwestward of Pinnacle Rock, a 12° true (N. by W. ½ W. mag.) course made good for about 23 miles, will lead to the anchorage in Katalla Bay. Strangers entering Katalla Bay should do so in the daytime and with clear weather.

From Katalla bound westward, vessels can pass 1 to 1½ miles southward of Martin Islands and make good a 273° true (SW. by W. ¾ W. mag.) course for 61 miles to a position 1½ to 2 miles southward of Cape Hinchinbrook. This course if made good should lead in a depth of over 15 fathoms (27.4 m.) 3½ to 4 miles southward of the sand islets lying 9 to 19 miles westward of Martin Islands.

COPPER RIVER

breaks through the mountains between Miles and Childs glaciers, above which are rapids. Below the rapids the river flows through flats about 5 miles wide in many changeable channels, varying in depth from 5 to 20 feet (1.5 to 6.1 m.) at high stages of the river, and not navigable. The current is swift and the effect of the tide on the current is only felt near the mouth.

The entire delta is low marshy flats except for sand dunes, 50 to 150 feet (15.2 to 46 m.) high, on the islands and banks of the main channel. From seaward the vicinity of Copper River shows as a vast, rugged mountain range, with numerous glaciers filling its gorges.

From Point Martin to the northeast end of Hinchinbrook Island the coast is fringed by sand islets from 5 to 30 feet (1.5 to 9.1 m.) high, lying 4 to 5 miles from shore. Shoals extend seaward from these islets, but they have not been developed. Danger will be avoided by giving the islets a berth of about 3 miles; the depth should not be shoaled to less than 10 fathoms (18.3 m.), low water. The space between these sand islets and the flats is largely bare at low water, and is navigable only for small craft of 3 or 4 feet (0.9 to 1.2 m.) draft, in places at high water only.

Alaganik Slough, the westernmost branch of Copper River, is ½ to 1 mile wide, with depths from 5 to 15 feet (1.5 to 4.6 m.), depending on the stage of the tide and the river. The mean rise and fall of the tide at the mouth is about 10 feet (3 m.) and at Alaganik 2 to 3 feet (0.6 to 0.9 m.), and the flood current is felt to the village.

Eyak River, 6 miles northeastward of Point Whitshed, is connected with Eyak Lake and has a swift current. At favorable stages of the tide it is navigable for small, light-draft craft to the lake.

MIDDLETON ISLAND

is about 7 miles long and has a greatest width of about 2 miles near its southern end. It is flat, about 120 feet high (37 m.), with clay bluffs and occasional shingle or bowlder beaches, and slopes gradually to its north end, which is a low spit. The island is moist, almost boggy, numerous ponds are formed by rains, and it is covered with grass, flowers, and berries, but there are no trees. It is frequented by wild fowl, and there is driftwood on the shores. There are large bowlders on the beaches and reefs around the island.

Reefs and breakers extend possibly 2 miles eastward and 4 miles southward from the island and are reported to extend 2 or 3 miles off its north end. On the west side kelp extends ½ to 1½ miles from shore. The island is not surveyed and should be approached with caution.

The usual **anchorage** is about 1½ miles off, about 320° true (WNW. mag.) from a shallow bight near the middle of the west side of the island, in 12 to 13 fathoms (21.9 to 23.8 m.), gravelly bottom. This anchorage is outside the kelp, with the north end of the island bearing 52° true (NNE. ⅛ E. mag.) and the extreme southwest end 206° true (S. ⅛ E. mag.). The landing is bad except with a smooth sea.

The **tidal currents** have a velocity of 2 to 3 knots at the anchorage, setting northward on the flood and southward on the ebb.

Wessels Reef, awash at low water and 2 miles long northeast and southwest, lies in latitude 59° 47′ N., longitude 146° 12′ W., or about 16 miles 11° true (N. by W. ½ W. mag.) from the north end of Middleton Island. There is a depth of 30 fathoms (55 m.) or more close to the reef, and with a smooth sea no indication of it can be detected.

PRINCE WILLIAM SOUND

Hinchinbrook Entrance, between Montague and Hinchinbrook Islands, is used by vessels entering Prince William Sound from eastward and southeastward, while Elrington Passage is used by vessels approaching from southwestward. Hinchinbrook Entrance is about 6 miles wide, and clear with the exception of Seal Rocks.

The **tidal currents** in the entrance set directly in or out of the sound. In Hinchinbrook Entrance, Montague Strait, Latouche Passage, and other passages to the westward slack water occurs about the time of high water or low water within Prince William Sound, or 50 minutes before the time of tide at Kodiak; the mean velocity of the current at strength is about 1 knot. The ebb current running out against a large swell causes overfalls, especially in the deep water 2 or 3 miles eastward of Zaikof Point, which have been mistaken for breakers. There are also tide rips on the broken ground around Cape Hinchinbrook. The flood entering westward of Montague Island sets northeastward past Montague Point and causes rips between it and Johnstone Point. Outside the entrance along the southeast coast of Hinchinbrook Island the current sets southwestward almost constantly.

Seal Rocks lie off the entrance 6 to 7 miles south-southwestward from Cape Hinchinbrook and over 6 miles from Montague Island. They are two bare rocks, 30 to 37 feet (9.1 to 11.3 m.) high, surrounded by low rocks. Sunken rocks extend 1 mile northeastward and a short distance southwestward from them. The entire reef within the 10-fathom (18.3 m.) curve forms an obstruction nearly 2½ miles long.

Hinchinbrook Island has two mountain ridges with elevations up to 2,900 feet (884 m.), and a low valley between them running through from the head of Port Etches. The tree line is about 1,000 feet (305 m.) above the sea, and the summits of the island are bare. There are a few rocky islets close to the southeast side of Cape Hinchinbrook, and sunken reefs on which the sea breaks in a moderate swell lie ⅜ mile southeastward and southward from the cape. It should be given a berth of over ¾ mile.

Cape Hinchinbrook Light, flashing white, is located on the southwest point of the cape, 235 feet (72 m.) above water, and visible 22 miles. It is shown from an octagonal tower on a building. The fog signal is an air diaphone, blast 5 seconds, silent 40 seconds.

Cape Hinchinbrook Radiocompass Station, call letters NRM is maintained by the United States Navy (see p. 9).

Northeastward of Cape Hinchinbrook the seaward face of Hinchinbrook Island is steep, with rocky bluffs at the water, for 12 miles to an open bight with a broad sand beach on the northwest side of Hook Point. From **Hook Point** to **Point Steele,** a distance of 2 miles, the coast is a bluff about 200 feet (61 m.) high, with low, swampy land between it and the mountains, which lie nearly 2 miles back. The coast is clear except from Hook Point to Point Steele, where reefs make out ⅜ mile. A boat can land in good weather on the northwest side of Hook Point and ½ mile northward of Point Steele. A depth of 2½ fathoms (4.6 m.) was found 3 miles southeastward of **Point Bentinck,** the northeast end of Hinchinbrook

Island, and breakers extend out nearly this distance in ordinary weather.

Montague Island is high and mountainous, and wooded to an elevation of about 1,000 feet (305 m.). At its north end are three prominent points forming Zaikof and Rocky Bays, and low depressions run through from the heads of the bays to the northwest side of the island. **Schooner Rock,** 61 feet (18.6 m.) high, lies nearly ¼ mile off Zaikof Point, the northeast end of Montague Island, and is marked by a beacon located northwestward from it.

For a distance of 20 miles southward of **Zaikof Point** the coast of Montague Island is unbroken and free from outlying dangers, excepting Seal Rocks. Thence southward the coast is more irregular and should be given a good berth in the absence of a complete survey. A vessel is reported to have struck a sunken rock lying about 9 miles northeastward of **Cape Cleare** and possibly as much as 2 miles offshore. The position is doubtful.

A bank with 18 and 20 fathoms (33 to 37 m.) is reported to extend 10 or 12 miles south-southwestward from Cape Cleare in the prolongation of Montague Island. No rocks or breakers were seen except within a mile of the shore.

Wooded Islands lie 13 to 17 miles northeastward of Cape Cleare and extend offshore about 3 miles. The largest are five in number, 60 to 130 feet (18.3 to 40 m.) high, flat-topped and wooded, with bluff sides. Rips or breakers are reported to extend 1¼ miles northeastward from the northernmost island.

Tides.—In Prince William Sound high and low water occur about 50 minutes earlier than at Kodiak, and the mean rise and fall of the tides is about 9½ feet (2.8 m.). To find the approximate height of the tide multiply the height of the corresponding tide at Kodiak by the ratio of ranges, 1.4.

Glacial ice is rarely found in the open waters of Prince William Sound. Ice is discharged by Columbia Glacier, northward of Glacier Island, and is driven into the sound by northerly winds; it may be expected, depending on the winds, from Bligh Island to Bald Head Chris Island and as far south as Storey Island.

There are numerous discharging **glaciers** in Port Wells, the northwest arm of the sound, but the ice rarely reaches the entrance of the port. There is a discharging glacier at the head of Blackstone Bay, but the ice is confined to the bay.

Ice is discharged by Chenega Glacier on the southwest side of the sound, and occasionally drifts eastward as far as Point Helen and the north entrance of Latouche Passage through the passage south of Chenega Island.

During very cold weather ice sometimes forms in the arms of the sound which reach well into the mountains, and is at times sufficiently heavy to impede navigation for wooden vessels.

PORT ETCHES

(chart 8520) is an inlet in the southwest end of Hinchinbrook Island, about 4 miles northwestward of Cape Hinchinbrook. The port is about 7 miles long in a 56° true (NNE. ½ E. mag.) direction and about 1¼ miles wide. It is a secure anchorage, the best in

Hinchinbrook Entrance, and is easy of access. The strongest gales are northeast and are not steady, but descend from the surrounding mountains in heavy williwaws of varied direction, and they sometimes blow hard in Port Etches when comparatively light winds prevail outside. Fresh water can conveniently be obtained from streams in Garden Cove and on the northwest side of Constantine Harbor.

The best anchorage for large vessels is in the middle abreast Garden Cove, 2 miles from the head of the port, in 12 to 15 fathoms (21.9 to 27.4 m.), muddy bottom. A flat extends 1½ miles from the head, but the lead is a good guide to avoid it. The swell is quite perceptible in heavy southerly weather.

Garden Cove (Mosquito Bight) on the southeast side, 2 to 2½ miles from the head of the port, is the best anchorage for small vessels. **Garden Island,** wooded and having a break through it, lies in the middle of the entrance; the bight eastward of this island is shoal, and there is no safe passage northeastward of it. **Point Horn,** the southwest point of the cove, is the most prominent of the projecting points on the southeast shore of Port Etches.

To enter Garden Cove pass 400 to 500 yards northward of this point and steer 93° true (NE. by E. ¾ E. mag.). Anchor with Point Horn in line with the southernmost of the Porpoise Rocks, and about 250 yards southeastward of Garden Island, with the break through it open, in 4 to 5 fathoms (7.3 to 9.1 m.), sticky bottom. No ocean swell reaches the anchorage, but, as elsewhere in Port Etches, the williwaws are bad in easterly gales, coming both from the head of the port and the head of the cove.

English Bay, on the southeast side at the entrance of the port, is a bight about ⅜ mile wide. It may be used as a temporary anchorage by small vessels, but it is exposed to the ocean swell in heavy weather and open to northerly and westerly winds. Easterly gales blow in williwaws from all directions but do not raise much sea if anchored well in the cove. The holding ground is good. When entering give the southwest point of the cove a berth of ¼ mile, and anchor in the middle just inside the entrance in about 5 fathoms (9.1 m.).

The two bights on the southeast shore of Port Etches, 1¼ and 3½ miles northeastward of English Bay, are rocky and should be avoided.

Porpoise Rocks, on the northwest side at the entrance of Port Etches, are three principal rocks about 48 feet (14.6 m.) high, with numerous small rocks between and northeastward of them. The westernmost and largest is flat on top and grass-covered, and a rock covered at high water lies 200 yards westward from it. There is deep water close to the rocks, except on their northeast side where there is foul ground extending to Point Barber at Nuchek, a distance of 1 mile, with no safe channel between. There is kelp around Porpoise Rocks and for a distance of ⅜ mile southwestward of Point Barber.

In good weather steamers sometimes anchor off the shingle spit northwestward of Nuchek to land or receive passengers and freight. It is an uncomfortable anchorage on account of the swell. The best anchorage is abreast the spit midway between the village and the

rocky, wooded knob on the middle of the spit, with the village bearing 95° true (ENE. mag.), and the southeast one of the three largest Porpoise Rocks in line with the end of Hinchinbrook Island, bearing 191° true (S. by E. ½ E. mag.), in about 10 fathoms (18.3 m.), sandy bottom.

Nuchek is an Indian village on the southeast end of the shingle spit at the southwest end of Constantine Harbor.

CONSTANTINE HARBOR

is the lagoon on the northwest side of Port Etches, its entrance lying 3 miles northeastward of Porpoise Rocks. It is suitable only for small craft on account of the very narrow entrance channel, which is 50 to 100 yards wide with depths of 18 to 19 feet (5.5 to 5.8 m.). The tidal currents have considerable velocity in the entrance. The best time to enter is at high water, preferably near slack water. The harbor is generally shallow, but has an area ½ mile long and ⅜ mile wide with depths of 3 to 4¼ fathoms (5.5 to 7.8 m.), sticky bottom, but exposed to williwaws.

On the northeast side of the entrance are three small, rocky, wooded islets with overhanging sides. Between them are three rocks bare at low water, and 60 yards south-southeastward from the western islet is a sunken rock, all marked by kelp at slack water. The channel is close to the islets, between them and a shoal with 9 to 10 feet (2.7 to 3 m.) over it extending 600 yards northeastward from Phipps Point.

To enter Constantine Harbor pass 100 yards southwestward of the western islet on a west-northwesterly course, follow the northwest shore at a distance of 125 yards, and pass through the narrow entrance in mid-channel heading for Bear Cape. Keep this course for ½ to ¾ mile from the entrance and anchor about 200 yards from the southeast shore, which affords some protection in northeast gales from the strongest williwaws that come apparently from the head of Port Etches.

A temporary anchorage can be made about ½ mile southeastward of the rocky islets in the entrance of Constantine Harbor, with the southeast Porpoise Rock open from the northwest shore of the port, bearing 242° true (SW. by S. mag.), in 10 to 12 fathoms (18.3 to 21.9 m.), sticky bottom, but there is considerable swell in heavy weather.

Tides.—High and low water occur about 50 minutes before high and low water at Kodiak. The mean rise and fall of the tides is 9 feet (2.7 m.). To find the height of the tide for any day at Port Etches multiply the height of the corresponding predicted tide at Kodiak by the ratio of ranges 1.3.

ZAIKOF BAY

the easternmost of the two bays in the north end of Montague Island, is clear and affords anchorage, but is exposed to northeast winds. Anchorage can be selected with the aid of the chart along the southeast shore, from 2 miles inside Schooner Rock to the head, also on a bar with 10 to 15 fathoms (18.3 to 27.4 m.) which extends across the bay 2½ miles from the head. A good berth is in 7 to 12

fathoms (12.8 to 21.9 m.), depending on the swinging room required, in the cove on the southeast side 2½ miles inside Schooner Rock, with Middle Point bearing 352° true (NW. ¾ N. mag.). This anchorage is exposed to winds from north to east, and a swell makes in during southeast gales. The only dangers are a short reef marked by kelp off the point westward, and two rocks, bare at half tide and marked by kelp, close to the shore eastward.

A small vessel can anchor in the cove on the southeast side 1⅝ miles from the head, with shelter from northeast winds. Anchor close to the southern side of the point, about 200 yards from the short spit making out from it, in 8 to 10 fathoms (14.6 to 18.3 m.). There is no swell, but the williwaws blow with great force over the lower land inside the point. When the wind hauls southeastward or southward the williwaws come from all directions, and it is well to shift anchorage farther from the spit. There is a small shallow lagoon at the head of the cove, and the bank is steep-to.

ROCKY BAY

has deep water and is exposed to northerly and easterly winds. A small vessel can anchor in good weather about ⅝ mile from the head and 400 yards from the northwest side, in 8 to 10 fathoms (14.6 to 18.3 m.). Small craft can anchor in the lagoon, on the southern side 1 mile from the head, where there is a small area with a depth of 10 feet (3 m.). When entering the lagoon care should be taken to avoid a reef, partly bare at low water, extending westward and northwestward from the north point at its entrance.

Two ledges, bare at low water and marked by kelp, lie nearly ½ mile off the southern side of Rocky Bay, ⅜ to ¾ mile inside Middle Point. Kelp extends northeastward from them to a 3¾-fathom patch lying ⅝ mile 355° true (NW. by N. mag.) from Middle Point. Foul ground marked by kelp extends ¼ mile off Middle Point.

A reef, the higher part bare at half tide, extends nearly ¾ mile northeastward from Montague Point.

NORTHWEST SHORE OF HINCHINBROOK ISLAND

Bear Cape is steep and high, and is the southwest end of the northwest mountain ridge of Hinchinbrook Island.

A small cove in Hinchinbrook Island, 3 miles northward of Bear Cape, has anchorage a little southward of the middle of the entrance in 8 to 10 fathoms (14.6 to 18.3 m.), with shelter from easterly and southeasterly winds.

Shelter Bay has a shallow entrance with strong currents, and can not be used even by small craft. Temporary anchorage, with shelter from offshore winds, may be had about ½ mile from shore, off the middle of the bight at the entrance of Shelter Bay, in 5 to 10 fathoms (9.1 to 18.3 m.), sandy and muddy bottom. A shoal, with rocks in places, extends about ¼ mile from the shore in the bight.

A vessel has anchored in 10 fathoms (18.3 m.), about ¼ mile northwestward of the **Seven Sisters**, and found the williwaws less strong with southeast winds than at the anchorage 3 miles northward of Bear Cape.

Temporary anchorage, with shelter from offshore winds, may be had southward of the sharp point, with two rocks about 30 feet (9.1 m.) high close-to, lying ⅜ mile southward of Johnstone Point. The anchorage is about ½ mile off the sand beach and southwestward of the sharp point, in about 10 fathoms (18.3 m.), sandy bottom.

Johnstone Point, the northwest end of Hinchinbrook Island, is low and wooded, with a small bluff at the water, and is marked by a flashing white light.

Eastward of Johnstone Point the shore is low, and there are two shallow bays or lagoons. The easterly bay has secure anchorage for small craft. The entrance, lying 4 miles eastward of Johnstone Point, is westward of the island in its mouth, and then leads between two rocks. The one on the west side is bare at half tide and is at the end of a sand spit making out from the shore; it should be given a berth of about 40 yards. The rock on the east side is bare at extreme low water. When inside the rocks, head for the cove in the southwest side of the bay, and anchor in about 3 fathoms, sticky bottom, about 250 to 300 yards from shore, and about halfway between the sand spit mentioned above and the south shore of the bay.

Anchorage can be selected off the shore, westward of Middle Ground Shoal, in 12 to 20 fathoms (21.9 to 37 m.), soft bottom, with shelter from southerly and easterly winds.

Middle Ground Shoal fills the opening between Hinchinbrook and Hawkins Islands and extends into Orca Bay 3 miles. The general depths on the shoal are 2 to 6 feet (0.6 to 1.8 m.), and it is a danger for vessels entering Orca Bay from southward. It is marked at its northwest end by a red gas and bell buoy.

Hawkins Island Cut-off, between Hinchinbrook and Hawkins Islands, is navigable only for small craft with local knowledge. It is filled with shoals, and in its eastern end are extensive flats bare at low water and largely covered at high water. There are strong tidal currents in its narrower parts.

ORCA BAY

is an extensive arm on the eastern shore of Prince William Sound between Johnstone Point and Knowles Head, having a length of about 30 miles in an 85° true (NE. by E. mag.) direction. Its principal importance is derived from the railroad terminal of Cordova on Orca Inlet at its head. Its southern side is formed by Hinchinbrook and Hawkins Islands and is clear with the exception of Middle Ground Shoal. Its north side is indented by large bays, which are of no present commercial importance.

Knowles Head, the southwest end of the mountainous peninsula between Port Gravina and Fidalgo Bay, is a steep massive headland, 1,502 feet (458 m.) high, with a prominent yellowish landslide down its southern face. There is a low depression between it and Porcupine Point, and others northeastward of it running through from Snug Corner Cove and the arms of Two Moon Bay. There are numerous rocks close to shore, but there are no known dangers if it be given a berth of over ½ mile.

Red Head, 4 miles east-northeastward of Knowles Head, is a high hill with a long, low, wooded neck behind it.

Port Gravina has its entrance between Red Head and Gravina Point.

Gravina Point, 12 miles eastward of Knowles Head, is low and wooded, and at its southern end is a bare spit with a large and a small clump of trees on it. It is marked by a group flashing white light.

Gravina Island, low and wooded, lies 1½ miles west-northwestward of the point and ⅜ mile from shore. Anchorage with shelter from northeast winds can be had about ½ mile from shore between the island and Gravina Point, in about 10 fathoms (18.3 m.).

Sheep Bay has its entrance between Gravina and Sheep Points, and extends northward about 7 miles. The bay has not been closely surveyed, the bottom is exceedingly broken, and vessels should proceed with caution. Foul ground extends ¼ to ⅜ mile from the eastern shore for a distance of 2 miles northward of Sheep Point. Indifferent anchorage in 18 to 20 fathoms (33 to 37 m.) can be selected in the middle about 3 miles above Sheep Point and ⅜ mile below the point where the bay contracts. Proceeding with care and preferably at low water, small vessels can follow the deep channel among the islands in the upper part of the bay and select anchorage in 11 to 15 fathoms (20.1 to 27.4 m.). The chart is the guide.

Sheep Point is moderately low and wooded at the end, with high land back of it. A wooded islet lies ¼ mile westward of the point, with bare rocks between, and foul ground extends ¼ mile southward and westward from the islet.

Hanks Island, small and wooded, lies ¾ mile eastward of Sheep Point and ½ mile from shore. **Gatherer Rock,** ⅝ mile 124° true (E. ½ S. mag.) from Hanks Island, is a pinnacle with 13 feet (4 m.) over it and deep water close-to. Broken ground on which the least depth found is 8 feet (2.4 m.) extends ⅞ mile southward from Hanks Island, and is marked at its south end by a black gas and bell buoy.

Simpson Bay has depths of 25 to 30 fathoms (46 to 55 m.), muddy bottom through the middle of its outer part. There are two islets abreast each other, about ¼ mile from the east and west shores, and nearly 1 mile inside the entrance, which are good marks for navigating this part of the bay. A rock, bare at extreme low water, lies 400 yards southward of the east point at the entrance to the inner part of the bay. Passing westward of this rock, the mid-channel is clear to the head of the bay, where there is anchorage, favoring the western shore, between the edge of the flat and the islets southward, in about 15 fathoms (27.4 m.). The chart is a sufficient guide.

The east arm of Simpson Bay is clear except near the shores. Good anchorage can be selected on either side of the islands in the upper part of the arm in 12 to 15 fathoms (21.9 to 27.4 m.).

Hawkins Island is about 20 miles long and mountainous, with elevations up to 2,025 feet (617 m.). **Canoe Passage,** dividing the island about 8 miles from its southwest end, is navigable only for boats at high water. The northwest shore southwestward of Canoe Passage is low tundra meadows with patches of trees. Northeastward of Canoe Passage the high land is nearer the northwest shore of the island; there are bluffs in places, and it is more densely wooded.

With the aid of the chart, anchorage can be selected in places along the northwest shore of Hawkins Island with shelter from easterly and southerly winds. The best anchorage is ¼ to ⅜ mile off the spit at the south end of **Cedar Bay** in 9 to 12 fathoms, soft bottom. There is a round, wooded islet at the north end of this spit, and a larger wooded one ½ mile northward. Small craft, entering at high water and passing northward of the rocks awash and sunken inside the entrance, can anchor in the north angle of the lagoon inside the spit, where there is a limited area with a depth of 7 feet (2.1 m.)

Channel Islands are wooded and nearly 1 mile long, and lie on the northwest side of the bay 6 miles above Sheep Point. The channel at the islands is ½ mile wide and is called **The Narrows.** A rock with 12 feet (3.7 m.) over it lies ⅜ mile south-southwestward of the southwest end of Channel Islands, and is marked by a black buoy. The rock is at the north end of a ridge about ⅜ mile long in a south-southwesterly direction, with depths of 13 to 14 fathoms (23.8 to 25.6 m.), except near the rock. The southeastern point of the larger island is marked by a flashing white light.

ORCA INLET

(chart 8525) extends in a southerly direction from the head of Orca Bay. From North Island to Spike Island the western side of the inlet is shoal, and southward of Spike Island the inlet is filled by flats. Northward of North Island it has depths of 25 to 30 fathoms (46 to 55 m.), and a flat extends 1 mile from the head at its north end.

Salmo Point, the northern extremity of Hawkins Island, is just above Channel Islands. **Knot Point,** the northeast end of Hawkins Island, lies 1½ miles south-southeastward from Salmo Point with a bay 1½ miles long and ½ mile wide between. This bay has depths of 3 to 6 fathoms (5.5 to 11 m.), but a shoal with 9 to 12 feet (2.7 to 3.7 m.) over it extends across its entrance; it may be used as an anchorage by small vessels that can cross the shoal.

Observation Island, ¾ mile long, high and wooded, lies ⅜ mile northeastward of Knot Point. There is good anchorage 300 to 500 yards westward of Observation Island, in 8 to 10 fathoms (14.6 to 18.3 m.), but care must be observed not to foul the cable which lies about 250 yards from the west side of the island.

North Island, ⅜ mile long, low and wooded, lies 1 mile northward of Salmo Point.

Shepard Point Cannery is located about 1½ miles northeastward from North Island. The dock has a face of 150 feet and it is reported that there are depths of 24 feet (7.3 m.) alongside. There is telephone communication with Cordova.

Stevens Creek Cannery is located about 3 miles northeastward from North Island. There is a dock with an 80-foot face and ample depths alongside. About 175 feet northward of the north corner of the dock, the depths shoal to 21 feet (6.4 m.) at low water. Fresh water can be obtained through a 2½-inch pipe line.

From Salmo Point there are three channels to Orca Cannery and Cordova.

The deepest channel is north of North Island, and then follows the eastern shore with a least width of 350 yards and a least depth of about 5 fathoms, and is marked by buoys. A rock bare at three-quarters ebb lies 650 yards northeastward from the north end of North Island. The shoal on the west side of the channel between North and Observation Islands has depths of 10 to 18 feet (3 to 5.5 m.), and with care can be avoided by the use of the lead.

The bight in the eastern shore eastward of North Island is filled by a flat, largely bare at low water and steep-to, which extends ¼ mile off the mouth of the stream known as **Humpback Creek.** The edge of the flat is marked by a black buoy. There is a power house on shore, but the dock is destroyed. The bight extending ½ mile northward from Cordova Wharf is filled by a flat, and depths of 19 to 24 feet (5.8 to 7.3 m.) are found on and a little westward of the line from the wharf to the north point of the bight. With these exceptions the eastern shore is clear.

Orca Channel, between North and Observation Islands, has a depth of about 18 feet (5.5 m.) and a width of about 300 yards between shoals with 10 to 12 feet (3 to 3.7 m.) over them. It is used by small vessels with local knowledge, but should be avoided by strangers. **South Rock,** bare at half tide, lies 250 yards northward from Observation Island. **North Rock,** covered only at high water, lies midway between Observation and North Islands.

Odiak Channel passes westward of Observation Island, and across the shoal 1¼ miles southward of the island where the depth is 18 to 20 feet (5.5 to 6.1 m.). The following **directions** lead through the channel in a least depth of 18 feet (5.5 m.):

Round Salmo Point at a distance of about 400 yards, steer 185° true (SSE. ⅛ E. mag.) and pass about 200 yards eastward of Knot Point. Then steer 167° true (SE. ¼ S. mag.) with Knot Point astern and the red gas buoy lying ½ mile northward of Cordova Wharf a little on the starboard bow. Pass eastward of the buoy and steer about 211° true (S. ⅛ W. mag.) for Spike Island.

Orca Cannery is on the eastern shore southeastward from Observation Island. There is a depth of 25 feet (7.6 m.) at the end of the wharf, and water can be obtained through pipe and hose. There is good anchorage about ¼ mile from the eastern shore abreast or southward of the cannery, in 7 to 9 fathoms (12.8 to 16.5 m.). The cannery has not been in use since 1915.

Cordova, the terminus of the Copper River & Northwestern Railway, is on the east shore of Orca Inlet eastward of Spike Island. There are stores and hotels, and provisions and supplies of all kinds can be obtained. There is communication by telephone to stations along the railroad, Katalla, and the naval radio station at Point Whitshed, and by cable to other Alaska ports and Seattle. Water and fuel oil can be obtained at the wharf. Coal may be purchased in limited quantities, and in larger quantities if sufficient notice be given.

Cordova Wharf is on the eastern shore ½ mile northward of Spike Island and 2 miles southward of Orca. It is 740 feet long and has a least depth of 29 feet (8.8 m.) along its face; a depth of 26 feet (7.9 m.) is found for a distance of 150 yards westward from its northern end.

In 1926 a new city wharf was under construction. This wharf is located at the foot of C Avenue and extends to deep water in a direction toward Spike Island. The dock is to have depths of 30 feet (9.1 m.) along its face.

Large quantities of copper ore are shipped from Cordova to the smelter at Tacoma, Washington.

There is good anchorage in the channel westward of the wharf and Spike Island, in 8 to 10 fathoms (14.6 to 18.3 m.). The edge of the flat on the western side of the inlet lies 3/8 mile westward of the wharf and 5/8 mile southwestward of Spike Island. **Spike Island** is about 300 yards long and wooded. The inlet eastward and southward of it is shoal.

CURRENTS, ORCA INLET

The tidal currents in Orca Inlet set southward on the flood and northward on the ebb.

At Orca the strength of the flood occurs 2 hours before the time of high water and the strength of the ebb 2 hours 30 minutes before the time of low water at Kodiak. The mean velocity of the current at strength of flood is about 1.5 knots and at strength of ebb is 0.8 knot. Slack water before the flood occurs 15 minutes before time of low water at Kodiak, and slack water before the ebb occurs 1 hour and 10 minutes after time of high water at Kodiak.

The current sets directly off the face of the Cordova wharf on both flood and ebb, due to the fact that the wharf is built off a small point with a decided bight in the shore on either side.

At Cordova the strength of the flood occurs about 3 hours before the time of high water, and the strength of the ebb about 3 hours before the time of low water at Kodiak. The mean velocity of the current at strength of flood is about 2 knots and at strength of ebb is about 1.2 knots, although at times the current may exceed 3 knots. Slack water before the flood occurs 10 minutes after the time of low water at Kodiak, and slack water before the ebb occurs 30 minutes after the time of high water at Kodiak.

DIRECTIONS, ORCA BAY

From Hinchinbrook Entrance.—Round Cape Hinchinbrook at a distance of about 1½ miles and follow the western shore of Hinchinbrook Island at a distance of about 1 mile, course 350° true (NW. 5/8 N. mag.). When the point 3 miles above Bear Cape is abeam, steer 31° true (N. ¼ E. mag.) for 7¾ miles to a position 1 mile west-northwestward of Johnstone Point Light. Then steer 66° true (NE. 5/8 N. mag.) for 8¼ miles to a position ½ mile northwestward of Middle Ground Shoal gas and bell buoy. Then steer 79° true (NE. ½ E. mag.) for 17 miles to a position 300 to 500 yards southeastward of the black gas and bell buoy south-southwestward of Channel Islands.

Then steer 58° true (NNE. 5/8 E. mag.) for 3½ miles and pass in mid-channel eastward of Channel Islands and in mid-channel northwestward of North Island. Then haul eastward, pass ¼ mile northward of North Island Rock and 200 yards northward of gas buoy No. 2. Then steer 197° true (S. by E. mag.) for Orca Cannery, follow a mid-channel course as defined by the red buoys and the

black buoy off the sawmill wharf, and pass the point on the eastern shore ½ mile southward of the sawmill at a distance of 250 to 300 yards. Continue the course until the north end of Observation Island is abeam. Then steer 213° true (S. ⅜ W. mag.) and pass the point on the eastern shore 1 mile southward of the cannery at a distance of 300 yards. Then steer 211° true (S. ¼ W. mag.) for Spike Island until about ¼ mile from the wharf at Cordova, and then haul in for the wharf.

Approaching Cordova Wharf with the flood (south-flowing) current, vessels generally drop an anchor, swing to it, and then make the wharf.

From northwestward.—Pass about 1 mile southward of Knowles Head and steer 107° true (E. by N. mag.) for about 12½ miles to a position 1 mile southward of Gravina Point Light. Then steer 96° true (ENE. mag.) for 8 miles to a point ½ mile southward of Hanks Island gas and bell buoy. Then steer 82° true (NE. ¾ E. mag.) for 5¼ miles to a position 400 yards southeastward of Channel Island Rock buoy.

Or, from a position 1 mile northward of Point Eleanor a 90° true (NE. by E. ½ E. mag.) course made good for 47½ miles should lead 1¾ miles southward of Gravina Point, 1½ miles southward of Sheep Point, and to a position ⅜ to ½ mile from the southeastern shore above Windy Bay. Then follow the directions in the third paragraph preceding.

From southwestward.—Directions from Latouche Passage to Seal Island are given on page 46. Pass about 1 mile southeastward of Seal Island and steer 74° true (NE. mag.) for 31 miles, passing 2 miles northwestward of Johnstone Point Light and to a position ½ mile northwestward of Middle Ground Shoal gas and bell buoy.

PORT FIDALGO

(chart 8519) has its entrance on the eastern shore of Prince William Sound between Goose and Bligh Islands, where it is 5 miles wide, and extends northeastward 22 miles or more. There are mines in Boulder and Landlocked Bays and on the south shore of Port Fidalgo, between Irish Cove and Whalen Bay.

The waters of the main arm of Port Fidalgo are deep and free from outlying dangers. Toward the head there are a number of small islets with good water close-to on the channel sides. Vessels may navigate with safety as far as the entrance to the southeasterly arm at the head of the bay by keeping over ¼ mile offshore.

Goose Island is 1½ miles long, 320 feet (98 m.) high, and wooded, and has two prominent knolls. **Gull Island,** small and rocky, is midway between it and the shore. The passage between the islands should be avoided by strangers, and that between Gull Island and Porcupine Point is foul.

Porcupine Point is a round, wooded bluff, 894 feet (272 m.) high, with a low depression between it and Knowles Head. A rock, bare at low water and marked by kelp, lies 350 yards northward of the point.

Snug Corner Cove, on the northeast side of Porcupine Point, has good anchorage except from northwest winds, but the bottom is irregular and it should be avoided by large vessels. Foul ground

extends 3/8 mile from the northeast shore of the cove, and a rocky patch with 4¼ fathoms (7.8 m.) possibly less, lies in the entrance ½ mile off the northeast side of Porcupine Point. There is a low divide at the head of the cove and another across Porcupine Point.

To enter Snug Corner Cove, avoid the rock off Porcupine Point and follow the southwest shore at a distance of about ¼ mile. Anchor about ¼ mile off the bight in the southwest shore, before reaching the narrowest part of the cove, in 10 to 11 fathoms (18.3 to 20.1 m.), soft bottom. Small vessels can find better shelter from northerly winds in the basin at the head of the cove, in a depth of 5 fathoms (9.1 m.). Favor the southwest shore slightly when entering and anchoring. The shores of the basin should be given a berth of over ¼ mile.

Twomoon (Bowie) Bay, on the southeast shore of Port Fidalgo, 4 miles above Porcupine Point, is 1 mile wide at the entrance, and about 2 miles long to the head of either of its two arms. Low divides extend through to Orca Bay from the head of the arms. There is good anchorage in the bay at the entrance to either arm, and vessels of moderate size can anchor in the arms, depths moderate, and bottom generally sticky. A mid-channel course should be followed in the arms. At the head of the southeast arm is a basin trending southward where small vessels can anchor in 6 to 8 fathoms (11 to 14.6 m.). The channel is between the west point and a reef bare at low water near the middle of the entrance.

Irish Cove, on the southeast shore of Fidalgo Bay, 7¾ miles above Porcupine Point, is a narrow inlet about 1 mile long. Small craft can find secure anchorage in the widest part near its head in 5 fathoms (9.1 m.). To enter favor the eastern side of the narrows and then keep in mid-channel.

A small wharf of the Fidalgo Mining Co. is located on the south shore, 1¾ miles southwestward of the entrance to Whalen Bay.

Whalen Bay is 2½ miles long with an average width of 0.3 mile. Mud flats bare at low water, extend across the bay for a distance of ½ mile from the head.

Small vessels may enter the bay on a mid-channel course, and find anchorage in 7 to 10 fathoms (12.8 to 18.3 m.) in mid-channel 1 mile inside the entrance.

A group of islands and islets 180 to 190 feet (55 to 58 m.) high lies near the head of Port Fidalgo. They are connected by mud flats to the shores to the eastward. A single islet lies about 900 yards southwestward of this group, the passage to the bight northward lying between the two. This bight has not been recommended as an anchorage. Its head is obstructed by mud flats, and it is reported that strong williwaws will be encountered.

The entrance to the southeast arm lies 2 miles southeastward of the group of islands described above. A **dangerous rock,** bare at half tide, lies on a line between the two entrance points, 460 yards off the easterly point. This rock is surrounded by deep water, and may be approached within 200 yards.

The head of the arm terminates in a narrow passage about 60 yards wide and ½ mile long, which opens out into a circular lagoon ¾ mile in diameter. It is reported that this passage is foul and should not be attempted. Opposite the outer entrance to this pas-

sage the head of the bay is obstructed by mud flats, which at low tide are bare or covered with 1 to 2 fathoms (1.8 to 3.7 m.) of water. For this reason the head of the bay should not be approached closer than 1 mile.

Anchorage for vessels of any size, well sheltered from wind and sea, may be found in mid-channel 5/8 mile northwestward from the rock awash at half tide, described above. The anchorage is in 15 fathoms (27.4 m.), mud bottom.

Small vessels may find anchorage near the head of the southeast arm, in mid-channel, 3/4 mile beyond the rock. There is about 7 fathoms (12.8 m.) in this position.

Fish Bay is on the northwest shore of Port Fidalgo, 9 miles above Porcupine Point. It is an indifferent anchorage and should be avoided by large vessels. The williwaws are very heavy with northeast winds, drawing through the bay from the high mountains above its head. A small wooded island lies just inside the entrance 1/4 mile from the west side. The channel is eastward of the island and is obstructed near the middle by a rock with 3 1/2 fathoms (6.4 m.), possibly less. Rocks bare at low water, lie 200 yards off the eastern point at the entrance. Anchorage can be had in the middle, 1/4 to 1 mile above the island, in 8 to 13 fathoms (14.6 to 23.8 m.), with soft bottom in places. A flat extends 7/8 mile from the head to the prominent point on the southeast side 1 1/4 miles above the island.

Landlocked Bay is on the northwest shore of Port Fidalgo east of Bidarka Point. It has a clear width of about 1 mile at the entrance, contracts to 400 yards at 2 miles from the entrance, and then widens again to 3/8 mile. There is secure anchorage in the widest part above the narrows in 14 to 15 fathoms (25.6 to 27.4 m.), sticky bottom. The bay is easily entered during daylight, but the shadows cast by the hills at night obscure the narrow entrance, rendering it difficult for vessels not equipped with a searchlight.

The islands on the eastern side below the narrows have covering rocks near them. On the northwest side at the entrance of the narrows is an abandoned wharf. Near the middle of the narrows is **Armeria Rock,** with 6 feet (1.8 m.) over it and marked by a buoy. The deepest water is northwest of the buoy, but the northwest shore abreast it should be given a berth of about 100 yards. There is a flat at the head of the bay with an islet at its lower edge. On the north side just below the edge of the flat is a wharf of the Three Man Mine. Water can be conveniently obtained from a fall on the south side of the bay southeastward of the wharf.

To enter Landlocked Bay follow the western shore at a distance of about 1/2 mile, pass in mid-channel westward of the islets below the narrows, and pass about 50 yards northwestward of the buoy in the narrows, above which the mid-channel is clear.

Bidarka Point is a wooded hill 912 feet (278 m.) high with a lower strip at its south end having considerable grassy areas. A shoal extends 1/4 mile southward from the point.

Boulder Bay, between Bligh Island and Bidarka Point, is about 4 miles long and 2 miles wide at the entrance. There are several dangers in the bay, the depths are very irregular, and there is no desirable anchorage. On the east side at the head of the bay is a wharf, for vessels, of a copper mine.

A reef, bare at lowest tides, lies 5/8 mile from the western shore of the bay; its eastern end, with 15 feet (4.6 m.) over it, lies 3/4 mile from the western shore and 7/8 mile 197° true (S. by E. mag.) from the southeast end of the islands at the entrance to Tatitlek Narrows.

A sunken rock, nearly awash at low water, lies 3/8 mile from a point on the eastern shore, and 1 5/8 miles northwestward from Bidarka Point.

A reef, partly bare at low water, lies 400 to 800 yards southeastward from the small wooded island in the middle near the head of Boulder Bay.

To enter Boulder Bay, bring the houses on the east side at the head to show just open westward of the wooded island in the middle near the head bearing 17° true (N. by W. mag.) and stand in on this line, passing about 200 yards westward of the sunken rock. On approaching the island, edge a little westward and pass midway between it and the grassy, partly wooded islet near the western shore. Then steer for the wharf.

Bligh Island, on the eastern shore of Prince William Sound, is 4 1/2 miles long, 3 miles wide, and mountainous. The southwest end of the island is a steep wooded head 1,630 feet (497 m.) high with some yellow landslides near the water. On its northwest side are a number of islands with foul ground between.

Reef Island, off the west side of Bligh Island, is 1 mile long, level and wooded, and has a single knoll, 338 feet (103 m.) high, in the middle, which distinguishes it from Goose Island. A rock, bare at low water, lies 1/4 mile 208° true (S. mag.) from the southwest end of the island.

Bligh Island Reef is 3/4 mile long with depths from 7 to 28 feet (2.1 to 8.6 m.). It is marked at its south end by a gas buoy. The passage between the reef and Reef Island has deep water and is used at times by vessels rounding Bligh Island; the line of Busby Island light and Rocky Point, bearing 23° true (N. 1/2 W. mag.), leads through the middle of the channel.

Busby Island, off the northwest end of Bligh Island, is 1 1/4 miles long, 275 feet (84 m.) high, and partly wooded. Its western point is long, level, and wooded, and is surrounded by a reef to a distance of nearly 1/4 mile. The point is marked by a light.

Currents.—At the entrance to Port Fidalgo, north of Goose Island the mean strength of current is about 0.6 knot; slack water before flood and ebb occurring about 2 1/4 hours before the times of low water and high water, respectively, at Kodiak.

TATITLEK NARROWS AND VIRGIN BAY

Tatitlek Narrows separates Busby and Bligh Islands from the main shore, and offers a more direct route for small craft between Port Valdez or Ellamar and points on Port Fidalgo. The channel has a depth of about 4 fathoms (7.3 m.), but it is narrow with foul ground on both sides and should not be used by vessels in the absence of aids.

Tatitlek is a small Indian village on the northeast shore at the southeast end of the narrows.

Virgin Bay is a shallow bight ½ to ¾ mile long on the northeast shore of Tatitlek Narrows. There is little water in the northern and southern ends of the bay, and on the north side in the entrance is a long reef bare at low water. There is a depth of 10 to 12 feet (3 to 3.7 m.) in the approach to the wharf, which is on the northeast side and has a depth of 12 feet (3.7 m.) at its end. Fresh water can be had at the wharf. Vessels now use the ore dock which has been built on the end of the reef ¼ mile westward (true) from the wharf, with which it is connected with an aerial cable.

Ellamar, on the northeast side of Virgin Bay, has a post office, store, hotel, and other buildings. Ore from the copper mine is shipped to Tacoma.

Anchorage can be had ¼ to ⅜ mile from the northeast shore of Tatitlek Narrows, and ½ to ¾ mile westward of the ore dock at Ellamar, in 12 to 16 fathoms (21.9 to 29.3 m.); sticky bottom. Two shoals lie in the narrows in the approach from northwestward to Virgin Bay—one with 15 feet (4.6 m.) over it ⅜ mile 298° true (W. mag.), and the other with about 17 feet (5.2 m.) over it about ¾ mile 287° true (W. by S. mag.), from the southeast point of Virgin Bay. The channel to the wharf is marked by two buoys.

VALDEZ ARM

(chart 8519), the northern arm of Prince William Sound, extends about 13 miles in a 32° true (N. ¼ E. mag.) direction from Busby Island and Point Freemantle to the northern end of Valdez Narrows, and then turns to about 85° true (NE. by E. mag.) for 11 miles to the town of Valdez at its head. The water is very deep and there are no outlying dangers except Middle Rock. There are few anchorages on account of the great depths. Rocks bare at low water lie ¼ mile from shore and 2⅝ miles northward of Point Freemantle, and with this exception the western shore is bold to Valdez Narrows.

Sawmill Bay, on the western shore 9 miles northward of Point Freemantle, is ⅜ mile wide at the entrance and 1½ miles long in a 349° true (NW. ½ N. mag.) direction. Entering in mid-channel, there is a secure **anchorage** with a clear width of over ¼ mile in the expansion ½ mile inside the entrance, in 9 fathoms (16.5 m.); sticky bottom. The south and west ends of the basin forming the anchorage are shoal, and a flat fills the head of the bay down to the narrows at the north end of the basin.

Rocky Point, off the western end of the peninsula between Tatitlek Narrows and Galena Bay, is a chain of low, rocky islands, the outer and highest one about 30 feet (9.1 m.) high and having some scattered trees. The south point of Galena Bay is a wooded islet joined to the shore by a low spit. A rocky, grass-covered islet lies ¼ mile northward from the south point at the entrance. There is a day beacon on the southwest extremity of the point.

Galena Bay is about 5 miles long in a general easterly direction, with a width of ¾ to 1¼ miles, but narrowed at 3 miles from the entrance to ¼ mile. The depths are great throughout except for flats off the mouths of streams. There is an islet on the north side below the narrows, and a rock with 12 feet (3.7 m.) over it lies 300

yards 62° true (NE. by N. mag.) from the islet. Care should be observed in the vicinity of the 11 and 13 fathom (20.1 and 23.8 m.) soundings in the narrows, as that area is not thoroughly developed. The only **anchorage** is about ¼ mile southward of the islets on the north side at the head of the bay, in about 15 fathoms (27.4 m.), bottom soft in places. A flat extends ⅝ mile from the southeast end of the head of the bay.

A group of rocky grass-covered islets extends ½ mile off the north point at the entrance of Galena Bay. There is anchorage in the middle of the cove northeast of the islets, in 10 to 12 fathoms (18.3 to 21.9 m.), sticky bottom.

Jack Bay, on the eastern shore southward of Valdez Narrows, is 5½ miles long in a 118° true (E. mag.) direction, with a width of ¾ mile at the entrance and ¼ to ⅜ mile in the upper 3 miles. **Anchorage** can be had in mid-channel or closer to the southern shore 1½ miles inside the entrance in 10 to 12 fathoms (18.3 to 21.9 m.), sticky bottom in places; also for small vessels in the entrance of the short arm, northeastward of the islands in the bay, in the same depths. The passage northward of the islands and that between the islands and the point eastward are not thoroughly developed and should be used with caution. The first cove on the south side is foul. Shoals make out about 400 yards from the southeast end of the second cove. A flat extends about ⅝ mile from the head of the bay to an islet. A small vessel can anchor about 300 yards westward of the islet and the same distance from the south shore in about 15 fathoms (27.4 m.).

Valdez Narrows is about 2 miles long and ¾ mile wide, with deep water and bold shores, especially the eastern one. A wooded islet lies 300 yards from the western shore at the north end of the narrows. **Middle Rock,** a pinnacle barely covered at extreme high tides, lies in the middle of the north end of the narrows 850 yards 85° true (NE. by E. mag.) from the islet and ½ mile from the eastern shore, and is marked by a light.

Shoup Bay at the mouth of **Shoup Glacier** is closed by a sand spit nearly all dry at low water and over which the best depth is about 7 feet (2.1 m.). This bay is often filled with floating ice, some of which escapes into the port when the wind and tide are favorable. A wharf of the Cliff mine extends into Port Valdez from the easterly point at the entrance to Shoup Bay. Vessels generally go to the wharf port side to, and the depth is said to be ample.

The rounding point 1 mile northwestward of Jack Bay, and **Entrance Island,** northeast of Middle Rock, are marked by day beacons.

Port Valdez is the designation given the body of water extending from Valdez Narrows to the head of the bay at the town of Valdez.

Swanport is a small anchorage under Jackson Point, the western end of the eastern one of the two islands on the south side of Port Valdez, 3¾ miles from Valdez. The bottom drops off abruptly, but a small vessel will have swinging room if anchored in 10 fathoms (18.3 m.), 350 yards 242° true (SW. by S. mag.) from Jackson Point and the same distance from the south shore. This is the best anchorage between Valdez Narrows and Valdez. The cove inside the island is nearly filled by a flat, and vessels have been beached on it.

A temporary anchorage for large vessels can be had about ½ mile from the north shore and ¾ mile eastward of **Gold Creek,** in about 30 fathoms.

Fort Liscum is an unoccupied Army post and wharf on the south shore 1 mile eastward of Jackson Point. Water can be had at the wharf.

Valdez is an important town at the head of Port Valdez. There are stores, hotels, assay office, and ore-testing plant, and provisions and supplies of all kinds can be obtained. Most of the vessels trading to Prince William Sound call at Valdez, and there is communication by small local craft with other places on the sound.

There is a military road from Valdez to **Fairbanks** about 400 miles distant. This road is open about four months in the year. Valdez is headquarters for the third judicial division and the Alaskan Road Commission. It has cable communication with Seattle and Alaskan ports and there is telegraphic communication with the interior.

There are two wharves, each with 30 feet (9.1 m.) or more alongside, and with loading faces 210 feet and 180 feet in length.

Coal can be procured in amounts up to 500 tons, but there is no fuel oil available. Gasoline and distillate can be had.

There is no hospital in Valdez. The nearest available hospital is in Seward.

The wharf of the Midas mine is located on the south side of Port Valdez, about 1½ miles eastward of Port Liscum. The mine is not in operation, but the wharf is reported as being in fair condition, with 30 feet (9.1 m.) at its face.

Currents.—At the entrance to Valdez Arm, west of Rocky Point, the mean strength of current is about 0.6 knot, slack water before the flood occurring about 45 minutes before the time of low water and slack water before the ebb occurring about 45 minutes before the time of high water at Kodiak.

DIRECTIONS, PORT VALDEZ

From Hinchinbrook Entrance.—Give Cape Hinchinbrook a berth of 1½ miles, and when the lighthouse bears 70° true (NE. ⅜ N. mag.), distant 2¼ miles, steer 349° true (NW. ½ N. mag.), keeping 1 mile off the southwest shore of Hinchinbrook Island. This course made good for 37 miles from Cape Hinchinbrook, or 30 miles from Bear Cape, should lead to a position 4 miles from Bligh Island with the highest peak at the southwest end of the island bearing 101° true (ENE. ½ E. mag.), and Bligh Island Reef gas buoy should then be on the starboard beam, distant 2 miles.

Then steer 30° true (N. ⅛ E. mag.) for 17 miles, passing 1½ miles westward of Busby Island Light, 1 mile westward of Rocky Point and to a position ¼ mile off the eastern shore about halfway through Valdez Narrows; Middle Rock Light should be ahead or a very little on the port bow. Then steer 48° true (N. by E. ¾ E. mag.) for 1½ miles, following the eastern shore of Valdez Narrows in mid-channel eastward of Middle Rock Light. When Entrance Island Beacon (close to southeast shore) is abeam, distant about ⅜ mile, an 82° true (NE. ¾ E. mag.) course made good for 10 miles will lead to the wharves at Valdez.

From Latouche Passage.—From a position in the northern entrance of Latouche Passage, about ¾ mile westward of Point Grace, steer 50° true (NNE. mag.) for 5¼ miles to a position 1 mile eastward of Point Helen Light. Then steer 26° true (N. ⅛ W. mag.) for 20 miles and pass 1 mile westward of Seal Island. When Seal Island Light bears 141° true (ESE. mag.), distant a little over 1 mile, steer 51° true (NNE. mag.) for 8 miles, passing 1¾ miles southeastward of Smith Island Light and to a position with the light bearing 276° true (WSW. mag.), distant 2½ miles. Then steer 24° true (N. ⅜ W. mag.) for 20 miles to a position 4 miles from Bligh Island, with the highest peak at the southwest end of the island bearing 101° true (ENE. ½ E. mag.). Bligh Island Reef gas buoy should then bear about 79° true (NE. ½ E. mag.), distant 2 miles. Then steer 30° true (N. ⅛ E. mag.) and follow the directions in the preceding paragraph.

ISLANDS IN PRINCE WILLIAM SOUND

Glacier Island is on the north side of Prince William Sound, westward of the entrance of Valdez Arm. It is mountainous and indented by a number of bays, of which Chamberlain Bay and Jackson Cove are the only ones that have been sounded.

Chamberlain Bay, on the south side of Glacier Island, is exposed southward but affords anchorage for small vessels about ⅜ mile from the head, in about 15 fathoms (27.4 m.), muddy bottom. Rocks, partly bare at low water, extend 400 yards from the western side of the bay about ⅝ mile from the head.

Jackson Cove, on the west side of Chamberlain Bay, is a secure harbor for small craft. The entrance has a least width of about 50 yards and a depth of about 12 feet (3.7 m.); at the narrowest part of the entrance favor the north side. The upper half of the cove has rocks on both sides, and a careful mid-channel course should be followed. **Anchorage** can be selected in the lower part of the cove, in 10 to 15 fathoms (18.3 to 27.4 m.), also about 350 yards from the head, in about 5 fathoms. A divide about 75 feet (22.9 m.) high extends through to Jackson Hole.

Naked, Peak, and **Storey Islands** form a group about 8 miles long north and south, with a greatest width of 6 miles, are 700 to 1,317 feet (213 to 401 m.) high, and are wooded to the summits. A small wooded island lies ¾ mile off the south side of Naked Island.

The bottom in the vicinity of the islands, including the passages among them, is rocky and exceedingly broken. As a measure of safety it is considered advisable for vessels, especially large ones, to avoid areas with depths less than about 20 fathoms (37 m.) in the vicinity of the islands and to avoid the passages between the islands.

It is safer for vessels to keep in the deeper part of the passage between Naked and Smith Islands, preferably between the 50-fathom curves. See the directions for Passage Canal from Hinchinbrook Entrance.

The anchorages about Naked Island are indifferent. Large vessels can anchor in the southerly part of the large bay on the north side of Naked Island, in 20 to 30 fathoms (37 to 55 m.), and small vessels can anchor in the easterly bight of this bay in 15 to 20 fathoms (27.4 to 37 m.).

Small vessels can anchor in the cove on the east side of the bay on the south side of Naked Island, also at the north end of the bay, in about 16 fathoms (29.3 m.).

The southerly bay on the west side of Naked Island has anchorage for large vessels in the outer bight on its southeast side, in about 25 fathoms (46 m.), avoiding, however, the 14-fathom (25.6 m.) sounding shown on the chart just southwestward of the anchorage. Small vessels can anchor at the southeast end of the inner bight, in 18 to 20 fathoms (33 to 37 m.).

Small craft can anchor in the small bight on the southwest side of Peak Island, also between Storey Island and the small island close to its southeast side. The entrance to the latter anchorage is from southwestward, between the small island and the islet between it and Storey Island; and the islet must be kept close aboard to avoid a reef extending from the small island. A reef bare at low water extends, also, southward and southeastward from the small island, as shown on the chart.

Smith Island is 3 miles long, wooded, about 500 feet (152 m.) high, and lowest at its southwest end. The northeast point of the island is marked by a light. A bank with depths of 34 fathoms (62 m.) or less extends 3 miles northeastward from Smith Island; depths of 11 and 12 fathoms (20.1 and 21.9 m.), rocky bottom, were found on the bank for a distance of 1 mile from the island, but it has not been thoroughly developed, and at least this part of the bank should be avoided.

Little Smith Island, bluff, wooded, and about 350 feet (107 m.) high, lies 3/8 mile off the southwest end of Smith Island. Rocky patches, on which the least depth found is 8 fathoms (14.6 m.), lie 1¼ miles northwestward and north-northwestward of Little Smith Island.

Seal Island is about 3/8 mile in diameter, wooded, about 350 feet (107 m.) high, and rounded in outline. There are two bare, rocky islets close to its eastern end, and a small bare rock about 200 yards off its west end. The northwest point of the island is marked by a light. Rocky, broken areas extend 1 mile northeastward and northward from Seal Island. The least depth is 2 fathoms (3.7 m.) on the northwest end of the broken areas, lying 1 mile northward of the light and is marked by a buoy.

The reef between Seal Island and Green Island is described with the latter.

PRINCE WILLIAM SOUND, NORTHWEST PART

The principal approaches to Passage Canal and the canal itself have been surveyed and offer little difficulty for navigation with the aid of the chart. These waters, including the Knight Island group and both shores of Knight Island Passage, are characterized by rocky and exceedingly broken bottom. Differences in depths of 50 fathoms (91 m.) between adjacent soundings are not uncommon, and it is probable that on the broken areas there may be less water and possibly dangers not obtained by the survey. As a measure of safety, vessels should avoid broken areas in these waters, where abrupt changes in depth are indicated by the chart to depths less than 50 fathoms (91 m.).

Unakwik Inlet is a long, unsurveyed inlet lying northwestward from the Storey and Naked Island group. No description of the inlet is available. The Pacific American Fisheries operates a salmon cannery on the east side of the inlet about 10 miles above the entrance. A bar which crosses the inlet at a point northward of the cannery holds the glacier ice in the head of the inlet.

There is a wharf with 30 feet (9.1 m.) alongside and a loading face of 100 feet. There is fresh water piped to the dock, which is in a sheltered location. Bears are numerous in this section, as there is little habitation except during the cannery season.

A small stock of supplies is kept on hand during the fishing season, but no fuel is available.

Directions.—The following directions are given by Capt. H. W. Fletcher, who has followed them a number of times as master of the steamship *Norwood*: From a position 1 mile northward from Smith Island Light, steer 300° true (W. ¼ N. mag.) for 7 miles to a position with the southwest point of Naked Island on the starboard beam and the 553-foot (169 m.) hill on Lone Island ahead. Then steer 333° true (NW. ⅞ W. mag.) for about 4¼ miles heading for the northern end of Bald Head Chris Island. When the north end of Naked Island is abeam, change course to 9° true (N. by W. ¾ W. mag.), heading for a conspicuous hill or island on the west side of Wells Bay. Follow this course for 12 miles, and when the north end of Olsen Island is abeam, distant about 1½ miles, haul to the westward and follow mid-channel courses to the cannery, which is on the east side of the inlet about 10 miles distant.

Captain Fletcher reports a **rock** awash at low tide about 1,200 yards 77½° true (NE. ¼ E. mag.) from the middle point on the east side of Olsen Island. A rock bare at low tide lies close to the shore off the southeast point of the peninsula between Unakwik Inlet and Wells Bay.

Lone Island is 2¼ miles long, wooded, comparatively level, and 553 feet (169 m.) high. Foul ground extends nearly ½ mile northward, and a bank on which 21 fathoms (38 m.) was found, extends 1 mile northward from the island. Broken ground, on which the least depths found are 11 to 16 fathoms (20.1 to 29.3 m.), extends 1½ miles southward from the island.

Dutch Group are several wooded islands and bare rocks, the largest having elevations up to 150 feet (46 m.). Foul ground extends 1¼ miles southward of the group to two prominent rocks about 5 to 10 feet (1.5 to 3 m.) high.

Fool Island is wooded and about 50 feet high (15.2 m.). A rock bare at low water lies 600 yards south-southeastward of Fool Island.

Egg Rocks are prominent, bare rocks, except for some grass, and lie 1½ miles westward of Fool Island.

Perry Island is wooded to a height of about 1,000 feet (305 m.), and is prominently marked on its northeast side by a round peak 1,618 feet (493 m.) high, the summit of which is small, bare, and dome shaped. The bays indenting the island are anchorages for small craft only, on account of the foul, rocky, and broken bottom.

Foul ground extends ½ mile eastward from the easterly end of Perry Island, and nearly 1 mile southeastward and southward from the southeast point of the island.

The bay indenting the southeast side of Perry Island has an indifferent anchorage at the head for small craft. On account of the broken bottom care should be exercised, especially in the vicinity of the 12 and 17 fathom (23.8 and 31 m.) soundings shown on chart 8517, (1921 edition).

East Twin Bay, indenting the north side of Perry Island, has anchorage for small craft on the southwest side of the head, in about 11 fathoms (20.1 m.), the area of soft bottom being small. A mid-channel course should be followed until up with a prominent rock about 20 feet (6.1 m.) high, which lies near the middle ¾ mile from the head. Pass northeastward of that rock and follow the northeast shore at a distance of about 150 yards. A rock with 6 feet (1.8 m.) over it lies 450 yards 135° true (ESE. ½ E. mag.) from the prominent rock and 275 yards from the northeast shore.

West Twin Bay, indenting the northwest side of Perry Island, is not an anchorage on account of the rocky, broken bottom. Small craft entering should favor the northeast side to the narrow part 1¼ miles from the head, and then favor the southwest side, passing westward of a rock, about 25 feet (7.6 m.) high, which lies near the middle ⅝ mile from the head.

From the point on the southwest side at the entrance of West Twin Bay a chain of islets and foul ground extends over 1 mile northwestward, its end on which the least depth found is 6 fathoms (11 m.), lying ⅜ mile northwestward of the outer islet.

Esther Island is mountainous, wooded to a height of about 1,000 feet (305 m.), and the summits are bare rock. The peak, 2,019 feet (615 m.) high, on the southeast point of Esther Island, and the sharp, twin peaks 1,821 and 1,822 feet (555 m.) high, on the southwest point, are prominent.

Esther Rock, lying 1 mile westward of Esther Point, Esther Island, is about 15 feet (4.6 m.) high and bare except for some grass. A rocky area with depths less than 50 fathoms (91 m.) extends ¼ mile northward and eastward and ½ mile southeastward and southward from Esther Rock.

A rock, bare at lowest tides, is reported to lie about ¾ mile off the south point of the bay (locally called **Granite Bay**) on the west side of Esther Island.

Culross Island is mountainous and wooded to a height of about 1,000 feet (305 m.).

Culross Bay, indenting the north side of Culross Island, is clear, but is a poor anchorage. The prevailing northeast winds send considerable swell up the bay. A small area of mud bottom is found near the head; it appears to be a soft, thin layer over rock, and anchors do not hold well in it.

Port Wells, Cochrane Bay, and **Blackstone Bay** are not surveyed, some sounding having been done by exploring parties as shown on the chart. Some mining development has been done on Port Wells.

Hobo Bay is on the west side of Port Wells just northward of Bettles Bay. A bar with a depth of about 5 fathoms (9.1 m.) extends across the entrance of the bay. Vessels entering follow the north side of the bay at a reported distance of 100 yards. There are several rocks bare at low tide along the southern shore of the

bay and there is a grassy rock a short distance offshore from a shack on the beach. A vessel entering this bay recently anchored off the grassy rock in 5 fathoms (9.1 m.).

Golden is a mining camp on the eastern shore of Port Wells, about 1 mile northward of the junction with Esther Passage. Steamers anchor 200 to 300 yards southward of the little island off Golden, in about 20 fathoms (37 m.), rocky bottom. It is regarded as a poor anchorage, and it is probable that the anchor will not hold with strong winds drawing down the canal. The area between the island and the shore is bare at low water.

PASSAGE CANAL

has its entrance at the southwest end of Port Wells between Point Pigot and the peninsula separating Cochrane and Blackstone Bays. The canal trends west-northwestward for 4 miles, and then southwestward for 8 miles.

The canal is 1 to 1½ miles wide, has great depth and is clear except a very few places near the shores. The shores rise abruptly to elevations of 2,000 to 4,000 feet (610 to 1,219 m.), and are wooded to an elevation of about 1,000 feet (305 m.). The higher peaks are bare or snow-covered rock.

Point Pigot is a peninsula lying between Pigot Bay and Passage Canal, and across it low divides extend from Entry Cove and Logging Camp Bay. A high-water islet about 50 feet high (15.2 m.) marks the south end of the point.

A **rock,** bare at lowest tides, lies ¼ mile off the east end of Point Pigot and ¾ mile 73° true (NE. mag.) from the high-water islet at the south end of the point.

Entry Cove lies westward of the south end of Point Pigot. Good anchorage with a clear width of 300 yards can be had in the entrance, in 14 fathoms (25.6 m.), soft bottom. The only danger is a rock bare at low water which lies 150 yards westward of the high-water islet and the same distance from shore.

Passage Bay, on the south side of the canal 6 miles above Point Pigot, has depths of 30 to 35 fathoms (55 to 64 m.), muddy bottom, through the middle. Foul ground fills the narrow parts at the head of the bay; approaching slowly, a small vessel can select anchorage just below this foul ground, in 15 to 20 fathoms (27.4 to 37 m.).

The bight on the southeast side of Passage Bay is obstructed near the middle, about on the line joining the points of the bight, by a rock with 4 feet (1.2 m.) over it. Anchorage with a clear width of ¼ mile can be had in the northeasterly part of this bight, with the westerly point of the bay in range with the point beyond, bearing 322° true (NW. by W. ⅞ W. mag.), in 15 to 20 fathoms (27.4 to 37 m.), muddy bottom.

Anchorage in 15 to 20 fathoms (27.4 to 37 m.), sticky bottom, can be had on the shoal which is about ½ mile long and extends ¼ mile from the south side of the canal at a point 1 mile above Emerald Island and 3½ miles from the head. The least depth found by a careful examination is 29 feet (8.8 m.) at the southwest end of the shoal.

Small craft can anchor in the cove at the northwest end of the head of the canal, in 6 to 12 fathoms (11 to 21.9 m.).

The **currents** in Passage Canal have little velocity.

DIRECTIONS, PASSAGE CANAL

From northeastward.—Passing southward of Glacier Island and northward of Storey Island, a course can be shaped for the highest peak of Perry Island, which will lead southward of the two bare rocks southward of the Dutch Group. Or a 250° true (SW. ¼ S. mag.) course for the peak of Perry Island will lead ⅜ mile southeastward of the two bare rocks southward of the Dutch Group, and a 270° true (SW. by W. ½ W. mag.) course for the peak of Perry Island will lead outside the 50-fathom (91 m.) curve on the shoal northward of Lone Island.

Pass ½ to ¾ mile southward of the two bare rocks southward of the Dutch Group and steer about 293° true (W. ⅜ S. mag.) for about 4 miles, heading for the southwest point of Esther Island, to a position ¼ mile northward of Point Perry, the north end of Perry Island. A 280° true (WSW. ⅜ W. mag.) course for 12 miles will then lead to the middle of the entrance of Passage Canal, passing ¾ mile northward of Point Culross.

From Hinchinbrook Entrance.—Passing 2 miles southwestward of Cape Hinchinbrook Lighthouse steer 323° true (NW. by W. ¾ W. mag.) for 25 miles, heading for the 1,235-foot peak on the east side of Naked Island until Smith Island light is abeam, distant 3½ miles. Then steer 275° true (WSW. mag.) for 7 miles heading for Point Eleanor until the west end of Naked Island opens from its south point.

Then steer 319° true (WNW. ⅛ W. mag.) for 11 miles, heading for the north island of the Dutch Group, until the northwest point of Lone Island is abeam distant 1½ miles. Then steer 286° true (W. by S. mag.) for 3½ miles, heading for Point Perry to a position ½ mile southward of two bare rocks southward of the Dutch Group.

From Knight Island Passage.—From a mid-channel position in Knight Island Passage between Herring Point and Crafton Island, steer 336° true (NW. ⅝ W. mag.), passing ¾ mile off the southwest point of Perry Island. This point is composed of light cobble stones and is prominent on account of this light color. Continue the course for nearly 18 miles, give the northeasterly end of Culross Island and Point Culross a berth of ¾ mile in rounding the island, and steer 280° true (WSW. ⅜ W. mag.) to the middle of the entrance of Passage Canal.

PORT NELLIE JUAN

(chart 8517) is an extensive inlet the entrance to which lies about 6 miles southward from Perry Island. The inlet extends in a southwesterly direction for about 23 miles, and has many glaciers feeding into it. It has been surveyed for a distance of 6 miles only.

The first reach of Port Nellie Juan is very deep with deep water soundings close up to the beach on either side.

The eastern entrance point is marked by a flashing white light.

Applegate Island at the western entrance is low, flat, and wooded.

Anchorages.—Due to deep water, there are no good anchorages so far as is known in Port Nellie Juan. An indifferent anchorage suitable for large vessels can be had in the bight just southward from the eastern entrance point. The southern of the two indentations at this anchorage has a wide, even, gravel beach and offers an excellent place to beach a small vessel. The mean range of tide is 9.5 feet (2.8 m.).

Small craft can find indifferent anchorages in some of the bights on the western side of the first reach.

McClure Bay is a deep narrow bay on the east side of Port Nellie Juan about 3 miles inside the entrance. It extends in a south-southeasterly direction for about 5 miles. It is from 80 to 100 fathoms (146 to 183 m.) deep, free from hidden dangers, and has bold shores.

The upper part of the eastern arm at the head of the bay is foul. Vessel requiring little swinging room may anchor at the entrance of this arm in 18 fathoms (33 m.), mud bottom.

The western arm is clear in mid-channel and offers anchorage in 15 to 20 fathoms (27.4 to 37 m.) to vessels not requiring great swinging radius. The shelter is perfect, but the anchorage is not suitable for vessels over say 250 tons.

There is a cannery located on the indentation on the east side of McClure Bay near the entrance. There is a dock here and fresh water is available.

There are two rocks with but little water over them in this indentation. One of the rocks is on the north side of the cove and is just ahead of a vessel as she lays at the dock. The other rock, which is marked by a buoy, is near mid entrance. Local reports state that these rocks have been seen bare, but they were never observed uncovered by the surveying party in 1917.

The cove is so small that it does not afford anchorage except for small craft and launches.

KNIGHT ISLAND AND ASSOCIATED ISLANDS

Knight Island is 22 miles long and very rugged, the peaks having elevations up to 3,280 feet (1,000 m.). It is wooded to an elevation of about 1,000 feet (305 m.), and above this is grass covered. Three mountainous, sparsely wooded islands, called Disk, Ingot, and Eleanor, extend 6 miles northward from Knight Island to Point Eleanor, the north end of the group.

Eleanor Island is about 4 miles long, has elevations up to 834 feet (254 m.), and bluff, rugged shores. Broken ground extends ⅜ mile northward and northwestward from Point Eleanor. **Northwest Bay** on the northwest side of Eleanor Island is deep and clear. There is anchorage for small vessels in the south arm, about ⅜ mile from the head, in about 20 fathoms (37 m.).

Near the eastern point of Eleanor Island, 2 miles southeastward of Point Eleanor, there is a rocky islet with a few trees and having foul ground inside of it. A bare rock lying ¼ mile southeastward of the islet should be given a berth of ¼ mile.

A group of prominent bare rocks, close together and about 12 feet (3.7 m.) high, lie over ½ mile off the southeastern point of Eleanor Island and 3 miles southeastward of Point Eleanor. There is broken ground, with depths of 6 to 7 fathoms (11 to 12.8 m.) between them and Eleanor Island. A bare rock about 5 feet (1.5 m.) high lies ½ mile southward of the group of bare rocks; it should be given a berth of over ¼ mile when southeastward of it.

Upper Passage, separating Eleanor and Ingot Islands, is generally deep and suitable for small craft. An island, 1 mile long and its northern end joined at low water to Eleanor Island, lies in the passage. In the narrowest part of the passage between this island and Ingot Island, favor, if anything, the northeast side of the channel. A ledge, with 5 fathoms (9.1 m.) over it, possibly less, lies in the middle of the southeastern entrance of Upper Passage 600 yards southeastward from the southern end of the island in the passage.

Entrance Island, a prominent wooded island, 269 feet (82 m.) high and with deep water all around it, lies 600 yards southward from Eleanor Island and on the northern side of the southeastern entrance of Upper Passage.

Sphinx Island, a larger and higher wooded island, lies ⅝ miles southeastward of Entrance Island and ⅜ mile eastward of Ingot Island; there is deep water all around it.

Ingot Island, lying between Upper and Lower Passages, is 4 miles long, over 1 mile wide, and 1,114 feet (340 m.) high. A prominent wooded island 246 feet (75 m.) high lies ¼ mile off the northwest end of Ingot Island.

Disk Island, on the northeastern side of Lower Passage, is about 1 mile in diameter and 677 feet (206 m.) high. The narrow channel between it and Ingot Island is blocked by reefs. A bay with two narrow entrances makes into the southwest side of the island. The main entrance is 50 yards wide with a depth of 3 fathoms (5.5 m.), and there is a depth of 13 fathoms (23.8 m.) in the bay.

Two small bare rocks, close together and nearly awash at high water, lie ½ mile 115° true (E. ¼ N. mag.) from the southeast point of Ingot Island, with deep water between. The rocks should be given a berth of ¼ mile when northeastward of them. A rock, with 3¾ fathoms (6.8 m.) on it and which should be avoided, lies ½ mile 109° true (E. ¾ N. mag.) from the bare rocks, with broken ground between.

Lower Passage is a deep, navigable channel, suitable for small vessels, at the northern end of Knight Island, between it and Disk and Ingot Islands. A ledge, on which the least depth obtained is 4 fathoms (7.3 m.), extends 300 yards northward from the turning point on the south side of Lower Passage southeastward from Disk Island. Broken ground, on which the least depth obtained is 6½ fathoms (11.9 m.), extends into the passage 400 yards from the southwest shore just northwestward of the entrance of Louis Bay. A rock, bare at half tide, lies 350 yards from the western shore, ¾ mile inside the northwest end of the passage. There is foul ground from this rock to the head of the cove ½ mile southward.

A rock with 4½ fathoms (8.2 m.), possibly less, lies nearly ⅜ mile northwestward from the northern end of Disk Island. Another rock with 5 fathoms (9.1 m.) over it lies nearly ½ mile from

Ingot Island and over ¾ mile 42° true (N. by E. ¼ E. mag.) from Passage Point. These rocks are well out of the usual track of vessels going through Lower Passage.

Entering Lower Passage from eastward, vessels should pass southward of the two small outlying bare rocks (see the description preceding). Give the prominent turning point on the south side of the passage southeastward of Disk Island a berth of 400 yards when northward of it, and follow the southern side of Disk Island at about that distance until up with its southwestern end. Then steer 349° true (NW. ½ N. mag.) and pass about ¼ mile off **Passage Point** at the northwestern end of the passage.

Louis Bay, at the southern end about halfway through Lower Passage, is ½ mile wide at the entrance, and affords anchorage for small vessels 250 to 300 yards from the head of either of its two arms in about 15 fathoms (27.4 m.). The western arm is clear so far as known.

The eastern arm of Louis Bay has a very broken bottom, and small vessels entering should proceed with caution. A rock with a depth of 5 feet (1.5 m.) lies 175 yards from the eastern shore and 350 yards northward from the entrance of the eastern arm. The eastern arm is ⅛ to ¼ mile wide; a ledge makes out about 30 yards from the western point (a wooded islet) at the entrance. When inside the entrance of the eastern arm, favor the western side to avoid three rocks which are bare at lowest tides; one lies 100 yards off a point on the east side 300 yards northward of the houses at the head; the other two lie 225 yards northward of the same point and the same distance from the east side.

Bay of Isles is on the eastern side of Knight Island, 260° true (SW. ⅝ W. mag.) from Seal Island. It has numerous islets and pinnacle rocks, sunken and awash, and is suitable only for small vessels proceeding with caution and preferably at low water. There is secure anchorage in the South and North Arms, the latter being easier of access. The depths in the bay are great, and the deep water extends close to the rocks, which are not marked by kelp.

To enter Bay of Isles, steer 260° true (SW. ⅝ W. mag.) with Seal Island astern, and pass in mid-channel northward of the islets lying in the middle of the bay. Continue the course ½ mile past the islets, and then steer 221° true (S. by W. ¼ W. mag.), and pass in mid-channel westward of the islands near the southern shore. Then steer about 269° true (SW. by W. ½ W. mag.), and keep the northern shore aboard distant about 150 yards in entering North Arm. Anchor in the middle of the broad part of the arm in 9 to 11 fathoms (16.5 to 20.1 m.).

Foul ground extends ½ mile southeastward from the northern point in the approach to Bay of Isles. At the end of the foul ground is a rock with 10 feet (3 m.) over it, lying ⅞ mile 73° true (NE. mag.) from an island near the northern shore. The tangent to the shore southward of Bay of Isles in line with the eastern shore of Knight Island southward of Snug Harbor, bearing 197° true (S. by E. mag.), leads eastward of the foul ground.

Manning Rocks lie about 2 miles off the entrance of Bay of Isles. They are three pinnacles, with depths of 5, 9, and 23 feet (1.5, 2.7, and 7.0 m.) on the south, middle, and north one, respectively, the

distance between the end ones being 7/8 mile. They are surrounded by deep water and are the worst danger on the east side of Knight Island. Between Manning Rocks and the foul ground in the entrance of Bay of Isles the bottom is very irregular, although the least depth found is 8½ fathoms (17.4 m.); this area should be avoided by vessels.

Marsha Bay, 4½ miles southward of Bay of Isles, has a crooked, narrow entrance, and is suitable only for small craft. The depths are great except at its north end, where anchorage can be selected in 15 fathoms (27.4 m.) or less. The entrance is between two sunken rocks, and the channel then leads southward of the islands which choke the mouth of the bay. Enter in mid-channel between the outer island and the south point of the bay on a 252° true (SW. mag.) course, and then favor the south point of the islands when passing through the narrowest part of the channel.

Snug Harbor is on the east side of Knight Island 6 to 7 miles northward of Point Helen. Its western arm is ¼ mile wide and clear near mid-channel, and is a secure anchorage at its head in 12 to 17 fathoms (21.9 to 31 m.). Anchorage, exposed to northerly and northeasterly winds, can be had in the broad cove on the south side in the entrance of the harbor in 12 to 15 fathoms (21.9 to 27.4 m.), rocky bottom.

Hogan Bay, on the east side of Knight Island 2½ miles northward of Point Helen, has anchorage in the middle, 5/8 mile inside the entrance, in 16 to 20 fathoms (29.3 to 37 m.). The bottom is rocky and uneven, and the anchorage is exposed eastward. Small craft can pass through the narrow channel at the head of the bay and find secure anchorage in the inner cove in 12 fathoms (21.9 m.) or less. The spit on the southwest side of the channel is bold, and should be favored when entering the inner cove.

Point Helen, the southeastern extremity of Knight Island, is marked by a flashing white light 35 feet (10.7 m.) high.

KNIGHT ISLAND PASSAGE,

on the west and south sides of Knight Island, is used by vessels calling at Drier and other bays on the west side of Knight Island. With easterly winds it offers a smoother channel from Latouche Passage to the northern end of the Naked Island group than the generally used route eastward of Knight Island.

From its northern entrance between Herring Point and Crafton Island, where it is 5 miles wide, it extends 16 miles in a 196° true (S. by E. mag.) direction to Pleiades Islands, with a least width of 2 miles at the southeast end of Chenega Island. The channel leads eastward of the Pleiades, where it is 1¼ miles wide between them and Point of Rocks. From these islands the passage has a 135° true (ESE. ½ E. mag.) direction for 10 miles, with widths of 3 to 4 miles, to Montague Strait between Point Helen and the north end of Latouche Island.

The depths in the passage range from 150 to 400 fathoms (274 to 731 m.). The west side is generally bold, with the exception of the bight between Crafton Island and Point Nowell, which is foul. From Pleiades Islands to 5 miles southward of Herring Point the

eastern shore is foul for ¾ mile off, many islands, rocks, and reefs being found in it.

There are no good anchorages in the bays on the west side of Knight Island. Small craft can anchor in nearly all the arms of the bays, but the bottom is generally rocky.

Main Bay, on the west shore southeastward of Port Nellie Juan, is deep and generally clear away from the shores, but affords no anchorage. Foul ground makes off the entrance points, especially from the northwest side, as shown on chart 8517.

Falls Bay affords no anchorage and is open to the prevailing northeasterly weather. The main body of the bay is clear and deep. Rocks make out from the points at the entrance, contracting it to a width of ¼ mile in which the least depth found is about 12 fathoms (21.9 m.).

Crafton Island is 1 mile long and wooded. At its north end are rocky bluffs about 100 feet (30 m.) high, while its southern part is lower and has sandy beaches in places. Two low islets with sandy beaches lie off its south end.

Crafton Island is surrounded by foul ground to a distance of about ½ mile on its east and south sides, where no sounding has been done. An exceedingly broken area extends over 2 miles southeastward from the island; and a rock, bare at about half tide, lies 1 mile east-southeastward from the south end of the islands. Vessels should avoid all broken areas in this vicinity on which depths less than about 50 fathoms (91 m.) have been found.

The **passage westward of Crafton Island** is foul along the shore of the islands and at its south entrance. Three rocks bare at low water lie in the middle of the south entrance. This passage should be used only by small craft, proceeding with care and preferably at low water; the channel favors the west shore from the south entrance until abreast the middle of Crafton Island.

The clearer **channel to Eshamy Bay** follows the shore northward from Point Nowell and has a width of about ¾ mile. Differences in depth of 50 fathoms (91 m.) between adjacent soundings are not uncommon in this locality. Foul ground extends 350 yards northwestward, and rocky broken ground, on which the least depth found is 14 fathoms (25.6 m.), extends ⅝ mile northward from the south point at the entrance of Eshamy Bay.

Eshamy Bay, at the head of the bight between Point Nowell and Crafton Island, affords no anchorage for vessels. Small craft can find secure anchorage, in 8 to 11 fathoms (14.6 to 20.1 m.), in the small cove back of the islands and rocks in the southeast corner of the bay. The better entrance is through the middle of the deep, narrow channel between the small islands and the eastern shore. Eshamy Lagoon, with a saltery at its head, extends westward from Eshamy Bay, but its foul entrance with strong currents renders it not available for strangers.

Point Nowell, 4½ miles from Crafton Island, is a small wooded hook, about 50 feet (15.2 m.) high, back of which the land rises abruptly to about 1,600 feet (488 m.). The cove on the south side of Point Nowell is about 300 yards in diameter and apparently clear, and affords anchorage for small craft in about 5 fathoms (9.1 m.).

Dangerous Passage, on the west side of Chenega Island, has rocks bare at low water near mid-channel in its northern entrance, and appears foul. It is unsurveyed and no information is available.

Chenega Island, on the west side of Knight Island Passage, is 7 miles long and 1,800 to 2,000 feet (548 to 610 m.) high. Close to the north end of the island is a low, wooded island, with several islets on its northwest side. There is a prominent landslide at the south end of Chenega Island over the small Indian village of **Chenega,** and two low, wooded islets close to the shore off the village.

Herring Bay, at the northwest end of Knight Island, is 4 miles long from Herring Point to the head of its southeast and south arms, and 1 to 2 miles wide except in the arms. The bay has no desirable anchorage, and is characterized by much foul ground and very broken bottom, with deep water extending close to the shores and dangers. Vessels navigating the bay should proceed with caution, especially in the vicinity of broken areas with depths less than about 20 fathoms (37 m.), and preferably at low water. The entrance is clear except along the eastern shore, which is foul. A prominent rock about 4 feet (1.2 m.) high lies near the middle 1½ miles southeastward of Herring Point; the best channel to the upper part of the bay is eastward of the rock. Water can be obtained from a fall in the southeast arm.

Herring Point is the north end of a narrow ridge, about 1,000 feet (305 m.) high, forming the west side of Herring Bay.

Channel Rock, a prominent bare, black rock about 6 feet (1.8 m.) high, lies nearly 1 mile off the entrance of Lower Herring Bay, and is a good mark for Knight Island Passage. A rock bare at low water lies 1½ miles 25° true (N. ¼ W. mag.) from Channel Rock and ⅝ mile from the shore of Knight Island; from this rock southward the eastern side of Knight Island Passage is very broken and foul, with deep water extending close to the dangers, as shown on the chart.

Lower Herring Bay is not an anchorage for vessels, and is suitable only for small craft. The best entrance is eastward of Channel Rock, avoiding the rocky patch with depths of 17 to 22 fathoms (31 to 40 m.) lying between Channel Rock and the south point of the bay. The principal danger in the bay is a rock bare at three-quarters ebb which lies in the middle 600 yards from the eastern end of the bay. The passage between this rock and the point northward (lying between the two arms) should be used with caution. A mid-channel course should be followed in the arms. Small craft can anchor in the cove on the south side 1¼ miles inside the entrance of the bay, in not less than about 10 fathoms (18.3 m.); water can be conveniently obtained in this cove from a fall.

A narrow deep passage, suitable for small craft, follows the shore inside the islands between Lower Herring and Johnson Bays. Strangers should take it at low water and exercise care.

Johnson Bay (chart 8524) is suitable only for small craft; strangers should enter at low water only, and proceed with caution in the vicinity of all broken ground. There is a wooded island in the mouth of the bay. The entrance is northward of the island, is about 125 yards wide between reefs bare at low water, and the axis

of the channel is about 125 yards from the north shore on a 125° true (E. 5/8 S. mag.) course. From Knight Island Passage a 98° true (ENE. 1/4 E. mag.) course for the north point at the entrance in range with a pyramidal peak of black rock [2,090 feet (637 m.) high], above the head of the bay will lead between the outlying dangers to the entrance. Water can be obtained from a fall near the head.

A **sunken rock,** dangerous for small craft, lies 200 yards southward of Aguliak Island, midway between the charted 9 and 16 fathom (16.5 and 29.2 m.) soundings.

Squirrel Island, 9 1/2 miles southward of Herring Point and 1/2 mile from the eastern shore, is the northernmost of the islands extending 1 1/2 miles northward of the entrance to Drier Bay. It is 5/8 mile long, 180 feet (55 m.) high, and wooded.

Drier Bay is described under a separate heading following.

Southward of Drier Bay there are two large islands on the east side of Knight Island Passage, separated from Knight Island by Long Channel. Mummy Island is described under Drier Bay. **Squire Island,** the southern one, is 3 miles long and about 1,000 feet (305 m.) high. A ledge, bare at low water, lies 1/4 mile southward from the south end of Squire Island. Two islands lie 1/4 mile off the west side of Squire Island, and from these islands a large reef extends 3/8 mile westward to **Point of Rocks,** the latter awash at high water. The channel between Mummy and Squire Islands leading into Long Channel has rocky, broken bottom, and should be used with caution.

Long Channel is a deep inside passage for small craft from Drier Bay to the southern part of Knight Island Passage. It is 4 1/2 miles long and the mid-channel is clear so far as known. The channel is generally 1/4 to 3/8 mile wide, but narrows to 175 yards abreast Mummy Island and to 250 yards 3/4 mile from the north end of Squire Island. A rock, covered at high water, lies in the northern entrance 1/4 mile 88° true (NE. by E. 3/8 E. mag.) from the north end of Mummy Island. The tidal currents have little velocity.

From southward, the mid-channel courses are 22° true (N. 1/2 W. mag.) for 1 mile, then 358° true (NNW. 5/8 W. mag.) for 3/4 mile to the southern end of the narrowest part of the channel abreast Squire Island, then 8° true (N. by W. 3/4 W. mag.) for 2 1/2 miles to the northern end of the narrowest part of the channel abreast Mummy Island, and then 30° true (N. 1/4 E. mag.) into Drier Bay.

There is a large bay on the east side of Long Channel abreast the north end of Squire Island. Its entrance is very narrow and foul, and suitable only for small craft with local knowledge. The **tidal currents** have considerable velocity in the entrance.

Pleiades Islands, in the middle of Knight Island Passage, are a group of 7 wooded islands 1 mile long. The southernmost and largest is about 80 feet (24.4 m.) high.

A **rock** bare at extreme low tide has been reported to lie just west of Pleiades Islands. These islands should be given a good berth.

Mummy Bay, in the south end of Knight Island 4 miles westward of Point Helen, is about 1 mile wide and 3 1/2 miles long. It is deep and clear, but rocks extend 1/4 mile from the head. Small vessels can anchor 1/2 mile from the head in 15 to 20 fathoms

(27.4 to 37 m.) The southern arm on the eastern side of the bay is clear and affords anchorage for small vessels in 12 to 15 fathoms (21.9 to 27.4 m.) The northern arm on the eastern side is an anchorage for small craft.

Thumb Bay is a small inlet opening into the southern part of Mummy Bay. There is a dock here with 20 feet (6.1 m.) of water alongside. The bay is deep and free from dangers.

Little Bay, on the south side of Knight Island, 1¾ miles westward of Point Helen, is 1 mile long, ½ mile wide, and clear so far as known. The depths are 13 to 18 fathoms (23.8 to 33 m.) rocky bottom, and it is a fair anchorage except with southerly winds.

Ice.—Considerable glacial ice was seen in the passage south of Pleiades Islands. It comes westward between Point Countess and Chenega Islands, and drifts eastward as far as Latouche Passage with the ebb.

The **tidal currents** in Knight Island Passage have a velocity of 1 to 2 knots at the strength of the large tides.

DIRECTIONS, KNIGHT ISLAND PASSAGE

From a position 1½ miles west of Storey Island make good a 211° true (S. ¼ W. mag.) course for 21 miles, passing 1¼ miles off the west side of Herring Point and to a position 1 to 1¼ miles eastward of Point Nowell.

Then steer 196° true (S. by E. mag.) for Pleiades Islands with Lone Island astern; having stood 7 miles on this course, Newyear Islands, on the north side at the entrance to Drier Bay, should bear about 1½ miles on the port beam. Continue the 196° true (S. by E. mag.) course for 10½ miles from Point Nowell until 1¼ miles from Pleiades Islands and the south tangent of Chenega Island is abeam.

Then steer 169° true (SE. ½ S. mag.) for 2½ miles, passing midway between Point of Rocks and the Pleiades. When the southwest end of Squire Island is 1 mile on the port beam, steer 146° true (SE. by E. ½ E. mag.) with the north end of Pleiades Islands astern. This course made good for 7 miles will lead 1¼ miles off the southern shore of the passage and to the north entrance to Latouche Passage; and the course made good for 10 miles will lead into Montague Strait.

DRIER BAY

has its main entrance between Mummy Island and Newyear Islands on the west side of Knight Island 11½ miles southward of Herring Point and 4½ miles northward of Pleiades Islands. The bay is 5 miles long in a northeasterly direction and nearly 1 mile wide. The southeast shore is indented by a number of bays and coves and by Long Channel.

The principal known dangers in the bay are mentioned in the following description. In addition, the entire bay and approach are characterized by exceedingly broken bottom, and vessels should proceed with caution in the vicinity of such areas where abrupt changes in depth are shown by the chart to depths less than 50 fathoms (91 m.).

Mummy Island, on the south side at the entrance, is 1½ miles long, 543 feet (166 m.) high, and wooded; there are patches of grass on the southern half of the island. Reefs extend ¼ mile southwestward from the northwest end of the island, and wooded islets with reefs around them extend ⅝ mile westward from the southern half of the island. A rock covered at high water lies ¼ mile 88° true (NE. by E. ⅜ E. mag.) from the north end of the island, but is in the way only when using Long Channel. A rock with 4 fathoms (7.3 m.) over it lies ¼ mile 64° true (NE. ¾ N. mag.) from the north end of Mummy Island.

Newyear Islands are the southernmost of the islands which extend 1⅝ miles northward from the entrance to Drier Bay. They are about ⅜ mile long, wooded, and the southern and largest one 200 feet (61 m.) high. Bare reefs extend 250 yards southward of the south island. A rock bare at low water lies ¼ mile 19° true (N. ¾ W. mag.) from the north island, and is a serious danger in the channel between Newyear Islands and the islands northward.

Newyear Islands Light is a flashing white light located on the most southerly timbered island of the group.

Clam Islands, two in number, low and wooded, lie between Newyear Islands and the north point of the bay. A rocky patch with 3¾ fathoms (6.7 m.) over it lies 600 yards 191° true (S. by E. ½ E. mag.) from Clam Islands, and nearly ¾ mile 102° true (ENE. ⅝ E. mag.) from the south end of Newyear Islands.

Range Isle, small and wooded, lies close to the north side of the bay and 2 miles inside Newyear Islands. The line of Range Isle just clear of the north shore eastward of it, bearing 75° true (NE. ¼ E. mag.), leads about through the middle of the entrance between Mummy Island and Newyear Islands, and is sometimes used as a range for entering the bay.

Cathead Bay, on the south side, 2 miles from Mummy Island, is 1 mile long and ¼ to ⅜ mile wide. There are two islands in the upper part of the bay. The soundings taken indicate deep water, but it is not thoroughly developed. In the entrance of the bay 200 yards from the west side is a rock with 4 feet (1.2 m.) over it.

Cat Head Shoal with a least known depth of 3½ fathoms (6.4 m.), lies about 500 yards north-northeastward from **Cat Head,** the point at the northwest side of the entrance. The shoal is marked by a red nun buoy on the north side of the shoal.

When entering Cathead Bay, favor the east side to avoid these rocks, and then proceed with caution on either side of the islands at its head.

Mallard Bay, on the south side, 2½ miles inside Mummy Island, is 1 mile long and ⅜ to ½ mile wide. The bay is foul for a distance of ¼ mile from its head. Approaching with care, anchorage can be made ⅜ to ½ mile from the head in 17 to 20 fathoms (31 to 37 m.).

Barnes Cove, 4 miles inside Mummy Island and 135° true (ESE. ½ E. mag.) from Chase Island, is obstructed by ledges at its entrance, and shoals make out from the shores of the cove. Small craft entering with care can find good anchorage in 8 fathoms (14.6 m.). Vessels can anchor 300 to 500 yards off the entrance in 20 to 22 fathoms (37 to 40 m.).

The point on the northeast side of Barnes Cove is prominent and high, with bare rocky sides. A reef extends 150 yards off the small point 3/8 mile northeastward of this point.

Chase Island, small and wooded, lies 700 yards from the northwest side of the bay and 1 3/4 miles above Range Isle. A ledge bare at low water extends 300 yards southward from Chase Island.

A rock awash at half tide lies 3/8 mile 61° true (NE. by N. mag.) from Chase Island. It is marked by a buoy on its northeastern side. There is a rock bare at extreme low water between the half-tide rock and **Mountain Point.**

A **sunken rock** marked by a nun buoy lies in the north arm of Drier Bay 300 yards 216° true (S. 3/4 W. mag.) from the point of land at **Midknight.** The rock is about 400 yards southward of the cannery wharf on the point of land in the northwestern part of the north arm.

There is 18 feet (5.5 m.) at the dock. Violent squalls blow out of the pass here and as the head of the bay is narrow there is no room for turning ships, and they are unable to get out during westerly winds. A mooring buoy is maintained to assist them in getting out.

Northeast Cove, on the southeast side at the head of the bay, is small and has shoals at its entrance and also inside for 200 yards from its head. Small craft entering with care can find good anchorage in 4 to 5 fathoms (7.3 to 9.1 m.). Vessels can anchor 300 to 500 yards off the entrance in 17 to 20 fathoms (31 to 37 m.).

Anchorage can be selected about 1/4 mile from shore in the north end of the bay, in about 20 fathoms (37 m.).

At the north end of the bay is the narrow entrance to a lagoon which affords good anchorage for small craft in 6 to 10 fathoms (11 to 18.3 m.). There is 7 feet (2.1 m.) in the narrow entrance; a flat extends 250 yards from the head. A sunken rock lies in the approach 50 yards from the eastern shore and 100 yards southeastward from the narrow entrance.

DIRECTIONS, DRIER BAY

Strangers may have some difficulty in recognizing the entrance to Drier Bay, as there are several groups of islands on the east side of Knight Island Passage, both north and south of the entrance. Approaching from northward the island in the mouth of Johnson Bay is a good mark.

From northward, follow the directions for Knight Island Passage, and when 7 miles past Point Nowell the position should be midway between Newyear Islands and the south end of a sand beach on the east side of Chenega Island. Then steer 129° true (E. by S. mag.) for the north end of Mummy Island and pass about 3/8 mile southward of the bare rocks off the south end of Newyear Islands. When Newyear Islands are a little abaft the beam, steer 84° true (NE. by E. mag.) and pass about 3/8 mile northward of Mummy Island into the bay.

From southward, steer 16° true (N. by W. mag.) with Pleiades Islands astern until about 1 mile past the southeast point of Chenega Island. Then steer 64° true (NE. 3/4 N. mag.) with the southeast

point of Chenega Island astern and pass about 3/8 mile northward of Mummy Island.

Entering about midway between Mummy Island and the bare rocks southward of Newyear Islands, steer 84° true (NE. by E. mag.) for 3¼ miles, passing ¼ mile southward of Range Isle. When 400 yards from the southeast shore above Mallard Bay, steer 50° true (NNE. mag.), passing about 600 yards southeastward of Chase Island and about 400 yards off the southeast shore above the island. Then keep near the middle of the bay.

MONTAGUE STRAIT

(chart 8515), between Montague and Latouche Islands, is the broadest of the passages westward of Montague Island, and passing westward of Green Island offers a clear channel 4½ miles wide from Prince William Sound to the sea. It is, however, rarely used, vessels generally passing through Latouche and Elrington Passages. The **passage between Green and Montague Islands** has considerable foul ground and should be avoided by strangers in the absence of a survey.

From a position 1 mile westward of Seal Island a 203° true (S. 3/8 E. mag.) course made good for 42 miles will lead 1 mile off the eastern shore of Latouche Island, 1½ miles off the western shore of Montague Island near its southern end, and to a position about 2⅜ miles westward of Cape Cleare.

Or, having made good the 203° true (S. 3/8 E. mag.) course for 30 miles to a position 1 mile off the eastern shore of Latouche Island 5½ miles from Point Grace, steer 230° true (SSW. mag.) for 8 miles to a position 2 miles southeastward from Danger Island. From this position a course can be shaped as desired. (See bearings and distances from Danger Island, on p. 64.)

Green Island is wooded, about 6 miles long, 520 feet (158 m.) high near its middle, and slopes gradually to its north and south ends. The vicinity of the island is very foul. Two wooded islets and numerous small ones lie close to the northwest side of the northeastern half of the island. Three prominent rocks 10 to 15 feet (3 to 4.6 m.) high lie 1 to 1¼ miles off the northwest and west sides, the southwesternmost lying 1 mile southwestward from the western end of the island.

An extensive reef, marked by kelp, lies midway between Green Island and Seal Island. It is apparently a ridge having a northerly direction for 2½ miles with bare rocks about 3 feet (0.9 m.) high at its north end, and numerous sunken rocks and others which show at extreme low water. The northern bare rock lies 3¾ miles southeastward from Seal Island, with deep water between. Between the reef and Green Island there is broken ground on which the least depth found is 10 fathoms (18.3 m.) but the area has not been completely surveyed and should be avoided by vessels.

A **rock**, bare at half tide has been reported about 2 miles southeastward from the southern point of Green Island. This area is unsurveyed and should be navigated with great caution.

Gibbon Anchorage is a secure harbor for small craft (up to 500 tons) in the cove about the middle of the northwest side of Green

Island. Passing 600 yards southward of the outlying prominent 15-foot (4.6 m.) rock which lies 1⅜ miles westward of the cove, steer 126° true (E. ¾ S. mag.) for Putnam Point, the prominent wooded point with a small bluff on the southwest side of the cove. When about ¼ mile from shore, steer more eastward and pass nothing southward of midway between Putnam Point and the rock awash at high water which lies 400 yards northward of the point. When past the rock, anchor in the cove east-southeastward of it, in 6 to 8 fathoms (11 to 14.6 m.). A rock awash at half tide lies 175 yards north-northeastward of the point lying ¼ mile west-southwestward of Putman Point; and the southerly one of two rocks, bare at extreme low water, lies ⅝ mile 133° true (ESE. ⅝ E. mag.) of the outlying bare rock.

A low, wooded island ½ mile long lies 1⅛ miles southward from the south end of Green Island. A large reef, partly bare at low water, lies ⅜ to 1⅛ miles south-southwestward from the south end of the low, wooded island.

The Needle is a flat-topped, steep-sided rock, about 75 feet (22.9 m.) high, in the strait 3¾ miles from the nearest point of Montague Island and 5½ eastward from Point Helen.

Hanning Bay is on the east side of the strait, 13 miles northward of Cape Cleare and 151° true (SE. by E. mag.) from the north end of Latouche Island. It is a good anchorage with easterly winds, but is exposed from northwest, through west, to southwest. It is about 2 miles in diameter, with depths from 7 to 22 fathoms (12.8 to 40 m.). Shoals extend nearly ⅜ mile off from the streams at the northeast and southeast parts of the bay, and a reef extends nearly ¼ mile from the point on the eastern side. The best anchorage with southerly winds is about ⅜ mile from the south side, with Danger Island open from the south point at the entrance bearing 258° true (SW.½ W. mag.), and the north point at the entrance bearing between 5° true (NNW. mag.) and 348° true (NW. ½ N. mag.), in 15 to 16 fathoms (27.4 to 29.3 m.), sticky bottom. With northwest winds a better berth can be had ¼ to ⅜ mile off the cove on the north side, ⅝ mile inside the entrance, in 5 to 8 fathoms (9.1 to 14.6 m.), hard bottom. When entering, give the points at the entrance a berth of over ⅜ mile.

Macleod Harbor, on the east side of the strait, 6½ miles northward of Cape Cleare, is not surveyed. It is 1½ miles wide at the entrance and possibly 2 miles long. The following information is from reports: Vessels can anchor in 13 to 14 fathoms (23.8 to 25.6 m.) about ½ mile off the sand beach on the south side in the lower part of the bay, but it is more exposed to the ocean swell than Hanning Bay. The depths at the entrance are 7 to 8 fathoms (12.8 to 17.1 m.), and in the bay 12 to 21 fathoms (21.9 to 38 m.). There is a dangerous flat on the eastern and southeastern sides of the bay. There is good anchorage for small craft and possibly very small vessels in a cove on the north side toward the head. The cove is formed by a point which is bold and should be kept aboard. The anchorage is with the south point of the harbor shut in by this point, about 200 yards from the later, in 4½ fathoms (8.2 m.).

Latouche Island is 10 miles long and has elevations up to 2,255 feet (687 m.). It is wooded to an elevation of about 500 feet (152 m.), and above this is covered with moss and bushes, except the highest peaks, which are bare rocks. The eastern shore is precipitous and the 100-fathom (183 m.) curve less than ¼ mile off in places.

Danger Island, 1⅜ miles southward of Latouche Island, is ⅜ mile in diameter, low and wooded. The island is surrounded by bare rocks and kelp to a distance of ⅝ mile northward and southward of it and ¼ mile eastward and westward. Eastward of the island the foul ground is not developed. There is no safe passage between it and Latouche Island. A bar with depths of 6 to 11 fathoms (11 to 20.1 m.) extends west-northwestward from Danger Island to Elrington Island. A depth of 3½ fathoms (6.4 m.) is found on it ⅜ mile westward of Danger Island and 3¾ fathoms (6.4 m.) 700 yards from Elrington Island and 308° true (W. by N. mag.) from Danger Island. The following are bearings and distances from Danger Island:

Barwell Island, off Cape Resurrection, 264° true (SW. by W. ⅛ W. mag.), 36½ miles.
Lone Rock, south end of Chiswell Islands, 246° true (SW. ½ S. mag.), 51 miles.
Seal Rocks, 242° true (SW. ⅞ S. mag.), 53 miles.

LATOUCHE AND ELRINGTON PASSAGES,

between Latouche and **Evans Island,** are generally used by vessels between Prince William Sound and the coast southwestward, passing westward of Elrington Island. There is also considerable traffic to the wharves of the copper mines on the west side of Latouche Island.

From Point Grace to the north end of Elrington Island, a distance of 5 miles, Latouche Passage is about 1¾ miles wide, with deep water. There is a wooded islet, with a grass-covered rock close to its north end, near Evans Island ¾ mile northwestward of the northern entrance.

Latouche Passage, east of Elrington Island, is 7 miles long and ¾ to 1 mile wide with moderate depths, under 30 fathoms (55 m.) in most places. Anchorage can be selected nearly anywhere in this channel where the depth is suitable. At the south end the least depths found are 6 to 11 fathoms (11 to 20.1 m.) on the bar between Danger and Elrington Islands.

A little southward of the former Barracks Wharf, nearly 2 miles southward of Point Grace, a reef makes out over 100 yards from shore; it is sometimes marked by a barrel buoy.

Latouche, a post office on the west side of Latouche Island, 2¼ miles southward of Point Grace, has a store and is the site of the copper mine of the Kennecott Copper Corporation.

There is a wharf with a loading face 200 feet in length and with 20 feet (6.1 m.) alongside. The rock 600 feet northward of the wharf is marked by a black can buoy. There is another sunken rock about 100 feet north of the dock but inshore 50 or 75 feet from the face of the dock. This rock is unmarked.

Vessels must approach this dock from the northward and on a strong ebb current it is difficult for large single-screw steamers to

make the landing. Vessels leaving the wharf usually swing the bow in and back out into the channel.

There are ore bunkers on the dock, and large quantities of copper ore are shipped to the smelter at Tacoma. Latouche is also a port of call for most of the passenger steamers.

Supplies.—Fuel oil of a good quality is kept on hand and is usually available in any quantity, although it is possible that if the plant were short a large quantity could not be supplied. There are good general stores.

Gasoline and distillate are procurable, and there is sacked coal in small lots.

Repairs.—There are well-equipped machine shops that can undertake almost any repairs to small vessels of any kind.

Communication.—The Kennecott Copper Corporation operates a radio station, call letters KIM, and coastwise steamers from Seattle make regular calls throughout the year.

The cove southward of the wharf is shoal, and a reef makes out 100 yards from **Powder Point** which lies southwestward from the wharf. Anchorage can be had 300 to 500 yards west-northwestward from the wharf in 10 to 15 fathoms (18.3 to 27.4 m.).

Chicken Island, 3½ miles southward from Point Grace, is the northern one of two small wooded islands, 2½ miles apart, on the east side of Latouche Passage. It is separated from Latouche Island by a pass 350 yards wide with a depth of 4 feet (1.2 m.). A rock with 15 feet (4.6 m.) over it lies 300 yards off the point on the eastern shore ⅝ mile northward from Chicken Island.

Horseshoe Bay is on the west side of Latouche Island, 4½ miles southward of Point Grace. Its southern half is shoal; small craft or a very small vessel, entering close to the north point of the bay, can anchor in its north end in 18 to 20 feet (5.5 to 6.1 m.) of water. Just northward of the south point of the bay is a rock, covered at high water. Vessels can anchor about ¼ mile off the entrance, in 16 to 18 fathoms (29.3 to 33 m.).

From a little southward of Horseshoe Bay to the southern island in Latouche Passage the eastern side has broken ground and kelp in places, and should be given a berth of ⅜ mile. The passage eastward of the southern island is ¼ mile wide, with much kelp, and should be avoided by vessels.

On the west side of Latouche Passage is a long bay separated from Elrington Passage by several high, wooded islands. The bay has deep water but is not thoroughly developed. At the southwest end of the bay is a cascade, which shows from Latouche Passage.

Elrington Passage, on the west side of Elrington Island, is 8 miles long, ½ to 1 mile wide, deep and clear. Anchorage is not easily found on account of the great depths.

A grass-covered rock, about 10 feet (3.0 m.) high and with some brush on its summit, lies close to the west side of Elrington Island 4 miles from its north end.

In the southeast angle of the passage 1⅜ miles southward of this rock there is anchorage in 5 to 20 fathoms (9.1 to 37 m.), muddy bottom, depending on the swinging room required.

An island ⅝ mile in diameter and 500 feet (152 m.) high lies in the bend at the south end of the passage close to Elrington Island,

from which its southeast point is separated by a narrow pass dry at low water.

A pyramidal, pinnacle rock, about 8 feet (2.4 m.) high and with grass on top, lies about 250 yards off the north point at the southwest entrance of Elrington Passage.

Evans Bay (Sawmill Bay) is a large open bay on the east side of Evans Island near the northern entrance to Elrington Passage. Considerable development has taken place in this bay, there now being five docks in use by the various cannery and mill companies, including one oil dock of the Standard Oil Co.

This bay is unsurveyed and care should be exercised pending surveys. Vessels now using the bay steer mid-channel courses and proceed with caution. Entrance is made by the channel northward of Bettles Island, or by that westward of the 166-foot (51 m.) island on which the light is located.

Port Ashton is in the southwestern part of Evans Bay. The dock has a 200-foot face with ample depths alongside. The oil dock has 25 feet (7.6 m.) alongside. All kinds of launch fuels and lubricating oils may be obtained, but neither fuel oil nor Diesel oil are obtainable. An abundance of fresh water is available.

Crab Bay is a small indentation on the north shore of the bay just inside the northern entrance point. The wharf is just inside the western entrance point to Crab Bay, and should be approached for a port landing. There are two sunken rocks directly off the wharf. These rocks are marked by a buoy and care should be taken to avoid them.

There is little or no **current** in Evans Bay and the docks (except as above mentioned) are easily approached.

Procession Rocks, near the south end of Bainbridge Island, 3¼ miles westward of the southwest entrance of Elrington Passage, are a good mark. They are a small cluster of rugged rocks, the three largest about 35 feet (10.7 m.) high.

Elrington Island, which divides Latouche Passage from Elrington Passage, is 10 miles long, about 1 mile wide, and has a greatest elevation of 1,967 feet (599 m.). The general tree line is about 500 feet (152 m.) high, and the higher peaks are precipitous and bare. The southwest end of the island is 2½ miles across in a northerly and southerly direction and is formed by three high, prominent points with two long bays between. Both bays are clear and afford anchorage. The southern one has the best shelter, with depths from 17 to 20 fathoms (31 to 37 m.), but is exposed to southwesterly and westerly winds.

Point Elrington, the southwest end of Elrington Island, is a small hill, 515 feet (157 m.) high and wooded, with cliffs at the water, and is joined to the island by a sand and gravel neck just above high water. A hill, 1,050 feet (320 m.) high, lying 1⅜ miles eastward of the point, has a low divide about 100 feet (30 m.) high at its east end. It is marked at its westerly end by Point Elrington Light.

The north point at the southwest end of Elrington Island is a hill 1,116 feet (340 m.) high and 1⅜ miles long. At its southeast end it is connected with the island by a long, low, wooded neck.

DIRECTIONS, LATOUCHE AND ELRINGTON PASSAGES

To go through Latouche Passage.—From a position ¾ to 1 mile eastward of Point Helen Light steer 230° true (SSW. mag.) for 5 miles to a position with Point Grace on the port beam distant ¾ to 1 mile. Then steer 221° true (S. by W. ⅛ W. mag.) for 6 miles to a mid-channel position abreast the southern island in Latouche Passage. Then steer 207° true (S. mag.) for 2 miles, following the western shore at a distance of about ⅜ mile. Then bring the southern island in Latouche Passage open half its width westward of Chicken Island, and steer out of the passage on this line, course 220° true (S. by W. ⅛ W. mag.) for about 4 miles, which leads in the deepest water, about 11 fathoms (20.1 m.), over the bar between Danger and Elrington islands.

To go through Elrington Passage.—From a position ¾ to 1 mile eastward of Point Helen Light steer 230° true (SSW. mag.) for 9¼ miles, passing about ¾ mile off the western shore of Latouche Island and to a position ⅜ mile eastward of Bettles Island. When Elrington Passage Light opens southward of Bettles Island, change course gradually to about 263° true (SW. by W. mag.) and pass in mid-channel between Bettles Island and the north end of Elrington Island.

When ¼ mile westward of Elrington Island steer 219° true (S. by W. mag.) in mid-channel for 4¼ miles, with Elrington Passage Light astern. When **Lonetree Point** Light opens from the south end of Evans Island, haul gradually westward, pass in mid-channel southward of Evans Island, steer 286° true (W. by S. mag.), and pass about ⅜ mile northward of Lonetree Point Light. Round the south point at the entrance at a distance of about ½ mile and steer 229° true (S. by W. ⅞ W. mag.) about 8 miles to a position 3 miles 168° true (SE. ½ S. mag.) from Cape Puget. From this position the courses and distances to Resurrection Bay and Seal Rocks are given on page 16.

PRINCE OF WALES PASSAGE.

between Evans and Bainbridge Islands, is between 10 and 11 miles long and from ½ to 2 miles wide. It offers a direct route for vessels from northward in Knight Island Passage bound southwestward along the coast; otherwise Elrington Passage is more direct and is generally used.

Prince of Wales Passage has a number of dangers and other broken ground, but no trouble should be had in going through it in daylight and clear weather, with the aid of chart 8523. The principal channel is eastward of Flemming Island, and then westward of the group of bare rocks lying 1½ miles south-southeastward of Flemming Island. When passing the broken ground lying 4 miles southward of Flemming Island, follow the western shore at a distance of 300 to 500 yards, heading for the prominent low, sandy point, with a fringe of trees, lying on the west side 3 miles farther southward.

Prince of Wales Passage has no **anchorage** for vessels. Small craft can find shelter at the head of the unnamed bay 1½ miles southeastward of Flemming Island; in the lagoon on the east side

nearly 3 miles southward of Flemming Island, and in the coves on the east side 6 and 8 miles southward of Flemming Island. Considerable swell makes into the last-named cove during southerly winds.

Flemming Island, over 2 miles long and 845 feet (258 m.) high, lies in the northern end of the passage. The channel westward of Flemming Islands has considerable foul ground, and should be avoided by strangers, except possibly small craft, at low water, and proceeding with caution.

The wooded island, with a group of partly bare rocks off its south side, which lies in Knight Island Passage ½ mile northward of Flemming Island, is a good mark for the north entrance of Prince of Wales Passage.

Ship Islet, with a few trees, is the southerly one of two on the easterly side of Flemming Island. A reef bare at low water extends 225 yards southeastward from it.

A group of bare rocks, highest about 3 feet (0.9 m.), lies ⅜ to ½ mile from the eastern shore and 1½ miles south-southeastward of Flemming Island.

About 1 mile south-southeastward of these rocks is a lagoon with a narrow entrance almost closed with rocks. It is a secure harbor for small, light-draft craft, in about 8 fathoms (14.6 m.), but the entrance requires local knowledge.

There are several wooded islands on the east side of the passage from 3 to 5 miles southward of Flemming Island. The area between them and Evans Island is foul, and the tidal currents have a velocity of 2 to 3 knots.

Nearly in mid-channel westward of the middle of these islands is an area of broken ground nearly ½ mile long on which the least depth found is 11 fathoms (20.1 m.). It should be avoided by vessels, the better channel following the western shore.

The broken area with depths less than 15 fathoms (27.4 m.), lying 1 mile farther southward, which extends ¼ mile from the western shore, should be avoided by vessels.

Currents.—With the large tides the tidal currents have a velocity of 2 to 3 knots at strength among the islands and in the narrower parts of the passage. In the passage between Flemming and Evans Islands the tidal currents have a velocity of 1½ to 2 knots at strength. The flood current sets northward and ebb southward through the passage.

KENAI PENINSULA, SOUTH COAST

CAPE PUGET TO CAPE RESURRECTION

This coast is high and rugged, with numerous glaciers showing in the valleys. The prominent headlands are fairly well located, but the bays are sketched and no information about them is available. There are no outlying dangers along the coast so far as known.

Cape Puget is a high, sloping headland, and there are several bare rocks off it, the farthest about ⅜ mile. Rocks about 30 feet (9.1 m.) high lie off its eastern side well northward of the cape. From alongshore eastward or westward the cape shows a wooded peak at the end, with a large conical rock in the water close to its foot.

Cape Junken is high and has two steps near the water at its end as seen from alongshore.

Cape Fairfield, on the west side of Johnstone Bay is a high, sloping headland, with an immense pinnacle shaped like a shark's tooth at its foot. As seen from southwestward there are two smaller pinnacles on either side of it.

There is a large glacier at the head of the eastern arm of Day Harbor.

Cape Resurrection is a precipitous headland of solid rock, with little vegetation except some trees on the lower slopes. From eastward two dome-shaped peaks, the north one the higher, with a slight notch between them, show at the end of the cape, with a somewhat lower ridge back of them, but rising to higher mountains farther north. **Barwell Island,** 3/8 mile southeastward of Cape Resurrection, is small, bare, rounded, precipitous, and 475 feet (145 m.) high. A gas and whistling buoy is located 1/4 miles southward of Barwell Island.

RESURRECTION BAY

(chart 8538) is about 16 miles long from Cape Resurrection. The depths are great throughout, and there are no dangers in the usual track of vessels. A flat extends 1/2 to 5/8 mile from the entire northern shore at the head of the bay. The shores and islands are steep and high, with precipitous slopes in many places. The valleys are wooded up to an elevation of about 1,000 feet (305 m.). The anchorages are few and indifferent on account of the great depths, and are subject to heavy williwaws.

Harding Gateway is the name given to the southern entrance to Resurrection Bay, or that part of the entrance between Cheval and Rugged Islands.

Seal Rocks, the southernmost point in the approach to the bay, are a group of four small, rocky islets. The northernmost and largest is 285 feet (87 m.) high and has an arch through the middle. The following are bearings and distances from Seal Rocks:

Cape Puget, 55° true (NNE. 1/2 E. mag.), 44 miles.
Point Elrington, 59° true (NNE. 7/8 E. mag.), 49 miles.
Danger Island, 63° true (NE. 7/8 N. mag.), 53 miles.
Cape Cleare, 75° true (NE. 1/4 E. mag.), 55 miles.
Marmot Island (southeast point), 220° true (S. by W. 1/4 W. mag.), 105 miles.
Pye Island Reef, 243° true (SW. 5/8 S. mag.), 27 miles.

Seal Rock Light is a flashing white light located on the summit of the largest island in the group.

Lone Rock stands well southwestward of Chiswell Islands and is a good mark. It is a round rock, 154 feet (47 m.) high, and there is a rock covered at high water about 1/4 mile northward of it. The passage between Seal Rocks and Lone Rock is clear and is frequently used by vessels between Resurrection Bay and the coast southwestward.

Chiswell Islands are a group of numerous, high, precipitous, rocky islands, the southeasterly ones of those lying in the entrance of Aialik Bay. The islands are sparsely wooded, most of them

having off-lying rocks, and there are strong tidal currents between them.

Pilot Rock, lying 1¼ miles from the nearest point on the western shore of Resurrection Bay, is a bare, rounded, rocky islet about 100 feet (30 m.) high, and is marked by a light.

Bear Glacier, large and prominent, is on the western shore westward of Cape Resurrection. It is not discharging.

Toward the eastern shore in the entrance of Resurrection Bay are three large, high, rugged islands, named in order from southward **Rugged, Hive,** and **Renard.** The passages through the islands are deep. Their shores are generally bold, but two rocks bare at low water lie 200 yards southward from the southeast end of Renard Island. Hive Island is marked by a flashing white light 80 feet (24.4 m.) high located on its northern side.

Sunny Cove, the southern bight on the west side of Renard Island, is the best anchorage in Resurrection Bay. No ocean swell makes into the cove, and it is sheltered from all but westerly winds. The williwaws are bad with easterly winds. The cove is ⅜ to ½ mile wide and clear. The anchorage is in the middle, 300 to 800 yards from its head, in 15 to 25 fathoms (27.4 to 46 m.), muddy bottom.

Small craft can anchor in the southeast arm of the bight on the eastern shore 1½ miles northward of Renard Island.

Caine Head is the projecting and prominent, precipitous, high headland on the western shore 2¾ miles above Renard Island. It is marked by a light.

Thumb Cove, on the eastern shore northeastward from Caine Head, is ¾ mile wide and 1½ miles long. Anchorage can be selected ⅜ to ½ mile from its head, in 25 to 30 fathoms (46 to 55 m.), soft bottom. A flat makes out 200 to 300 yards from the northern shore for a distance of ⅜ mile from its head.

Seward is the southern terminus of the Government-owned Alaska Railroad. There are well-stocked stores and hotels, and provisions and supplies of most kinds can be obtained.

There are three wharves in Seward, the largest of which, the railroad wharf, has a frontage of 600 feet and a depth alongside of 42 feet (12.8 m.). This wharf has rail connections. With strong southeast winds vessels can not lie at this wharf as it is exposed to the sweep of the bay. There is a plentiful supply of good water on the dock.

Supplies.—There is a fuel-oil station with 10,000 to 15,000 barrels capacity. The oil wharf has a 100-foot face and 32 feet (9.8 m.) of water alongside. Dolphins are driven on each side of the dock and large tankers discharge fuel oil.

Diesel fuel oil, gasoline and distillate, and lubricating oil can be obtained.

Coal in small amounts may be obtained. Coal in any quantity can be brought in from the mines with about two days' notice.

Repairs.—Machine shops are available and a limited amount of repairing can be done.

Communication.—There is cable communication with other Alaskan ports and Seattle, and telegraphic communication via the

Photo by Schallerer's Alaska Shop, Seward, Alaska.

Seward, Alaska.

railroad to Fairbanks. It is a port of call for the regular coasting steamers from Seattle and has good service the year around.

The railroad extends to Fairbanks in the interior and service is maintained throughout the year. This railroad taps coal fields and mineral areas. There is a naval radio station, call letters NPV.

Hospitals.—There is a private hospital where marine cases are cared for.

Anchorage.—Due to the great depths, there are no good anchorages off Seward. Vessels may anchor close in about ½ mile northward of the railroad wharf in 20 fathoms (37 m.), soft bottom, with scant swinging room. This anchorage is exposed to southeast winds, and with offshore winds vessels are apt to drag off into deep water on account of the steep pitch of the bottom. The edge of the flats at the head of the bay is marked by a nun buoy placed in 10 fathoms (18.3 m.) of water.

There are depths of 20 to 30 fathoms (37 to 55 m.) in the bight between Lowell Point and Tonsina Creek, except near the point, where the depths are greater.

Seward is the headquarters of a large fishing fleet and there is a cold storage plant for handling the catch which consists mostly of halibut from the offshore banks.

Tides.—At Seward high and low water occur about 45 minutes earlier than at Kodiak, and the mean rise and fall of the tides is about 8½ feet (2.4 m.). To find the height of the tide multiply the height of the corresponding tide at Kodiak by the ratio of ranges, 1.2.

DIRECTIONS, RESURRECTION BAY

From eastward.—From a position 1 mile 173° true (SE. by S. mag.) from Barwell Island steer 319° true (WNW. mag.) for 5 miles, passing ½ mile southwestward of Barwell Island and midway between Hive and Renard Islands. When ½ mile off the southwest end of Renard Island steer 4° true (NNW. mag.) for 5½ miles to a position ½ mile off the northeast side of Caine Head. From this position a 342° true (NW. mag.) course for 6¾ miles will lead to Seward.

From southward.—Seal Rocks, marked by a light, are high, have deep water around them, and are the best mark for which to shape the course. See also the remarks under Aialik Bay relating to the route occasionally used by small vessels passing northward of the islands in its entrance.

Pass about 2 miles eastward of Seal Rocks and steer 15° true (N. by W. mag.) for 14 miles, passing about 1½ miles eastward of Chiswell Islands and to a position 1 mile eastward of Pilot Rock Light. Then steer 2° true (NNW. ¼ W. mag.) for 6¾ miles to a position ½ mile off the southwest point of Rugged Island. Then steer 13° true (N. by W. ¼ W. mag.) for 8½ miles to a position ½ mile off the northeast side of Caine Head. From this position a 342° true (NW. mag.) course for 6¾ miles will lead to Seward.

Or, for vessels going inside of Seal Rocks, pass 1 to 1½ miles northwestward of Seal Rocks and steer 56° true (NNE. ⅝ E. mag.) for 4½ miles until the easternmost of the Chiswell Islands bears on

the port beam distant 1½ to 2 miles. Then steer 15° true (N. by W. mag.) for 10 miles to a position 1 mile eastward of Pilot Rock, as in the preceding paragraph.

AIALIK BAY

is 16 miles long from the north end of Harbor Island. It is inclosed by rugged mountains and glaciers and is of no importance except occasionally as an anchorage. The shores are steep and high, with precipitous slopes in many places, and are partly wooded in the southern part of the bay to an elevation of about 1,000 feet (305 m.). The northern part of the bay is covered with alders in places.

Aialik Bay has deep water with the exception of rocks near the shores, and a bar which crosses the bay from the glacial flat fronting Pederson Glacier. The least depth found on this bar near the middle of the bay is 18 feet (5.5 m.), but it and the broken ground near the shores at the entrance of Holgate Arm are liable to have bowlders and less water than charted. As a measure of caution vessels should avoid the passages among the islands in the mouth of the bay.

To take advantage of smoother water, small vessels in coasting southwestward from Resurrection Bay, and the reverse, sometimes enter the bay at **Aialik Cape,** pass south of Chat Island, round the north end of Harbor Island, and pass out at Granite Cape. From a position 1 mile east-southeastward of Granite Cape a 226° true (S. by W. ¾ W. mag.) course for 26 miles will lead to a position 3½ miles 155° true (SE. ½ E. mag.) from the peak of the outer Pye Island.

Chat Island is a steep, rocky, wooded island, 470 feet (143 m.) high; two conspicuous pinnacles lie close to its south shore. Between it and Aialik Cape are a smaller island and a number of rocks.

Harbor Island is the largest of a group of high, precipitous, rocky, partly wooded islands, lying in the mouth of the bay and northwest of Chiswell Islands. The shore in many places is a sheer cliff, especially the east shore of the eastern and highest island. Lying midway in the channel between the northern, beehive-shaped Chiswell Island and the small island at the southeast end of the Harbor Island group is a rock which is bare at lowest tides.

Granite Island is a partially wooded, steep, precipitous island, 1,570 feet (479 m.) high. **Granite Cape** forms the southern end.

Between Granite Cape and the main shore are two small wooded islands about 200 feet (61 m.) high with a rock about 10 feet (3 m.) high between them.

Twin Islands resemble each other in contour and are 400 and 550 feet (122 and 168 m.) high. They are wooded, and the arch off the south end of the northern island is conspicuous.

Anchorages.—The anchorages are few and indifferent due to the great depth. With southerly weather a swell makes well into the bay.

The best anchorage is near the head of the middle arm of the three-arm bay on the east side of Aialik Bay, about 3 miles north of Harbor Island, in 30 fathoms (55 m.), good holding bottom.

Anchorage can be had in the cove on the west side of the bay, westward (true) of the north end of Harbor Island. The anchorage is in 28 fathoms (51 m.) near the center of the cove. On each side

of the entrance to this cove is a sharp, conical, wooded hill about 800 feet (244 m.) high. Close inshore off the point at the north entrance is a sharp pinnacle rock about 25 feet (7.6 m.) high; about 600 yards northeastward of this pinnacle is a rock which covers at about half tide.

There is fair anchorage off the small bight which lies on the east side 1¼ miles southward of the bar crossing the bay. Anchor in 22 to 25 fathoms (40 to 46 m.) off the middle of the bight and a little outside of the line joining the two points forming the bight. The bight may be recognized by a hanging glacier at its head.

Ice.—There are discharging glaciers at the head of Aialik Bay and Holgate Arm, and ice is frequently driven to Harbor Island by northerly winds. Holgate Arm and the entire bay above the bar are frequently filled with ice.

NUKA BAY

lies between Pye Islands and Nuka Island; the outer part is about 8 miles long and 5 miles wide, and there are two main arms at its head. There are several bays and coves affording anchorage. The bay is not surveyed, but soundings through the middle indicate very deep water, as shown on the chart.

Pye Islands, on the east side at the entrance of Nuka Bay, are three rugged, mountainous islands having a total length of 7½ miles. The highest peak of the outer island is near its eastern end, and is a good mark. Approaching from northeastward the break between the outer and second islands shows well. From southwestward the separate islands do not show, but at the eastern end is seen the highest peak, from which there is a slope to a high shelf at the water. There are breakers in places along the eastern side of the islands, the southernmost lying ⅜ or ½ mile eastward from the eastern end of the outer island.

Pye Island Reef, awash or barely covered at high water, lies 2⅜ miles 206° true (S. mag.) from the peak of the outer Pye Island. There is always a break on the reef, but at high water with an exceptionally smooth sea there may be some interval between them. Depths of 18 to 60 fathoms (33 to 146 m.) were found about midway between it and the island. The line of the western ends of the outer and second islands leads a little westward of the reef, and the line of the eastern ends of the outer and third islands leads well eastward of it.

The channel between the second and third Pye Islands has a kelp patch in its western entrance a little southward of mid-channel, and the eastern entrance is obstructed by breakers.

McArthur Pass, between the third Pye Island and the mainland, is about 100 yards wide in its narrowest part for a distance of about 200 yards. A least depth of 7 fathoms (12.8 m.) was found in mid-channel, and the tidal current had a velocity of 4 to 5 knots southwestward through the pass near the time of low water. It is not recommended except for small vessels at slack water.

The **east arm of Nuka Bay** lies at the western entrance of McArthur pass. It is about 2 miles wide at the entrance and 5 miles long. A large glacier comes down to high-water mark at its head,

and frequently discharges some ice. No bottom at 20 fathoms (37 m.) was found through the middle, and no bottom at 35 fathoms (64 m.) was found about 100 yards or less from the bare spit at the foot of the glacier. Indifferent anchorage in 25 fathoms (46 m.) was found near the northern shore of the first cove northward of McArthur Pass on the east side of the arm.

Nuka Island, on the western side of Nuka Bay, is mountainous and about 8 miles long. At its southern end are two points; the southern one has the appearance of a large, high island, its outline being an arc of a circle, and is distinctive; the northwestern one is a high peak with a fairly regular slope to the water. Bare rocks show in the bight between these points and off the entrance. No information is available for Nuka Island Passage, westward of the island, and the eastern shore of the island should be given a good berth.

Palisade Bay, on the east side of the west arm of Nuka Bay, 9½ miles above outer Pye Island, will be known by a high, wooded island on the south side in its entrance. Anchorage can be had on the northeast side of the island, about on a line from its north end to the point on the main shore, in 14 to 20 fathoms (25.6 to 37 m.). The cove on the southwest side of the island is foul.

Palisade Bay is about 3 miles long. Anchorage can be had about ⅓ mile from the narrow part at its head, in 17 fathoms (31 m.), with ample swinging room. From the top of an adjacent mountain a sunken rock was seen between this anchorage and the northeast shore, but a search in a boat did not find it.

Cabin Bay, on the west side, opposite Palisade Bay, is about 2½ miles long. No bottom at 20 fathoms (37 m.) was found through the middle of the bay. A very small vessel anchored at its head in 13 fathoms (23.8 m.). From the prominent point on the west shore southward of Cabin Bay a reef makes out about ¼ mile.

Rock Bay, on the east side of the west arm, 11½ miles above outer Pye Island, will be known by a cluster of wooded islets and bare rocks on the south side at its entrance. From the islets to the north point at the entrance is a bank, on which there is kelp for about 150 yards from the islets, and a reef extending one-third the distance across from the point. Entering in mid-channel or slightly favoring the islets, a depth of 9 fathoms (16.5 m.) will be found over the bank. Anchorage can be had toward the eastern shore in 14 fathoms (25.6 m.). The course in is about 121° true (E. ½ S. mag.).

Shelter Cove, on the west side, 13½ miles above outer Pye Island, lies 236° true (SSW. ¾ W. mag.) from the point dividing the north and west branches at the head of the west arm. The cove is small, but affords anchorage in the middle of its entrance, in 13 fathoms (23.8 m.), with ample swinging room. At the head of the cove is a grassy flat, in front of which is a good sized mud flat that covers.

The point dividing the north and west branches at the head of the west arm has a small cluster of grass-covered rocks and wooded islets close-to.

The west branch is 1½ miles long, with deep water to the large mud flat at its head.

The north branch is 5 miles long in a 31° true (N. ½ E. mag.) direction and nearly 2 miles wide at the entrance, and has a depth of about 77 fathoms (141 m.) through the middle until abreast Pilot Harbor. There is a depth of 18 fathoms (33 m.) less than 50 yards from the low-water edge of the flat at its head. **Pilot Harbor,** on the eastern side of the north branch, 1 mile from its head, is a short bay having a 93° true (ENE. mag.) direction. There is a large bare rock, about 3 feet (0.9 m.) high, off each point at the entrance. Entering in mid-channel, a secure anchorage will be found in the middle, or slightly favoring the south side, in 13 to 15 fathoms (23.8 to 27.4 m.). There is a flat at the head, on the low-water edge of which is a wooded islet, lying about ¼ mile above the bare rock off the north point at the entrance.

POINT GORE

is a prominent headland lying 18 miles 247° true (SW. ¼ S. mag.) from Pye Island Reef and 16 miles 70° true (NE. mag.) from the southeast end of East Chugach Island. From eastward and westward it shows as an island with a high peak near the middle and a broad, high shoulder at the ends, and separated from the high land northward by a narrow gap. There is an arch in the rocks at the eastern end of Point Gore, which shows over a small arc from southward, and a folding in the strata in the face of the cliff on the south side of the point.

The neck joining Point Gore to the mainland is low and wooded. Anchorage with shelter from southwest winds is reported toward the northwest shore off the east side of this neck in about 17 fathoms (31 m.), but no description or definite information as to its exact location in available. It is wide open to all easterly winds, and vessels must be prepared to leave immediately when the swell begins to make around the point to the anchorage.

On the west side of the neck back of Point Gore is a cove affording indifferent anchorage with easterly winds. The south point of the cove is the northwest end of Point Gore, and is a shelving ridge of bare rock, from the end of which rocks, bare at low water, and kelp extend about 200 yards northwestward. A rock covered at high water lies about 100 yards from the cliff at the southeast end of the cove, and a large kelp field extends about 200 yards northwestward from the rock. The anchorage is in 18 to 25 fathoms (33 to 46 m.), soft bottom, 250 to 300 yards from the beach of the low neck and from the edge of the kelp off the rock, and about ¼ mile from the cliff on the southern side. The water deepens rapidly northwestward, the swinging room is scant, and the anchorage is uneasy.

To enter, round the south point of the cove at a distance of ½ mile and steer 115° true (E. mag.) for the gap in the trees, or lowest part of the neck.

PORT DICK

(chart 8554), on the west side of Point Gore, is about 2½ miles wide at the entrance and has a 357° true (NNW. ½ W. mag.) direction to the glacier at its head. From the western side West Arm extends westward about 6½ miles. The port is not surveyed; the depths in

the middle are over 100 fathoms (183 m.) until well toward the head of West Arm.

Sunday Harbor, on the east side, opposite the entrance of West Arm, is a small, double-headed bay, with anchorage for vessels of any size in its southeastern cove. The southern point at the entrance has a few rocks close-to, and a reef marked by kelp extends westward from it. The western end of the reef is a very dangerous sunken rock, barely covered at low water, lying about ⅜ mile 295° true (W. mag.) from the point.

To enter Sunday Harbor, stand up the middle of the port on a 357° true (NNW. ½ W. mag.) course, heading for the glacier at the head until off the entrance of the harbor. Enter the harbor on a 90° true (NE. by E. ¾ E. mag.) course, with the head of the harbor ahead and a high wooded islet on the southern side of West Arm astern. Anchor with the southwest point at the entrance to Port Dick open from the southeast point of the harbor, in 12 to 15 fathoms (21.9 to 27.4 m.). There are a number of high-water islets at the head of the harbor.

The arm of Sunday Harbor northwest of the anchorage has a large grass-covered rock in its entrance.

West Arm of Port Dick is about 1 mile wide at the entrance, and extends 295° true (W. mag.) for 2½ miles to the narrowest part of the arm, and then 291° true (W. ⅜ S. mag.) about 3¾ miles, where there is anchorage in 13 to 15 fathoms (23.8 to 27.4 m.) below the rocky islet, with a few trees on top, which lies near the southern shore. The flat at the head extends below the houses on the north side, and vessels can not go above the islet. There is a cascade inside the islet.

There is a bare reef close to the south point at the entrance to West Arm, and a high wooded islet lies on the south side, about ¾ mile inside the entrance of the arm.

On the north side of West Arm is a bay with an island in it. Anchorage is reported in the bay eastward of the island.

Taylor Bay, the north arm of Port Dick, is reported to be foul.

In the southwest approach to Port Dick there is a dangerous sunken rock, locally called **Gore Rock,** having 8 feet (2.4 m.) at mean lower low water, lying 7½ miles 244° true (SW. ½ S. mag.) from Point Gore and 8½ miles 74° true (NE. ⅜ E. mag.) from the southeast point of East Chugach Island. It lies about ¾ mile outside the line between these points and approximately 3½ miles from shore.

CHUGACH ISLANDS

are three large, mountainous islands, named in order from eastward—East Chugach, Pearl, and Elizabeth Islands, near the coast of Kenai Peninsula at the entrance of Cook Inlet.

East Chugach Island is about 3¾ miles long and mountainous, and has a low valley through the middle in a northeasterly and southwesterly direction. The south peak has an elevation of 1,451 feet (442 m.), and the peak near the west end is higher. The southeast point of the island is a cliff with a peak at its crest and slightly lower land back of it before rising to the mountains. There is a

flashing white light on this point. The northwest point of the island is a low wooded point or spit. There is considerable foul ground between the island and the coast. The passage between East Chugach and Pearl Islands is clear and is used by vessels passing inside of Pearl and Elizabeth Islands.

Pearl Island is about 2½ miles long and 1¾ miles wide. It is mountainous, with elevations up to 1,742 feet (531 m.), but its northwest part is much lower. Its northwest point is a sand spit on the west side and a high cliff on the north side. High bare rocks extend ½ to ¾ mile off the middle of the south side of the island. There is a flashing white light on the extreme northeastern point of Pearl Island.

Nagahut Rocks are three large, prominent, bare rocks, close together and connected at low water, lying 1½ miles southwestward from the southwest end of Pearl Island, with foul ground and no safe passage between.

Dora Reef is a small patch of sunken rocks, on which the sea breaks at low water with a moderate sea, lying 1¼ miles 238° true (SW. by S. mag.) from Nagahut Rocks. It is steep-to.

There is deep water in the passage between Nagahut Rocks and Dora Reef on the southeast and Elizabeth Island on the northwest, but a depth of 6 fathoms (11 m.) was found ½ mile eastward from the rock or islet close to the southeast end of Elizabeth Island, and 4 fathoms (7.3 m.) 1 mile westward of the west end of Pearl Island.

A reef, bare at low water, makes out about ⅝ mile from the eastern side of the prominent point on the north shore between Pearl and Elizabeth Islands. On the northeast part of the reef, about one-third the distance from the shore to its end, is a bare ledge that always shows above water. The outer rock that shows at low water lies about ⅞ mile 130° true (ESE. ⅝ E. mag.) from the point and about 1⅛ miles 333° true (NW. ⅝ W. mag.) from the northwest end of Pearl Island. This is the worst danger in the passage inside of Pearl and Elizabeth Islands.

Elizabeth Island is about 3 miles in diameter and is two mountain masses, with elevations up to 1,656 feet (504 m.), and a low valley between them extending through in a northwesterly direction. The northeast point of the island is a sand spit, awash at high water. There is a prominent, large, bare rock close to the north shore of Elizabeth Island about ⅜ mile westward of the sand spit. Southward of the rock, kelp makes out about 350 yards from Elizabeth Island. **Cape Elizabeth** is the western end of the island.

There is a flashing white light located on the extreme northeast part of the island. This light marks the channel between the island and the mainland.

The passage inside Pearl and Elizabeth Islands is commonly used by vessels entering Cook Inlet from eastward. It is about 1 mile wide, and depths of 9 to 10 fathoms (16.5 to 18.3 m.) were found in the shoalest part of the channel between the southeast end of Elizabeth Island and the dangerous reef extending from the north shore. The end of this reef is marked by a red nun buoy.

There are strong **tidal currents** in the passage on either side of Elizabeth Island, and heavy tide rips occur from the northwest end of Pearl Island to the western end of the passage. The heaviest rips

are in the vicinity of Pearl Island, with an ebb current and easterly wind. Heavy rips also occur off the southeast point of East Chugach Island. The turn of the current occurs later, possibly as much as one hour, in the passage than in the main entrance south of Elizabeth Island.

DIRECTIONS, INSIDE PEARL AND ELIZABETH ISLANDS

From a position 1 mile south-southeastward from the southeast point of East Chugach Island, steer 293° true (W. ⅛ S. mag.) for 8 miles to a position ½ mile off the high north point of Pearl Island. Then steer 275° true (WSW. ¼ W. mag.), heading for the high south peak of Elizabeth Island. When Nagahut Rocks bear 180° true (SSE. ¼ E. mag.), steer 347° true (NW. ⅝ N. mag.), heading for the prominent white scar in the cliffs on the north shore of the approach to Port Chatham, and pass about mid-channel between the shores of Elizabeth Island and the mainland.

When the large bare rock close to the north shore of Elizabeth Island is abeam, and is closed with the north shore of Elizabeth Island west of it, steer 284° true (W. by S. mag.) for about 4½ miles, with the middle one of the three highest peaks on the eastern shore astern, and pass ⅜ mile northward of the rock and over 1 mile southward of the yellow bluff at the east entrance point of Koyuktolik Bay.

Then steer 307° true (WNW. ⅞ W. mag.) with the sharp southwest peak of Pearl Island showing over the middle of the low valley in Elizabeth Island astern, and pass 1½ miles southwestward of Point Adam.

DIRECTIONS, POINT GORE INSIDE EAST CHUGACH ISLAND

This area was partly surveyed in 1915. The results of this survey indicate the existence of a good channel inside East Chugach Island, with least depths of about 12 fathoms (21.9 m.) off the north spit, and depths of 20 to 80 fathoms (37 to 146 m.) eastward of the island.

On the other hand, the depths found were very irregular, and a more detailed examination might reveal shoaler areas than those already found. The region is one which should not be considered free from danger until it has been dragged.

A kite, set to depths of 12 fathoms (21.9 m.) from Elizabeth Island to the spit of East Chugach Island, and 15 to 20 fathoms (27.4 to 37 m.) in the deeper water eastward, was towed over the track here recommended. In using the passage, therefore, vessels are advised to follow this track closely, as elsewhere there is not, as yet, adequate assurance that the passage is free from dangers.

From a position 1⅝ miles off Point Gore, steer 265° true (SW. by W. ⅜ W. mag.) with the end of the sand spit on the northwest end of East Chugach Island right ahead, and in range with the south shore of Elizabeth Island. This course passes midway between Gore Rock and another rock, bare at low water, which lies 2⅜ miles 352° true (NNW. ⅞ W. mag.) from Gore Rock. Hold this course for 12 miles, until the southeast end of East Chugach Island bears 220° true (S. by W. ⅜ W. mag.), then steer 283° true (W. by S. mag.) for 4½

miles for the head of Chugach Bay, passing 1¾ miles off the northeast point of East Chugach Island.

When the end of the spit on the northwest end of the island bears 211° true (S. ½ W. mag.) haul sharply to a 236° true (SSW. ¾ W. mag.) course, heading midway between the two peaks of Pearl Island, and pass in mid-channel between the end of the spit and the bare reef off the south point of Chugach Bay. At the above change in course the reef on the north shore of East Chugach Island just eastward of the end of the spit should be abeam and in range with the high western peak of the island. Hold this course for 2.9 miles, until the rock off the south point of Chugach Bay bears 9° true (N. by W. ⅜ W. mag.), and then steer 264° true (SW. by W. ¼ W. mag.) for 3¼ miles, heading for the rocks off the south shore of Elizabeth Island, to a point ½ mile off the high north point of Pearl Island. Then proceed as directed for the passage inside Pearl and Elizabeth Islands, page 79.

In following the above courses, care should be taken to make proper allowance for the **currents** which set in and out of Port Dick, and diagonally across the course in approaching East Chugach Island. Because of these currents, the passage should not be attempted unless the weather is clear enough to permit the leading marks to be seen.

BARREN ISLANDS

are six, mountainous, grass-covered islands nearly in the middle of the entrance to Cook inlet between Chugach Islands and Shuyak Island, and are about 13 miles long and 5 miles wide. The best anchorages are Amatuli Cove and the northern bight in the western end at Ushagat Island. Some sounding has been done, and the dangers so far as known are mentioned.

The **tidal currents** have great velocity among and outside the islands, the flood current setting northwestward and being apparently stronger than the ebb. Heavy tide rips occur with strong winds in the vicinity of the islands, and during spring tides are frequently dangerous for small vessels.

East Amatuli Island, at the eastern end of the group, is about 2 miles long and has a high peak at either end joined by a sharp ridge, which at the head of Amatuli Cove is about 300 feet high. A rocky islet about 100 feet (30 m.) high lies 250 yards off its eastern end. This islet is marked by a flashing white unwatched light.

Amatuli Cove, on the northwest side of East Amatuli Island, is about ½ mile in diameter and a good anchorage for small vessels. With heavy northeast winds, considerable sea makes in to the anchorage unless well in the bight, but the wind is little felt. The anchorage is in the middle, abreast or inside the north point of the cove, in 6 to 11 fathoms (11 to 20.1 m.), mud and rock bottom. Scattered kelp grows in places in the cove, and along the shores there is thick kelp, which makes out farthest on the southeast side. There are no known dangers outside the thick kelp. There is a stream at the head of the cove.

Approaching from southward pass about ½ mile westward of Sugarloaf Island and in mid-channel between East and West Am-

atuli Islands, course about 38° true (N. by E. ¼ E. mag.). The least depth found was 7 fathoms (12.8 m.) when the southwest peak of East Amatuli bore about 103° true (E. by N. mag.).

Approaching Amatuli Cove from northward pass in mid-channel between East Amatuli Island and the bare rocks about 20 feet (6.1 m.) high lying ⅝ mile eastward from the northeast end of West Amatuli Island. The least depth found in this entrance was about 12 fathoms (21.9 m.).

West Amatuli Island is about 3 miles long and mountainous. A cluster of rocks about 20 feet (6.1 m.) high lies about ⅝ mile eastward from the northeast end of the island, with a reef between. A bare rock lies close to the northwest point of West Amatuli, and a dangerous rock, awash at low water and on which the sea generally breaks, lies about 1¼ miles 348° true (NW. ¾ N. mag.) from the same point and 3¼ miles 88° true (NE. by E. ⅝ E. mag.) from the summit of Nord Island.

Sugarloaf Island, 1⅛ miles southward of East Amatuli Island, is about ¾ mile in diameter and about 1,200 feet (366 m.) high. A large bare rock lies ⅜ mile southeastward of it, with foul ground and breakers between. There is also a rocky islet close to its eastern end, and breakers extend nearly ¼ mile off its western end.

Nord Island, 1¼ miles northward from the eastern end of Ushagat, with deep water between, is about ½ mile in diameter. Its southern half is a dome 570 feet (174 m.) high, while its northern half is lower and irregular.

Sud Island, 1⅛ miles off the southeast end of Ushagat, is 1⅛ miles long and about 1,200 feet (366 m.) high near its southwestern end. Near its northeastern end is a knob over 300 feet (91 m.) high.

A small rocky island over 200 feet (61 m.) high lies 1½ miles southeastward from the south end of Ushagat. A low rock and breakers lie 600 yards and two large bare rocks lie ¾ mile southward from it.

Ushagat Island, the westernmost and largest of the Barren Islands, is 6¾ miles long and 3½ miles wide near its western end. It is practically inaccessible except at the low neck near the northeast end and at several beaches fronting the valley in its northwest part. The southern part of the island is high, rocky peaks, with elevations up to 1,985 feet (606 m.). **Table Mountain,** at the northeast end, is 1,356 feet (416 m.) high, and is separated from the other high land of the island by a low, narrow neck. There are several fresh-water lakes.

Two rocks nearly awash at high water lie ⅜ mile northward from the northwest end of Ushagat.

A bare rock about 5 feet (1.5 m.) high lies ⅞ mile southwestward from the northwest end of Ushagat. A reef awash at half tide lies 250 yards northwestward from the bare rock. A bare reef, nearly awash at high water, lies ½ mile eastward from the bare rock and ⅜ mile 260° true (SW. by W. mag.) from the high bare rocks close to a point of Ushagat ⅜ mile southeastward of its northwest end.

The west side of Ushagat Island is indented about 1 mile by an open bay, about 2½ miles long, and having two bights. A good

anchorage for all easterly winds may be had in the bight at the north end of the bay. **To enter from westward,** give the northwest end of the island a berth of 1 mile and pass about ½ mile westward and southward of the bare rock lying ⅞ mile southwestward from the northwest end. Then steer 92° true (ENE. mag.) for Table Mountain and anchor about ⅜ mile from shore in 6 to 8 fathoms (11 to 14.6 m.), hard bottom. Kelp extends some distance off the point dividing the bights on the east side of the bay.

Bare rocks extend ⅜ mile southwestward from the southwest end of Ushagat Island.

COOK INLET

Surveys are available of all parts of Cook Inlet northward of Port Graham and Augustine Island, with the exception of parts of Turnagain Arm. The inlet is shown on charts 8502, 8553, and 8554, Knik Arm on chart 8557, Iliamna Bay on chart 8665, Port Chatham on chart 8588, and Port Graham and Seldovia Bay on chart 8589.

Prominent features.—The shore on both sides of the inlet can be seen in clear weather, but it is sometimes difficult to locate the position on account of the lack of marked features on the eastern shore and the currents are so strong that logged distances are deceptive. Augustine, Iliamna, and Redoubt Volcanoes are conspicuous and useful marks in the lower inlet, and Mounts Susitna and Spurr in the upper inlet. The numerous peaks of the high land southward of Kachemak Bay and northward fom Kamishak Bay, Anchor Point, the 1,900-foot (579 m.) hill lying 10 miles from the east shore between Capes Starichkof and Ninilchik, Chisik Island, Kalgin Island, East, West, and North Forelands, Point Possession, and Fire Island are prominent in their respective localities.

Dangers.—The shoals in Cook Inlet are generally strewn with bowlders, which lie on the otherwise flat bottom, give no indication to the lead unless it strikes them, and are not marked by kelp. Most of those located by the survey were found by sighting them at low water. Many of the bowlders are of sufficient size to show above low water in depths of 30 feet (9.1 m.). As a measure of caution, therefore, it is considered advisable for vessels to avoid areas having depths not more than 30 feet (9.1 m.) greater than the draft. At low water deep-draft vessels should avoid areas with a charted depth less than 10 fathoms (18.3 m.).

In general the shoal banks fronting the marshy parts of the shores in the upper inlet are free from bowlders, the deposit having been sufficient, apparently, to cover them; but there are indications that bowlders do occur in the deeper water outside these banks.

With an average tidal current there are swirls throughout the inlet, but they do not necessarily indicate dangers as they show in depths of 15 fathoms (27.4 m.) if the bottom is uneven. Heavy swirls with slight overfalls should be avoided, and any disturbance which has a recognized wake in the water should be considered as indicating a dangerous rock or shoal.

The waters of the inlet are much discolored by glacial silt. At low water the discoloration may extend to the mouth of the inlet, and at high tide the water may be comparatively clear to East and

West Forelands or even above. Frequently with either a flood or ebb current the water above the Forelands appears as a liquid mud.

Harbors and anchorages.—Port Graham, Seldovia Bay, Kahsitsnah Bay, and Coal Bay in Kachemak Bay, Iniskin Bay, Tuxedni Harbor, and Knik Arm are the secure harbors in the inlet, and the anchorage at East Foreland (Nikishka) is sheltered from all easterly winds. Temporary anchorage in thick weather can be selected at most places in the inlet with the aid of the chart. On account of the great range of the tides, the stage of the tide must always be kept in mind when anchoring to insure a depth sufficient to lie afloat and have swinging room at low water.

Settlements and supplies.—There are stores and settlements at Port Graham, Seldovia, Kenai, Susitna, Anchorage, Knik, Hope, and Sunrise, and at the canneries operating during the summer at Kenai and Kasilof.

Water is piped to the wharf at Port Graham and Seldovia. It can also be readily obtained from numerous streams along all of the high shores. In the upper inlet water is difficult to obtain and is accessible only at high water. The streams at East Foreland (Nikishka), the north side of Point Possession, and in Knik Arm are the only ones known where a vessel can approach the shore closely enough to permit boating water in any quantity.

Weather.—The prevailing winds during the summer are easterly with rain, the gales during that time being from the same direction. In the late summer and early fall, fresh southwesterly winds with hazy weather but without rain are of frequent occurrence in the lower inlet, but they seldom blow with much force above the Forelands. Fresh northwesterly winds may occur during the early summer; they are generally accompanied by rain and last from one to two days. At such times navigation in the inlet, except southward with an ebb tide, is uncomfortable and even dangerous for small vessels.

Easterly gales become more frequent in the fall, and southeast gales may also be expected in and following September. Snowstorms may be expected from the 1st of October to the last of April. Cloud caps forming about the high peakes are generally followed by easterly weather and rain.

Fog may be expected occasionally during the summer. Its duration without partially clearing is generally short, although spells of generally foggy weather may last several days.

Ice.—The winter of 1915–16 was the first in which there had been any attempt at navigating the upper inlet after the ice had begun to form. The data as yet available are very meager, but the following statement will furnish a close approximation of prevailing conditions:

The upper part of the inlet is more or less obstructed by floating ice, which forms on the flats and in the shallower waters from December to April. The determining factor is the severity of the winter, which varies greatly from year to year.

During a mild winter or after a period of several days of mild weather, vessels will probably have no difficulty in reaching the head of the inlet and lying at anchor long enough to discharge their cargoes to lighters alongside.

During a severe winter or after a considerable period of severe cold such a course is not feasible; full-powered vessels could probably reach the head of the inlet even at such times but, because of the heavy masses of ice floating in the strong currents, would find it impracticable to discharge to lighters, either when lying at anchor or drifting with the current.

Ice does not generally interfere with navigation southward of Anchor Point except on the western side of the inlet, where large fields of it are sometimes carried by wind and tide as far as Augustine Island, closing Iliamna Bay for brief periods.

Tides.—Daily predictions of high and low waters at Seldovia and Anchorage are given in the tide tables.

CURRENTS, COOK INLET

The tidal currents have great velocity in Cook Inlet and must be considered at all times. The small local steamers plan their trips so as to have a favorable current and prefer to anchor rather than steam against the current of a large tide. A vessel with a speed of 8 knots, picking up the flood current of a large tide a little northward of Anchor Point, can carry it to Fire Island.

At the entrance of Cook Inlet the tidal currents have an estimated average velocity of 2 to 3 knots at strength, and in general the velocities increase up the inlet, with maximum velocities in the vicinity of Harriet Point, East and West Forelands, and the entrances to Knik and Turnagain Arms. The maximum current velocity measured by the Survey ship *McArthur* was 5 knots at anchorages near East and West Forelands, Tyonek, and Point Mackenzie. These anchorages were out of the full strength of the current, and there is little doubt that the maximum velocity of the current at the strength of a large tide is as much as 8 knots between East and West Forelands and probably more between Harriet Point and the south end of Kalgin Island.

The following statements are made from observations taken near the shores, and it is probable that the velocities in the main channel exceed these somewhat; also, since the current runs in the channel somewhat longer than it does near the shore, the times in the channel may be a little later than these given.

In general, the direction of the current is approximately parallel to the trend of the nearest shore, and when flats are uncovered, parallel to their edges. Off the various bays a set may be expected, toward the bay on a flood current and from the bay on an ebb current.

At Dangerous Cape.—A current of nearly 3 knots sets at times across the broken ground around the cape, causing heavy rips and overfalls.

Kachemak Bay.—From Dangerous Cape, a flood current sets up Kachemak Bay with a velocity of 1 to 2 knots in a northeasterly direction, and the ebb flows in a southwesterly to westerly direction. The currents at the mouth of the bay are uncertain, and may vary from place to place, making it difficult to make correct allowance for set in crossing from Anchor Point to Seldovia.

At Seldovia.—The tidal currents have an estimated velocity of 1 to 2 knots at strength.

At Anchor Point.—The strength of flood and ebb occur, respectively, about 1¼ hours before the times of high and low waters at Kodiak. Slack water before flood and ebb occur, respectively, 2 hours after the times of low water and high water at Kodiak. The mean velocity of the current at the strength of flood and ebb is about 3 knots.

Off Cape Kasilof.—The strength of flood and ebb occur, respectively, about the times of high water and low water at Kodiak. Slack water before flood and ebb occur, respectively, 2¾ hours before the times of high and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 3 knots.

Off East and West Forelands.—The strength of flood and ebb occur, respectively, about ½ hour after the times of high water and low water at Kodiak. Slack water before the flood and ebb occur, respectively, about 2¼ hours before the times of high water and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 5 knots.

Off Moose Point.—The strength of flood and ebb occur, respectively, about 1¼ hours after the times of high water and low water at Kodiak. Slack water before the flood and ebb occur, respectively, about 1¾ hours before the times of high and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 3½ knots.

Off the west side of Fire Island.—The strength of the flood and ebb occur, respectively, about 1¾ hours after the times of high and low water at Kodiak. Slack water before flood and ebb occur, respectively, about 1¼ hours before the times of high and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 3½ knots.

Off Point Woronzof.—The strength of the flood and ebb occur, respectively, about 2¼ hours after the times of high and low water at Kodiak. Slack water before the flood and ebb occur, respectively, about ¾ hour before the times of high and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 5 knots.

In Knik Arm, South of Goose Creek.—The strength of the flood occurs about 2½ hours after the time of high water at Kodiak, and the strength of the ebb about 3¾ hours after the time of low water at Kodiak. Slack water before flood and ebb occur, respectively, about 20 minutes after the times of high and low water at Kodiak. The mean velocity of the current at strength of flood and ebb is about 5 knots.

At Knik Harbor.—The tidal currents have moderate velocity at the anchorage near the shore, and are strong in mid-channel.

Turnagain Arm.—The currents are very strong, and the flood frequently comes in as a bore, with spring tides, under certain weather conditions. This bore is said at times to be 4 to 6 feet (1.2 to 1.8 m.) high, and is very dangerous for small craft. Boats should be beached well above the level of the flats, and thus avoid the bore when it comes in. The bore can be heard about ½ hour before it reaches one, sounding like breakers on the beach; it travels slowly.

Harriet Point.—The currents are very swift at Harriet Point, exceeding 5 knots on spring tides, and with southerly breezes bad

tide rips occur between Harriet Point and Kalgin Island, and extend some distance southward.

Tuxedni Harbor.—Slack water before ebb occurs about 3/4 hour after the time of high water at Kodiak, and slack water before flood about 1½ hours after the time of low water at Kodiak. The average velocity of the current at strength of flood and ebb is about 2 knots. The currents set fair with the channel.

Iniskin Bay.—The currents set fair with the channel. At the entrance, the strengths of the flood and ebb occur, about 1½ hours before the times of high and low water at Kodiak. Slack water before the flood and ebb occur, respectively, about 1½ hours after the times of low and high water at Kodiak. The mean velocity of the current at the strength of the flood and ebb is about 1¼ knots.

Kamishak Bay.—In the northern part of the bay, the currents follow the coast, flooding northeastward and ebbing southwestward at a rate of about 1 knot at strength. The current appears to flood inside of Augustine Island and then flow toward Chinitna Point. A slight set northward has been observed on the flood, and westward on the ebb. The current is more noticeable near the shore. With a strong westerly wind, tide rips occur about 2 to 4 miles north of Chinitna Point. A very slight current was observed off Rocky Bay, and at time of low water a small rip was seen near the reefs off Rocky Bay.

DIRECTIONS, COOK INLET

The tidal currents have great velocity in Cook Inlet, and must be considered at all times. The small local steam vessels plan their trips so as to have a favorable current, and prefer to anchor rather than steam against a current of a large tide.

A vessel with a speed of 8 knots, picking up a flood current of a large tide a little northward of Anchor Point, can carry it to Fire Island.

The shoals fringing the shores of Cook Inlet are generally strewn with bowlders, and the lead is not a sufficient guide to avoid them. As a measure of safety deep-draft vessels should avoid areas with depths less than 10 fathoms (18.3 m.) southward of the Forelands. The following courses are suggested:

From a position with Cape Elizabeth bearing 359° true (NNW. ¼ W. mag.) distance 5½ miles, make good a 335° true (NW. ⅜ W. mag.) course for 13½ miles, passing 2 miles off the outer rocks near Cape Elizabeth and Point Adam; Flat Island light should then bear 28° true (N. ¼ E. mag.) distant 4½ miles.

Then make good a 0° true (NNW. ¼ W. mag.) course for 31 miles to a position with Anchor Point light abeam, distance 6 miles.

Then make good a 16° true (N. ⅞ W. mag.) course for 43 miles to a position with the northeast point of Kalgin Island abeam, distant 5 miles.

Then make good a 12° true (N. by W. ¼ W. mag.) course passing midway between East and West Forelands and continue the course for a total distance made good of 19 miles.

Then bring the southeast end of West Foreland astern on a 57° true (NNE. ⅝ E. mag.) course, and make good this course for 45 miles to a position ¾ to 1 mile northwestward of Race Point, Fire

Island. To make good this course, it is imperative to make proper allowance for the currents setting to or from Turnagain Arm. An allowance of as much as two points is sometimes necessary.

Passing ¾ to 1 mile off Race Point, a 65° true (NE. ⅝ N. mag.) course for Point Mackenzie leads in about the best water across the bar at the entrance to Knik Arm. Having in mind, however, the difficulties of navigation due to strong currents and swirls, vessels should not depend on finding a greater depth than 17 feet (5.2 m.) at mean lower low waters. Vessels of less than 15 feet (4.6 m.) draft going at moderate speed should experience no difficulty at mean lower low water; those of greater draft should wait for sufficient tide to insure a safe passage. When Point Woronzof bears southward of 95° true (ENE. mag.) the bar will have been passed and a mid-channel course should then be followed until up with Cairn Point, above which the channel favors the western shore as shown on the chart.

It is important to have in mind the minus tides on the bar at the entrance of Knik Arm. See tides preceding.

PORT CHATHAM

(chart 8588) lies northward of Elizabeth Island, and has a 25° true (N. mag.) direction for 2 miles, narrowing from about 2 miles to ½ mile. It then turns to about 115° true (E. mag.) for 1½ miles with a width of ⅜ to ½ mile. It is a secure harbor for vessels of any size and easily entered in the daytime with clear weather. During heavy gales some williwaws are felt at the anchorage, but they are not dangerous. Southward of Chatham Island the shores are foul, but northward of it the main part of the harbor is clear. The dangers are marked by kelp with the water below half tide. The mountains on either side of the harbor and approach rise abruptly from the water and are wooded about halfway to the summits. There is a herring saltery operated in Port Chatham.

Claim Point, on the west side at the entrance, is a wooded hill 220 feet (67 m.) high, with a low wooded neck back of it. Bare rocks and kelp extend about 400 yards off the southeast side of the point. The bay between Claim Point and Kelp Point has considerable foul ground, and there are depths of 4 to 6 fathoms (7.3 to 11.0 m.) in the entrance.

Chrome Bay, at the northern entrance to Port Chatham was formerly the location of a mine and wharf, but the wharf is now gone and the mine is no longer in operation.

Kelp Point is on the west side ½ mile northeastward from Claim Point. A bare rock lies 250 yards southeastward from Kelp Point, and kelp extends ¼ mile eastward from the rock toward Chatham Island. Care should be taken to avoid it at high water when the kelp does not show.

Chatham Island, small, low, rocky, partly wooded, and marked by a light on its western end, lies in the middle of the port about 1¼ miles inside the entrance. The channel is west of the island, and the only known danger is a rock with 7 feet (2.1 m.) over it, marked by a black can buoy, nearly in the middle 354° true (NNW. ¾ W. mag.) from the island. There is deep water on either side of the rock. A depth of 5 fathoms (9.1 m.), with a possibility of less,

was found 250 yards 230° true (SSW. ¼ W. mag.) from the western end of Chatham Island.

The passage east of Chatham Island is foul and should not be attempted by strangers. A rock, with 13 feet (4.0 m.) over it and marked by kelp, lies ⅜ mile from the eastern shore and over ⅝ mile 165° true (SE. ½ S. mag.) from the western end of Chatham Island.

On the east side, ⅝ mile north-northeastward from Chatham Island, is a projecting rocky, wooded point, where the port changes direction. The opposite side, northeastward from this point, is a low, grassy spit, wooded near its eastern end. The best anchorage is in the broad part of the harbor ¼ to ½ mile eastward of this spit, in 10 to 13 fathoms (18.3 to 23.8 m.), soft bottom. At the eastern end of the harbor are some rocks showing but little above high water. On the south shore, 188° true (S. by E. ½ E. mag.) from these rocks, fresh water can be conveniently obtained by boats, which can be placed under a waterfall at the higher stages of the tide.

Tides.—High and low water occur about 20 minutes earlier than at Seldovia. And the mean rise and fall of the tides is about 12 feet (3.7 m.). To find the height of the tide at Port Chatham, multiply the height of the corresponding tide at Seldovia by the ratio of ranges, 0.8. The tidal currents have little velocity in the entrance and harbor, but in the approach on either side of Elizabeth Island there are strong tidal currents, and at times heavy tide rips.

DIRECTIONS, PORT CHATHAM

The entrance and harbor of Port Chatham are very broken and not completely developed. As a measure of safety vessels should proceed with caution in the vicinity of broken areas where abrupt changes in depth are indicated by the chart to depths less than about 15 fathoms (27.4 m.).

From eastward.—Follow the directions for passing inside Pearl and Elizabeth Islands preceding, until up with Elizabeth Island, and then steer 356° true (NNW. ½ W. mag.) with Nagahut Rocks astern and Chatham Island a little on the starboard bow. Pass 500 yards southwestward of Chatham Island and steer 47° true (NNE. mag.), passing 150 to 200 yards westward of the island. When inside the prominent point ⅝ mile above it, steer about 109° true (E. ½ N. mag.) in midchannel for ¾ mile to the anchorage.

From westward.—Reverse the direction for passing inside Pearl and Elizabeth Islands, page, 79, until approaching Elizabeth Island, or enter about midway between Elizabeth Island and the shore northwestward. Then steer about 47° true (NNE. mag.) for the west end of Chatham Island with the hummock at the west end of Elizabeth Island astern. Pass 500 yards southwestward and 150 to 200 yards westward of Chatham Island and continue to anchorage as directed in the preceding paragraph.

COAST FROM PORT CHATHAM TO SELDOVIA

Koyuktolik Bay, about 3 miles westward of Port Chatham, is 1½ miles long, with a uniform width of about 1 mile. Its north shore consists of bare rocky cliffs, while the south shores are lower,

the south entrance point consisting of a low yellow bluff. The entrance is clear, with depths of 14 to 16 fathoms (25.6 to 29.3 m.), except for a reef which makes off about 600 yards from the yellow bluff point. A sand and gravel shoal makes out about 3/8 mile from the stream in the southeast corner at the head of the bay.

Temporary anchorage in 8 to 10 fathoms (14.6 to 18.3 m.), hard bottom, may be found 1/2 mile from the head of the bay. It is probable, however, that in any heavy weather a considerable swell reaches this anchorage.

Point Adam, 6 1/2 miles 336° true (NW. 3/8 W. mag.) from Cape Elizabeth, is low at the end, and rises in a steep grassy slope to mountains.

Magnet Rock lies 3 1/4 miles 345° true (NW. 3/8 N. mag.) from Point Adam and about 3/8 mile from the coast in the vicinity of Point Bede. It is small, black, and prominent.

Flat Islet, 1 1/8 miles 13° true (N. by W. mag.) from Magnet Rock, is small, flat, grass-covered, and about 50 feet (15.2 m.) high, and is two closely connected islands joined by bare reefs. There is a light on the northwest part of the island.

Port Graham is described below.

There is a prominent, flat-topped, grassy point, with rocky sides and about 50 feet (15.2 m.) high, 6 1/2 miles northward of Flat Islet and 1 1/2 miles northward of Dangerous Cape. Its end is detached. At this point the coast changes direction northeastward for about 5 miles to Seldovia Bay.

Kelp extends 1/2 mile off the bight lying 2 miles southwestward of Point Naskowhak.

PORT GRAHAM

(chart 8589), on the east side of Cook Inlet, 4 miles northward of Flat Island, is a secure harbor inside Passage Island, and with care is easily entered in the daytime. Its entrance, between Russian Point and Dangerous Cape, is about 2 miles wide, and has extensive outlying reefs, covered at various stages of the tide. The dangers are generally steep-to and are marked by kelp in summer and fall.

Russian Point, on the south side of the entrance, lies about 2 3/4 miles northeastward of Flat Island. **Alexandrovsk,** a small Indian village with a Greek church, is on the northeast side of English Bay, 300 to 400 yards southeastward of the point.

English Bay, the open bight south of Russian Point, is not surveyed and should be avoided by strangers. English Bay Reef, bare at low water, lies about 3/4 mile off the bay and 1 mile 268° true (SW. by W. 5/8 W. mag.) from Russian Point. Foul ground also extends nearly 1/2 mile westward of Russian Point.

A reef bare at low water extends 600 yards northward from Russian Point. Between this reef and that extending 7/8 mile southwestward from Passage Island is a channel 250 yards wide, with depths of 6 to 8 fathoms (11 to 14.6 m.) on the rocky bar, leading into Port Graham southward of Passage Island. A small reef, with 7 feet (2.1 m.) over it, lies 5/8 mile inside Russian Point and 400 yards from the southern shore; the channel is northward of it.

Dangerous Cape, on the north side at the entrance, lies 5 miles northward of Flat Island. A reef extends 1/2 mile westward from

the western side of the cape; there are two rocks bare at low water, and a rock with 7 feet (2.1 m.) over it lies nearly ½ mile from shore.

A reef, with bare rocks and some that cover, extends 650 yards southward from Dangerous Cape.

Bird Reef, 250 yards long, lies ½ to ⅝ mile southward from Dangerous Cape. The highest rock at the north end of the reef is covered at extreme high tide. A rock with 3 feet (0.9 m.) over it and marked by kelp lies nearly ¼ mile northeastward from the north end of Bird Reef.

Midway between this reef and Passage Island and ½ mile from the north shore is a small shoal with 2½ fathoms (4.6 m.) marked by kelp and a buoy. Vessels should pass southward of it, as another shoal with kelp makes out 650 yards from the shore inside it, and there are probably bowlders on the shoals.

Passage Island, 1 mile inside the entrance, is 140 feet (43 m.) high and wooded. It is generally fringed with reefs to a distance of 150 yards, and a shelving spit, covered at high water, extends 350 yards eastward from its eastern end. A reef, with numerous rocks, bare and covered at various stages of the tide, extends ⅞ mile southwestward from the western end of the island. The northern end of the island is marked by a light.

A rock, bare at low water and marked by a buoy, lies 250 yards west-southwestward from the point on the north shore northeastward of Passage Island. This is the worst danger in the entrance north of the island. The channel has a width of 300 yards between the rock and the reef fringing Passage Island.

The outer end of the reef extending eastward from Passage Island is marked by a day beacon placed in 3 fathoms (5.5 m.) of water.

Above Passage Island the port is 4½ miles long and ½ to ¾ mile wide, with depths of 10 to 17 fathoms (18.3 to 31 m.). The shores are generally fringed with kelp to a distance of 200 yards. The only serious danger is a narrow, sunken reef with kelp which extends halfway across the port from the northern shore ⅝ mile above Passage Island, and is marked at its south end by a black buoy. There are small streams on the shores of the port and a large stream and valley at its head.

There are a cannery and wharf on the south side 1⅞ miles above Passage Island. There is a depth of 18 feet (5.5 m.) at its end. Water can be obtained through pipe and hose, and small quantities of coal are generally kept on hand. There is a small store.

At a point about 850 yards westward from the wharf there is a shoal extending about 300 yards offshore. A red buoy is placed here to assist vessels in keeping off this shoal.

Anchorage.—Temporary anchorage for a small vessel can be selected in the middle of Coal Cove, inside Dangerous Cape, in 5 to 10 fathoms (9.1 to 18.3 m.), rocky bottom; the shore of the cove is fringed with kelp to a distance of 350 yards, and the cove should be used with caution. A better anchorage with more room will be found in the bight on the north shore northward of Passage Island in 7 to 10 fathoms (12.8 to 18.3 m.); a shoal extends 400 yards from the northeast end of the bight, and kelp extends 250 yards from its north shore. These anchorages are exposed to a heavy swell in southerly or westerly weather.

When inside Passage Island, anchorage can be had in any part of the port, the depths being 10 to 17 fathoms (18.3 to 31 m.). One of the best is northward or northeastward of the wharf, in 10 to 13 fathoms (18.3 to 23.8 m.), sticky bottom. The cove southeastward of the wharf is shoal. An equally good anchorage is in the middle 1 mile above the wharf, in 9 to 10 fathoms (16.5 to 18.3 m.); above this anchorage the port narrows to ⅜ mile, and is then shoal to the head, a distance of 1¼ miles.

Tides.—High and low waters occur about 5 minutes earlier than at Seldovia, and the mean rise and fall of the tides is about 14½ feet (4.3 m.). To find the height of the tide, multiply the height of the corresponding tide at Seldovia by the ratio of ranges, 0.9.

Strong tidal currents, both ebb and flood, set across the mouth of the harbor, but there is little current at or inside of Passage Island. With opposing wind and current, heavy tide rips occur off and well northward and southward of the entrance to Port Graham.

DIRECTIONS, PORT GRAHAM

The safest time to enter the port is at low water, and the better entrance is north of Passage Island. The channel south of Passage Island should not be used by strangers.

From southward, pass 1 to 1½ miles westward of Flat Island and steer for the prominent coast point northward of Port Graham, course about 41° true (N. by E. ½ E. mag.). When the village of Alexandrovsk is abeam, head in with Passage Island a little on the starboard bow, course about 92° true (ENE. mag.), and pass not less than 300 yards northwestward of the light on the north end of Passage Island and steer 129° true (ESE. ¾ E. mag.), passing southward of the can buoy marking the reef making off from the north shore. Continue this course to a position eastward of the beacon marking the end of the reef off the eastern end of Passage Island, then steer 157° true (SE. ¼ E. mag.), with the point on the north shore astern, and pass westward and southward of black can buoy No. 5. Then keep in mid-channel. A flat extends 1¼ miles from the head of the port, and the cove in the south shore southeastward of the wharf is shoal.

From northward.—Follow the shore northward of the port on a 210° true (S. ½ W. mag.) course, and pass over 1 mile westward of Dangerous Cape. Then steer for the village of Alexandrovsk, course about 168° true (SE. ¾ S. mag.), and when Bird Reef is about ½ mile on the port beam steer for the summit of Passage Island, course about 120° true (E. ½ S. mag.). When the point on the north shore northeastward of Passage Island bears 103° true (E. by N. mag.), steer for it and pass about 300 yards northwestward of the light on the north end of Passage Island. Then follow the directions in the preceding paragraph.

SELDOVIA BAY

(chart 8589), on the southeast side of Kachemak Bay, eastern shore of Cook Inlet, is a secure harbor in any weather. It extends 2 miles in a 176° true (SSE. ½ E. mag.) direction to Powder Island,

with a width of ½ to ¾ mile, and then turns to 147° true (SE. by E. ⅛ E. mag.) for 2 miles. The head of the bay is shoal down to ½ mile southeastward of Powder Island.

From the entrance until nearly up with the wharf, shoals with 10 to 12 feet (3 to 3.7 m.) in places on their eastern part extend halfway across the harbor from the western shore. The channel is between the shoals and several rocks and kelp patches near the eastern shore, and varies in width from 150 to 400 yards. The shoals and rocks are marked by kelp at slack water in summer and fall, but it is run under during the strength of the tidal currents.

The channel has a least depth of 2½ fathoms (4.6 m.) at mean lower low water, although a deeper depth can be carried to the inner harbor with local knowledge. The best water in the channel off the commercial wharf (just south of Watch Point) can be had by keeping Gray Cliff Light barely open off Watch Point.

Point Naskowhak, the western point at the entrance, is the northwest one of two small, high, rocky, wooded knobs which stand on a low, grassy spit surrounding a lagoon. A reef extends nearly ¼ mile northward from the point, and broken ground, marked by kelp, with 26 feet (7.9 m.) at its end, extends nearly ½ mile 41° true (N. by E. ½ E. mag.) from it. Two kelp patches, in which the least depth found is 18 feet (5.5 m.), lie 600 to 700 yards northeastward from the point.

Gray Cliff, the eastern point at the entrance, is a bare rock cliff 60 to 70 feet (18.3 to 21.3 m.) high, and is marked at the south end by a light.

Seldovia Point, lying 1 mile northward of Gray Cliff, is a cliff 200 feet (61 m.) high, wooded on top. Kelp extends ⅝ miles from the shore in the bight northeastward of Seldovia Point.

On the eastern side of the harbor, nearly ¼ mile southward of Gray Cliff, is a prominent high, reddish bluff, which is a good mark.

A rock, bare 4 feet (1.2 m.) at low water, lies 300 yards southwestward from the red bluff, with foul ground between. This rock is steep-to on its western side, and is the principal danger in the harbor. It is marked by a buoy.

A high, pointed rock with some dead brush on top lies near the eastern shore about midway between the rock and Watch Point.

Watch Point, on the eastern shore, ⅜ mile southward of the red bluff, is a small, grassy head, about 30 feet (9.1 m.) high, with a few trees, and a short, low grassy neck behind it.

A rock, with 15 feet (4.6 m.) over it and marked by kelp, lies 150 yards 210° true (S. ½ W. mag.) from Watch Point. The channel is westward of the rock, which is marked by a black buoy.

Seldovia is a village and post office, with several stores, a small hotel, and a Greek church, on the eastern side of the harbor, ¼ mile southeastward of Watch Point. The village has a few white men and about 100 Indians. A shoal, partly bare at low water, extends 200 yards southwestward from the point at the village, and the cove southeastward of it is nearly dry at a good low water. The southwest side of the cove is formed by a grassy head with a few trees about 75 feet (22.8 m.) high, which at its southeast end, at the inner end of the wharf, is joined to the shore by a low, narrow spit.

A cannery and wharf are on the eastern side of the harbor, 5/8 mile southward of Watch Point. The wharf has a depth of about 11 feet (3.4 m.) at its end. Water can be obtained through pipe and hose. The cannery shows, when approaching the harbor from southwestward, over the low spit westward of the entrance. When in the harbor the wharf is hidden until nearly up with it by the grassy head northwestward.

A red can buoy marks the point of the shoal opposite the cannery wharf. A shoal with 15 feet (4.6 m.) over it lies about in midchannel off Seldovia.

There is a wharf at Seldovia, and the monthly mail steamer from Seward calls on both the outward and homeward trips. There is a radio station, call letters KEA.

The best **anchorage** in the harbor is in the middle, about 3/8 mile 238° true (SW. by S. mag.) from the wharf, in 9 to 10 fathoms (16.5 to 18.3 m.), sticky bottom. A small vessel can anchor in the channel off the village, with the high, red bluff open westward from Watch Point, and the Greek Church bearing 86° true (NE. by E. 1/2 E. mag.), in 5 fathoms (9.1 m.).

Tides.—Daily predictions of high and low water at Seldovia are given in the tide tables. The tidal currents have an estimated velocity of 1 to 2 knots at strength.

DIRECTIONS, SELDOVIA BAY

Steer for the north end of Gray Cliff on a 137° true (ESE. mag.) course until Point Naskowhak is a little forward of the beam. Then steer for Watch Point in range with the pinnacle rock off the north side of the wooded head lying northwestward of the wharf, course 168° true (SE. 3/4 S. mag.). A spot on Watch Point and the pinnacle rock are kept whitewashed; otherwise the pinnacle rock blends with the background. The course on the range should lead about 300 yards westward of Gray Cliff and about 50 yards westward of the rock, bare at low water.

When about 350 yards from Watch Point, and the high, pointed rock near the eastern shore is forward of the beam, steer 193° true (S. by E. mag.) and pass 125 to 150 yards westward of Watch Point.

When abeam the black buoy marking the 2 1/2-fathom (4.6 m.) spot, haul to the eastward and bring Gray Cliff Light just open off Watch Point, and hold this range until the inner basin is reached.

EASTERN SHORE OF COOK INLET

The eastern shore at the entrance of Cook Inlet is mountainous, with steep slopes from the water in the vicinity of Point Adam and Point Bede. The mountains trend northeastward between Kachemak Bay and the sea, and then extend across to the head of Turnagain Arm. The greatest elevations occur about halfway up Kenai Peninsula, where there are numerous glaciers. The coast and harbors from Port Chatham to Seldovia are included in the description preceding.

Kachemak Bay is a large bay on the east side of Cook Inlet. The entrance lies between Seldovia Point on the south, and Anchor

Point on the north. It affords excellent anchorages for vessels of all classes and sizes. The bay was surveyed in 1923 and is now shown on chart 8554.

Nubble Point is a long sand spit terminating in a rocky knoll, which may be mistaken for Point Naskowhak if not sure of the position. The eastern part of the point is wooded.

Kasitsna Bay, between Nubble Point and Herring Islets, affords good anchorage in 12 to 15 fathoms (21.9 to 27.4 m.), good holding ground. The water shoals abruptly to the shore, and to the flat which fills the cove formed by Nubble Point; but the flat in the cove will be avoided by keeping the easterly end of the point bearing westward of 14° true (N. by W. mag.).

A rock, bare at extreme low water and marked by a buoy, lies ½ mile 59° true (NE. by N. mag.) from the north end of Nubble Point. A least depth of 14 fathoms (25.6 m.) was found between the rock and Nubble Point, by giving the north end of the point a berth of over 200 yards.

Hesketh, Yukon, and **Cohen Islands** are high and wooded. There is an islet on the reef which extends ½ mile northwestward from Hesketh Island. A rock 60 feet (18.3 m.) high lies near the north end of a reef which extends ½ mile northward from Cohen Island. There is a prominent yellow cliff on the west end of Cohen Island. The passages between the islands should be avoided. **Eldred Passage,** eastward of the islands, is deep near the middle, except at the north end, where there is a bar on which the least depths found are 8 to 12 fathoms (14.6 to 21.9 m.).

Tutka Bay has no desirable anchorage and is not completely surveyed. Broken ground, on which some pinnacle rocks have been found, extends across the entrance.

Vessels entering, pass in midchannel between Hesketh Island and the 60-foot (18.3 m.) grass-covered rock ½ mile south of it, then follow mid-channel courses to the southermost island shown on chart 8554. There is a herring saltery on the shore just northeastward of this island. The dock goes dry at low water, but it is proposed to extend the dock so that steamers may go alongside at any tide. Just northwestward of this island, there is a half-tide rock which closes that channel to all but small boats.

Sadie Cove, the inlet in the east side of Eldred Passage, is not completely surveyed, but is apparently clear near mid-channel.

A rock, bare at low water, lies ½ mile northward of the point lying 1½ miles northeastward of Cohen Island, and the bight eastward of the point is foul.

Gull Island is a prominent pile of bare rocks, visible about 10 miles.

China Poot Bay, lying eastward of Sadie Cove, is a large bay that is nearly dry at low water.

Homer Spit is a low gravel and shingle spit, 3½ miles long, from 100 to 500 yards wide, and covered with grass and some trees. There is a fixed white light on the outer end of the spit. **Homer,** a village at the end of the spit, is abandoned. A wharf on the north side of the spit near its end is dry at lowest tides.

There is excellent anchorage at a distance of ¾ mile or more northwestward of the wharf, in 10 to 15 fathoms (18.3 to 27.4 m.),

soft bottom. Greater depths and abrupt shoaling are found near the wharf, and it is not safe to anchor in less than 18 fathoms (33 m.). **Coal Bay**, the bight northwest of Homer, is shoal, but there are no outlying dangers. There are coal outcrops in the vicinity of Coal Bay, and a small amount of coal is mined for local use.

Halibut Cove, on the south shore about 6 miles east of Homer Spit, affords excellent anchorage in 23 fathoms (42 m.) with good holding bottom. A light is established on the north side of Ismailof Island.

There is an abandoned cannery here with a wharf that goes dry at about half tide. Excellent fresh water can be obtained at the cannery. There is a settlement of fishermen on **Ismailof Island,** just west of Halibut Cove. A nun buoy marks the rock awash which lies southeast of Halibut Cove Light.

Bear Bay on the south side and near the head of the bay, affords good anchorage in 12 fathoms (21.9 m.), although the williwaws are violent and the swinging room is restricted.

The head of Kachemak Bay consists of extensive mud flats. The north side of the bay is bordered with mud flats and the 10-fathom (18.3 m.) curve is about 2 miles offshore. From this curve the water shoals abruptly towards the north shore.

From Homer Spit to **Anchor Point** the coast is a line of bluffs, with a greatest height of 750 feet (229 m.) at Bluff Point. In front of the bluffs there is a narrow, rocky and shingle beach. The depths inside the 10-fathom (18.3 m.) curve are rocky and irregular, and there is a possibility of detached bowlders not found by the survey. There is a light on Anchor Point. There is a day mark consisting of a black and white tripod located about 10 yards from the light.

From northward of Anchor Point to **Cape Ninilchik** the coast is free from dangers so far as known, and anchorage can be selected, the bottom being sandy. The surveying vessel frequently used an anchorage close inshore just northward of Cape Starichkof, in 6 to 7 fathoms (11 to 12.8 m.) (low water). The holding ground is fair, and there is some shelter from southerly weather.

The hill, 1,900 feet (579 m.) high, lying 10 miles from the shore between Cape Starichkof and Cape Ninilchik, is a sharp peak with a high saddle between it and a slightly lower peak just southward, and is the only prominent feature between Anchor Point and the Forelands.

Ninilchik is a small native settlement with a Greek Church at the mouth of a small stream. The church and a part of the village are prominent from well offshore.

North of Cape Ninilchik the coast is very foul, being characterized by immense bowlders not marked by kelp. The bowlders rest apparently on a comparatively flat bottom, so that soundings give no indication of them. From the appearance of those found and the soundings taken alongside, it is probable that there are many of the same character not found by the survey.

The Sisters are three prominent rocks, close together and the largest showing about 5 feet (1.5 m.) above high water. The foul ground inside the Sisters and extending about 10 miles southward from Cape Kasilof is strewn with bowlders from 15 to 50 feet (4.6 to

15.2 m.) high, of which the Sisters are the largest. There are many bowlders in this area not located by the survey.

There is a break in the high bluffs on the eastern shore between Cape Kasilof and Kenai.

Temporary anchorage can be had in 4 fathoms (7.3 m.) about 5/8 mile from shore a little southward of Cape Kasilof. This anchorage is exposed except in northeasterly weather.

Kasilof is a cannery on the northern bank at the mouth of **Kasilof River.** An extensive flat with bowlders in places fills the bight between Cape Kasilof and the mouth of the river, and extends offshore 2½ miles. A narrow winding channel, nearly dry in places at low water, leads through the inner shoals to the mouth of the river. This channel is marked for the cannery steamers and launches during the season. The river is narrow and has a strong current. Boats up to 6 feet (1.8 m.) draft can lie afloat in the river at low water.

To anchor off the cannery, stand for it on a 105° true (E. by N. mag.) course. Keep the lead going and anchor 3 to 4 miles from the cannery, in a depth not less than 5 fathoms (9.1 m.) at low water.

Karluk Reef, partly bare at low water, is 2½ miles long, its southern end lying 4 miles 298° true (W. ¼ N. mag.) from Kasilof cannery. There are shoals between it and the shore.

Kenai is a cannery and post office on the northern bank at the mouth of **Kenai River.** Extensive bowlder flats make off about 3 miles from the mouth of the river. **Salmo Rock,** which shows well at low water, is one of the outer ones of numerous scattered bowlders located by the survey, and lies 2¾ miles 232° true (SSW. ⅜ W. mag.) from Kenai Church. It is generally marked by a buoy, maintained by the cannery vessels. A **sunken rock** is reported to lie about 2 miles west of Salmo Rock. The shore in this vicinity is strewn with bowlders and strangers are advised to keep well away from the shore. The bar at the entrance of the river is nearly dry at low water, and there are depths of 8 to 10 feet (2.4 to 3 m.) in places in the channel in the river. The **tidal currents** in Kenai River have a velocity of 3 to 6 knots. The currents turn about 1 hour after high water and about 2 hours after low water.

The entrance to the river is marked by range lights, which are maintained from March 15 to November 30 of each year.

Salamato is an old village 4½ miles northward of Kenai and 6 miles southeastward of East Foreland.

East Foreland is a prominent, nearly level, wooded headland, with a bluff at the water 276 feet (84 m.) high. There is a light on the highest point of the bluff. A dangerous shoal with a least found depth of about 11 feet (3.4 m.) at lowest tides lies 2 miles from the eastern shore for a distance of 3 miles southeastward from East Foreland. The area is not thoroughly developed.

Nikishka is a fish trap and house 2½ miles northeastward of East Foreland. There is good anchorage for a small vessel, sheltered from all easterly winds, ⅜ to ½ mile from shore abreast or a little below the fish house, bearing 151° true (SE. by E. mag.), in about 6 fathoms (11 m.), good holding ground. An anchorage farther southwestward is not desirable, as the holding ground is not as good and the ebb current increases greatly in velocity on approaching East Foreland. Fresh water in small quantities may be had by boats

at high water from a seepage just north of the fish house. Water in larger quantities may be had from a stream ¾ mile northeastward of the fish house, but the flow does not usually last through the summer.

From the fish house northward nearly to Boulder Point, a distance of 2½ miles, bowlder shoals, bare in places at low water, extend ¾ mile from shore.

Middle Ground Shoal, in the form of a long ridge of hard sand with rocky bottom in places, lies in the middle of the inlet 10 miles northward of East Foreland. It shows at low water for a distance of 3½ miles in a northeasterly and southwesterly (magnetic) direction, and its greatest height above low water is about 6 feet (1.8 m.).

Beginning at **Boulder Point,** a prominent bowlder reef with but few breaks in it extends along shore to Moose Point, a distance of 20 miles. For the greater part of this distance the bowlders, some very large, show at low water to a distance of 2 miles from shore, and there are occasional ones which show above high water. A rock awash at low water lies 3½ miles from shore and 4 miles 346° true (NW. ½ N. mag.) from Gray Cliff; there is a depth of 10 fathoms (18.3 m.) close to the west side of the rock. Owing to the size of the bowlders along this shore, it is not safe to skirt it in a less depth than about 5 fathoms (9.1 m.) greater than the draft.

There is a prominent yellowish bluff 4 miles northeastward of Boulder Point. **Gray Cliff,** 164 feet (50 m.) high, lies 10 miles northeastward of Boulder Point, and is a good mark from the inlet. There is a break in the bowlder reef off Gray Cliff, and a small vessel may here approach the shore as close as ¾ mile, and find anchorage in about 5 fathoms (9.1 m.), mud bottom, sheltered from easterly and southeasterly weather.

Moose Point is low and wooded, with a grassy flat at its end, and is not prominent. Between it and Point Possession, a distance of 10 miles, there are few bowlders so far as known, but the bottom is generally rocky and irregular. Moose Point Shoal, 5 miles long and partly bare at low water, begins just above Moose Point, and lies from 1¾ to 2¼ miles from shore.

About 6 miles northeastward of Moose Point there is a prominent reddish bluff, on the north side of which is a small stream in a deep canyon, the latter showing from southwestward.

Point Possession is a low, rounding, heavily wooded headland, with a bluff at the water. There is a small native village on the western side of the point, where the bluff is low and a valley leads inland. The bluff is 140 feet (43 m.) high ⅞ mile southward of the village, and from the village the bluff increases in height northeastward around into Turnagain Arm to a greatest elevation of 284 feet (87 m.) at Grand View.

A reef extends about 1 mile off the northwest side of Point Possession for a distance of about ¾ mile northward of the village. There are depths of 3 fathoms (5.5 m.), on its western edge; the northern edge drops off abruptly to depths of 12 to 20 fathoms (21.9 to 37 m.). The range of the eastern side of Fire Island and Point Woronzof leads close to the western edge of the reef, and care should be taken when rounding the point at low water not to open this range

until well clear of the reef. A current line generally indicates the edge of the reef when the tidal current is strong in either direction.

Temporary anchorage for a small vessel may be had ¾ mile from shore and 2 miles southward of the village in 4 fathoms, sandy bottom. It is sheltered from easterly and southeasterly winds, but considerable sea makes around Point Possession at times from the violent northeasterly winds that blow at intervals out of Turnagain Arm.

On the north side of Point Possession temporary anchorage for a small vessel can be had in 4 fathoms, (7.3 m.) hard bottom, ¼ mile off a gulch at the western end of a high bluff 1¼ miles northeastward of the village. The anchorage is inside of the strong tidal currents that set in and out of Turnagain Arm. Water can be secured by boats at high water from the gulch, but in the late summer the flow is small and the water discolored by flowing over the clay bluff.

Turnagain Arm is partially surveyed, the shore line being correct. Most of the arm at low water is a large mud flat interspersed with winding sloughs, and navigation is safe only for small craft of 6 feet (1.8 m.) or less draft. Local knowledge is necessary since the channels wind from side to side and are subject to change, and strong currents and tide rips increase the difficulties of navigation. The flood tide comes in at spring tides as a bore, sometimes attaining a height of 6 feet (1.8 m.). It travels about 6 knots, but the velocity of the current may exceed that in places.

Small craft generally use the anchorage on the west side of Fire Island until the conditions are favorable for proceeding up Turnagain Arm. The only anchorage in the arm is in the narrow channel close to the shore northward of Burnt Island; but it is exceedingly uncomfortable and even dangerous for launches when the strong easterly winds are blowing down the arm. For launches the best thing to do is to beach them on a gradually sloping, smooth sand beach in the bight on the west side of Gull Rock or the bight on the west side of the small point 2 miles westward of Gull Rock.

Hope, Sunrise, and **Girdwood** have stores, and can be reached by small craft at high water.

Turnagain Arm is noted for the violent winds which blow out of it whenever the wind is easterly, and is locally referred to as the "Cannon," which expresses the opinion held of it. With light to moderate easterly winds in other parts of the inlet, a moderate gale will frequently blow out of the arm and a heavy sea and tide rips will be raised from its mouth across to Ladd on the western shore.

Fire Island is wooded and has a greatest elevation of 350 feet (107 m.) near its middle. Its southern part is broken, there being some high sand hills with bare summits, between which is a lake. There is another lake near the north end of the island. The shore is high bluffs, except the northern and southern ends of the island, which are low. There are no streams on the island, and after the snow is melted the island is dry except for the lakes. Except in late summer some fresh water may be had at a depth of a few feet at the foot of the low bluff on the shore northwestward of the lake near the south end.

West Point, the southwesterly extremity of Fire Island is marked by a flashing white light.

There is good anchorage for a small vessel in the northern part of the bight on the western side of Fire Island, in 4 to 5 fathoms (7.3 to 9.1 m.), hard bottom. It is about ½ mile from shore and about 1 mile from Race Point, with the highest hill near the middle of the island bearing about 128° true (E. by S. mag.). The current is strong here throughout the flood, but the ebb current has little velocity and after the first 2 hours of ebb is nearly slack. With fresh southwesterly, northwesterly, or northerly winds the anchorage is untenable, as a rough sea and tide rips prevail.

Fire Island is joined to **Point Campbell** by a flat, bare at low water. A flat, bare at low water, fills the bight on the west side of Fire Island and extends about ½ mile northwestward from Fire Island Light, at the southwest end of the island. A white slatted tripod is located on the shore about 1 mile northward of Point Campbell.

There is a sand shoal or bar about 2 miles northward of Fire Island on the crest of which the least depth found is 17 feet (5.2 m.). Having in mind the difficulties of navigation due to strong currents and swirls, vessels will find it difficult to avoid the shoal places in the absence of aids. With the minus tides, and especially with strong northerly winds, the low tides may fall as much as 6 feet (1.8 m.) lower than the plane of reference, and vessels of more than about 10 feet (3 m.) draft should wait for sufficient tide to insure a safe passage at lowest tides.

Knik Arm (chart 8557) has sufficient depth for deep-draft vessels, with the exception of the bar at its entrance which is mentioned in the preceding paragraph. The generally used anchorage is in the bight between **Woodrow Creek** and **Cairn Point**, 3 miles northeastward of Point Mackenzie, where good depths extend fairly close to the shore. Toward Cairn Point, anchorage can be selected in as little as 8 fathoms (17.1 m.) at low water; toward Woodrow Creek, the anchorage depths are greater. Vessels anchored close in avoid the strongest currents, which have an estimated velocity of 4 knots or more at strength in the middle of the arm. The currents, however, are so strong that vessels should use a long scope of chain, and they will generally foul the anchor if remaining over two tides. Chart 8557 is the best guide.

Anchorage, near the mouth of Woodrow Creek, is the principal town on Cook Inlet. It is the headquarters of the Government railroad which extends from Seward to Fairbanks. Due to silting, vessels can lie at the wharf only at near high water. Most freight is handled by lighters. There is telegraphic communication with the interior and with Seward.

There are good stores, hotels, and machine shops, and a hospital is maintained in connection with the railroad. Small coasting vessels call at Anchorage, but the larger passenger vessels no longer make regular calls since the railroad is in operation to Seward.

A radio station, call letters KWL, is operated by the Alaska Railroad.

Goose Bay is a slight indentation on the west side of Knik Arm, 7 miles above Cairn Point. A cannery is located here, with a wharf having a depth at the end of about 30 feet (9.1 m.) at low tide. The

channel is narrow here, and the currents are very strong; in making the wharf a vessel should first drop an anchor and swing to it.

From a point about 5 miles above Cairn Point the head of the arm is obstructed by extensive mud flats which bare soon after high water. These flats are cut by numerous channels and sloughs leading from the various streams. The main channel to the head of the arm lies close to the west shore at the point just above Goose Bay, thence diagonally outward to the middle of the arm, and up the middle to the head. It is narrow and intricate, navigable only on the tide, and then only with local knowledge.

Knik is a village on the western side of the arm, about 15 miles above Point Mackenzie, to which small craft go at high water and lie on the bottom at the ends of the landings at low water. Above Goose Bay the channel to Knik lies close along the western shore. This channel is said to be filling in at present.

WESTERN SHORE OF COOK INLET.

On the western side of Cook Inlet, from Cape Douglas to Chisik Island, the mountains generally rise abruptly from the water, and Iliamna and Redoubt Volcanoes tower well above the surrounding peaks, affording excellent marks from all parts of the lower inlet. Northward from Redoubt Volcano the higher snow-clad peaks trend away from the inlet, passing through the lofty Mount Spur.

Kamishak Bay is not surveyed southward of Rocky Cove and Augustine Island. Its south and west sides are said to be occupied by a flat as shown on the chart, and it is probable that there are numerous bowlders. The shore is mountainous, with cliffs and slides in many places, and there is no timber except at the north end of the bay. From Iniskin Bay to Chinitna Bay the lower lands are about half wooded. There are sand beaches in the bights and bays, which are covered, however, at high water.

Kamishak Bay is characterized by bowlders, which can be seen strewn along the shores and extending off toward the deeper water. So far as surveyed the shoaling is abrupt on approaching the reefs which fringe the shores, and the lead will not serve as a guide to clear them. Vessels should proceed with caution where the depths are not more than about 3 fathoms (5.5 m.) greater than the draft, as there are probably bowlders on the bottom. An unsurveyed bank, on which 4 fathoms (7.3 m.) was obtained, extends over 3 miles westward from Augustine Island. Owing to the probability of bowlders, vessels should not pass westward of Augustine Island, and great caution should be exercised if attempting to pass south of the island.

Augustine Island, about 7 miles in diameter and 3,970 feet (1,210 m.) high, is a volcanic, conical peak from the crater of which steam is frequently discharged. The shore is low with bluffs in places, and is generally strewn with bowlders. A bowlder reef extends about ¾ mile off the northwestern half of the island as shown on the chart, and this area has not been closely developed. The north end of the island consists of numerous small mounds of bowlders with sloughs between. The west end is detached from the main island by a lagoon, the entrances to which are partly blocked

by bowlders. The lower parts of the island are covered with brush and alder.

The survey ship anchored in the bight on the southwest side of Augustine Island. There are no bowlders on the beach and it seemed clear; it affords shelter in northerly and easterly winds. The ship approached the anchorage on a 65° true (NE. ⅜ N. mag.) course for the volcano, and anchored in 6 fathoms (11 m.), sandy bottom, about ¾ mile from shore.

The survey ship also anchored about 1 mile off the northwest side of Augustine Island, with the volcano bearing 135° true (ESE. ⅛ E. mag.) and the north tangent of the island bearing 75° true (NE. ½ E. mag.) in 8 fathoms (14.6 m.), sandy bottom. Care should be taken not to get nearer the island, as there are numerous bowlders. It is exposed to northerly and northeasterly winds.

Augustine Rocks lie 8 miles 168° true (SE. ¾ S. mag.) from the peak of Augustine Island, and approximately 5½ miles from the shore of the island. They are two flat rocks, with a smaller one between them, all covered at high water. Their position is said to be generally indicated by kelp or breakers.

Bruin Bay is obstructed by numerous bowlder reefs and is not available as an anchorage. The upper end is bare at low water.

Rocky Cove is obstructed by reefs, bare at lowest tides, which extend 2 miles offshore.

Ursus Cove is exposed to a heavy swell in easterly weather, and the bottom is very broken.

Iliamna Bay (chart 8665) is in the northwest corner of Kamishak Bay about 15 miles 347° true (NW. ¾ N. mag.) from the peak of Augustine Island. It is 1 mile wide at the entrance and wider inside, and has a length of about 5 miles to its northern end and to the head of its western arm, called **Cottonwood Bay.** The greater part of the bay is filled by a flat, but there is good anchorage just inside the entrance. The shores are mountainous and there are no trees except the cottonwoods on the flats at the heads of the bay.

A. C. Point on the north shore of the bay about 2 miles northwestward from North Head, is often used as a landing place. There was a house here in 1923.

From the small native village in the cove 1 mile from the north end of Iliamna Bay, a trail about 12 statute miles long leads to **Iliamna,** a village on a river of the same name 4 miles from Iliamna Lake. The summit of the pass is about 3 miles from the bay and has an elevation of about 900 feet (274 m.). From Iliamna village boats up to about 3 feet (0.9 m.) draft can be taken through Iliamna Lake and Kvichak River to Bristol Bay. See also Iliamna Lake and Kvichak River.

White Gull Island, grass-covered and about 70 feet (21.3 m.) high, is conspicuous near the middle of Iliamna Bay just inside the entrance. There is a depth of 7 fathoms (12.8 m.) in the entrance north of White Gull Island, and the deepest water extends diagonally across to the entrance of Cottonwood Bay, where the depth is 12 feet (3.7 m.). Anchorage in 4½ to 5 fathoms (8.2 to 9.1 m.), soft bottom, may be had ¾ mile inside the entrance, with the northern side of White Gull Island in range with the south point at the entrance, and the north point at the entrance bearing 106° true (E.

¾ N. mag.). The anchorage is exposed to east and southeast winds and there are heavy williwaws with westerly winds, but it is regarded as secure during the summer.

In the approach to Iliamna Bay the depths are 6 to 8 fathoms (11 to 14.6 m.) several miles from shore, and these depths extend close to Turtle and Black Reefs so that the lead will not serve as a guide to clear them. Enter the bay on a 305° true (W. by N. mag.) course, passing between the north point at the entrance and White Gull Island, favoring the point slightly, and anchor ¾ mile inside the entrance. When in the bay the lead is a good guide, but care must be taken to avoid a reef, partly bare at low water and with 2½ to 3 fathoms (4.6 to 5.5 m.) close-to, which extends ⅜ mile eastward (true) from the south point at the entrance to Cottonwood Bay.

Turtle Reef extends over ⅜ mile eastward (true) from the south point at the entrance of Iliamna Bay. The reef is largely bare at low water, and is about 15 feet high at its highest point.

Black Reef lies over ½ mile from shore and 1⅛ miles 93° true (ENE. ⅛ E. mag.) from the northern point at the entrance of Iliamna Bay. The highest part of the reef is two rocks 5 to 10 feet (1.5 to 3 m.) high. Lying ½ mile northeastward of Black Reef is another reef which covers at half tide and extends ½ mile from shore.

It is reported that Iliamna Bay does not freeze, but that drift ice in large quantities sets in at times from the upper inlet. Fresh water may be obtained from streams on the northeast side about 1 mile inside the entrance. Northerly gales prevail in winter, and heavy williwaws are reported to come from the mountains on the northeast shore. The prevailing summer winds are down the bay. and are frequently fresh, especially on bright days.

The tidal currents at the anchorage have an estimated velocity of 1 to 2 knots.

Iniskin Bay is a secure harbor in any weather, although subject to some williwaws from the mountains on the west shore. The west shore is formed by sharp, bare peaks about 2,900 feet (884 m.) high, while the eastern shore is generally low and alder-covered. The western side and upper part of the bay are filled with bowlder-strewn flats bare at low water, and the eastern part is shoal and fringed by a reef. The channel is nearly ¾ mile wide at the entrance and tapers to a narrow slough at the head.

To enter Iniskin Bay, avoid the reefs which rise abruptly from deep water and extend about 1 mile from the shore eastward of the bay. Keep White Gull Island bearing northward of 278° true (WSW. ⅝ W. mag.), and pass over 1 mile southward of the outer islands off the entrance. When the two prominent headlands on the west side of Iniskin Bay, 1½ and 4 miles inside the entrance, are in line steer this range, course 14° true (N. ⅞ W. mag.) until approaching the western shore. Follow this shore at a distance of ¼ mile until Range Peak, on the north side of Right Arm, is in line with Iliamna Volcano, and then steer this range, course 26° true (N. ⅛ E. mag.). Anchor on the range, from 1½ to 2½ miles above Scott Island, in 7 to 8 fathoms (12.8 to 14.6 m.), muddy bottom, where the width of the channel between the 5-fathom (9.1 m.) curves is about 700 yards.

Water can be obtained from the streams in Iniskin Bay, the most convenient to the anchorage being a stream on the west side about 2 miles above the entrance. The tidal currents at the anchorage have an estimated velocity of about 1½ knots at strength, setting fair with the channel.

Iniskin River, at the head of Iniskin Bay, is navigable for boats of not more than 3 feet (0.9 m.) draft for a distance of about 2 miles above the entrance.

Three small islands with outlying reefs lie on the east side of the entrance of Iniskin Bay. The northerly one, called **Scott Island,** is about 40 feet (12.2 m.) high and partly wooded, and from it a reef with rocks about 15 feet (4.6 m.) high extends ½ mile northwestward. The middle island is about 35 feet (10.7 m.) high, and from it a reef extends ¾ mile southwestward. The outer island is 50 feet (15.2 m.) high on the north side, and from it a reef partly bare at low water extends ½ mile southwestward; lying 1 to 1¼ miles southwestward from the islet is a sunken reef with little depth, which does not break in heavy weather. These reefs rise abruptly from depths of 7 to 8 fathoms (12.8 to 14.6 m.), and the lead will not serve as a guide to clear them.

From **Iniskin Bay** to **Oil Bay** the coast is fringed by a reef, which extends about 1 mile from shore and rises abruptly. Many of the rocks show at low water. **Pomeroy Island,** 2¼ miles eastward of Scott Island, is small and rocky and has a few trees on its west end. A large rock about 10 feet (3 m.) high lies 1 mile eastward of Pomeroy Island. From Iniskin Bay to Oil Bay there is a comparatively smooth passage for launches inside the reefs.

From Oil Bay to **Chinitna Point** reefs extend about 1 mile from shore in places and rise abruptly from deep water. Rocks show at low water close to shore only. With northerly winds small boats can get some shelter in Oil Bay, Dry Bay, and the small bight under Chinitna Point.

Oil Bay is a shoal open bay having a sand beach at its head, which bares ¾ mile from shore. The bottom is rocky and broken, and is foul for about 1 mile offshore on the west side of the entrance. Abandoned oil wells are located in the valley of Bowser Creek about 2 miles from the head of the bay. From Oil Bay a valley leads through to Chinitna Bay and there is a good trail to Iniskin Bay along the north side of Mount Pomeroy.

Dry Bay is a rocky, shoal bight between Oil Bay and Chinitna Point. The head is a sand beach, on the eastern end of which is a cabin of an abandoned oil company.

Chinitna Bay is shoal, and an anchorage in 4 to 5 fathoms (7.3 to 9.1 m.) in the entrance is exposed to all easterly winds. The bottom is muddy and good holding ground, and anchorage can be selected anywhere in the bay where there is sufficient depth to lie afloat at low water. A small vessel of less than about 12 feet (3.7 m.) draft can anchor with fairly good shelter in a depth of about 18 feet (5.5 m.) in a narrow channel 300 yards northwestward of the low point on the south side 3 miles above the island in the entrance. There are strong williwaws with westerly winds. The bay is reported to be full of ice during the winter. The tidal currents rarely exceed 1¾ knots in the bay.

A prominent, rocky, grass-covered island, about 140 feet (43 m.) high, lies on the south side in the entrance of Chinitna Bay. Reefs extend 5/8 mile northward, northeastward, and southeastward from the island. A deep channel 3/8 mile wide leads into the bay southwestward of the island, but the main entrance is northward of the island and surrounding reefs as shown on the chart.

From Chinitna Bay to the prominent waterfall 5 miles southward of Chisik Island, the coast is low and wooded, with lagoons and marshes in places, and there is some quicksand. Thence into Tuxedni Harbor the coast is rocky bluffs and rises quickly to high land.

An extensive shoal, apparently an old glacial moraine, with rocky, very irregular bottom and indications of bowlders, extends 6 miles from the west shore between Chinitna Bay and Tuxedni Harbor. The least depth found is about 3¾ fathoms (6.8 m.), but there is probably less. Deep-draft vessels should avoid areas with depths less than 10 fathoms (18.3 m.) Tide rips mark the shoal at all times except at slack water, and are dangerous at times for small craft in heavy weather; the heaviest rips are near the extremity of the shoal, about 6 miles from shore.

Iliamna Volcano, 10,017 feet (3,053 m.) high, is an important mark. Steam generally issues from fissures just below the summit and from one of the lower peaks on its southeast slope.

Chisik Island is a narrow ridge, about 5 miles long and comparatively smooth on top, that slopes gradually upward from the southeast end of the island to its northwest end, where it terminates in a cliff 2,678 feet (876 m.) high, which is a conspicuous mark. A reef extends about ¼ mile southeastward from the southeast end of the island. A fixed white light has been established on the southeasternmost point of Chisik Island. It will be maintained from March 1 to November 1 of each year.

Tuxedni Harbor, on the southwest side of Chisik Island, is a large and secure anchorage. Heavy williwaws occur with gales from any direction, and raise a choppy sea in the harbor dangerous to open boats. There is a cabin on the sand spit on Chisik Island 4 miles from its southeast end. Water can be had from a fall 5/8 mile northwestward of the cabin. The harbor is reported to be blocked with ice from December to March.

Snug Harbor is the name locally applied to the cove, where there is a cannery and wharf, on the southwest side of Chisik Island, just inside the lighthouse.

To enter Tuxedni Harbor give the southeast point of Chisik Island a berth of over ½ mile, keep in mid-channel until about 2 miles inside the entrance, and then follow Chisik Island at a distance of ½ mile. The anchorage is about 3/8 to ½ mile from Chisik Island for a distance of 1 mile below the cabin, in 15 to 17 fathoms (27.4 to 31 m.), sticky bottom, and has a clear width of ¾ mile. On the island side the shore is bold, but a shoal makes out 5/8 to 1 mile from the main shore abreast the anchorage; the shoaling is abrupt on the sides of the channel and there are bowlders in places on the shoals. The passage northward of Chisik Island should be avoided, even by small craft.

Current.—The tidal current sets fair with the channel, and turns from ½ to 1 hour after high water. The ebb runs about 2 hours

longer than the flood. The average velocity of the current at strength of flood and ebb is about 2 knots.

From Tuxedni Harbor to Harriet Point the shore is a gravel bluff with trees on top and a few bowlders in the water. The point 8 miles southward of Harriet Point is an alder-covered bluff from 200 to 300 feet (61 to 91 m.) feet high, with a number of bare slides. There are bowlders in places on the shoals which fringe this shore, and vessels should proceed with caution when inside the 10-fathom (18.3 m.) curve.

Redoubt Volcano, 10,198 feet (3,108 m.) high, is an important mark, lying 12 miles from the shore westward of Harriet Point. There is a notch on its southeast slope just below the summit.

Double Peak, lying 15 miles northward of Redoubt Volcano, is 7,088 feet (2,160 m.) high, has two knobs on top, and is easily identified from the inlet.

Harriet Point is a clay bluff about 100 feet (30 m.) high, with bowlders at the water. A bowlder reef bare at low water extends ¾ mile eastward from Harriet Point, and the point should not be approached closer than 1½ miles on the line of the reef.

There is a fair anchorage in moderate weather on the north side of Harriet Point, which so far as known is safe during the summer except for southerly, southeasterly, and northeasterly gales. Very small vessels can anchor in about 5 fathoms (9.1 m.) about ½ mile from shore, with the point bearing 177° true (SSE. ½ E. mag.). At the anchorage the ebb current has a velocity of 2 to 3 knots, while the flood current is weak and of short duration.

From **Harriet Point to West Foreland** the shore is generally low and backed by patches of woods, which appear continuous, and is subject to overflow at extreme high tides. It is fronted by a flat which extends off a greatest distance of 2½ miles in the bight northwestward of Harriet Point and at the north end of **Redoubt Bay.** The edge of the flat is generally steep-to, but no bowlders were seen on those parts lying in front of marshy shores. Drift River is shallow, rapid, and obstructed by rocks and snags.

Butte is a prominent wooded hill 488 feet (149 m.) high, lying 4 miles inland and 14 miles southwestward of West Foreland.

Kalgin Island is 11 miles long, over 200 feet (61 m.) high at its north and south ends, and wooded. The entire island is fringed with bowlders.

A shoal extends 16 miles southward from Kalgin Island. There are spots bare at low water for a distance of nearly 8 miles from the island, and thence southward the least depths found are 9 and 14 feet (2.7 to 4.3 m.). It is apparently a part of an old glacial moraine, the bottom is very broken, and there are probably less depths than found by the survey, especially between the shoaler lumps. No bowlders show at low water, however, on the shoal except near the island. The shoaling is abrupt on the sides of the shoal from depths of 15 to nearly 40 fathoms (27.4 to 73 m.), as shown on the chart. There is a 5-fathom (9.1 m.) spot close to the 10-fathom (18.3 m.) curve at the south end of the shoal which lies 110° true (E. ½ N. mag.) from the peak of Chisik Island.

A passage with general depths of 12 to 15 feet (3.7 to 4.6 m.), which is used by cannery tenders, leads across the shoal from 1 to

2½ miles southward of Kalgin Island, as shown on the chart. A range should be picked up in the opening northward of Chisik Island to insure making the course good, as the currents on either side of the island have a velocity of 3 to 4 knots at times, and are nearly slack in the lee of the island. There are bowlders near Kalgin Island, and they may also exist in the passage.

A sand shoal or ridge about 8 miles long lies 2½ to 3½ miles westward of Kalgin Island. It shows about 7 feet (2.1 m.) above mean lower low water at the highest point near its middle. The shoaling is abrupt on the sides of the shoal.

The northeast point of Kalgin Island is marked by a flashing white light.

A bowlder-strewn shoal with depths of 7 fathoms (12.8 m.) or less extends 8 miles northward from the northeast point of Kalgin Island. The area has been gone over at a good low water, and the outer bowlders which show at low water lie 2½ miles from the island in depths of nearly 30 feet (9.1 m.). As there may be other bowlders not found, it is advisable to proceed with caution where the depths are not more than 30 feet (9.1 m.) greater than the draft.

Small vessels can select **anchorage** off the middle of the north end of Kalgin Island, with good shelter from southerly gales drawing up the inlet. The holding ground is good and the currents as little as will be found at any of the exposed anchorages. Caution must be observed, however, at low water when crossing the broken, bowlder-strewn area with depths less than 7 fathoms (12.8 m.) making off from the north end of the island.

The highest parts of the shoal lying between Kalgin Island and West Foreland show between 3 and 4 feet (0.9 and 1.2 m.) at mean lower low water. Although the bottom is rocky in places, there are no bowlders showing in its vicinity at lowest tides. There are bowlders in places on the bottom between the shoal and West Foreland.

West Foreland is a flat wooded headland 262 feet (80 m.) high, with a bluff at the water. The shore at West Foreland and for a distance of 4 or 5 miles northward is fringed with bowlders, which extend below low water. The bottom is broken and there are bowlders between West Foreland and the shoal southward.

Kustatan River has its entrance 3½ miles westward of West Foreland. It connects inland with **McArthur River**, which enters the inlet 12 miles northward of West Foreland, and this route is used by the natives in bidarkas when going to Tyonek.

For a distance of 8 miles northward from West Foreland the bluff is at the water and there are numerous bowlders on the beach. The bluff then trends inland to a conspicuous wooded ridge, 5 miles long and 300 feet (91 m.) high, which is 2½ miles inland at its northern end.

For a distance of 15 miles northward from the end of the bluff the shore of **Trading Bay** is flat, grass covered, and subject to overflow, and there are several sloughs. This part of the bay is fronted by a flat which extends off a greatest distance of 2⅛ miles at the mouth of McArthur River. This river is about 1 mile wide at its entrance at high water, but due to a bar across its mouth it can not be entered at low water.

Nikolai River is a narrow slough 19 miles northward of West Foreland. There is a depth of 1 to 2 feet (0.3 to 0.6 m) at low water in the channel across the flat which extends upward of 2 miles from shore. A depth of about 15 feet (4.6 m.) can be taken into the river at high water. The water in the river is fresh nearly to its mouth except for a short time at high water.

Beginning at a prominent gulch 2¾ miles northeastward of Nikolai River the bluff comes to the shore and so continues around North Foreland. The gray bluff just eastward of the gulch is a prominent feature. There is a small stream in the gulch. Anchorage can be had about ¾ mile off the gulch, in 4 to 5 fathoms (7.3 to 9.1 m.), hard bottom, with the village of Tyoneck open about 100 yards from the grayish bluff point eastward of the anchorage. Rocks awash at low water extend ¾ mile from shore 1 mile eastward of the gulch.

Old Tyonek is a small native village 6½ miles northeastward of Nikolai River. For a distance of 1 mile westward of Old Tyonek there are several large bowlders ¾ mile from shore. Thence eastward the shore is less foul.

Moquawkie is a native village on a grassy spit on the southeast side of North Foreland 3 miles eastward of Old Tyonek. Anchorage can be had about 300 yards off the eastern end of Tyonek, with the Creek Church bearing about 4° true (NNW. mag.), in 4 to 5 fathoms (7.3 to 9.1 m.), mud and gravel. The flood current has a velocity of 4 to 5 knots, and ebb 2 to 3 knots. Care should be taken to avoid a shoal bare at low water which lies about 250 yards westward of the anchorage and extends 100 yards from shore. The anchorage is good during moderate weather or with offshore winds.

North Foreland is a bluff about 150 feet (46 m.) high at the end of a hilly, wooded ridge. Thence northward the bluff is lower. It is marked by a light which is shown from April 15 to November 15.

Chuit River, about 3 miles northward of North Foreland, is marked by a low break in the bluff. A depth of about 8 feet (2.4 m.) can be taken into the mouth of the river at high water, and the tides are felt about 1 mile up the river. **Ladd** is a small native village and has a large warehouse on the north side at the mouth of the river.

There is a prominent bluff 150 feet (46 m.) high on the south side of **Threemile Creek.** The bluff continues northward for 2½ miles from this creek, and then the tree line is from 2 to 3 miles inland from ordinary high-water mark, the strip between being subject to overflow at extreme high tides. This feature continues to within 2 miles of Point Mackenzie.

Beginning at Threemile Creek the shore is fronted by a mud flat which extends off an increasing distance from the shore northward. Its low-water edge is about 2 miles off the mouth of Beluga River, 5½ miles off the mouth of Susitna River, 3½ miles off the shore eastward nearly to Little Susitna River, and extends to the shore about 1 mile westward of Point Mackenzie.

Beluga River is 11½ miles northward of North Foreland. The channel through the flats at the mouth of the river has a depth of about 2 feet (0.6 m.) or less at low water, and is said to shift in the winter and spring from the action of ice. A depth of as much as

18 feet (5.5 m.) at high water can be carried from the flats to **Beluga,** a former trading station, about 2 miles above its entrance, where the depth is not over 8 feet (2.4 m.) at low water. The effect of the tide is felt in the Beluga River 6 or 8 miles from its mouth, and it is said that boats can ascend to **Beluga Lake,** about 20 miles inland.

A fixed white light is located on the northeast bank at the river entrance. The light is shown from April 15 to October 31 of each year.

Theodore River, 3½ miles northward of Beluga River, is similar to Nikolai River. About 3 or 4 miles up Theodore River it reaches to within ¾ mile from Beluga River, and there is an easy portage between.

Lewis River, 3 miles northward of Theodore River, is a slough draining the marshes.

Susitna River is navigable for stern-wheel steamers of 2 or 3 feet (0.6 or 0.9 m.) draft to the **Talkeetna River,** a distance of about 68 nautical miles, but this was done only at good stages of high water and presented many difficulties; under the most favorable conditions of very high water a steamer has been taken to **Indian Creek,** about 100 miles from the mouth. Launches occasionally run up the **Yentna River** to the forks, about 65 nautical miles above its junction with the Susitna. The tides are not felt more than 7 miles up the Susitna, and above this the current is swift.

The channels across the flat at the mouth of the river have depth of about 2 feet (0.6 m.) or less at low water. They change during the winter and spring, due to the action of ice and freshets, and the channels in and above the entrance are said to change frequently in the spring and early summer.

Susitna, the principal base of supplies, is on the Susitna about 18 nautical miles above the entrance and just below the mouth of the Yentna. The principal traffic is in launches, occasionally towing scows, which run from Knik Arm to Susitna.

Little Susitna River, about 9 miles westward of Point Mackenzie, is reported to be navigable for launches at high water for a distance of 8 miles.

Susitna Mountain, the prominent mark in the upper inlet, is 4,401 feet (1,341 m.) high and lies on the west side of Susitna River, 13 miles above the head of Cook Inlet. A high ridge extends off from it in a westerly direction.

KODIAK AND AFOGNAK ISLANDS

This group, lying southwestward of Cook Inlet, and separated from the mainland by Shelikof Strait, consists of the two large islands above named, and numerous small ones along their shores. The group is about 155 by 54 miles in extent, with its greatest length in a southwesterly direction.

The land is rugged and mountainous, with elevations of 2,000 to 3,000 feet (610 to 914 m.) along the shores, and in excess of 4,500 feet (1,372 m.) in the interior. The shores are rugged and rocky, and are indented by numerous deep narrow inlets, in which are numerous rocks and reefs.

The eruption of Katmai Volcano in 1912 covered this group with a thick deposit of volcanic ash. The effects of the eruption have gradually disappeared and at present (1926) the ash deposits are no longer apparent.

There are a number of canneries engaged in canning salmon during the season, and the cod, halibut, and herring fisheries are important. Afognak Island is mostly timbered and is a Government forest reserve.

Some cattle and sheep raising is carried on, and a few mineral prospects have been located.

There is much more fine weather on these islands than on the adjacent mainland, and considerable success has been attained in growing vegetables and foodstuffs.

EAST COAST OF SHUYAK AND AFOGNAK ISLANDS

Shuyak Island is generally wooded and hilly, with elevations probably above 1,000 feet (305 m.). Some of the hills on the island, and the outlying islands and rocks on its northern and western sides, are located. The island is deeply indented by inlets, but no information is available respecting them.

Point Banks is an island about ¾ mile long close to the northeast end of Shuyak Island. A rock about 20 feet (7 m.) high lies ½ mile northwestward of Point Banks; no breaker was seen outside of the rock at low water with a moderate swell.

Perevalnie Island is close to the northern shore of Shuyak, its western end lying 1⅞ miles southwestward of the rock northwestward of Point Banks. Temporary anchorage for a small vessel, sheltered from southeasterly winds, can be had in the western entrance of the narrow passage between Perevalnie and Shuyak Islands, in 10 fathoms (18.3 m.) muddy bottom. There is no shelter in northeasterly weather, and it is a bad place to leave on account of the heavy sea and tide rips.

The northern side of Shuyak Island westward of Perevalnie Island is apparently foul, rocks awash and sunken extending well off in places. The western and southern coasts of Shuyak Island are described on page 131.

Sea Otter Island, lying 7½ miles southeastward from Point Banks, is grass covered, ⅜ mile long, and about 100 feet (30 m.) high. It is surrounded by bare rocks and breakers to a distance of 1½ to 2 miles. It is reported that there are breakers and rocks bare at low water all the way from this island to Point Banks and breakers about midway between the island and Tolstoi Point.

Afognak Island is in its eastern part a series of mountain ridges with low depressions between them running through the island from north to south. From a distance Marmot Island shows as the easternmost of these ridges. The lower parts of Afognak Island are wooded, except its eastern coast, and its southwestern end southward of Paramanof Bay. The northern part of the island between Black Cape and Tonki Cape is not surveyed.

Tonki Cape is the northern end of the high ridge separating Tonki Bay from Marmot Strait. It is about 70 feet (21.3 m.) high and grass covered, and rises gradually southward to high land. A

short reef with some large bare rocks on it extends northward from the cape, terminating in a rock, bare at low water, ¼ mile from shore. Temporary anchorage in southeasterly weather can be had by a small vessel off the bight on the west side of the end of Tonki Cape.

Tonki Cape is marked by an unwatched flashing white light located on the north point of the cape. It is about 75 feet (22.8 m.) above the water, and is visible 11 miles.

Tonki Bay, on the west side of Tonki Cape, has two main arms. The eastern one is about 5 miles long from Tonki Cape. The arm is 1¾ miles wide abreast the headland separating the arms, which is 2½ miles inside Tonki Cape, and has a high rocky islet about ⅜ mile northward from it. Three rocks, covered at high water, lie about ⅜ mile from the eastern shore and 1¾ miles southward of Tonki Cape. The west side of the arm is steep and apparently bold; the east side is lower and more broken. There is anchorage about ¼ mile from the head of the arm in 10 fathoms (18.3 m.), soft bottom, but it is not secure with northerly winds.

The western arm of Tonki Bay extends southward to within about 2 miles of Izhut Bay, with low land between. There is no bottom at 20 fathoms (37 m.) in mid-channel until ¼ mile from the beach in the bight on the eastern side ¾ mile from the head, where there is secure anchorage in about 12 fathoms (21.9 m.), hard bottom.

The coast for 5 miles southward of Tonki Cape is a low bluff, with a marsh ¼ to ½ mile wide between it and the foot of the ridge which rises abruptly. Numerous islets and rocks fringe the coast, extending off ¼ mile in places. Thence southward the bluffs increase in height toward King Cove. Southward of King Cove the coast is a bluff over 500 feet (152 m.) high, which extends around Pillar Cape.

King Cove, lying 288° true (W. ½ S. mag.) from the south end of Marmot Island, is an open bight 1½ miles long and indents the coast ½ mile. It may be used as a temporary anchorage with offshore winds, and otherwise affords no shelter. There are numerous kelp patches in the cove near the shore.

Marmot Strait, between Afognak and Marmot Islands, is 2½ to 3 miles wide, and is frequently used by vessels. While no sounding has been done, it is apparently deep and clear in the middle. The shores are more or less foul and should be given a berth of over 1 mile. A rock, bare at extreme low water, has been reported about 1 mile off the western shore in latitude 58° 14′.6 N. The tidal currents have an estimated velocity of 1 to 3 knots the flood current setting northward. Sailing directions through the strait are given on page 18.

Sealion Rocks lie 5¼ miles east-northeastward from Tonki Cape and 4 miles northward from Marmot Island. They are two bare rocks, close together, the larger one about 50 feet (15.2 m.) high, and a reef, bare at low water, lying ⅝ mile northeastward from the bare rocks.

Marmot Island is about 6½ miles long, with elevations up to about 1,300 feet (396 m.), and wooded to a height of about 500 feet (152 m.). The north end is low and rises gradually to the high land. The eastern side and southern end of the island are bluffs over 500 feet (152 m.) high in places. The western shore is also steep but

lower. There are three high rocks close to **Marmot Cape,** the south end of the island, and two close to its southeast side.

A rock about 6 feet (1.8 m.) high lies 600 yards from the northwest side of Marmot Island, about 1½ miles from its northern end. An extensive kelp field makes out from the island to a distance of about ½ mile northward from the rock, and extends around to the north end of the island.

Two sunken rocks, on which the sea generally breaks at low water, lie about 1 mile apart and 2½ miles eastward of **Cape St. Hermogenes,** the eastern end of Marmot Island. The northern rock lies 108° true (E ½ N. mag.) from the north end of the island and 38° true (N. by E. ¼ E. mag.) from its southeast end. The southern rock lies 120° true (E. ½ S. mag.) from the north end of the island and 45° true (N. by E. ⅞ E. mag.) from its southeast end. The range of the two pinnacle rocks close to the southeast side of Marmot Island, bearing 232° true (SSW. ½ W. mag.), passes southeastward of both breakers.

Pillar Cape is a bluff over 500 feet (152 m.) high, similar to the southeast side of Marmot Island, and there is a high pinnacle rock at the foot of the bluff ½ mile eastward of the south end of the cape. On the southwest side of Pillar Cape are three high bluff points with small coves between. About 1½ miles westward of the cape is an open bight from which a low divide extends through to the western arm of Tonki Bay.

MARMOT BAY

extends westward between Afognak and Kodiak Islands to Whale Island. The route along the south side of the bay through Narrow Strait and Whale Passage is generally used by vessels from Kodiak bound to Shelikof Strait. These passages are described on pages 123 and 125.

The northern part of Marmot Bay is clear except its western end between Kostromitinof Cape and Hog Island. The outlying broken ground in the entrance and middle of the bay has not been closely developed. Pillar Cape may be rounded at a distance of 1 mile in depths of over 20 fathoms (37 m.). Deep water extends as close as ¼ mile to Izhut Cape. In the western end of the bay danger will be avoided by keeping eastward of a line from the eastern end of Kostromitinof Cape to Stripe Rock, and eastward of this range extended southward, until Hog Island is open from the northwestern side of Whale Island.

Izhut Bay has its entrance between Pillar Cape and Peril Cape, and extends into Afognak Island about 7 miles in a northwesterly direction with a width of 3 miles in its lower part. No dangers were seen in the bay, but it has not been sounded and kelp extends a short distance off all the points. The shores are wooded and water may be obtained from numerous streams.

The southern arm on the western side of Izhut Bay has its entrance 3 miles inside Peril Cape, and is about 3 miles long in a 316° true (WNW. mag.) direction with a width of about ¾ mile. Lying 1½ miles inside the entrance of the arm there is an islet with a rock, bare at low water, 50 yards off its southern side. The surveying vessel used the channel southward of the island. Just above the island

the arm contracts to ¼ mile and then expands into a basin about ¾ mile in diameter. There is a rock, bare at low water, close to the north point at the entrance of the basin. Secure anchorage can be selected in the basin. A stream enters on its southern side.

At the northern end of Izhut Bay is the entrance to two small arms, about ¼ mile off the western point of which is a prominent, steep rocky islet about 60 feet (18.3 m.) high. The eastern arm has an islet in it, the channel being eastward of it; there is secure anchorage for a small vessel above the islet in 7 to 9 fathoms (12.8 to 16.5 m.). The western arm is straight and clear and has secure anchorage about ½ mile from the head in 9 fathoms (16.5 m.). A mid-channel course should be followed in the arms.

Peril Cape is a prominent, precipitous headland about 600 feet (183 m.) high, and there is a high pinnacle rock close to its southern side.

Izhut Cape, lying 2½ miles southwestward of Peril Cape, is a projecting, long, wooded, hilly point from 250 to 500 feet (76 to 152 m.) high. There is deep water around the cape as close as ¼ mile.

Duck Bay is about 6 miles long from Izhut Cape to Kostromitinof Cape. At the eastern end of the bay temporary anchorage may be had in the middle of the cove 1½ miles northwestward of Izhut Cape, in 6 to 7 fathoms (11 to 12.8 m.). The anchorage is eastward of an islet, about 30 feet (9.1 m.) high, which lies ¼ mile from the northern shore and should not be approached closely.

A round, rocky island, 160 feet (49 m.) high and grass covered on top, lies 2½ miles westward from Izhut Cape and ¾ mile from shore. Kelp extends nearly ¼ mile westward and northward of the island, and numerous bare rocks extend ½ mile eastward of the island and to the shore northeastward of it. In the cove northward of the island is a small native settlement. Temporary anchorage may be had in the middle of the cove, in 10 to 12 fathoms (18.3 to 21.9 m.). Enter the cove westward of the island, between it and a large rock, awash at high water, lying ¼ mile southward from the western point of the cove.

The next cove westward, having its entrance 1 mile northwestward of the island, is 1 mile long and ¾ mile wide. The bottom is rocky and kelp extends some distance from shore in places. Small craft, entering with care, can anchor in 5 to 8 feet (1.5 to 2.4 m.) of water at the head.

Kostromitinof Cape is a projecting, long, level, wooded point, about 200 feet (61 m.) high, with bluffs in places at the water. Northward from the cape the land rises gradually in a distance of 5½ miles to a prominent peak 2,080 feet (634 m.) high.

Spruce Island, on the south side of Marmot Bay, has generally a low, wooded strip all around it, but the middle of the island is a grassy ridge 1,580 feet (482 m.) high, with but few trees. **South Point** of the island is marked by a high, black, rocky islet, with a lower one close to its south side, lying 600 yards southward from the point. **East Cape** has some large bare rocks close-to, and broken ground, with 8 fathoms (14.6 m.) on it and a possibility of less, extends 1½ miles northward from it. **North Cape** is a wooded knob 550 feet (168 m.) high. There is a high, wooded island close

to the western end of Spruce Island. A fair anchorage protected from easterly winds can be had just to the southward of this island.

The Triplets, lying 1½ miles westward of North Cape of Spruce Island, are three grass-covered islands, the highest 190 feet (58 m.). The group forms a chain 1 mile long, and there are bare rocks between them. The 14-fathom (25.6 m.) soundings lying nearly 1 mile and 2⅜ miles northward of The Triplets, and the 25-fathom (46 m.) sounding lying midway between The Triplets and Kostromitinof Cape, have not been developed.

Whale Island, at the western end of Marmot Bay, is about 4 miles in diameter. Its southern half is a grass-covered mountain 2,030 feet (619 m.) high with a narrow, light streak or landslide down its eastern slope. The northern side of the island is low, and the lower parts of the island are generally wooded. **Treeless Islet,** rocky and grass covered, lies ⅜ mile off the eastern side of the northern end of the island. Whale Passage is southward of the island and Afognak Strait northward.

DANGER BAY,

on the north side near the western end of Marmot Bay, has its entrance between Kostromitinof and Kazakof Capes, where it is 2¼ miles wide, and extends 6 miles 4° true (N. by W. ¾ W. mag.) to its head, where it is 1 mile wide. From the head of the bay two narrow arms extend northward, the western one 1 mile long and the eastern one 2 miles.

Parrot Islet, round, rocky, and 30 feet (9.1 m.) high, is in the entrance of the bay and ¾ mile westward of Kostromitinof Cape. Broken ground, on which are several rocky islets and rocks awash, extends southward from the islet to two rocks bare at low water lying ½ mile 171° true (SE. by S. mag.) from it.

A sunken ledge, with some kelp and on which the least depth found is 22 feet (6.7 m.), lies ¾ to 1½ miles 143° true (SE. by E. ½ E. mag.) from Parrot Islet, and its northern end lies ½ mile southwestward from Kostromitinof Cape.

Stripe Rock, lying off the entrance of the bay 2⅞ miles 190° true (S. by E. ¼ E. mag.) from Parrot Islet, has two pinnacles close together and about 35 feet (10.7 m.) high, the higher one having a prominent white streak for its entire height. There are some smaller rocks near them, and two rocks, covered at high water, lie ⅜ mile northwestward from the pinnacles.

A large bare ledge about 30 feet (9.1 m.) high lies 1 mile north-northwestward from Stripe Rock. From this ledge and Stripe Rock to the island and Skipwith Reefs off the eastern entrance to Afognak Bay, the area is foul, having numerous reefs and kelp patches, and should be avoided by vessels.

On the eastern side of Danger Bay, 3¼ miles northward of Parrot Islet, there is a cove which affords anchorage for a small vessel, in 12 to 14 fathoms (21.9 to 25.6 m.), and small craft can anchor in its southeastern end in about 5 fathoms (9.1 m.). A reef extends about 100 yards off the south side just inside the entrance of the cove, and the small bight in its eastern side is shoal.

A bare rock, a few feet high, lies 3/8 mile from the eastern shore and 5/8 mile from the head of the bay. Vessels of any size can anchor about midway between this rock and the point separating the two arms at the head, in 14 to 15 fathoms (25.6 to 27.4 m.), muddy bottom. Small vessels can anchor, in 8 to 10 fathoms (14.6 to 18.3 m.), either in the broadest part of the western arm 1/4 mile from its head, or in the entrance of the eastern arm.

DIRECTIONS, DANGER BAY

From eastward, shape the course for a position about 1/2 mile southeastward of Kostromitinof Cape. Then steer for Parrot Islet on a 305° true (W. by N. mag.) course until the southwestern end of the cape is a little forward of the beam. Then steer 330° true (NW. 3/4 W. mag.) and pass 1/4 mile off the southwestern end of the cape and the same distance northeastward of Parrot Islet.

Then steer 359° true (NNW. 1/4 W. mag.) with Parrot Islet astern, which will lead to the head of the bay. Above Parrot Islet there are no dangers if the shores be given a berth of 1/4 mile, except the bare rock lying 3/8 mile from the eastern shore and 5/8 mile from the head of the bay.

From southwestward, keep Hog Island open from the northwestern side of Whale Island until Stripe Rock is in range with the eastern side of Kostromitinof Cape. Then steer 41° true (N. by E. 1/2 E. mag.) for 2 1/4 miles to a position 1/4 mile eastward of Stripe Rock. Then steer 6° true (N. by W. 5/8 W. mag.) for 1 1/8 miles to a position 1/4 mile eastward of a bare ledge about 30 feet (9.1 m.) high. Then steer 333° true (NW. 1/2 W. mag.) about 1 mile. Then steer 358° true (NNW. 1/4 W. mag.) for 3/4 mile, keeping Stripe Rock open westward of the bare ledge about 30 feet (9.1 m.) high astern until Parrot Islet is 1/2 mile on the starboard beam. From this position a 5° true (N. by W. 5/8 W. mag.) course will lead to the head of the bay.

AFOGNAK BAY,

making into Afognak Island from the western end of Marmot Bay, is a secure anchorage and easily entered in the daytime. It is 5 miles long from Hog Island, the entrance is nearly 3 miles wide between Big Rock and Afognak village, and above Dot Island the bay is 1/2 mile wide. On the western shore 1 1/8 miles above Dot Island is an unused cannery, and at the head of the bay is a Government fish hatchery. The best anchorage is off the cannery in 8 to 10 fathoms (14.6 to 18.3 m).

The eastern side of the entrance is formed by a chain of islands and bare rocks. **Lamb Island,** nearest to the shore, is 1/2 mile long and wooded. **Alexander Island,** 3/4 mile eastward of Lamb Island, is grass covered, and has a knob about 80 feet (24.4 m.) high at its north end. **Skipwith Reefs,** a chain of bare rocks, extend 1 1/2 miles southeastward from Lamb Island to Big Rock. The southern side of the rocks should be given a berth of over 3/8 mile. The principal danger in the approach is a rock, awash at low water and steep-to, lying 5/8 mile 118° true (E. 3/8 S. mag.) from **Big Rock;** Hog Island open from the northwestern side of Whale Island leads

¼ mile southward of the rock awash, and Stripe Rock in range with the eastern end of Kostromitinof Cape leads ½ mile eastward of it. The better entrance to the bay is between Big Rock and Hog Island, and has a clear width of over ½ mile.

Hog Island, the prominent mark in the entrance of the bay, is ⅜ mile long, and has two wooded knolls with a saddle between. Foul ground marked by kelp extends about 350 yards northeastward from its eastern end and 650 yards westward from its western end.

Afognak is a village with post office which extends along the western shore of the bay for a distance of nearly 2 miles northward of Head Point. The church (white with green roof) is the best mark in the village, and lies ¼ mile southward of Graveyard Point.

There is a radio station operated by the Bureau of Fisheries. Regular passenger steamers do not call at Afognak. The mail is brought from Kodiak.

Village Reefs are partly bare at low water and covered with kelp, and extend over 1 mile eastward from Afognak toward Hog Island. The point of the reefs is midway between Graveyard Point and Hog Island. Southeastward from the point of the reefs is a detached shoal with a least found depth of 3½ fathoms (6.4 m.). Between this shoal and the reef extending westward from Hog Island is a channel ½ mile wide.

Danger Reef lies 1⅛ miles 57° true (NE. by N. mag.) from Graveyard Point and 1½ miles 317° true (WNW. mag.) from the west end of Hog Island. It is small, bare at half tide, marked by some kelp, and is a serious danger when covered.

A rock, with 14 feet (4.3 m.) over it and marked by kelp, lies ⅝ mile west-northwestward from Danger Reef and the same distance 52° true (NNE. ½ E. mag.) from Lipsett Point on the western shore.

Dot Island, small and wooded, is the western one of three small islands close to the eastern shore where the bay narrows to ½ mile. On the western shore opposite Dot Island is a cascade where fresh water can be obtained by boat.

For tides, see Afognak Strait.

DIRECTIONS AFOGNAK BAY

From eastward, keep Hog Island open from the northwestern side of Whale Island, bearing anything westward of 250° true (SW. ⅛ W. mag.) until about ¾ mile from Hog Island, to clear the dangers on the northern side of the approach. Then pass midway between Hog Island and Big Rock.

From Narrow Strait, follow the directions on page 128 until westward of Three Brothers. Then steer 328° true (NW. by W. mag.) for 6 miles with Low Island astern to a position ½ mile northeastward of Hog Island.

Pass midway between Hog Island and Big Rock and steer 315° true (WNW. ⅛ W. mag.) for the old cannery building showing midway between Dot Island and the eastern shore. Keep this range for about 2 miles until the western end of Lamb Island is abeam. Then steer 308° true (WNW. ¾ W. mag.) for 1¾ miles and pass 400 to 500 yards southward of Dot Island.

Keep this course for about ¼ mile past Dot Island until ¼ mile off the cascade on the western shore. Then steer 353° true (NNW. ¾ W. mag.), favoring slightly the western shore, for ¾ mile. Anchor near mid-channel off the old cannery in 8 to 10 fathoms (14.6 to 18.3 m.). The anchorage is clear if Winter Island be given a berth of 300 yards and Last Point (on the north shore) 400 yards.

From Afognak Strait, steer for the south end of Hog Island with Deranof Rock astern, course 73° true (NE. ⅜ E. mag.) until ⅜ mile past Dolphin Point (northeast end of Whale Island). Then steer for the western end of Lamb Island with eastern end of Whale Island astern, course 8° true (N. by W. ⅜ W. mag.) and pass ⅝ mile westward of Hog Island. When ½ mile past Hog Island and Big Rock is a little forward of the beam, steer 325° true (NW. by W. ¼ W. mag.), heading for Dot Island with the western end of Hog Island astern, which leads nearly ¼ mile northeastward of Danger Reef. Keep this course for 2 miles until about ¾ mile from Dot Island, and then steer 308° true (WNW. ¾ W. mag.) and pass 400 to 500 yards southward of it. Then follow the directions in the preceding paragraph.

AFOGNAK STRAIT,

between Whale and Afognak Islands, is not generally used, but is convenient for small vessels when bound to or from Afognak Bay and the currents are only half as strong as in Whale Passage. With care the navigation is not difficult on a clear day when the marks for the strait can be seen. It has a least width of ⅝ mile, but large areas, especially on the north side, are foul and there are many dangers. The channel at Chiachi Point, where it is narrowest and shoalest, has a width of ¼ mile and a general depth of 24 feet (7.3 m.), but there is a rock with 16 feet (4.9 m.) over it in mid-channel. The dangers are marked by kelp, which grows in depths up to about 6 fathoms (11 m.) and shows at slack water.

Dolphin Point is the northeast end of Whale Island. A reef partly bare at low water extends 600 yards from Whale Island at a point ¼ mile westward of Dolphin Point.

Fox Bay, the bight in Whale Island 1 mile westward of Dolphin Point, has a reef in its entrance which shows well at low water. A small vessel can anchor in the bay inside the reef in 4 to 5 fathoms (7.3 to 9.1 m.), but the south shore must be given a berth of 300 yards. Thence westward the shore of Whale Island is clear to Chiachi Point, the northwest end of the island, from which a shelving reef makes out about 350 yards in a northwest direction.

In the narrowest part of Afognak Strait, for a distance of ¾ mile westward of Afognak village, foul ground extends ¼ mile from the north shore. Thence westward the northern half of the strait is foul. The principal danger is a reef awash at low water lying a little over ⅜ mile northwestward of Chiachi Point and 1¼ miles 69° true (NE. mag.) from the south end of Deranof Island.

A rock with 16 feet (4.9 m.), over it lies ¼ mile eastward of the preceding reef, ⅜ mile 24° true (N. mag.) from Chiachi Point, and on or a very little northward of the range of Deranof Rock and Kupreanof Mountain. The channel is southward of the rock and is about 300 yards wide.

Deranof Island, ½ mile long, low and wooded, is the southernmost and largest of the islands at the western end of Afognak Strait.

Deranof Rock, about 8 feet (2.4 m.) high, lies nearly 200 yards southward of the island. Broken ground with a least depth of 16 feet (4.9 m.) lies ⅜ mile eastward of the island and 74° true (NE. ½ E. mag.) from Deranof Rock.

Temporary anchorage may be had in the channel of Afognak Strait between Fox Bay and Afognak village, in 7 to 8 fathoms (12.8 to 14.6 m.), but exposed to the full strength of the currents and to easterly and northeasterly winds. A small vessel can anchor in Fox Bay.

Small vessels can anchor near the kelp on Village Reefs, with the church (white with green roof) in Afognak bearing 344° true (NW. ½ N, mag.), and Head Point (south of the village) in line with Deranof Rock, in 5 fathoms (9.1 m.). Little current will be felt here, but it is exposed to easterly winds.

With easterly winds small vessels can anchor about ¼ mile westward of the point on the north side of Afognak Strait, ¾ mile westward of Head Point, in about 4 fathoms (7.3 m.), but care is required. When rounding into the anchorage, pass northeastward of a reef, bare at low water, lying ⅜ mile southwestward of the point, and give the point a berth of over 300 yards.

Tides.—High and low water occur about 10 minutes later than at Kodiak, and the mean rise and fall of the tides is about 8 feet (2.4 m). To find the approximate height of the tide, multiply the height of the corresponding tide at Kodiak by the ratio of ranges 1.2.

The **tidal currents** in Afognak Strait set westward on the flood and eastward on the ebb. The estimated velocity is 2 to 5 knots at strength, depending on the range of the tide. Slack water occurs about 1 hour before high and low waters at Kodiak. During the flood there is a strong set into Raspberry Strait which should be kept in mind when in the western end of Afognak Strait.

DIRECTIONS, AFOGNAK STRAIT

From Narrow Strait follow the directions on page 128 to a position ¼ mile northward of Shakmanof Point. Then steer 313° true (WNW. ¼ W. mag.) for 5½ miles and pass ½ mile northeastward of Dolphin Point.

From eastward in Marmot Bay, keep Hog Island open from the northwest side of Whale Island, bearing anything westward of 250° true (SW. ⅛ W. mag.), and pass ¼ mile or more southward of Hog Island and ½ mile northward of Dolphin Point.

From Afognak Bay, steer 145° true (SE. by E. ¼ E. mag.) for the western end of Hog Island with Dot Island astern, which leads nearly ¼ mile northeastward of Danger Reef. When Alexander Island is abeam, steer 188° true (S. by E. ⅜ E. mag.) for the eastern end of Whale Island with the western end of Lamb Island astern, and pass ⅝ mile westward of Hog Island.

Passing ½ mile northward of Dolphin Point, steer for Deranof Rock in range with the summit of Kupreanof Mountain, or if the mountain is hid, steer for Deranof Rock with the southern end of

Hog Island astern, course 253° true (SW. ⅜ W. mag.). In the narrowest part of the strait for ¾ mile westward of Afognak village, go nothing northward of the range. When approaching the western end of the strait, keep a little southward of the range to avoid the rock with 16 feet (4.9 m.) over it, but give the shore of Whale Island a berth of over 300 yards; on the flood guard against a northerly set toward Raspberry Strait.

When the eastern one of the two highest peaks on the southern side of Whale Passage opens westward of Whale Island, bearing 184° true (S. by E. ¾ E. mag.), steer 238° true (SW. by S. mag.) and pass ¼ mile southeastward of Deranof Rock. Continue the course ¾ mile past the rock, and then steer 286° true (W. ¾ S. mag.) with the summit of Whale Island astern. This course made good will lead through Kupreanof Strait, passing ⅜ to ½ mile southward of Gori Point, ⅞ mile northward of Outlet Cape, and ½ mile southward of Malina Point.

CHINIAK BAY AND ST. PAUL HARBOR

Chiniak Bay (chart 8570) is the indentation in the northeast end of Kodiak Island between Cape Chiniak and Spruce Cape, and St. Paul Harbor is inside the islands on its northwest side. The harbor is not difficult of access in the daytime and clear weather, but the entire bay and its approaches are dangerous at other times, and the narrow channel leading to the wharf at Kodiak requires careful piloting. Kodiak Island is mountainous, while the shores and islands of the bay are comparatively low. The prominent features in the bay and approaches are:

Cape Chiniak, the southeast point of the bay, is low and wooded for ¾ mile back and then rises gradually to high land. A flat, wooded islet and numerous high, bare rocks extend 1⅛ miles northeastward from the cape.

Long Island, the easternmost island in the northern end of the bay, is 3½ miles long, about 250 feet (76 m.) high, hilly, with cliffs at the water, and wooded except toward its northern end. The northeast end is two grassy knolls joined by spits, and a high, steep, rocky islet lies 250 yards eastward of it. Extensive kelp-marked reefs, with some high, bare heads, extend from ⅝ to ⅞ mile north-northeastward from the northern side of the island, and broken ground with a possibility of danger extends in the same direction beyond the reefs to a distance of about 2 miles from the island. The southeastern side of Long Island is fringed with rocks and kelp to a distance of ¼ to ½ mile from shore. There is a high pinnacle close to its south end, and a high grass-covered rock lies ⅜ mile eastward of the pinnacle and 300 yards from shore.

Woody Island, westward of Long Island, is 2½ miles long, 166 feet (51 m.) high, and heavily wooded. There is a native village, church, and boat landing on its western end.

There is a flashing white light on the bluff on the northwest extremity of the island.

Westward of Woody Island is a group of islands, of which **Holiday Island,** the northernmost, is 165 feet (50 m.) high and wooded. **Bird Islet,** close eastward of Holiday Island, is about 30

feet (9.1 m.) high and there is a bare rock close to its southern end. **Near Island,** the largest of the group, is 198 feet (60 m.) high and grass-covered.

Spruce Cape, the northwest point of the bay, is a low bluff, grass-covered on top and backed by woods. Bare rocks and foul ground extend ⅝ mile northward from the cape to **Hanin Rocks,** which are two masses about 30 feet (9.1 m.) high with an extensive surrounding ledge and marked by a light showing two flashes every 10 seconds. A rock, bare at low water, lies 250 yards northward of Hanin Rocks, and Hutchinson Reef lies ½ mile eastward from them.

Miller Point, 1 mile westward of Spruce Cape, is partly wooded and terminates in a rocky bluff. High, bare rocks extend 300 yards off the cape, and three rocks, covered at high water, lie ⅜ to ½ mile northward of it.

Devils Prongs are three prominent peaks southwestward of Sycamore Bay. Approaching from southeastward they appear of nearly equal height, the middle one flat on top. The northern prong is 2,075 feet (632 m.) high.

Pillar Mountain, a short ridge 1,206 feet (367 m.) high, rises steeply from the western shore about 1 mile southwestward of Kodiak.

Barometer Mountain is a peak 2,475 feet (754 m.) high lying 2 miles from the western shore of Chiniak Bay and 5 miles southwestward from Kodiak. It is a useful guide in clear weather for the northern approach, from which direction a notch shows on the western side of its summit.

Kodiak is a village and post office on the western shore of the bay inside Near Island. There are good general stores, fresh water is piped to the wharf, and coal in limited quantities can be obtained. There is communication by the mail steamers with Seattle, Seward, and points southwestward to Unalaska.

There is a cannery on the north shore about ½ mile southwestward of the town. Fuel oil is kept on hand for the use of the cannery and arrangements can sometimes be made for the purchase of limited quantities. There is a wharf with ample depths alongside.

SOUTHERN ENTRANCE

The entrance to the bay and harbor from southeastward is southward of Long and Woody Islands, and between the latter and Holiday Island. The principal dangers near the sailing line are:

Humpback Rock, lying 3 miles 143° true (SE. by E. ⅜ E. mag.) from the south end of Long Island, is a pinnacle with two bare rocks about 5 feet (1.5 m.) high. There are numerous reefs between Humpback Rock and the southern shore.

Woody Island.—Foul ground extends ½ mile southward from Woody Island to Inner Humpback Rock, which is a pinnacle about 10 feet (3 m.) high. There is a kelp patch about 300 yards southwestward of the rock. A rocky patch with 6 fathoms (11 m.) over it lies ½ mile westward (true) from the southern end of Woody Island.

A sunken rock marked by kelp lies ¼ mile eastward (true) from the southern end of **Holiday Island** and ⅜ mile southward (true)

of **Bird Islet.** A rock, bare at low water and marked by kelp, lies 200 yards from Bird Islet in the direction of the northern end of Woody Island. Foul ground and kelp extend 600 yards northeastward from the northern end of Holiday Island.

NORTHERN ENTRANCE

The northern entrance to the harbor is not difficult in clear weather, but is dangerous at night or in thick weather. The soundings are irregular in the approach, and the lead can not be depended on as a guide to the entrance or to avoid danger. The principal dangers in the northern approach and entrance are:

Williams Reef is two rocks, 100 yards apart and bare at lowest tides, with deep water close-to. There are generally breaks on them, except near high water with a smooth sea. The reef lies 3¼ miles 26° true (N. ⅛ E. mag.) from the northeast end of Long Island, and 126° true (E. by S. mag.) from the summit of Spruce Island. The range of the cliffs at the southwest end of Long Island open from the high, grassy head at its northern end, bearing 221° true (S. by W. ½ W. mag.), leads about ⅜ mile westward of the reef. Barometer Mountain in range with Kodiak village or the northwest side of Near Island, bearing 247° true (SW. ¼ S. mag.), also leads about ⅜ mile northwestward of it.

A small patch with 5 fathoms (9.1 m.) over it lies 1¾ miles 288° true (W. ½ S. mag.) from Williams Reef. The ranges given in the sailing directions for the northern entrance clear this patch.

Kodiak Rock which is reported as lying between Williams Reef and Long Island was unsuccessfully searched for in 1909, but pending further surveys is still shown on the chart as "position doubtful."

Hutchinson Reef, partly bare at low water, is ¼ mile long, and its northern end lies ½ mile 122° true (E. ¾ S. mag.) from Hanin Rocks. There is a large kelp patch between the reef and rocks. A bell buoy is moored ½ mile northeastward of Hutchinson Reef to mark the end of the broken ground surrounding Spruce Cape.

On the western side of the channel, ⅜ and ¾ mile southward of Spruce Cape, are two bare reefs which extend 600 yards from shore. **Channel Rock,** the southern one, is a black rock about 10 feet (3 m.) high with extensive surrounding ledges. Kelp surrounds the reefs and extends ¼ mile southward of Channel Rock, and there is deep water close to the kelp.

A rock with 2 fathoms (3.7 m.) over it lies near the middle of the northern entrance, ⅞ mile 148° true (SE. by E. mag.) from Spruce Cape. The ranges given in the sailing directions for the northern entrance clear the rock. The rock is marked by a horizontally striped buoy. The clearer channel is westward of the rock.

Rocks, bare at low water, and kelp extend 1¼ miles northward from the eastern end of Woody Island, also nearly ⅜ mile northward and 300 yards westward from the northern end of the island.

CHANNEL WESTWARD OF NEAR ISLAND

The channel on the northwest side of Near Island has a depth of about 26 feet (7.9 m.) and a width of only 50 to 60 yards in places. The dangers are marked by kelp, but it also sometimes grows in the channel. The entrance is between Cyane Rock and foul ground

which extends nearly 200 yards from the bight in the western shore. **Cyane Rock** is 300 yards northward of Near Island and is bare at lowest tides; it is marked on its northerly side by a gas and bell buoy. The northern side of Near Island is foul, but its northwest side bordering the channel is bold. The western side of the passage is foul nearly to mid-channel until through the narrowest part. The passage is then clear to the wharf if the shores be given a berth of 50 yards.

The wharf is 150 feet long on its face and has 17 to 27 feet (5.2 to 8.2 m.) alongside. Vessels entering from sea usually pass through to the inner basin where they turn, and then make a port landing at the wharf. There is only room off the wharf for short vessels to turn around. It is a difficult place from which to get away in a strong northeast wind.

From the point southwestward of the wharf an extensive shoal extends ¼ mile southwestward. It is bare at low water 300 yards from shore, and there is 18 feet (5.5 m.) near its southern end abreast the narrow opening between Near Island and Uski Island, where it is marked by a red buoy. The range of the outer rock crib southward of the wharf and the western shore of the narrows ¼ mile 56° true (NNE. ⅞ E. mag.) from the crib leads close eastward of the southern half of the shoal.

A shoal extends 200 yards westward from Round Island, on the eastern side, 600 yards southward from the preceding shoal.

Anchorages.—The outer anchorage or roadstead is off **Shahafka Cove,** ⅞ mile northward of Near Island, in 13 to 14 fathoms (23.8 to 25.6 m.), soft bottom. A good berth is with the high bluff south point of the cove bearing 294° true (W. mag.), distant 300 to 500 yards, and Barometer Mountain in range between Near Island and the water front of Kodiak. This is a good anchorage, but not convenient, owing to its distance from the landing, and it is exposed to considerable sea and swell in heavy northeasterly weather. A rocky patch with 5 fathoms (9.1 m.) over it lying ⅜ mile 107° true (E. ⅝ N. mag.) from the south point of the cove should be avoided when anchoring. The cove is shoal, and there are some shacks on it.

The inner anchorage is about ½ mile southwestward of the town and 250 to 300 yards from the western shore in 7 to 8 fathoms (12.8 to 14.6 m.). This is considered a good anchorage, but the williwaws are heavy and vessels occasionally drag.

For **tides** see the Pacific Coast Tide Tables, in which the tides are predicted for every day of the calendar year.

Currents.—In Chiniak Bay, including the passage westward of Near Island, the flood current sets northward and the ebb southward with considerable velocity in places among the islands. In the northern entrance the tidal currents have an estimated velocity of 2 to 3 knots at the strength of the large tides. They turn sharply around Spruce Cape across the reefs northward of it, and must be kept in mind.

DIRECTIONS, ST. PAUL HARBOR

St. Paul Harbor and approaches are characterized by broken ground which generally has not been closely developed, and pinnacle rocks are a common feature. As a measure of safety, vessels should

proceed with caution in the vicinity of shoal areas where abrupt changes in depth are indicated by the chart to depths less than about 10 or 12 fathoms (18.3 to 21.9 m.).

Southern entrance.—Approaching from southward or eastward, **Ugak Island** will be made unless the weather is thick. This island can hardly be mistaken, as it is well detached from the land and possibly 1,200 feet (366 m.) high.

Cape Chiniak will be recognized by the islets and rocks extending northeastward from it, and may be rounded at a distance of 2 miles. Passing 2 miles or more off Cape Chiniak, steer for the south end of Long Island. The range of the south end of Long Island and the north peak of the Devils Prongs, bearing 313° true (WNW. ¼ W. mag.), leads over 1 mile outside the rocks off Cape Chiniak and ⅝ mile northward of Humpback Rock, and the distance from the cape to the rock is 5½ miles.

Pass ⅝ mile northward of Humpback Rock, steer 294° true (W. mag.), and pass 1 mile southward of Long Island and ½ to ¾ mile southward of Inner Humpback Rock. On this course guard against the flood current, which sets strongly northward at times. Continue the course for 5 miles until 1 mile past Inner Humpback and the passage between Long and Woody Islands is closed.

Then steer 18° true (N. ½ W. mag.) for 2 miles and pass the western end of Woody Island at a distance of 200 to 250 yards. When Near Island opens northward of Holiday Island, steer 345° true (NW. ½ N. mag.) for the anchorage off Shahafka Cove.

To go to the wharf at Kodiak, round the northern end of Holiday Island, giving it a berth of over ⅜ mile, and enter as directed in a following paragraph.

Northern entrance.—From seaward, keep the summit of Spruce Island bearing anything southward of 294° true (W. mag.) until the cliffs at the southwest end of Long Island are open westward of the high, grassy head at its northern end. Then steer for Barometer Mountain, course about 243° true (SW. ½ S. mag.), until on the range for the entrance.

From northward.—Directions from Marmot Strait to the entrance are given on page 18.

Or, for vessels approaching eastward of Marmot Island, from a position 3 miles off the southeast point of the island, steer 221° true (S. by W. ½ W. mag.) for 26 miles, which should lead 2¼ miles westward of Williams Reef. Woody Island should be made ahead, its western end a little on the starboard bow, and the course and distance made good should lead to a position about ½ mile eastward of Hutchinson Reef bell buoy. Then enter on the range for the entrance.

Or, passing 1½ to 2 miles eastward of East Cape of Spruce Island, steer for the middle of Long Island, course about 180° true (SSE. ⅛ E. mag.), which will lead about ½ mile eastward of Hutchinson Reef bell buoy.

From Narrow Strait.—Pass ¾ mile northward of Hanin Rocks and steer 144° true (SE. by E. ⅜ E. mag.) for 1¼ miles, heading for the northeastern end of Long Island, until the northwestern side of Near Island opens from the shore northeastward, and then enter on this range.

Entering on the range.—Bring the northwestern side of Near Island barely open from the shore northeastward, bearing 239° true (SW. 7/8 S. mag.), and stand in on this range until Spruce Cape is abeam, taking care to pass to the westward of the horizontally striped buoy marking a 2-fathom (3.7 m.) spot. Then steer 229° true (SSW. 1/4 W. mag.) and follow the western shore at a distance of 1/4 mile until 1/2 mile past Woody Island light.

Having followed the directions in either of the two paragraphs preceding, when Barometer Mountain is in line with the passage between Near Island and the water front of Kodiak, steer this range, course 247° true (S.W. 1/4 S. mag.), and anchor off Shahafka Cove. (See "Anchorages" preceding.)

To go to the wharf.—Steer the range of the preceding paragraph until up with the end of the small bluff 1/4 mile northward of Near Island. Then bring the southernmost building (extreme left-hand one) near the wharf at Kodiak open 100 feet from Near Island (nearer that side than the western shore), and keep this range which leads in mid-channel westward of Cyane Rock where the channel is 75 yards wide. Keep the northwest side of Near Island aboard distant about 100 feet until through the narrowest part of the channel, and then steer for the wharf.

Vessels usually pass through to the inside basin where they turn, and make a port landing at the commercial wharf.

To go to the inner anchorage, when through the narrowest part of the channel steer 238° true (SW. by S. mag.), heading a little westward of the islands southward, until abreast the first narrow opening between Near Island and the next islet (Uski) southward. Then haul westward to the anchorage under Pillar Mountain. (See "Anchorages" preceding.)

NARROW STRAIT TO WHALE PASSAGE

Narrow Strait, between Spruce and Kodiak islands, is used by vessels from Kodiak bound to Shelikof Strait. It has a clear width of 1 mile at its eastern end, while at its western end the channel is 150 to 300 yards wide with a least depth of about 7 fathoms (12.8 m.). With easterly gales a heavy swell sets into the strait, but this generally loses much of its force toward the western end.

There are two islands on the north side of the strait. The eastern one is very uneven and grassy on top; foul ground extends 300 yards southward from it. **Nelson Island,** the western one, is higher and wooded. A rock, bare at low water, lies 350 yards southward of Nelson Island, and three similar rocks lie 1/4 to 1/2 mile westward of the island and about 3/8 mile from the northern shore.

Course Point, on the southern shore 1 1/2 miles westward of Nelson Island, is prominent and is marked by a small, rocky, grass-covered islet 150 yards from shore.

Prokoda Island, in the middle near the western end of the strait, is 114 feet (35 m.) high and partly wooded. An islet lies 100 yards off its northeast end, and kelp extends 100 yards off the islet and the southeastern side of the island.

The southwest point of Prokoda Island is marked by a fixed white light 40 feet (12.2 m.) high.

A rock, showing about 6 feet (1.8 m.) at low water and marked by a day beacon, lies 250 yards southwestward from the western end of Prokoda Island. It is 40 yards southward of a line from the southern end of Prokoda Island to Uzinki Point. The channel southward of the rock has a depth of 7 fathoms (12.8 m.) and is 125 yards wide between it and a shelving spit with kelp which extends 125 yards from **Otmeloi Point,** on the southern shore.

The channel northward and westward of Prokoda Island is 300 yards wide and clear, but the turns are sharp and are sometimes difficult to make when the current is running.

Uzinki is a small native village at the head of the cove in Spruce Island northward of Prokoda Island.

The principal industry centers in a salmon cannery which is located on the eastern side of the bay, about ½ mile northwestward from Black Point. There is a good dock here with least depth of 16 feet (4.9 m.) alongside. A port landing should be made.

Shoaling is reported on the 6-fathom (11 m.) spot off the dock, due to a deposit of volcanic ash from the near-by streams since the great eruption of Katmai in 1912. In 1926 a vessel reported touching in 15 feet (4.6 m.) on this spot which is about 250 feet off the dock.

The best **anchorage** in Narrow Strait is in the middle of the cove between Prokoda Island and Uzinki village, in 18 to 20 fathoms (33 to 37 m.), somewhat exposed to an easterly swell. A small vessel and small craft can anchor at the head of the cove near Uzinki, slightly favoring the western side, in 5 to 10 fathoms (9.1 to 18.3 m).

Uzinki Point, the southwest end of Spruce Island, is wooded, and has several knolls about 100 feet (30 m.) high. There is kelp close to the point, and it should be given a berth of about 100 yards.

Entrance Point, on the south side at the western entrance of Narrow Strait, is grassy with some scattered trees, and a rock 10 feet (3 m.) high lies 100 yards off its eastern side. A kelp-marked shoal with 7 to 12 feet (2.1 to 3.7 m.) over it extends 250 yards northward from the point.

A good anchorage for a small vessel, exposed to northwest winds only, may be had in the cove between Otmeloi and Entrance Points in about 13 fathoms (23.8 m). The shore of the cove must be given a berth of over 100 yards, and a flat extends 300 yards from its head.

Low Island lies in the bight on the southern shore ¾ mile westward of Entrance Point. It is grass covered and about 40 feet (12.2 m.) high at its southern end. Near its northern end is a clump of trees. A shoal, with 20 feet (6.1 m.) at its end and some kelp, extends 350 yards northward of the island, and a bank with 7 to 8 fathoms (12.8 to 14.6 m.) extends northward to a spot with 17 feet (5.2 m.) over it lying 900 yards from the island.

Three Brothers is a kelp-marked reef 400 yards long and steep-to except on its eastern side. At its southwestern end are two rocks bare at half tide, and at its northeastern end is a rock covered at one-third flood. The southwestern end of the reef lies ½ mile 356° true (NNW. ½ W. mag.) from the northern end of Low Island, and is on the range of Uzinki Point and the tangent to the southern shore of Narrow Strait, bearing 120° true (E. ½ S. mag.). By keeping the strait well open vessels will pass clear southward of the reef.

The southern side of the reef is marked by a red nun buoy.

Shakmanof Point is the prominent, heavily wooded point 1¼ miles westward of Low Island. Some rocks show at low water close to the point, and it should be given a berth of over 250 yards.

Kizhuyak Point, ¾ mile southwestward of Shakmanof Point, is higher than the latter, partly wooded, and terminates in white cliffs in places. A rock bare at half tide lies 400 yards northward from the point.

Between Kizhuyak Point and Kekur Point, a distance of 6 miles, there are two bays which have not been sounded.

Kizhuyak Bay is the head of Marmot Bay southward of Whale Island. Kekur and Peregrebni Points, lying 3½ miles southward of Whale Island, are at the entrance to the upper part of the bay, which trends 221° true (S. by W. ½ W. mag.) for 2½ miles and then 181° true (SSE. mag.) for 6 miles, with an average width of 1½ miles. In this part of the bay the depths are irregular, but the mid-channel is clear. The western shore from 1¼ to 4½ miles southward of Peregrebni Point is foul; a rock bare at low water lies 2¼ miles southward of the point and ⅜ mile from the western shore. Anchorage sheltered from northeasterly winds can be selected about 300 yards from the eastern shore and 3½ to 4½ miles southward from Kekur Point in 16 to 18 fathoms (29.3 to 33 m.). A flat extends nearly ¼ mile from the mouth of the stream on the eastern shore 5¼ miles southward of Kekur Point and 1 mile northward from an islet. This islet lies ⅜ mile from the eastern shore and 2½ miles from the head of the bay; rocks bare at low water lie 300 yards westward of the islet. A flat extends ⅜ to ½ mile from the head of the bay where there is a large valley.

The **tidal currents** are weak except in the western entrance of Narrow Strait, where the estimated greatest velocity is about 2 knots.

For sailing directions, see page 128.

WHALE PASSAGE,

between Whale and Kodiak Islands, is a part of the route used by vessels from Kodiak bound to Shelikof Strait. It is ½ to ¾ mile wide and generally clear, and the navigation is not difficult in the daytime when the current is not too strong. The depths are 9 to 30 fathoms (16.5 to 55 m.), and the bottom is very uneven, especially in the eastern entrance.

Ilkognak Rock, awash at high water, lies in the middle of the eastern entrance. A sunken reef extends 250 yards southwestward, and a ledge with a least found depth of 6 fathoms (11 m.) extends ⅜ mile eastward from the rock. A detached rock with 4 fathoms (7.3 m.) over it lies 500 yards 44° true (N. by E. ¾ E. mag.) from Ilkognak Rock, and 550 yards 151° true (SE. ¾ E. mag.) from a rock awash at high water near Whale Island. With a strong ebb current, heavy swirls and overfalls occur in the wake of this broken ground, and dangerous tide rips prevail at such times with northeasterly gales.

Shag Rocks, bare at half tide, lie a little over 3/8 mile southward of Ilkognak Rock.

A rock, with a least found depth of 16 feet (4.9 m.) lies in the vicinity of the broken ground, with a charted depth of 8 fathoms (14.6 m.), lying a little northward of the middle of Whale Passage and 7/8 mile westward of Ilkognak Rock. Gori Point, open a little southward of the south end of Koniuji Islet, leads in about the deepest water found by the survey, and southward of the rock.

Koniuji Islet, grass-covered and about 40 feet (12.2 m.) high, lies 1/4 mile from the south side of Whale Passage and 2 miles westward of Irkognak Rock. Kelp extends 1/4 mile and broken ground 3/4 mile westward from the islet. The channel is northward of Koniuji Islet, and it should be given a good berth, as the current sets toward it at times.

Temporary **anchorage** can be had in the bight on the north side of Whale Passage if stopped by too strong a flood current in the passage eastward. There is an eddy current in the bight, and care should be taken to get in far enough to ride to the eddy alone. A good berth is in about 8 fathoms (14.6 m.), 300 yards from Whale Island, with Koniuji Islet bearing about 238° true (SW. by S. mag.).

A better anchorage can be had 1/4 to 3/8 mile off the western side of Whale Island, in 8 to 10 fathoms (14.6 to 18.3 m.). This is convenient to either Whale Passage or Afognak Strait and is well out of the current, but it is exposed to westerly winds.

The **tidal currents** in Whale Passage set westward on the flood and eastward on the ebb. The estimated velocity is 4 to 10 knots at strength, depending on the range of the tide. Slack water occurs about 1 1/4 hours before high and low waters at Kodiak. With a strong current swirls occur in the passage in the wake of all broken ground, and rips occur at the entrances when the current sets out against a strong wind. The worst place is at the eastern entrance, where these conditions are dangerous at times.

For sailing directions, see page 129.

KUPREANOF STRAIT

extends from Whale Island to Shelikof Strait, between Raspberry and Kodiak Islands. Its width is 1 3/4 to 3 miles and the strait is generally clear, but there are shoals to be avoided off the southeast end of Raspberry Island, on the south side from Islet Point to the western end of Dry Spruce Island, and 4 1/4 miles westward of Dry Spruce Island and 1 3/8 miles from the south shore.

The islands on both sides are grass-covered and mountainous, the north shore especially rising abruptly. The timber extends westward along the shores to Last Timber Point and Dry Spruce Island, where it terminates except for scattered clumps. **Anchorage** may be had in places near the shore, but the only secure harbor is Dry Spruce Bay.

Between Deranof Island and the southeast end of Raspberry Island there are two wooded islands, the south end of the western one being **Nachalni Point. Thomas Rock,** awash at low water, lies 3/8 mile 226° true (SSW. mag.) from Nachalni Point, and a patch

with 6 fathoms (11 m.) over it lies 5/8 mile in the same direction from the point.

Chernof Point is a prominent, low, wooded point on the south shore, 2½ miles westward of Whale Island.

A ledge of rock about 150 feet long and 50 feet wide, baring 5 feet (1.5 m.) at low water lies 3/5 mile westward of Chernof Point and 1/5 mile offshore. It is marked by a heavy growth of kelp.

Islet Point, 2 miles westward of Chernof Point, is low and wooded, and has a high, grassy islet close-to. Broken ground with a depth of 4½ fathoms (8.2 m.) lies 5/8 mile 47° true (NNE. mag.) from the islet.

Dry Spruce Island lies 3/4 mile westward of Islet Point, with a wooded island between, the two islands and the shore eastward being joined by shoals dry at low water. It is 1 3/8 miles long, 225 feet (69 m.) high, and wooded. Foul ground extends 3/8 mile northeastward from its eastern point, and broken ground with a depth of 5 fathoms (9.1 m.) lies over 3/8 mile northward from the same point. Two grassy islets and a pinnacle rock lie off the north side of the western point of Dry Spruce Island, and a ledge bare at half tide lies 650 yards 334° true (NW. ½ W. mag.) from the same point. Broken ground with a least found depth of 5 fathoms (9.1 m.) lies 5/8 mile northward from the western end of the island.

Bare Island, southward of the western end of Dry Spruce Island, is 7/8 mile long and partly wooded on its eastern half. There is a fox ranch on its northeastern side. A small grassy island lies 3/8 mile westward of Bare Island.

Dry Spruce Bay, the only secure harbor in Kupreanof Strait, is on the south side inside Bare and Dry Spruce Islands, and extends 2 miles eastward from the latter. The entrance between Dry Spruce and Bare Islands is over 1/4 mile wide, and is clear with the exception of a rock bare at low water lying nearly 200 yards from the south side of Dry Spruce Island just inside its western end; a shoal extends 150 yards off the northern side of the eastern end of Bare Island. The entrance south of Bare Island and the small island westward of it is over ½ mile wide and clear. The bay is clear with the exception of a rock, bare at low water, in the middle, 3/4 mile from its eastern end.

The best anchorage for large vessels is about ½ mile eastward of Bare Island and 3/8 mile off the cove in Dry Spruce Island, in 16 to 19 fathoms (29.3 to 35 m.). A small vessel can anchor in the middle of the entrance to this cove in about 6 fathoms (11 m.), taking care to keep clear of the flat, which extends 250 yards from its northeast side. With strong southwesterly winds some williwaws are felt from Kupreanof Mountain. Water may be obtained from a stream in a cove on the south side of the bay south (true) from the eastern end of Bare Island.

Approaching Dry Spruce Bay from eastward, give Dry Spruce Island a berth of 3/4 mile, and steer for the western end of Bare Island on any bearing southward of 226° true (SSW. mag.) until past the reef northwestward of the western end of Dry Spruce Island. Then haul eastward and pass midway between Dry Spruce and Bare Islands, course about 139° true (SE. by E. 3/4 E. mag.).

Approaching Dry Spruce Bay from westward, vessels may enter either between Bare and Dry Spruce Islands, or south of Bare Island and the small island westward of it.

A rock with 16 feet (4.9 m.) over it lies in Kupreanof Strait 4¼ miles westward of Dry Spruce Island, 1⅜ miles from the south shore, and 2¼ miles 97° true (ENE. ½ E. mag.) from the northern extremity of Outlet Cape. It is at the northern end of a bank about ¼ mile in diameter with depths of 7 to 20 fathoms (12.8 to 37 m.). The range of Chernof Point and the southern side of Whale Island leads 200 yards northward of the rock.

Onion Bay makes into Raspberry Island about 2 miles, and from its head a low divide extends through to Shelikof Strait. The entrance is narrow, and just inside it the bay is blocked by shoals partly bare at low water, between which are narrow channels suitable only for small craft. Above these shoals the bay has depths of 15 to 21 fathoms (27.4 to 38 m.). The tidal currents have an estimated velocity of 3 to 5 knots in the entrance. Temporary anchorage can be had ⅜ to ½ mile off the entrance, in 10 to 15 fathoms (18.3 to 27.4 m.).

Outlet Cape is the western end of the peninsula included between Kupreanof Strait and Viekoda Bay. The cape has a steep slope to a peak 1,620 feet (494 m.) high, eastward of which is a low divide extending through. A cluster of bare rocks lies 350 yards off the northwest end of the cape. **Kupreanof Mountain,** 7¼ miles eastward of Outlet Cape, has a surface of broken, gray rock; it is 2,400 feet (732 m.) high and prominent.

Malina Point, 2 miles eastward of Raspberry Cape, is projecting and prominent. It has a grass-covered knoll at its end, with a low neck behind it, and then a steep slope to 1,500 feet (457 m.).

Raspberry Cape, the southwestern end of Raspberry Island, is steep and high, and has areas of bare rock for one-third its height. There are some bare rocks in the water close to its foot.

Tides.—At Onion Bay high and low water occur about 25 minutes later than at Kodiak, and the mean rise and fall of the tides is about 12 feet (3.5 m.). To find the approximate height of the tide, multiply the height of the corresponding tide at Kodiak by the ratio of ranges, 1.7. The tides meet in the strait a little westward of Dry Spruce Island. The tidal currents in Kupreanof Strait have an estimated velocity of 2 to 3 knots at the strength of the large tides.

DIRECTIONS, KODIAK TO SHELIKOF STRAIT

Narrow Strait.—Coming from Kodiak, pass 400 yards eastward of Channel Rock and steer 49° true (NNE. ¼ E. mag.) for 2 miles, passing westward of the horizontally striped buoy marking the 12-foot (3.7 m.) rock and over ¼ mile eastward of Hutchinson Reef bell buoy. When Miller Point opens northward of Hanin Rocks, bearing 280° true (WSW. ¾ W. mag.), change course to 300° true (W. ½ N. mag.), with Uzinki Point just open from the southern shore of Narrow Strait ahead, and pass ¾ mile northward of Hanin Rocks. Steer this range for 4½ miles past Hanin Rocks until Nelson Island is ½ mile on the starboard beam. Then steer 304° true (W. ⅞ N. mag.), pass about ¼ mile northward of Course Point, and continue the course about ¾ mile past the point.

When Shakmanof Point shows in the middle of the passage southward of Prokoda Island, bearing 290° true (W. ⅜ S. mag.), steer this course, pass 75 to 100 yards southward of the rock marked by a beacon westward of the island, and give Otmeloi Point on the south shore abreast the rock a berth of 150 yards. Continue the course until Uzinki Point is 125 to not over 150 yards on the starboard beam.

Then steer 286° true (W. ⅝ S. mag.) with Uzinki Point in range with the south side of Prokoda Islet. This is considered a safe range for crossing the reef northward of Low Island for vessels under 15 feet (4.6 m.) draft. When Three Brothers buoy is abeam, haul to the northward and round Shakmanof Point at a distance of ½ mile.

In 1925 a vessel drawing 18 feet (5.5 m.) struck on the reef north of Low Island on line between Uzinki Point and Shakmanof Point. Pending further surveys, vessels of more than 15 feet (4.6 m.) draft are advised to use the passage north of Three Brothers for which the following directions may be useful. After passing through the strait as directed in the preceding paragraphs, change course to 0° true (NNW. ⅛ W. mag.) with Entrance Point astern. When the south side of Whale Island opens on Shakmanof Point, change course to 277° true (WSW. ½ W. mag.) with the peak of Whale Island a little on the port bow.

Whale Passage.—From a position ½ mile northward of Shakmanof Point steer 262° true (SW. by W. ⅛ W. mag.) for 6¾ miles, passing over ⅜ mile northwestward of Kizhuyak Point. The southern end of Whale Island will show as a small wooded head, and there is a rock awash at high water close-to. Keep the southern end of the island aboard distant about 350 yards in entering Whale Passage, and pass about 300 yards southward of the rock awash at high water and ¼ mile northward of Ilkognak Rock. Strict attention to the steering is important on account of heavy swirls.

Then steer 298° true (W. ⅜ N. mag.) with Gori Point in range with or open a little southward of the south end of Koniuji Islet; or Ilkognak Rock astern and Koniuji Islet ahead will also lead in about the best water southward of the 16-foot (4.9 m.) rock. When about ¾ mile from the islet steer 317° true (WNW. mag.) for the end of Whale Island to a position ¼ mile northward of Koniuji Islet.

Kupreanof Strait.—From a position ¼ mile northward of Koniuji Islet steer 292° true (W. ⅛ S. mag.) for 7¾ miles passing ⅜ mile northward of Chernof Point, to a position ⅜ to ½ mile southward of Gori Point. Then steer 286° true (W. ¾ S. mag.) with the summit of Whale Island astern, passing ⅞ mile northward of Outlet Cape and ½ mile southward of Malina Point, the distance from Gori Point to Malina Point being 10¼ miles.

By keeping northward of Chernof Point in range with the south tangent of Whale Island, the 15-foot (4.6 m.) rock in the middle of the strait will be avoided.

If bound down Shelikof Strait, from a position ½ mile southward of Malina Point make good a 244° true (SW. ⅜ S. mag.) course for 18 miles, which leads 1½ miles westward of Cape Uganik and to a position 2 miles westward of Cape Ugat. Then a 230° true (SSW. ⅜ W. mag.) course made good for 28 miles will lead nearly 2½ miles westward of Cape Uyak and to a position 2 miles westward of Cape Karluk.

The triangulation has been extended southward through the strait to Cape Karluk and Cape Kubugakli. Only the outlying islands and rocks are located from the northwest end of Shuyak Island to Black Cape, but from the latter point to Cape Karluk most of the points are determined by triangulation. From Shaw Island to Takli Island most of the principal points and outlying rocks are located.

The hydrography of the main part of the strait has been done from Barren Islands southward to Raspberry Island. In this part of the strait great depth is not generally found near the land, and depths suitable for temporary anchorage will be found near the shore in most places. In thick weather or when uncertain of the position the depth should not be shoaled to less than 50 fathoms (91 m.).

Currents.—Current observation were made for short periods at the anchorages used by the surveying vessel near the shore. The currents are principally tidal, but the relation of the current to the rise and fall of the tide is not in all cases clear. On the western side of the strait a current of ½ and ¾ knot is recorded, setting along shore in either direction. It is believed that along the western shore the southerly current predominates.

Between Cape Douglas and Shaw Island the current is stronger, a 2-knot current being recorded, setting along shore to and from Kamishak Bay. The current seems to decrease in velocity with increase of distance from shore. Apparently there is less current along the west coast of Afognak Island than on the opposite side of the strait.

Strong tidal currents are encountered off the northwest side of Shuyak Island, and heavy tide rips variable in position are frequently seen along the western side of Dark Island and Latax Rocks. The flood sets into Shelikof Strait and the ebb the opposite way. The direction of the set is dependent upon the adjacent land, and a knowledge of its configuration will enable one to estimate closely the direction of the set. The greatest velocity recorded on the southwest side of Dark Island is 1.3 knots on the flood, but this probably is not the maximum velocity. On the day of the observations slack water occurred near the time of low water at Kodiak.

Weather.—During the summer of 1908 gales and rainy conditions were frequent. June was the best month and July perhaps the worst. Northeast winds invariably bring rain and thick weather, and it is from this direction that most of the heavy weather comes. During the greater part of the season the wind when strong from this quarter rarely varied much in direction while its strength lasted, and it never backed. In the latter part of the season a northeast gale almost invariably backed through northwest to west or southwest, blowing with great force.

Southeast winds generally bring clouds, but may be accompanied by either rain or fair weather.

Southwest and west winds are invariably accompanied by fine clear weather, but they often blow with great force. The southwest gale is perhaps the most to be dreaded in Shelikof Strait, as it raises a short, heavy sea that is trying to a small vessel.

Southerly winds generally bring haze, which is sometimes so thick as to resemble fog.

Northwest winds bring fair weather and a clear atmosphere.

During the early spring northwest gales are often accompanied with freezing weather and vessels are in danger of becoming iced down. Small craft especially should hug the northwest shore under such conditions, so that they may seek shelter before the icing becomes serious.

Gales in this region last without intermission anywhere from a day to two or three days.

Northeast winds are generally accompanied by a low barometer and southwest winds by a high barometer, but the rule is not invariable. The barometer is of little or no value in foretelling the weather, as it accompanies rather than precedes corresponding conditions. The slope of the barometric curve is apt to change suddenly, the weather changing with equal suddenness. A sure sign of rainy weather and wind from northeast is the gathering of clouds on the northeast side of the mountains.

Little fog was encountered during the season, but blinding snowstorms were frequent early in spring.

WEST COAST OF SHUYAK ISLAND

The general trend of the western coast to Shuyak and Afognak Islands is 218° true (S. by W. ¼ W. mag.), and the distance from the northernmost of the Latax Rocks to Raspberry Cape is 48 miles. From Raspberry Cape the eastern coast of Shelikof Strait trends 230° true (SSW. ⅜ W. mag.) for 45½ miles to Cape Karluk.

Party Cape is the northwest end of Shuyak Island. It is about 300 feet (91 m.) high and grass covered for a mile or more back. A reef bare at low water lies about midway between the cape and **Dark Island.** The latter lies 1¼ miles northward from the cape, and is about ¾ mile in diameter, about 200 feet (61 m.) high, and grass-covered. There are several large black rocks off the southwest end of Dark Island.

Latax Rocks are a chain of three rocky islets, about 60, 50, and 30 feet (18.3, 15.2, and 9.1 m.) high, respectively, lying 1¼ to 3 miles northward of Dark Island. Between the two outer ones is a reef bare at low water, and a rock bare at low water lies about ⅜ mile northward of the outer rock. Vessels should not attempt to pass between Party Cape and the outer rock, 5¼ miles northward, in the absence of a survey.

A depth of 7 fathoms (12.8 m.), with a probability of less, was found 1½ miles westward of the southernmost Latax Rock.

The western side of Shuyak Island is irregular and fringed by a chain of islets and rocks 1 to 2 miles from shore. Between them and the island there are many rocks and kelp patches. Some of the outer ones are located, and these only are mentioned. They lie nearly on a line from the rocks westward of Party Cape to Black Cape, bearing 214° true (S. ⅞ W. mag.).

A rock a few feet high lies ⅞ mile westward of Party Cape. **Shag Islet,** rocky and about 50 feet high, lies 1 mile southward of the preceding rock and about ⅝ mile from a point on Shuyak.

Gull Island, the highest and most prominent of the off-lying islets, is about 150 feet (45.7 m.) high, and has a rounded, grass-covered summit. It lies 2¾ miles southwestward from Party Cape. Some rocks, covered or awash at high water, lie off the south side of Gull Island, and kelp shows between it and Shuyak.

A rock with 6 feet (1.8 m.) over it is reported near the middle of the bay on the west side of Shuyak Island, eastward of Eagle Cape.

SHUYAK STRAIT

between Shuyak and Afognak Islands, has considerable importance as the site of extensive herring fisheries and numerous salteries. The strait was surveyed in 1926 and the following descriptions and directions are from a preliminary report of the survey party. Many of the names used are local names not yet authorized by the United States Geographic Board. The strait is about 1½ miles wide at its western end and has an average width of about 1 mile, narrowing to ¼ mile at Cape Current. Wooded hills, about 400 feet (122 m.) high, line the rocky shores on both sides and there is practically no low flat land. The strait apparently is clear of dangers in mid-channel except as noted below. Soundings indicate depths of from 60 to 80 fathoms (109 to 146 m.) near mid-channel as far east as Redfox Bay.

Western entrance.—Soundings indicate irregular bottom inside the 100-fathom (183 m.) curve at the western entrance. There is a **rock,** bare at about half tide, marked by kelp, and surrounded by about ½ mile of shoal water, 110° true (E. ⅜ N. mag.) 2 miles from Rocky Island. This rock lies off the entrance to Bluefox Bay. There is a shoal area 50° true (NNE. ⅜ E. mag.) 2½ miles from Rocky Island. A depth of 11 fathoms (20.1 m.) was found by a preliminary examination and probably there is less.

Rocky Island (lat. 58° 29′.5 N., long. 152° 47′.3 W.), off the western entrance of the strait, is a bare rock about 100 feet in diameter and 10 feet (3 m.) high.

Alligator Island, so called from the resemblance from certain directions, is a grass-covered island about ¼ mile in diameter and 50 feet (15.2 m.) high, lying 1¼ miles southward from Rocky Island.

Cape Newland, the southwestern extremity of Shuyak Island, is about 75 feet (22.8 m.) high and grass covered for several hundred feet up to the tree line. Foul ground with several rocks bare at various stages of the tide extends around this cape; to the westward, to the southward for about ⅓ the distance to Lighthouse Point, and to the eastward about half way to Shuyak Harbor.

Shuyak Harbor, indenting the north shore of the strait ¾ mile eastward of Cape Newland, is 1 mile long, in a north-northwest direction and ¼ mile wide. The firm of Svendson & Shaw has a herring location and is building a dock in this harbor. The name of the firm is sometimes applied to the harbor.

In the middle of the entrance to the harbor are two rocks, about 300 feet apart, the southerly one about 5 feet (1.5 m.) high and 15 feet in diameter, the other 10 feet (3 m.) high and 30 feet in diameter. At low tide the two rocks are nearly connected. In the middle of the eastern entrance to the harbor and 90° true from the 5-foot rock mentioned above is a **pinnacle rock,** unmarked by kelp, with

a depth of 2 feet (0.6 m.). The distance between this rock and the eastern entrance point is about 180 yards and the least found depth is 9 fathoms (16.4 m.). The course used for the east entrance is midway between the pinnacle rock and the eastern point.

The channel west of the mid-entrance rocks is about 345 yards wide, has a least found depth of 13 fathoms (23.8 m.) in mid channel, and is believed to be safe for deep-draft vessels. The harbor has been examined and apparently is clear except in the entrance as noted.

Port Lawrence, on the north shore of the strait ½ mile east of Shuyak Harbor, is ½ mile wide and ¼ mile long in a north-northeasterly direction. The San Juan Fish & Packing Co. is building a herring saltery and a dock on the west side of the port and steamers have docked here. There is a small grass covered islet on the eastern side of the entrance. The port apparently is clear of hidden dangers.

Port Williams, ½ mile east of Port Lawrence, is 0.3 mile wide and ½ mile long. Sklarof & Co. have established a wharf and herring saltery on the west shore of the port and a wharf is under construction on the east side. This port apparently is free from hidden dangers.

A **rock,** bare at half tide, 200 feet in diameter, and marked by kelp lies 250 yards offshore between Port Lawrence and Port Williams. Near by and closer inshore is a rock about 10 feet (3 m.) high which in 1926 was marked by whitewash and a survey signal. Vessels entering either port should guard against this danger.

Daylight Harbor is ½ mile east of Port Williams. A dock on the north side has shoal water at low tide. Another dock extending out to deep water is planned. From this harbor to Cape Current, a distance of about 2 miles, there are no important indentations and very little traffic at present.

The narrows at Cape Current extend approximately east and west for about 1 mile and are ¼ mile wide at the western end and ½ mile wide at the eastern end. The Shuyak Island side is abrupt, wooded, and about 700 feet (213 m.) high. The Afognak side is grass covered for a distance of about 200 feet back from the shore and about 50 feet (15.2 m.) high with level top and abrupt shore.

A **dangerous patch** of small rocky heads with a least depth of 15 feet (4.6 m.) exists about in the middle of the strait 1 mile west of the narrows. This danger is abreast the westernmost of two small islets which is about 100 yards in diameter, half grass covered and half wooded. The kelp marking this spot usually is drawn under by the current.

The western part of the narrows apparently is clear with general depths over 10 fathoms (18.3 m.). For about ⅓ mile at the eastern end of the narrows, foul ground with numerous rocks either above water or baring at various stages of the tide extends from the south shore to within 195 yards of the north shore. Along this part of the narrows, vessels should pass about 100 yards off the north shore where the least found depth is 8 fathoms (14.6 m). A channel through the middle of the narrows, passing between the rocks on the foul ground, is reported but can not be recommended to those without local knowledge.

There is a large kelp patch off the eastern entrance to the narrows just south of **Big Fort Island.**

Lighthouse Point is the eastern point of Bluefox Bay and the southwestern point of Shuyak Strait. It is about 75 feet (22.8 m.) high and grass covered up to the tree line. The bight just east of this point is foul.

Redfox Bay, on the south side of the strait due south from Port William, is about ¾ mile wide and 1¾ miles long in a south-southwest direction. The bay has been surveyed and found clear except as noted below; having general depths less than 20 fathoms, mud bottom, it is an excellent anchorage in any weather. During the legal season, herring pounds line the shores of the bay.

In the middle of the entrance is a small islet, 330 yards in diameter, its southern half wooded. Southwest from the middle of the wooded part and about 80 yards off the western shore of the bay is a rock, unmarked by kelp, which bares about 1 foot at extreme low water. The channel between this rock and the islet is about 440 yards wide and apparently clear. Freight steamers use this channel and anchor just south of the islet to discharge cargo to boats or barges.

A pinnacle rock, unmarked by kelp, which bares 1 foot at extreme low water, lies about 125 yards off the eastern shore of the bay, 180° true 0.7 mile from the southwestern end of the entrance islet.

Just east of Redfox Bay is another bay, about 2 miles wide and 1 mile long, which is foul in places. There are two small islets in mid-entrance.

The **tidal range** in Redfox Bay is about 20 feet.

A **tidal current** of 5 knots was measured in the narrows at Cape Current. It is believed that the current attains a maximum velocity of 7 or 8 knots. Tide rips are bad in the narrows and have been seen as far west as Redfox Bay.

Entering Shuyak Strait from Shelikof Strait, vessels pass about 1 or 1½ miles northward of Rocky Island and head for the middle of the strait on a course about 113° true (E. ⅛ N. mag.).

WEST COAST OF AFOGNAK ISLAND

From Shuyak Strait to Black Cape the coast of Afognak Island is irregular, rocky, and wooded to an elevation of about 700 feet (213 m.). Some grass appears on the points. The small island about halfway between Black Cape and Alligator Rock is about ¼ mile in diameter, 50 feet (15.2 m.) high, and covered with grass. Inside a line from Black Cape to Alligator Island the water is very foul with numerous pinnacles showing at low tide.

Bluefox Bay, indenting the shore of Afognak Island southwestward from Lighthouse Point, has an entrance about 2 miles wide. During the herring season several floating salteries are anchored near the head of this bay.

Two islands about ½ mile in diameter lie in the entrance to the bay and south from the northeastermost of these is a third island about ¾ mile in extent. These three are the main islands in the bay. They are wooded and have an elevation to the tops of the trees of about 200 feet (61 m.). On the southeast shingle spit of the northeast island the wooden buildings of a fox farm can be seen from the

southward. Three channels into the bay are formed by the entrance islands. The western channel has been used by small boats but is foul with rocks that bare at various stages of the tide. There is a kelp-marked rock with a least found depth of 10 feet (3 m.) off the middle entrance.

The eastern channel leads directly to the head of the bay and is the main ship channel at present. The dangers found in this channel are described below.

In addition to the three islands mentioned above there are a number of islets, reefs bare at low tide, and sunken rocks in the bay. The following dangers have been located:

A rock with a least depth of 3½ fathoms (6.4 m.) in the middle of the eastern channel 185 yards off the middle of the east side of the northeast entrance island and 220 yards south of the point where the channel doubles in width.

A rock with a least depth of 8 feet (2.4 m.) in mid-channel about 350 yards eastward from the southeast point of the southern entrance island.

A rock bare at low tide ½ mile south-southeastward from the same point. At this rock the head of the bay is about 1 mile southward and the east tangents of the northeast and south entrance islands are on range.

A rock with a least depth of 12 feet (3.6 m.) ⅗ mile southward from the same point.

A rock off the entrance to the bay is described above with the entrance to Shuyak Strait.

To enter Bluefox Bay, vessels are reported to hold the course into Shuyak Strait until the eastern channel opens; then to change course to about 177° true (SSE. ½ E. mag.) and proceed through the east entrance in mid-channel, heading for a wooded point on the east side of the bay near its head, but favoring the west side of the channel near the 3½-fathom spot mentioned above. When abreast the middle of the southern entrance island, the west side is favored and at the head of the bay the southern side is favored.

Devil Bay, just northeast from Black Cape, has wooded shores. About ¼ mile inside the entrance are rapids which run heavily except at high water when there is a depth of about 3 feet (0.9 m.). The entrance outside the rapids is a good anchorage in heavy weather for small craft.

Black Cape is low and grassy at the end, and rises gradually in a narrow heavily wooded ridge to a prominent bald knob, 1,155 feet (352 m.) high. Bare and sunken rocks extend a short distance off the cape, and a reef, mostly showing above water, lies on its south side.

The bay between Black Cape and Ban Island has reefs, which do not extend westward of the island.

Ban Island is mountainous, its highest peak being found near its south shore. There is kelp close to its west end.

Paramanof Bay, between Ban Island and Cape Paramanof, is not surveyed. It is recommended to favor Ban Island when entering. The survey ship *Explorer* anchored on the south side, 3 miles eastward of Cape Paramanof and about ½ mile off a rocky shore, in 22 fathoms (40 m.), soft bottom. There is a short sand beach just

eastward of the anchorage, and a rocky islet close to shore a short distance westward. The anchorage is exposed to westerly and northerly winds. There is said to be good anchorage farther in, but no definite information is available.

Cape Paramanof is the northwest end of the peninsula included between Paramanof and Malina Bays. It is a low tongue of land projecting ½ mile northward from the mountains. A reef lies on the north side of the cape inside Paramanof Bay, and a part of it, about ½ mile from shore, is bare at low water.

The peninsula between Paramanof and Malina Bays is marked by two mountain ridges trending eastward, with a small stream in the valley between them. The land is grass covered, with bare rocks in places, and there is no timber. The northern ridge rises in steep, grassy slopes to an elevation of 1,842 feet (561 m.), with a saddle behind it and then extends eastward with about the same height. **Tanaak Cape** is the northern point at the entrance of Malina Bay.

Malina Bay is described below.

Steep Cape is a cliff 1,600 feet (488 m.) high, with a deep break (saddle) behind it, and then a gradual rise to higher land. From offshore the top of the cliff shows irregular, but from northward or southward the summit is sharp. Lying 1 mile northward of Steep Cape is another cliff 1,060 feet (323 m.) high, which is on the south side at the entrance to Malina Bay.

Raspberry Strait, between Afognak and Raspberry Islands, is not surveyed. Its southeast end is bare at low water.

There is a cannery located on the north side of Raspberry Island, about 6 miles from the Shelikof entrance. The dock has a 90-foot face and depths of 29 feet (8.8 m.) alongside. It is reported that there is ample room for maneuvering vessels in approaching and leaving the dock. Mid-channel courses are used in approaching this dock and as far as is known no dangers exist except the sand spit on the Raspberry Island shore, shown on chart 8555.

Raspberry Island is mountainous and grass covered on its western side, the principal points being three high cliffs, between which are two deep valleys trending eastward. The southern valley, about the middle of the island, is especially low and extends through to Onion Bay.

MALINA BAY

lies between the mountainous peninsulas terminating westward in Tanaak and Steep Capes. It is about 10 miles long and is a secure harbor. Water can be obtained from numerous small streams. There is some timber near the head of the bay and in some of the valleys. Steep Cape and the high cliff at the south point at the entrance, and the rounded grass-covered mountains on the northern side of the bay, mark the entrance.

The bay is 2½ to 3 miles wide for nearly 4 miles and then contracts rapidly to a neck about 1½ miles long with a least width of ⅜ mile. From the south side of the neck an arm extends 1½ miles southeastward. Above the neck is a basin 2 miles long with a greatest width of 1¼ miles. From the eastern end of the basin an arm extends 2 miles eastward, with a width of about ¼ mile; it is filled by a flat nearly to its mouth.

The outer part of the bay is clear, with the exception of a rock bare at low water lying ¼ mile from shore in the bight on the south side nearly 4 miles inside the entrance. Rocks awash at high water extend 300 yards off the south side at the entrance to the neck, and lie ½ mile westward of the island in the entrance of the southeast arm. The depths are suitable for anchorage ¼ to ⅜ mile from shore nearly anywhere in the outer bay. An anchorage, exposed only to westerly winds, can be had on the north side of its eastern end, about ¼ mile westward of an islet, and the same distance from the shore northwestward, in 15 fathoms (27.4 m.), sticky bottom.

In **the neck** off the entrance of the southeast arm is an island, ⅜ mile long and 115 feet (35 m.) high, with a clump of trees near its middle. There is no safe passage between it and the shore southeastward. An islet 30 feet (9.1 m.) high lies on the south side of the neck ⅜ mile eastward of the island, and foul ground extends 225 yards from the south shore just eastward of the islet. A rock 15 feet (4.6 m.) high, with a small one close westward, lies 400 yards northeastward of the islet, the best channel being between them. A rock bare at low water lies 400 yards eastward of the rock 15 feet (4.6 m.) high and over 300 yards from the northern shore.

To go through the neck, pass 200 yards northward of the island, steer 121° true (E. ⅝ S. mag.), and pass 100 yards southward of the rock 15 feet (4.6 m.) high lying in the middle of the neck.

The basin has depths of 30 to 47 fathoms (55 to 86 m.) in its western half and shoals gradually eastward, affording secure anchorage. A rock covered at high water lies 400 yards westward from the north point at the entrance to the narrow arm extending eastward, and a shoal extends 600 yards southwestward from a point on the north shore ⅜ mile northward of the rock. The best anchorage is about ⅜ mile off the bight at the northern end of the basin, with the entrance (neck) just closed, in 15 to 18 fathoms (27.4 to 33 m.), sticky bottom.

The **southeast arm** is a secure anchorage with a clear width of nearly ¼ mile. The northwest point of the island in the entrance should be given a berth of over 100 yards, and a rock bare at low water lies 100 yards from the shore southwestward of the same point.

To enter the southeast arm, steer 163° true (SE. ⅜ S. mag.), pass 150 yards southwestward of the northwest point of the island, and follow the southwest shore of the arm at a distance of about 250 yards. Anchor in the broad part about ⅝ mile from the head, in about 10 fathoms (18.3 m.), sticky bottom. A flat extends nearly ⅜ mile from the head.

Tides.—High and low water occur about 20 minutes later than at Kodiak, and the mean rise and fall of the tides is 12 feet (3.7 m.). To find the height of the tide multiply the height of the corresponding tide at Kodiak by the ratio of ranges, 1.7.

VIEKODA BAY

is on the eastern side of Shelikof Strait between Outlet Cape and Uganik Island. It extends into Kodiak Island in a 131° true (ESE. ½ E. mag.) direction, and has a length of 13½ miles from Outlet Cape and 17 miles from Cape Uganik. The lower part of the bay

is 3 miles wide. From its southern side, 8 miles below the head, Uganik Passage extends southeastward. Above Uganik Passage the bay is 2 miles wide and narrows to ½ mile at its head.

Foul ground exists near the shore in places, but except where mentioned below danger will be avoided by giving the shore a berth of ½ mile.

The head of the bay is shoal for 1 mile to two islets. About ½ mile below the islets there are two islands near the southern shore. Good anchorage may be had ½ to 1 mile below the islands and about 2 miles from the head of the bay, in 12 to 17 fathoms (21.9 to 31 m.).

Off the entrance, 2¾ to 3¼ miles from Outlet Cape, is a bank on which the least depth found is 6¾ fathoms (12.2 m.) at its northeast end, lying 267° true (SW. by W. ⅝ W. mag.) from the north end of Outlet Cape and 166° true (SE. ⅝ S. mag.) from Raspberry Cape.

A narrow point, its end detached, extends ⅜ mile from Uganik Island 1 mile eastward from its northern end. Broken ground, with depths of 4 and 5 fathoms (7.3 and 9.1 m.), extends ⅝ mile 10° true (N. by W. ¼ W. mag.) from the point. There is a fair anchorage in southerly weather in the bight on the east side of the point, ¼ to ⅜ mile from shore, in 10 to 15 fathoms (18.3 to 27.4 m.).

A rock, with 4½ fathoms (8.2 m.) on it and which should be avoided, lies ⅝ mile from Uganik Island and 2½ miles westward of the point dividing Viekoda Bay and Uganik Passage.

The latter point has an islet near it, and a rock bare at low water lies ¾ mile above the islet and ⅜ mile from the south shore of Viekoda Bay. Depths of 3 to 5 fathoms (5.5 to 9.1 m.) extends ¼ mile northward of the rock.

UGANIK PASSAGE

borders the northeast and south sides of Uganik Island and connects Viekoda and Uganik Bays. The depths in the passage are too great for anchorage except in Terror Bay.

The part of Uganik Passage on the northeast side of Uganik Island is clear in mid-channel except 5 miles from Viekoda Bay and 1 mile from the southeastern end of Uganik Island. At this point a flat makes two-thirds the distance across the passage from the mouth of a stream in a large valley on the northeastern shore, and leaves a clear channel 350 yards wide close to a point of Uganik Island. There is an islet close to Uganik Island in the bight southeastward of this point.

Terror Bay extends 4 miles 190° true (S. by E. ¼ E. mag.) from the southeast end of Uganik Passage, with a width of ⅝ to ¾ mile. It then narrows to ⅜ mile, trends 154° true (SE. ½ E. mag.) for nearly 2 miles, and is filled by a flat. The main bay is clear with the exception of three rocks which lie 300 yards from the western shore; the first two, lying ¾ and 1¼ miles inside the entrance, have 3 feet over them; the upper one, lying 1¾ miles inside the entrance, is bare at low water. There is secure anchorage for vessels of any size 3 miles above the entrance and about 2½ miles from the head of the bay, in 7 to 15 fathoms (12.8 to 27.4 m.).

The part of Uganik Passage south of Uganik Island is 9 miles long from the southeastern end of Uganik Island to East Point, where it joins Uganik Bay.

A rock bare at low water lies ¼ mile from the south side of Uganik Island ⅝ mile from its southeastern end.

A high **peninsula** extends southeastward from Uganik Island 2 miles from its southeastern end and narrows the passage to ¼ mile. From the point on the south shore southeastward of the peninsula a ledge bare at low water makes nearly halfway across the passage where narrowest, and the southeast end of the peninsula must be kept aboard distant 100 to 150 yards until past the narrowest place.

Westward of the peninsula is an island in the middle of the passage, in the vicinity and westward of which are several rocks, sunken and bare at various stages of the tide. Vessels from eastward may pass northward of the foul ground by following the southwest shore of the peninsula at a distance of about 200 yards (taking care to avoid the rock awash which lies 350 yards offshore), until the island is abaft the port beam, and then steer 300° true (W. ½ N. mag.) for the southernmost point on Uganik Island which shows ahead with the summit of the peninsula a little on the port quarter. When the bare rock ⅜ mile westward of the island is abaft the port beam the dangers will be passed. These are:

A rock bare at low water lies 300 yards northeastward of the island.

A rock bare at low water lies 250 yards northward of the bare rock ⅜ mile westward of the island.

Foul ground and rocks bare at low water extend ¼ mile from Uganik Island ⅜ to ⅞ mile westward of the peninsula.

The channel southward of the island is narrower than that northward. To go through this channel from eastward, bring the south end of the peninsula barely open from the point eastward astern, and steer for the prominent point on the south shore ¾ mile westward of the island, course 281° true (WSW.⅞ W. mag.). Keep close on this line, passing midway between the island and an islet near the south shore ¼ mile westward of the island. When the islet is passed, haul northward and give the point a berth of over 200 yards. The principal dangers are:

A rock bare at low water lies 200 yards southwestward of the island.

A rock with 8 feet (2.4 m.) over it lies ⅜ mile westward of the island and ¼ mile northwestward of the islet.

The islet should be given a berth of over 100 yards.

Westward of these dangers Uganik Passage is broad and free from outlying dangers. In the large bight of Uganik Island 5 miles eastward of East Point shoals extend ½ mile from its northwest shore for a distance of 1 mile from its head. From this bight a broad, low divide extends across the island.

Rocks bare at low water extend ½ mile from the south shore of the passage 1¾ miles eastward of East Point, and ½ mile farther eastward rocks make out 600 yards on the northwest side of a point on the south shore.

UGANIK BAY

(chart 8555) is on the eastern side of Shelikof Strait, between Uganik Island and the mountainous peninsula terminating westward in Cape Ugat. Only the entrance from Noisy Islands to East Point is sounded. Anchorage with shelter from southerly and westerly winds can be had in the bight 2 miles southeastward of Broken Point, and there is secure anchorage in East Arm. Heavy williwaws occur during southwest gales, which are worst toward the head of the bay where the mountains are highest. The shores rise abruptly with cliffs in places, and are generally covered with grass and bushes.

Cape Uganik, the northwest end of Uganik Island, is low for about ¼ mile back, and then rises quickly to elevations of 1,200 to 1,500 feet (366 to 457 m.). A valley extends across the island about 1½ miles eastward of the cape, and the gap can be seen from southward. For a distance of 1½ miles southward from the cape shoals extend about ¼ mile from shore in places.

The cape is marked by a flashing white light located 75 feet (22.9 m.) above the water.

Noisy Islands lie ½ to ⅝ mile from Uganik Island and 2½ miles southward of Cape Uganik. The group is 1 mile long and is two principal islands—the northwest one 205 feet (62 m.) high, the southeast one low and flat. Reefs extend about ¼ mile northward and northwestward from the northwest island, and possibly as much southeastward from the southeast island. The passage between them and Uganik Island has a depth of about 8 fathoms (14.6 m.).

Cape Ugat is on the eastern shore of Shelikof Strait 12 miles southwestward from Cape Uganik. It is a high ridge sloping to a low, rocky shelf at the point of the cape. A short distance off the cape is a rocky, grass-covered islet, which can be seen about 15 miles on a clear day and is a good mark. **Little River** is on the south side of Cape Ugat.

Miner Point, 4¼ miles northeastward from Cape Ugat, terminates in two island-like knobs, the inner one 430 feet (131 m.) high and conical, the outer one lower and flatter.

Broken Point, 3¼ miles eastward from Miner Point, is low and flat for ⅜ mile back, its end being detached, and then rises to high land. A depth of 3½ fathoms (6.4 m.), with deep water close-to, was found 400 yards northward of the point. The entrance of Uganik Bay is 3 miles wide between this point and Noisy Islands, and inside the point the bay widens to about 5 miles until up with East Point.

A stream empties in the bight 1¾ miles southward of Broken Point. There is good anchorage sheltered from southerly and westerly winds about ¾ mile southeastward of the mouth of the stream and ⅜ to ½ mile from shore, in 8 to 15 fathoms (14.6 to 27.4 m.).

East Point, 5 miles eastward of Broken Point, is the northwestern extremity of the high peninsula separating Uganik Bay and Passage. There is a flat rock with bluff sides close to the point, and from the latter there is a long, gentle slope to high land.

At East Point, Uganik Bay is 2½ miles wide, from which it extends 12½ miles 180° true (SSE. mag.), narrowing gradually, to the head of South Arm. Little sounding has been done, but the bay is clear so far as known.

Northeast Arm, not surveyed, extends eastward from Uganik Bay 2½ to 4 miles southward of East Point. **Rock Point,** the south point at the entrance, is marked by several bare rocks which extend off 250 yards.

There are two docks on the northern shore of the arm near its head. A vessel which entered Northeast Arm in 1924 carried deep water in mid-channel courses, but the courses actually steered did not agree with the chart. The chart is reported as a poor representation of the place.

Village Islands are numerous islands and rocks extending ¼ to ½ mile from the western shore 2 to 4 miles southward of East Point. In the cove between the south end of the islands and Village Peninsula anchorage is reported for small vessels. There is a native village at the head of the cove.

East Arm extends eastward from Uganik Bay 7 miles southward from East Point. It is 1 mile wide at the entrance and over 3 miles long, but a flat extends 1½ miles from its head or ½ mile below the island in the bight on the south side of the arm. The depths range from 15 fathoms (27.4 m.) at the entrance to 6 fathoms (11 m.) near the edge of the flat. The arm is clear so far as known and is a secure anchorage for vessels of any size. It is subject to heavy williwaws during southwest gales, but these are not dangerous to well-found vessels. The north point at the entrance is a low spit, on which is an unused cannery.

A saltery is established on the southern shore of East Arm. The dock is too small for large vessels which anchor in 10 fathoms (18.3 m.) off the dock.

South Arm extends 5½ miles southward from the south point of East Arm. No sounding has been done.

DIRECTIONS, UGANIK BAY

From northward, round Cape Uganik at a distance of 1 mile and steer 222° true (S. by W. ⅝ W. mag.) for 3¼ miles to a position 1 mile westward of Noisy Islands. Then steer 164° true (SE. ½ S. mag.), passing about ⅞ mile off the western shore from West Point to Village Islands, and ½ mile eastward of the islands. This course made good for 10 miles should lead to a mid-channel position between the southernmost of the Village Islands and Rock Point. Then steer 192° true (S. by E. mag.) for 2½ miles, following the eastern shore at a distance of about ½ mile, to the entrance of East Arm.

From southward, give Cape Ugat and Miners Point a berth of about 1½ miles and Broken Point a berth of about ¾ mile. Then steer 154° true (SE. ⅜ E. mag.) for 3½ miles to a position about ⅞ mile off West Point. Then steer 164° true (SE. ½ S. mag.) for 4 miles to a mid-channel position between the southernmost of the Village Islands and Rock Point as in the preceding paragraph.

UYAK BAY

(chart 8555) is on the eastern side of Shelikof Strait, southward of the mountainous peninsula terminating westward in Cape Ugat, **Uyak Anchorage** (chart 8822), a secure harbor convenient to She-

likof Strait, is on the southern side of the bay, 16 miles southward of Cape Ugat and 18 miles northeastward of Cape Karluk. Some of the points in the approach to the bay are determined by triangulation, and Uyak Anchorage and Uyak Bay above Harvester Island are surveyed. The principal dangers in the surveyed areas are mentioned in the description following.

The approach between Cape Kuliuk and Rocky Point is about 11 miles wide, eastward of which the bay converges rapidly to Harvester Island. It extends 25 miles in a southeasterly direction above Harvester Island, and is 3 to 4 miles wide from the latter to Amook Island. The shores of the bay rise in steep slopes to elevations of 2,000 to over 4,000 feet (610 to 1,219 m.), and there are numerous mountain streams.

Cape Kuliuk, about 5 miles southward from Cape Ugat, is a cliff at the end of a ridge about 2,000 feet (610 m.) high.

From Cape Uyak high cliffs extend about 5 miles northeastward to **Rocky Point.** Between Rocky Point and Bear Island the coast is low bluffs, and a wide valley extends back several miles.

Bear Island, about 5½ miles east-northeastward from Rocky Point, is nearly ⅜ mile in diameter, 249 feet (76 m.) high, and grass-covered. It lies ¼ mile from the shore, with which it is connected by a bowlder spit, bare at half tide.

Harvester Island, ¾ mile eastward of Bear Island, is over 1 mile long, 844 feet (257 m.) high, steep-sided, and grass covered. The 20-fathom (37 m.) curve is about ¼ mile off the northern and eastern sides of the island.

Uyak Anchorage is the best harbor on the eastern side of Shelikof Strait southward of Uganik Bay, and is easily entered. It lies between Harvester Island and the shore, the passage having a width of ¼ to ⅜ mile. The depths range from about 7 fathoms (12.8 m.) between Harvester and Bear Islands to 20 fathoms (37 m.) ¼ mile northwestward of the cannery. The best anchorage is about ½ mile northwest of the cannery, in 12 to 14 fathoms (21.9 to 25.6 m.). There is also good anchorage, except with heavy northeasterly or easterly winds, in the bight ¼ to ⅜ mile southeastward of the cannery and ¼ mile from shore, in 12 to 14 fathoms (21.9 to 25.6 m.).

The better and safer entrance is around the south end of Harvester Island. **Cormorant Rock,** bare at half tide, lies over ⅝ mile southeastward of Harvester Island and 300 yards from shore. A spit, bare at low water and steep-to, extends 425 yards 218° true (S. by W. ⅜ W. mag.) from the south end of Harvester Island. This spit has extended 45 yards in the direction of its axis between the years 1908 and 1915.

The end of the spit is marked by a beacon showing a fixed red light placed in 12 feet (3.7 m.) of water.

The northwest entrance is ⅜ mile wide between two reefs, partly bare at half tide and marked by kelp, one extending 400 yards westward from the northwest end of Harvester Island, and the other lying 250 to 550 yards eastward from Bear Island. With care this entrance is not difficult in the daytime, especially at low water when the principal dangers show above water.

Uyak is a post office and cannery on the southwest side of Uyak Anchorage opposite the south end of Harvester Island. There is a

depth of 20 feet (6.1 m.) at the dock, and fresh water is available. There is considerable undertow, and good fore and aft spring lines are needed with westerly weather.

Uyak is a port of call for the monthly mail steamer from Seward and the cannery company operates a radio station during the summer season. The call letters are KHV.

Zachar Bay is on the eastern side, 6 miles 124° true (E. by S. mag.) from Harvester Island and 2½ miles northward from Amook Island. It is 6 miles long 124° true (E. by S. mag.) and ¾ to 1 mile wide. No sounding has been done, but the north side is apparently clear. The south point at the entrance is surrounded by sunken reefs, and a reef bare at half tide lies ⅜ mile northward from the point. A flat extends nearly 2 miles from the head of the bay.

A floating cannery operates in Zachar Bay. A small dock has been built from the northern shore of the bay near its head and a schooner used for the floating cannery is moored off this dock.

About ½ mile westward of the dock is a shoal which is marked by a red buoy placed by the cannery employees. The best time to enter is at low water with a rising tide.

Larsen Bay (chart 8822) is on the western side, 6 miles southward of Harvester Island and 262° true (SW. by W. ¼ W. mag.) from the north end of Amook Island. It is 4 miles long 259° true (SW. by W. mag.), about ½ mile wide, and has depths of 30 to 40 fathoms (55 to 73 m.) on its northwest side and less on the opposite side. From its head low land extends to Karluk River, a distance of about 2 miles. A cannery is maintained by the Alaska Packers' Association in the bight just southward of the inner south entrance point.

The entrance to Larsen Bay is through a crooked channel ½ mile long and 200 yards wide, between flats partly bare at low water, one extending 300 yards southward from the north point at the entrance and the other filling the bight on the south side opposite. A rock bare at low water lies in the entrance of the channel 200 yards northwestward from a black rock about 20 feet (6.1 m.) high, which lies 100 yards off a point on the south shore. The better channel is between the black rock and the rock awash, and has a depth of about 27 feet (8.2 m.). The **tidal currents** in the entrance have an estimated velocity of 2 to 4 knots at strength.

Strangers should enter Larsen Bay at low water, or buoy the rock at the entrance and the flat on the north side. With care small vessels can enter by the following directions: Pass 75 to not over 100 yards northward of the black rock near the south shore, and steer 260° true (SW. by W. mag.) for the mound on the southern side until the north point at the entrance is abeam and the unused cannery is open about one-half point westward of it. Then haul northwestward and pass about 200 yards northward of the mound.

Anchorage can be had in mid-channel southward of the unused cannery on the north side just inside the entrance, in 5 to 8 fathoms (9.1 to 14.6 m.). Near the south shore of Larsen Bay 1 mile southward of the unused cannery is a small island. There is good anchorage 300 to 400 yards northward or northwestward of the island, in 6 to 10 fathoms (11 to 18.3 m.), but care must be taken to avoid the flat which makes out ¼ mile in the bight northeastward of the

island. A flat extends about ¼ mile from the head of the bay; anchorage can be had below the flat in 10 to 12 fathoms (18.3 to 21.9 m.).

There is a depth of 8 feet (2.4 m.) at the cannery dock. Vessels usually anchor outside and cargo is lightered in, but in 1924 a vessel 210 feet in length entered the inner bay. The entrance should not be attempted except with local knowledge.

Amook Island, 7½ miles long and 1,686 feet (514 m.) high, divides Uyak Bay into two passages, the north end of the island lying 6½ miles southeastward of Harvester Island. Reefs extend ¼ mile northward from the north end of Amook Island.

The passage west of Amook Island is the principal one. It is 1 to 1¾ miles wide and generally clear. In the bight of Amook Island 2½ miles from its north end there is anchorage for a small vessel, in about 10 fathoms (18.3 m.), with shelter from easterly and southerly winds. The bottom is uneven and there is a possibility of dangers. The entrance is between the south point of the bight and a bare rock lying ⅝ mile northward from the point and ½ mile from Amook Island. Between this rock and the island is a reef, partly bare at low water, which extends ½ mile southeastward from an islet.

A rock, bare at low water and which may be passed on either side, lies ¼ mile from Amook Island and ⅜ mile 253° true (SW. ½ W. mag.) from its south end.

The passage east of Amook Island is obstructed at points 2½ miles from the north end of the island and 3¼ miles from the south end, and should be used only by small vessels with local knowledge. For a distance of 2½ miles the north end of the passage is clear, with depths of 14 to 20 fathoms (25.6 to 37 m.), and anchorage can be had here. At the southeast end of this anchorage is a shallow lagoon at the mouth of a deep valley. Small vessels can anchor 300 yards off the mouth of the lagoon in 5 to 6 fathoms (9.1 to 11 m.).

At ¼ mile westward of the lagoon the passage narrows to 300 yards, and from the east point of the narrows a kelp-marked reef extends westward and northwestward over halfway across, leaving a narrow channel between it and the west shore. Near the northwest end of the reef is a bare rock. There is a good anchorage around the point on the west side at the south end of the narrows, in 5 to 8 fathoms (9.1 to 14.6 m.).

Thence for a distance of 2 miles the passage is clear to the second narrows. At this point a spit partly bare at low water extends halfway across from a low grassy point on the west side and leaves a channel 125 yards wide between the southeast end of the spit and an island. The channel is westward of this island and the next one ⅜ mile southward, and the western shore should be favored until over ¼ mile southward of the southern island. Southward of this point the passage is clear. Some prospecting has been done on the east side of the passage 2 miles from its south end.

Lying ¾ to 2½ miles southward of Amook Island is a chain of islands with foul ground between them and about 300 yards off the northwest end of the northern one called **Alf Island.** There is deep water between the islands and the foul ground abreast them making out from the western shore, but the safer channel is eastward of the

islands and is clear. Lying 1½ miles southeastward of Amook Island is a bare rock at the end of a reef extending 200 yards from the eastern shore.

At the south end of these islands there is an inlet in the west shore about ¾ mile long and 300 yards wide, affording anchorage in about 12 fathoms (21.9 m.).

Southward of the island, Uyak Bay is 1½ miles to 1 mile wide, and trends 158° true (SE. mag.) for 7 miles from the south end of Amook Island. In the last 3 miles of this distance the depths shoal gradually from 20 to 7 fathoms (37 to 12.8 m.), and anchorage can be selected in any depth desired. The bay then turns to 119° true (E. ½ S. mag.) for 5 miles, with a width of ¼ to ¾ mile, and is filled by a flat.

Tides.—At Uyak Anchorage high and low water occur about 15 minutes later than at Kodiak, and the mean rise and fall of the tides is about 11½ feet (3.5 m.). To find the height of the tide multiply the height of the corresponding tide at Kodiak by the ratio of ranges, 1.7.

DIRECTIONS, UYAK BAY

From northward, round Cape Ugat at a distance of about 1½ miles and steer 220° true (S. by W. ½ mag.) for 6 miles to a position 2½ miles off Cape Kuliuk, bearing 102° true (E. by N. mag.). Then steer 172° true (SSE. ¾ E. mag.) for 10 miles, giving the eastern shore a berth of about 2 miles, to a position ½ mile eastward of Harvester Island.

Then steer 237° true (SW. by S. mag.), passing about ¼ mile southeastward of Harvester Island. Anchor 500 yards northeastward or northward of the slipways, in 10 to 14 fathoms (18.3 to 25.6 m.).

To go to the inner harbor, follow the preceding directions, and then hauling northwestward, round the light beacon at a distance of 100 yards, and steer 341° true (NW. ¼ N. mag.) for the northwest end of Harvester Island, pass 150 to 200 yards off the cannery wharf, and continue the course to mid-channel.

From southward, it is said in going from Karluk to Uyak Anchorage that there are no dangers 1 mile offshore. The following are the approximate courses and distances: From a position 1 mile northwestward of Cape Uyak 68° true (NE. mag.) for 4½ miles, and then 93° true (ENE. ¼ E. mag) for 6 miles, passing 1 mile off Rocky Point and Bear Island. When Bear Island bears 180° true SSE. mag.) steer about 124° true (E. by S. mag.) for 2 miles to a position ½ mile northeastward of Harvester Island. Follow the eastern shore of Harvester Island at a distance of about ½ mile and proceed as directed in the two paragraphs preceding.

CAPE UYAK TO CAPE KARLUK

Cape Uyak is a precipitous, high headland at the end of a ridge. From the water the slope is rapid to an elevation of 647 feet (197 m.). There is then a slight fall to a deep notch in the narrow neck back of the cape, from which there is a rise in steep, grassy slopes to higher land.

Northeast Harbor is a bight about 1 mile long, with a beach of sand and shingle, on the south side of Cape Uyak. It affords anchorage for small vessels in depths of 9 to 15 fathoms (16.5 to 27.4 m.), bottom sand and good holding ground, with fair shelter in northeasterly weather.

Between Cape Uyak and Karluk there are two long cliffs about 1,300 feet (396 m.) high, the southern one having a marked slide extending from its highest point almost to the water. In the valley between the cliffs are two waterfalls. There is a house on the bluff near the south fall and a fishermen's camp on the beach near the north one.

Karluk lies 5½ miles southward of Cape Uyak and 1½ miles eastward of Cape Karluk. A cannery and hatchery is maintained on Karluk River by the Alaska Packers Association. The entrance to Karluk Lagoon is through a narrow channel at the south end of the spit and is only passable for boats with the water above half tide.

The anchorage off Karluk is an open roadstead, sheltered from easterly winds but exposed to winds from southwest through west to northeast. It should not be used by vessels without power to get away in case of its coming on to blow. Anchorage may be had ⅝ mile northward of the entrance to the lagoon in depths of 12 to 14 fathoms (21.9 to 25.6 m.). The 3-fathom (5.5 m.) curve lies about 300 yards off the spit, and there are no dangers so far as known in the approach. Uyak Anchorage is the nearest harbor for vessels compelled to leave Karluk from stress of weather.

Karluk has an extensive salmon fishery and that constitutes the only importance of the place.

There is a cliff 820 feet (250 m.) high just west of Karluk, and between this cliff and Cape Karluk is a small bight called **Tanglefoot Bay.** Low land extends through back of Cape Karluk to the beach south of the cape.

Cape Karluk is a prominent, projecting head, 1,438 feet (438 m.) high, with bare rock cliffs on its seaward face and grassy slopes on its eastern side to low land. It is readily identified by its cone-shaped appearance, a notch in the summit, and the low land behind it.

KODIAK ISLAND, SOUTH COAST

The south coast of Kodiak Island is unsurveyed, with the exception of the west side of Alitak Bay and part of the shore line of Sitkinak Island and the north end of Tugidak Island. The following notes are from reports and should be used with caution. The land is partly wooded for several miles southward from Cape Chiniak and otherwise there are scattered clumps of alders in places in the valleys.

Ugak Island is about 1,200 feet (366 m.) high, with fairly steep sides; bare rocks show for a distance of possibly ½ mile off its eastern side, and breakers at high water were seen for a considerable distance off its western side. There is a low spit on the northwest side of the island; there is a reported anchorage for small craft under the lee of the spit in northeast winds. The **passage between Ugak Island and Narrow Cape** is about 3 miles wide; it is said to have strong currents with heavy rips resembling breakers. The best water is reported to be near Ugak, but the passage is not recommended for strangers.

Narrow Cape is a flat headland possibly 200 feet (61 m.) high, terminating southward in a vertical face in places. From northward it appears like an island.

Ugak Bay is reported to have good anchorages for small craft at least. The north point at the entrance westward of Narrow Cape is a prominent cliff. The rocks shown on the chart in the north side of the bay westward of the cliff are said to show above water mostly and are easily avoided in clear weather. Small craft have anchored in two coves on the north side of Ugak Bay westward of the valley leading to Kalsin Bay. A sketch of the south arm shows an anchorage for small craft in the cove, which has 7 fathoms (12.8 m.), shown in its entrance on chart 8502; the depths in the cove are shown as 4 to 6 fathoms (7.3 to 11 m.) and its west side is shoal. There are portages to Kalsin Bay and Kiliuda Bay, the latter from the native village of **Eagle Harbor.**

Dangerous Cape is said to be a continuous line of bluffs, which should be approached with caution on account of off-lying rocks.

Kiliuda Bay, reported to have several good harbors, is about 17 miles long and has two arms. On the south shore of the western arm are several open bays, some of which may afford anchorage; at the head is an extensive shoal flat. Just westward of Shearwater Bay, there is an open bay with some rocks, the western one about 70 feet (21.3 m.) high, lying about ¼ mile from shore. About 4 miles westward of the rock there is a sand spit on the north side, about ½ mile long, westward of which anchorage might be obtained in a depth of 10 fathoms (18.3 m.).

About 1 mile farther westward is the entrance, ¾ mile wide, to an inlet which extends 2 or 3 miles north-northwestward with high mountains on both sides, their lower parts covered with thick scrub. At the head the inlet shoals abruptly from 25 fathoms (4.6 m.). A river empties at the northwest corner and a small creek on the northeast side. Anchorage with good holding ground may be obtained in the middle of the inlet near the head, in 24 fathoms (44 m.); also in a depth of 15 fathoms (27.4 m.) in a bay on the south side of the western arm, southward of the entrance to this inlet.

Shearwater Bay (chart 8822), the north arm of Kiliuda Bay, extends about 6 miles in a northerly direction, the land being generally low except on the southeast side, where there are grassy slopes up to high hills. A flat extends 600 yards from the head, which is low and marshy. Secure anchorage may be had in 5 to 6 fathoms (9.1 to 11 m.), ½ to ⅝ mile from the head, after passing low spits which extend from each side. Rocks awash extend some distance from each side of the entrance, so a mid-channel course should be followed.

There is a cannery on the northern shore of Shearwater Bay just southwestward from Observation Point. There is a dock with a 50-foot face and ample depths alongside. Fresh water can be obtained at the dock.

Sitkalidak Strait, separating Sitkalidak Island from Kodiak Island, is wide at the entrances, but the through passage is a narrow, tortuous channel which has been used by small local craft of 8 feet (2.4 m.) or less draft, but is not available for strangers.

Cape Barnabas, the northeast end of **Sitkalidak Island,** is a conspicuous, bold, rocky bluff, surrounded by rocks. A rock on which the sea breaks lies a little over 1 mile northward of the cape.

A rock or reef marked by kelp is reported to lie about 2 miles north true from Cape Barnabas. Breakers have been reported 1 mile east of Left Cape.

Port Hobron, the second deep bay from Cape Barnabas on the north side of Sitkalidak Island, is a good harbor for any vessel. A whaling station is established here and a dock with a face of 130 feet is built out to 30 feet (9.1 m.) of water. Fresh water is piped to the dock.

A rock bare at low water lies about 100 yards eastward of the dock and in line with its face.

Directions.—The following directions are given by Captain Glass of the steamer *Admiral Evans*. In entering from the southward pass about 2½ miles outside Cape Barnabas and stand over toward **Dangerous Cape** to avoid the rock 2 miles northward of Cape Barnabas. Pass about 1½ miles off **Right Cape** and then follow mid-channel courses into Port Hobron, passing to the southward of the island in the middle of Sitkalidak Strait.

Newman Bay, on the west side of Sitkalidak Island, is the one shown on chart 8502 with 27 fathoms (49 m.) in the entrance. A sketch of the bay shows the following: A reef extends southward from the north point at the entrance; there is a point, or possibly a spit, on the southeast side of the upper part of the bay; a reef bare at low water lies off the southwest side of the point, and a shoal extends a short distance off its northeast side; there are depths of 8 to 10 fathoms (14.6 to 18.3 m.) in the bay above the point, and secure anchorage for small craft above the point in the angle between it and the shore; deep water is indicated up the middle of the bay.

Three Saints Bay, on the west side of Sitkalidak Strait, is reported to afford good anchorage for vessels, but is surrounded by high land and is subject to heavy williwaws. A local sketch of Three Saints Bay shows an anchorage for small craft in a lagoon inside of a spit on the west side just inside the entrance. The entrance to the lagoon is around the north end of the spit, and has a depth of 6 fathoms (11 m.); the depths inside are 8 to 11 fathoms (14.6 to 20.1 m.). The sketch also shows a shoal bordering the east side of the spit, and a reef of apparently bare rocks extending southward from the north point at the entrance of the bay.

There is a fish-packing plant in Three Saints Bay.

Old Harbor is on the west side of Sitkalidak Strait about 4 miles northward of Three Saints Bay. The *Albatross* anchored in 7 fathoms (12.8 m.) in Sitkalidak Strait off the native village. Entering from southward a mid-channel course was followed to the anchorage, the strait being free from hidden dangers except near the shores. Two-headed Island is the best mark for the approach. The country around Old Harbor is mountainous with a narrow belt of level land near the water where the village stands.

Black Point, the south end of Sitkalidak Island, shows darker than its surroundings. There is an islet 200 yards in prolongation of the point, and ¼ mile farther is a rock just above water which marks the end of a ledge extending from the point.

Twoheaded (Nasikan) Island has two irregularly rounded peaks and is easily recognized. Old sketches indicate some high rocks near the shores. Both sides of the island are said to be clear.

Kaguyak Bay affords anchorage in 6 to 8 fathoms (11 to 14.6 m.) for all winds except from north to east. With northeast winds small craft formerly anchored close under the inner bluff on the east side of the bay. The native village of **Kaguyak** is at the head of the bay. The land is low, except westward of the bay, and the low land extends to Cape Trinity. The south point at the entrance has a reef of bare rocks making off in prolongation of the point, and there is said to be a sunken rock about one-third the distance from the bare rocks to Twoheaded Island, the island side being clear.

Cape Trinity, the south end of Kodiak Island, is a tableland of moderate elevation which increases in height very slowly northward and terminates abruptly in rocky cliffs. The shore is fringed with reefs and pinnacle rocks.

Albatross Bank.—While engaged in sealing, Indians reported to S. Applegate that they saw kelp in the vicinity of the 15-fathom (27.4 m.) soundings shown on the chart. From bearings on the east end of Sitkinak while at anchor in the vicinity of the reported kelp, and the run of his vessel from that island, the position is placed approximately 27 miles 116° true (E. ¼ S. mag.) from the east end of Sitkinak Island.

Geese Islands are flattened in appearance, the highest possibly 200 feet (61 m.), and have no marked feature. **Aiaktalik Island** shows as two flattened knolls, the eastern one the sharper; there is a native village with a Greek Church at the southwest end of the bight on the north side of the island. There is foul ground between the islands, and possibly as much as 2 miles in places off their south side. The strait between the islands and Kodiak is obstructed by reefs and is unsafe. A sunken rock has been reported about 2 miles north-northeastward of the northeasternmost island.

Russian Harbor, between Aiaktalik Island and Kodiak, is a temporary anchorage in moderate weather, in about 8 fathoms (14.6 m.), hard sand bottom; but there is little shelter, and with strong winds there are heavy tide rips on account of the strong currents. The little sounding that has been done indicates a broken bottom, and the harbor is not recommended for strangers.

The cove in Aiaktalik Island at the village has depths of 2 to 4 fathoms (3.7 to 7.3 m.) with bowlders in places. It has been used by small craft, but is exposed to northeast winds. An extensive reef, bare at half tide and marked by kelp, extends ⅝ mile northward from the west point of the cove. There is a narrow channel with strong currents between the reef and the point. With northeast or northwest winds small craft anchor close to shore in the bight of Kodiak Island northward of Aiaktalik.

Sitkinak Strait is not surveyed, but is known to be navigable for vessels. In the narrowest part of the strait favor Sitkinak Island, taking care, however, to give it a berth of over 1 mile; the depths are 12 to 17 fathoms (21.9 to 31 m). As mentioned above, the vicinity of Geese Islands is foul. A bank of considerable extent, on which the least depth found is 5 fathoms (9.1 m.), lies near the middle of

the strait off the small island southwestward of Aiaktalik. The reef on which the *Pavlof* struck is reported to lie 2 miles southeastward of the southeast end of Aiaktalik Island. The position is doubtful.

Another vessel drawing less than 13 feet (4 m.) is reported as having struck a kelp-covered rock about 3 miles southeastward of Aiaktalik Island.

The **currents** in Sitkinak Strait set westward on the flood and eastward on the ebb. There are heavy tide rips in the strait, sometimes in spots southward and westward of Aiaktalik Island, and at times extending in a double line of breakers across to Sitkinak. So far as observed they are heaviest with westerly winds and a flood current. They are often dangerous for small craft, and may at times trouble small vessels.

TRINITY ISLANDS

lie off the south end of Kodiak Island. There are two principal islands, called Sitkinak and Tugidak, which are again divided by lagoons that are navigable only by small boats at high water and have strong currents. The shore line of Sitkinak Island, except for about 6 miles on its southwest side, and the north end of Tugidak Island have been surveyed. The soundings around the islands are from reports.

Fresh water can be obtained from the ravines and pools on the islands. Landing can be made only when the weather is unusually quiet, and the sea makes rapidly. The beaches are generally a heavy shingle. There are a few alder bushes and there is driftwood on the beach. There are no inhabitants except occasionally a few hunters and fishermen in summer. Some prospecting has been done at the southwest end of Tugidak Island.

Sitkinak Island is divided by a lagoon. The eastern part has hills separated by low valleys. A reef extends northeastward from its east end; there are two pairs of bare rocks on the reef, the outer ones 1 miles from shore, and at low water extensive reefs show around them. The south shore of the islands is believed to be foul and should be carefully avoided.

The western and high part of Sitkinak Island is composed of two main ridges separated by a high valley, the easterly ridge having an elevation of about 1,500 feet (457 m.) and the westerly one about 1,200 feet (366 m.). The north point is low and flat, and is backed by high land which rises steeply. The northwest side of the island is earth cliffs several hundred feet high, broken by narrow ravines, and is foul offshore.

The **passage between Sitkinak and Tugidak Islands** has very strong tidal currents, and its south approach is apparently blocked by shoals.

Tugidak Island, in its northern part, is chiefly sand flats, but little above high water, the higher parts of which are low, grassy sand hills; it is separated from the southern or higher part of the island by lagoons of some depth with strong currents. The western and higher part of the island is earth cliffs from 200 to 400 feet (61 to 122 m.) high, from the crest of which the surface slopes gradually to the eastern shore.

In 1909, S. Applegate located the foul and broken area which extends about 10 miles southward from the south end of Tugidak Island, as shown on chart 8502, by compass bearings on Tugidak Island and the summit of Sitkinak Island. Until a survey is available it is considered unsafe for vessels to cross this area. The bottom is very uneven, the depths changing abruptly from 2 to 4 fathoms (3.7 to 7.3 m.) in places, and bowlder reefs with little depth may be expected. There are strong currents and heavy rips and overfalls.

The north and west sides of Tugidak Island may be generally approached as close as 1 mile in good weather by a careful use of the lead. Care should be observed near the middle of the west side of Tugidak, as an unsurveyed bank with depths probably as little as 2 fathoms (3.7 m.) lies some distance off, possibly 2 or 3 miles.

Alitak Bay is described under a separate heading following.

Cape Alitak and Low Cape are determined by triangulation, and the position of the salient points and rocks from the latter to Cape Karluk have been approximately determined, so that fairly good courses can be given. No sounding has been done, and it is advisable to give the points and outer rocks a berth of 2 miles.

The following are approximate **courses and distances** along the coast; allowance should be made for the tidal currents, which have an estimated velocity of 1 to 2 knots at strength, setting along shore, northward on the flood and southward on the ebb:

Passing 2 miles off Cape Karluk, steer 222° true (S. by W. ¾ W. mag.) for 6 miles to a position 2 miles westward of a high, white cliff. Then change to 213° true (S. ⅞ W. mag.) for 10.5 miles to a position 2 miles westward of the two large and high pinnacle rocks lying ¾ mile westward of the middle ridge northward of Cape Ikolik. Then haul to 191° true (S. by E. mag.) for 4 miles to a position 2 miles west-southwestward of the outer Seal Rocks off Cape Ikolik. Then steer 152° (SE. ½ E. mag.) for 23 miles to a position 2 miles southwestward of Low Cape. Then a 143° true (SE. by E. ⅜ E. mag.) course for 11.5 miles leads to a position 2 miles southwestward of Cape Alitak.

Twin Peaks, described under Alitak Bay, are prominent along the coast as far as Cape Ikolik.

Low Cape, lying 11.5 miles 323° true (NW. by W. ⅜ W. mag.) from Cape Alitak, is the western extremity of the low land in this vicinity. A spit and apparently shoal water extend a considerable distance off the cape, and it should be given a berth of 2 miles. Kelp extends 2 or 3 miles from shore in places in the bight between Cape Alitak and Low Cape. There are high bluffs about 4 miles northward of Low Cape. There is said to be good anchorage in northeasterly winds along the shore between Low Cape and Ayakulik Island.

Ayakulik Island is small and about 350 feet (107 m.) high. **Ayakulik River** makes inland a little southward of the island. Foul ground is reported between Ayakulik Island and Cape Ikolik.

The west end of Kodiak Island consists of three headlands which are the ends of three high ridges. The name Cape Ikolik is here applied to the southerly headland.

Cape Ikolik is marked by two high conical islets close-to, and there are some pinnacle rocks on its south side. **Seal Rocks** are

two principal rocks off Cape Ikolik. The inner one, lying about ½ mile west-southwestward of the cape, is a large, steep-sided, bare rock, with a yellowish tinge, and having a nub on top which gives it the appearance of a lighthouse; there is a small, low rock close to its southwest side. The **outer Seal Rock** lying nearly 2 miles westward of the cape, is a pinnacle which at a distance resembles a sail; foul ground which does not break is reported to extend about ½ mile outside the rock.

The middle headland lies about 3 miles northward of Cape Ikolik, and there is a large bight between it and the cape. Two large and high pinnacle rocks, one twice as high as the other, lie close together and about ¾ mile westward of this headland.

The northerly headland, lying about 1¼ miles northward of the middle one, is marked by a high, steep-sided, rocky islet, and a number of pinnacle rocks which lie close to shore.

Halibut Bay is the local name of the bight between the headland described in the preceding paragraph and Cape Grand. It is frequently used as an anchorage by fishing vessels in northeasterly winds.

The southern part of the bay, which was surveyed in 1920, affords good anchorage with protection in all southerly winds. Vessels anchor in about 7 fathoms (12.8 m.) hard sand bottom, ¾ mile off the beach. Small craft may find more protection by anchoring closer in near the mouth of the lagoon.

There is also an anchorage in the unsurveyed northern portion of the bay where there is shelter from northeast winds. Halibut Bay was one of the regular anchorages used by the Survey ship *Surveyor*. during the season of 1920.

Cape Grant lies about 10 miles southward of Cape Karluk and about 6 miles northward of the two large and high pinnacle rocks, lying off the middle headland previously described. The cape is a rugged headland at the end of a high ridge, the summit of which is marked by a small cluster of peculiar pinnacle rocks. A reef which breaks in heavy weather extends possibly ½ mile off the cape.

A headland of high, white cliffs lies about 4 miles northward of Cape Grant and about 6 miles southward of Cape Karluk. The cliffs are at the end of a fairly level ridge which extends some distance back with an estimated elevation of 1,200 feet (366 m.).

ALITAK BAY,

at the south end of Kodiak Island, is about 7 miles wide at the entrance between Cape Alitak and Cape Trinity, and in its length of about 13 miles in a north-northeasterly direction the bay narrows to about 4 miles at the entrance to its northerly arm, called Deadman Bay. Lazy Bay is a good anchorage convenient to Cape Alitak, and there is a cannery in Olga Bay at the head of the northwest arm of Alitak Bay.

The west side of Alitak Bay from Cape Alitak to the entrance of the narrows leading to Olga Bay has been surveyed, although the soundings are not sufficient to develop all dangers, especially in the open waters of Alitak Bay.

There are no trees, the largest growth being scattered clumps of alders. Except the beaches and the outcropping ledges of bare rock

on the knolls and peaks, the land is covered with thick moss and grass; there are lakes in places and numerous streams. The prominent feature in the approach is Twin Peaks, on the peninsula between Lazy Bay and Kempff Bay, which can be seen from Cape Ikolik on a clear day. The peninsula between Kempff Bay and Olga Bay is broken by mountain masses rising to a height of about 2,000 feet (610 m.).

The eastern shore of Alitka Bay consists of high bluffs, terminating in Cape Trinity. No sounding has been done.

Cape Alitak is the south end of a sloping ridge with numerous knolls, which is partly grass covered but has much bare rock. The cape slopes upward gradually to Tanner Head, a rocky knoll about 600 feet (183 m.) high, between which and Twin Peaks there is a break formed by Lazy Bay.

A shoal, apparently of sand and with a very uniform bottom, extends from the southeast side of Cape Alitak toward Cape Trinity; the 3-fathom (5.5 m.) curve on the shoal is about ½ mile from shore for a distance of 1¼ miles northward of Cape Alitak, and the 5-fathom (9.1 m.) curve is about 1½ miles from shore. Heavy tide rips are frequent off the cape. It is reported that this shoal extends across to Cape Trinity; a depth of 7 fathoms (12.8 m.) was found on it at the limits of the survey, 2 miles southeastward from Cape Alitak, and a depth of 8 fathoms (14.6 m.) was reported by U. S. S. *Ranger* about 3 miles southeastward of that cape.

Lazy Bay, lying 4 miles northward of Cape Alitak, is well marked by Twin Peaks and Egg Island on its north side, and there is a bare, white, flat ledge close to its south entrance point. The shore southward of the entrance is clear if given a berth of ⅜ mile, with the exception of the shoal making off the southeast side of Cape Alitak. Approaching from northward in Alitak Bay, vessels can haul in for the entrance when Egg Island bears 270° true (WSW. mag.).

Entering in mid-channel, good anchorage for vessels can be had ½ to ⅝ mile from the head of Lazy Bay, and midway between the sandspit on the north shore and a dark, bare rock on the south shore, in 7 to 9 fathoms (12.8 to 16.5 m.), sticky bottom. A narrow ridge on which the least depths found are 5 to 6 fathoms (9.1 to 11.0 m.) extends across Lazy Bay in a north-northeasterly direction from the rock (covered at three-quarters flood), on the east side at the entrance to Rodman Reach. A flat extends ⅜ mile from the head of the bay, and the shores at the anchorage should not be approached closely.

There is a cannery and wharf located in Lazy Bay. The wharf has a face of 40 feet and 26 feet (7.9 m.) of water alongside with fresh water facilities. There is a general store, and minor repairs can be handled by the cannery company machine shop.

The cannery operates a radio station, call letters KEPS.

The anchorage off the cannery is the most accessible one on the south coast of Kodiak Island and serves as a good harbor of refuge.

Rodman Reach is a narrow arm which extends southward from Lazy Bay and inside of Tanner Head to Cape Alitak, where it forms a shoal basin from which another narrow arm extends some distance northwestward, being separated from the sea by a narrow shingle

spit. The depths are 4 to 5 fathoms (7.3 to 9.1 m.), hard bottom, in the channel for a distance of ½ mile from the entrance, and a spit projects from its west side just inside the entrance; the channel of this part of the reach might be used as an anchorage for small craft. No further soundings are available.

Egg Island is a small rocky island about 15 feet (4.6 m.) high lying on the north side at the entrance to Lazy Bay. The passage inside the island is foul, and foul ground with rocks bare at low water extends 600 yards northward toward the rocky islet off the south side of Kempff Bay.

Twin Peaks, between Lazy Bay and Kempff Bay, are about 1,000 feet (305 m.) high, and are the most conspicuous mark from westward as far north as Cape Ikolik, being first raised as an island.

Kempff Bay, on the north side of Twin Peaks, has too deep water for convenient anchorage, and its north shore has broken ground which should be avoided. Favoring somewhat the south shore through the bay, anchorage can be selected in the middle about ⅜ mile from the head, in 18 fathoms (33 m.); a spit with deep water close-to extends 350 yards from the north shore at a point ¾ mile from the head. For the purpose probably of communicating with Akhiok, small craft have used an anchorage in the middle of the first large bight on the north side of Kempff Bay ¾ mile above the small island on the north side of the entrance; there is broken ground, which has not been fully developed, making well off the shores of the bight.

A reef, covered at high water and with a rocky islet a few feet high near its end, extends ½ mile from the shore just southward of Kempff Bay; the islet should be given a berth of over ¼ mile, passing eastward of it in Alitak Bay, and northward of it when entering Kempff Bay.

Between Kempff Bay and Moser Bay, a distance of 4 miles, the shore is fronted by islands and rocks about 1 mile wide, the shores of which are fringed with reefs. **Akhiok** is a native village on the shore 1¼ miles north-northwestward of Round Hill.

Round Hill, about 180 feet (55 m.) high, is on the east end of the large island forming the north side of Kempff Bay. It is a small symmetrical grassy knoll, and is quite distinctive. An extensive reef, with a few heads, which always show, extends ⅜ mile off the east side of the north end of the island at Round Hill.

The principal **outlying dangers,** so far as known, in Alitak Bay lie eastward of the island and rocks between Kempff Bay and Moser Bay. They are in the form of long ridges trending with the bay, the two on the west side lying nearly ¾ mile and 1½ miles from the islands and rocks on the west side; and the deepest and clearest channel in the bay lies between the second ridge and Middle Reef, the latter being a third ridge.

The first ridge lies on 33° true (N. ⅞ E. mag.) bearing to High Rock, and the following are the shoaler places determined on it; it should not be crossed except with caution.

A 12-fathom (21.9 m.) sounding, not developed, lies 95° true (ENE. ⅜ E. mag.) from the south Twin Peak and 1½ miles 179° true (SSE. ⅛ E. mag.) from Round Hill; it is apparently the south end of the first ridge.

A reef, covered at highest tides, lies 7/8 mile 136° true (ESE. mag.) from Round Hill, with foul ground between.

A reef, 1/2 mile long on the line of the ridge, partly bare at low water and marked by kelp, lies 3/4 mile off the island northward of Round Hill, with foul ground between, and lies between the bearings 93° true (ENE. 1/4 E. mag.) and 73° true (NE. 3/8 E. mag.) from Round Hill.

A 9-fathom (16.5 m.) sounding, not developed, lies 3/4 mile northward of the preceding reef, about the same distance from the nearest island westward, and bears 175° true (SSE. 1/2 E. mag.) from the northeast end of the island on the south side of the entrance to Moser Bay; it is apparently the north end of the first ridge.

The least depth found on the second ridge is a 10-fathom (18.3 m.) sounding which lies 1 3/4 miles 143° true (SE. by E. 3/8 E. mag.) from Round Hill. Other soundings on this ridge are 14 fathoms (25.6 m.) 1/2 mile southward, and 16 fathoms (29.3 m.) 5/8 mile northward, of the 10-fathom (18.3 m.) sounding, with no development.

Middle Reef, about 3/8 mile long and covered at about half tide, lies 3 5/8 miles 100° true (ENE. 7/8 E. mag.) from Round Hill; a rock bare at low water lies 1/2 mile eastward of Middle Reef. Broken ground which has not been developed extends 1 mile northeastward and 2 miles southward from Middle Reef; a rock, bare at a good low water and not located, was seen well southward of Middle Reef, possibly as much as 1 mile.

Deadman Bay, the northerly arm of Alitak Bay eastward of Moser Bay, is not surveyed. On its western side is a flat island about 40 feet (12.2 m.) high, and there are some islets and rocks between it and the western shore. The peninsula between Deadman Bay and Moser Bay is a high grassy ridge with a number of summits, and it slopes gradually southward.

High Rock is a steep-sided, flat islet, with grass on top and a split in the middle, which lies 200 yards off the southeast end of the peninsula between Deadman and Moser Bays. From southward it shows as a small bluff against the low shore northward. A kelp-marked reef, partly bare at low water, extends 3/8 mile southward from High Rock. Another reef, partly bare at low water, lies 3/8 mile eastward of High Rock.

Moser Bay, the large northwest arm of Alitak Bay, has depths of 10 to 14 fathoms (18.3 to 25.6 m.), soft bottom, and is a secure harbor. The entrance is nearly 1/2 mile wide between a sand spit on the north and a low rocky island on the south. It is obstructed by a rocky shoal which extends northward from the island, the northerly end of the shoal with depths of 3 to 4 fathoms (5.5 to 7.3 m.), lying 300 to 600 yards westward of the sand spit. There is less depth on the shoal for one-half the width of the entrance from the island, and little depth near the island. The deepest channel, over 5 fathoms (9.1 m.), lies 100 to 250 yards off the west side of the sand spit. From the sand spit eastward toward High Rock the 3-fathom (5.5 m.) curve is about 250 yards from shore. A kelp-marked reef also extends 1/4 mile eastward from the island on the south side at the entrance to Moser Bay.

The **tidal currents** are strong with swirls in the entrance of Moser Bay, and rips occur at times with a fresh wind opposing the current; but these rips do not compare in magnitude with the heavy ones which occur in Sitkinak Strait and off the mouth of Alitak Bay.

About one-half the distance from the entrance of Moser Bay to Point Fassett there is a shoal or reef which extends halfway across from the northeast shore of Moser Bay toward a spit on the southwest shore. The shoal has depths of 4 to 9 feet (1.2 to 2.7 m.) on it for a distance of ⅜ mile from shore, and a depth of 3 fathoms (5.5 m.) was found on its outer part.

A shoal bare at low water extends ¼ mile east-northeastward from a spit on the southwest shore opposite the preceding shoal.

Point Fassett, a low grassy head with lower land back of it, is the turning point on the northeast side of Moser Bay nearly 2 miles inside the entrance. A shoal makes off from the eastern shore between Point Fassett and the Narrows, the greatest distance being ¼ mile in the bight between them and extending with this width nearly to the Narrows.

Snug Harbor, the cove southwestward of Point Fassett, has a depth of about 12 fathoms (21.9 m.) in the entrance and shoals gradually westward. It is clear with the exception of a flat which extends nearly ¼ mile from its head. A valley between mountains extends through from Snug Harbor to the sea.

Chip Cove, on the west shore of Moser Bay 1½ miles northward of Point Fassett, has a depth of about 8 fathoms (14.6 m.) in its entrance. Shoals extend from the shores of the cove, and a flat extends about ⅜ mile from its head. Vessels can anchor off the entrance, favoring slightly the western shore of Moser Bay, and a small vessel and small craft can select anchorage near the middle of the cove.

The Narrows.—About 1 mile northward of Chip Cove is the south entrance to the Narrows which leads to Olga Bay. They are about 1 mile long and in the narrowest part about 300 feet wide. The channel is tortuous with many rocks, some bare at low water and others which are only apparent by the heavy swirls over them when the current is running. The small cannery steamers use the Narrows, but local knowledge is necessary and a large vessel should not attempt it. With the current running full the cannery steamers wait for slack water, which occurs 2 hours after high and low water at Snug Harbor. The current at its greatest velocity probably reaches 8 knots. It is said that 3½ fathoms (6.4 m.) can be carried through the channel at low water, but this statement should be received with caution.

Olga Bay is an irregularly shaped body of water, 17 to 18 miles long and ½ mile to 2 miles wide. The western end is the largest and is separated from the sea, about 6 miles northward of Low Cape, by a strip of low land only ¾ mile wide. The bay has the appearance of a lake, and the rise and fall of tide varies from 1 to 2 feet (0.3 to 0.6 m.) at the cannery, which is at the entrance of the stream on the north shore about 10 miles northwestward of the Narrows.

A cannery operated by the Alaska Packers Association is located in Olga Bay. During the fishing season the company maintains a

radio station, call letters KYL. There is also a small herring-packing plant in the bay.

DIRECTIONS, ALITAK BAY

Approaching through Sitkinak Strait, note the description of the strait preceding. Approaching from northwestward, courses are given in the description of the coast preceding.

From southwestward.—U. S. S. *Ranger* passed 8 miles off the northwest shore of Tugidak Island on a 43° true (N. by E. ¾ E. mag.) course, with soundings of 15 to 20 fathoms (27.4 to 37 m.) over an even bottom of sand and gravel. When the north end of the higher part of Tukidak bore 166° true (SE. ¾ S. mag.), distant 9 miles, 27 fathoms (49 m.) was found, broken shell bottom. The course was then changed to 76° true (NE. ¾ E. mag.), and the water suddenly deepened from 32 fathoms (58 m.) to 42 fathoms (77 m.) rocky bottom. This depth was carried with the same character of bottom until Cape Alitak bore 355° true (NNW. ½ W. mag.), distant 3¾ miles, when 29 fathoms (53 m.), gray sand and shell, was found. The water then shoaled quickly and the ship anchored in 9 fathoms (16.5 m.), with Cape Alitak bearing 318° true (NW. by W. ¾ W. mag.), distant 3 miles.

The shoal across the entrance to Alitak Bay is described in the paragraph following Cape Alitak, preceding. Passing 2 miles east-southeastward of the cape should lead across the shoal in a least depth of 6 to 7 fathoms (11 to 12.8 m.). The principal shoals, so far as known, in Alitak Bay are in long ridges trending with the bay and lie abreast the islands and rocks between Kempff Bay and Moser Bay, as described in the paragraphs following Round Hill, and including Middle Reef. The following courses lead in the best water, as determined by the survey:

With Cape Alitak bearing 315° true (WNW. mag.), distant 2 miles, steer 45° true (NNE. mag.) for 7 miles to a position with a reef covered at high water in range with Round Hill, bearing on the port beam, the reef distant 1¼ miles and the hill distant 2⅛ miles.

Then steer 15° true (N. ¾ W. mag.) for 3 miles, heading for High Rock, until 1 mile from it, and then steer 338° true (NW. mag.) and pass 200 to 300 yards southwestward of the sandspit on the north side of the entrance to Moser Bay.

When the sandspit is well abaft the beam, haul westward for the south side of Snug Harbor, which will lead southward of the shoal making off from the north shore, 1 mile westward of the entrance; a 320° true (NW. by W. ⅝ W. mag.) course, with the south point at the entrance to Moser Bay astern, will lead midway between the shoal and the end of the spit on the south shore. Above the shoal there are no dangers, but the west shore should be favored somewhat from Point Fassett to the entrance of Chip Cove.

CHIRIKOF ISLAND

(charts 8881, 9196), lies about 60 miles south-southwestward of the Trinity Islands. The southern part of the island has bold, high peaks and bluffs, from which it gradually slopes to the north end,

terminating in a low, green, undulating country. There is an islet near the southeast end. The island is easily recognized at night unless fog-covered.

Anchorage may be found in the bight at the southwest corner (Southwest Anchorage, chart 9196), at the mouth of the stream and opposite the houses; or in 10 fathoms (18.3 m.), on the west side off the bluff just south of the stream, possibly 2 miles from the northwest point. There is foul ground between Chirikof Island and the islets west of it. These islets are known as Nagai Rocks; the largest, Round Rock, appears like a haystack.

A shoal is reported to extend from the east side near the middle of the island; the *Albatross* reported breakers 3 miles 114° true (E. ¼ S. mag.) from the middle of the island. A breaker is reported in an estimated position 4 miles east-southeastward from the southeast point of the island. A shoal with kelp is reported to extend about 1 mile westward from the northwest point of the island.

In 1923 the U. S. S. *Cardinal* was wrecked on the east side of Chirikof Island and the survey ship *Discoverer* while engaged in rescue work struck a reef about 1½ miles offshore.

SEMIDI ISLANDS

(Chart 8881), consisting of two large and seven small islands, are 1,200 to 1,500 feet (366 to 457 m.) high with bold shores and may be safely approached as the soundings are deep. There are strong tidal currents among the islands, which form bad tide rips in the channels and off the points. The breaker shown southwestward of **Chowiet Island** is reported by some navigators to lie much closer in than charted.

Small sealing schooners formerly anchored in the coves at the southwest end, east side, and in both coves in the bight on the northwest side of Chowiet Island; on the south side of **Kateekuk Island,** and on the east side, near the north end, of **Aghiyuk Island.** Vessels of the Coast Guard have reported that the anchorages on the east side near the north end, and on the northwest side of Chowiet Island are available shelters in westerly and easterly gales, respectively.

Lighthouse Rocks, lying about 30 miles southwestward of Chowiet Island, consist of several detached, barren rocks, occupying an area about ¼ mile in diameter. The largest rock is 500 feet long and 90 feet (27.4 m.) high. They can be approached as close as ½ mile with safety. There is a large sea-lion rookery on the rocks.

A rock awash has been reported to lie 25 miles 154° true (SE. ⅛ E. mag.) from Lighthouse Rocks. There is considerable doubt about the existence of this rock and it is marked "Existence doubtful" on the chart. The locality has been partially gone over, but the rock was not found.

Currents.—Between Sitkinak and Chirikof Islands the general set of the current is reported to be about 249° true (SW. ⅛ W. mag.), 0.5 knot. There is a current between Chirikof Island and Lighthouse Rocks, with a southerly set, less than 0.5 knot. From Lighthouse Rocks to Kupreanof Point the current sets generally 260° true (SW. by W. ¼ W. mag.) and varies from 0.3 to 0.7 knot.

Vessels crossing the Gulf of Alaska westbound are often subjected to a strong northerly set and should verify their position by sounding when approaching the meridian of Chirikof Island. It was this northerly set in conjunction with thick weather that was responsible for the loss of the *Cardinal* in 1923.

ALASKA PENINSULA

General Remarks.—The south coast of the Alaska Peninsula, from Cape Douglas to Cape Pankof, has a length of about 425 miles. It is irregular and greatly broken by numerous indentations affording anchorages. Many of its points are rugged cliffs of great height which can not be approached too closely on account of reefs at the bases of them, while others are low with more or less shoal water off them.

The mountains on the peninsula are high, irregular and bold, and many of the peaks reach heights of 2,000 to 9,000 feet (610 to 2,743 m.).

Pavlof Volcano, the most prominent of several on the peninsula, is about 9,000 feet (2,743 m.) high, lies on the west side of Pavlof Bay, and has three peaks lying in a general north and south line, the middle one being the highest. These peaks are very symmetrical. Smoke is frequently seen issuing from the central one, and it has been in active eruption several times in recent years.

Frosty Peak, a noticeable snow-capped mountain near the southwest end of the peninsula, is 5,800 feet (1,768 m.) high; it is not very regular in outline and has several peaks, one of which, however, rises above the others.

Many lakes and sizable streams are found inland and there are several portages across the peninsula and between the adjacent bays.

Occasional settlements, canneries, and fishing stations are scattered along the coast and among the off-lying islands.

There are numerous off-lying islands and groups of islands with navigable passages between, and good harbors on their coasts.

The **weather** along the Alaska Peninsula is moist and cool throughout the year. Rain and snow falls are excessive and there are long periods of rainy, moist, and cloudy weather. Snow may fall at the water level until June and on the peaks until late in the summer. It extends far down the slopes at the close of September and may be expected at the water level early in October. Fog and mist may be expected at any time from spring until fall and often last for several days.

Fog.—Fog may be encountered at any time during the summer months, but it is more prevalent during the months of June, July, and August. There is much less fog on the north side of the Alaska Peninsula east of Unimak Pass. The southeast winds bring in the fog from the great fog banks that lie in the North Pacific.

Fog often hangs about the headlands and entrances to bays when the upper parts of the bays are clear.

Winds.—During the winter and early spring, the strong northwest winds predominate. During the summer months the winds are variable but are mostly southeast to southwest. With September the

northwest winds again become prevalent. The strong northwest winds are usually accompanied with clear weather.

The southeast and southwest gales of summer are usually accompanied with rain and thick weather.

Strong winds draw in and out of the various bays and inlets and a ship coasting will often experience a variety of weather in a short distance.

With the exception of an occasional fine summer, the weather of the Alaska Peninsula can be classed as bad, and the difficulties of navigation are many.

The **tidal currents** are weak, probably never exceeding 1½ knots. There is a continuous current westward along the mainland, which becomes stronger on the approach of a northeast storm, and is often the best warning of such a storm. Westerly winds weaken the current. The barometer indicates that some storms reach this coast from the south or southeast, while others are typical cyclonic storms approaching from the west.

Kelp.—The navigator can not rely on seeing kelp on rocks and shoals; many rocks and gravel banks bear no kelp, especially early or late in the summer. Many others have only a light growth of thin ribbon kelp which can not be seen until the vessel's stem enters it, and which is often drawn under by a current or sea.

Commerce.—There is only one small steamer which makes regular trips along this coast. Stops are made regularly at the post offices at Chignik, Unga, Sand Point, Belkofski, Kings Cove, and False Pass; stops are made at other places on payment of a bonus. Many other irregular vessels use the south Alaska Peninsula passage, however, in voyages between southeast Alaska and Bering Sea.

Local attraction has been reported in the vicinity of Arch Point, in the passage between Dolgoi and Goloi Islands, and off Kings Cove.

DIRECTIONS, CAPE IKTI TO CAPE KALEKTA

For a vessel bound westward along the south coast of the Alaska Peninsula there exists an **inside passage from Mitrofania Island to Cape Pankof,** 195 miles in length, measured along the usual steamer tracks. This passage is used entirely or in part by the majority of vessels navigating between these points. While it has been by no means completely surveyed, many soundings have been taken upon it and the points of departure have been accurately located. A careful navigator may safely follow it except with a vessel of the deepest draft, if he observes the directions given. However, a large vessel of good power would undoubtedly find it better to keep to the open sea; while a vessel of 2,000 tons or less would probably be favored more by the shelter of the islands and numerous harbors. The passage is exposed at several places to the open sea, but for the greater part of the way is effectively protected by islands and reefs.

The channels have no characteristic formation or direction; the depth is less than 100 fathoms (183 m.) at all points, and the bottom is extremely irregular and rocky in most places. At several critical points a good location may be obtained with a hand lead. Many of the points of departure are rugged cliffs of great height, which

can not, however, be approached too closely on account of reefs at the bases of them; while others are low sand points with more or less shoal water off them. The passage follows the mainland coast almost invariably, passing inside of almost all of the islands.

The islands are 1,200 to 2,000 feet (366 to 610 m.) high, while the mainland has peaks near the sea 2,000 to 8,000 feet (610 to 2,438 m.) high. The land has no timber whatever upon it, but in the months of July and August bears a heavy growth of grass. The snow line in these months is at about 2,500 feet (762 m.) elevation.

Cape Ikti to Kupreanof Point.—The following courses are recommended because lines of soundings have been run upon them, which would indicate that they are safe.

Pass 1.6 miles off Cape Ikti and steer 252° true (SW. ⅝ W. mag.) for 6.5 miles, with the north end of Mitrofania Island ahead. When the southeastern point of Mitrofania Peninsula is abeam, 1.5 miles distant, steer 285° true (W. ⅜ S. mag.) 7.3 miles, for the river mouth, which is near the foot of the hills northeastward of Long Beach. Run ¾ mile after the west ends of Little Brother Island and Mitrofania Island are in range, and when Long Beach is 0.9 miles distant steer 195° true (S. ½ E. mag.) for 3.1 miles and pass 0.9 mile off the next point, passing midway between Little Brother Island and the mainland, and heading about 1 mile to westward of Mitrofania Island. Then steer 242° true (SW. ¼ S. mag.) for 4.6 miles, heading for the south part of Chiachi Island, and passing 1 mile off Coal Cape.

With Coal Cape bearing 0° true (N. by W. ¾ W. mag.) 1 mile distant, steer 301° true (W. by N. mag.) for 3.6 miles, heading for Perry village. When the west tangent of Shapka Island is abeam, 1 mile distant, and closed on Chiachi Island, steer 236° true (SW. ¾ S. mag.) for 10.7 miles, passing midway between Three Star Point and Chiachi Island; on this course pass 0.2 mile off Paul Island, nearer to it than to Egg Island, and avoid the reef which extends from Egg Island; there is 7 fathoms (12.8 m.), gravel bottom, abreast of Egg Island on this course, and the tangent of Alexander Point is right ahead. When past Paul Island, with the west tangent of it abeam, steer 204° true (S. ½ W. mag.) for 16.2 miles, passing 0.7 mile eastward of Leader Island, 1.2 miles eastward of Fox Cape, and 1 mile off Kupreanof Point.

To enter Kupreanof Harbor, steer 90° true (ENE. ¼ E. mag.) through the middle of the westerly entrance, and when the northern point at the entrance is abeam 0.3 mile distant steer 45° true (NNE. ¼ E. mag.), with the peak of Paul Island ahead and Leader Island in range with the tangent of Jacob Island astern. When the east entrance between Paul and Jacob Islands is about to open, anchor in 10 fathoms (18.3 m.) with the two points of this eastern entrance in range. This is the best harbor in this part of the peninsula.

Kupreanof Point to Unga Strait.—From a position 1 mile south-southeastward of Kupreanof Point steer 267° true (WSW. mag.) for 15.4 miles to a position 1 mile north-northwestward of Karpa Island; then steer 248° true (SW. ⅜ W. mag.) for 18.2 miles to Swedania Point, bearing 0° true (N. by W. ¾ W. mag.), distant 3 miles. From here steer 270° true (WSW. ¼ W. mag.) for 6.7 miles, passing 0.9 mile off Gull Island, to Unga Strait, with the light on the

low sandy point on Unga Island abeam 0.9 mile distant. Soundings were made upon these courses, and they appear safe.

A rock (E. D.) has been charted northward of Karpa Island, and there is undoubtedly broken bottom northward of Korovin Island, although of greater depth than pinnacles are generally found in. Therefore most vessels steer 238° true (SW. ⅝ S. mag.) for 22 miles from Kupreanof Point abeam to the middle of Gorman Strait; then round Cape Devine, and with it bearing 333° true (NW. ⅛ W. mag.), 1.4 miles distant, steer 280° true (W. ⅞ S. mag.) for 6.5 miles to Korovin Strait; then with High Island abeam, 0.9 mile distant, steer 290° true (W. ⅛ N. mag.) for 8.2 miles to the above position off Swedania Point and follow the directions in the preceding paragraph.

A portion of this track has already been surveyed, and it is for that reason safer; but Gorman Strait is a poor mark in bad weather; there are dangerous rocks on both sides of it, and there are variable currents across the course from Kupreanof Point. Therefore some navigators might be led to choose the shorter and easier route, hence directions are given for it.

Gorman Strait to Unga.—From a position in the middle of Gorman Strait, a 220° true (S. by W. ⅞ W. mag.) course for 10 miles leads 1 mile east-southeastward of Popof Head. If bound to Sand Point, round Popof Head at a distance of 1 mile; then follow the directions for entering Popof Strait from eastward. If bound to Unga, steer 235° true (SW. ⅞ S. mag.) for 6.6 miles to a position off Delarof Harbor; then follow the directions for entering the harbor.

To pass through West Nagai Strait.—From a position with Kupreanof Point bearing 294° true (W. ⅜ N. mag.), distant 1 mile, steer 220° true (S. by W. ⅞ W. mag.) for 24 miles to a position 1 mile 130° true (ESE. ⅛ E. mag.) from the south point of the southeast island of the Haystacks. **If bound to Unga,** change to 251° true (SW. ⅝ W. mag.) for 16.4 miles to a position off Delarof Harbor; then follow directions for entering the harbor.

If bound to Sand Point.—From the position 1 mile 130° true (ESE. ⅛ E. mag.) from the southeast island of the Haystacks, steer 261° true (SW. by W. ½ W. mag.) for 11. 4 miles to a position 1 mile southward of Popof Head; then follow directions for entering Popof Strait from the eastward.

Unga Strait to Arch Point.—From the position in Unga Strait, 0.9 mile 0° true (N. by W. ¾ W. mag.) from the light on the low sandy point on Unga Island, steer 246° true (SW. ⅛ W. mag.) for 15.8 miles, with Swedania Point astern, to Jude Island abeam, distant 3.4 miles. Then steer 270° true (WSW. ¼ W. mag.) for 13 miles, passing 1.8 miles off the point east of Seal Cape, the same distance off Moses Rock, to a position with the west tangent of Cape Tolstoi abeam 3.6 miles distant. Then steer 241° true (SW. ¼ S. mag.) for 15.8 miles to pass 1½ miles off Ukolnoi Island, and 0.4 mile off and 1 mile beyond Arch Point, which is marked by a light and a beacon.

There is a 5¾-fathom (10.5 m.) shoal 0.8 mile off Arch Point; and about halfway between Arch Point and Dolgoi Island is a shoal with 11 feet (3.4 m.) and marked by a buoy. Arch Point has deep water close-to.

If desired, one may leave the same point of departure in Unga Strait and steer 253° true (SW. ¾ W. mag.) for 33.9 miles to the northwest point of Ukolnoi Island abeam, 0.8 mile distant; then steer 245° true (SW. ⅛ W. mag.) for 8.9 miles to pass the same distance off Arch Point. This course passes 0.9 mile off shore on approaching Seal Cape. At the point of departure in Unga Strait the depth is 24 fathoms (44 m.), increasing to 60 fathoms (110 m.) off Beaver Bay; a few miles farther the depth decreases to 10 fathoms (18.3 m.), and approaching Seal Cape it increases again to 15 fathoms (27.4 m.). From Cape Tolstoi southwestward, and off Ukolnoi Island, the depth is 50 to 60 fathoms (91 to 110 m.).

Arch Point to Stag Point (chart 8703).—From a position 1 mile southwestward from Arch Point steer 180° true (S. by E. ⅝ E. mag.) for 4 miles with the beacon on the sand spit at the northwest end of Goloi Island in range with the middle of Iliasik Strait, until the beacon on the sand spit at the easterly end of Moss Cape is a little abaft the beam, 0.6 mile distant. Then steer 207° true (S. ¾ W. mag.) for 0.9 mile, heading for the northwest point of Inner Iliasik Island, avoiding a kelp-marked shoal which extends about 0.4 mile from shore on the south side of the sand spit at the easterly end of Moss Cape, and passing 0.4 mile westward of the sand spit at the northwest end of Goloi Island. Rocks extend 400 yards off the southwest side of Goloi Island at a distance of ½ mile southeastward of the spit.

Then steer 168° true (SSE. ¾ E. mag.) for 4.4 miles with the beacon on the sand spit at the east end of Moss Cape astern and the highest point of the ridge across the north end of Outer Iliasik Island ahead, to a point opposite the middle of Iliasik Strait. Approaching Iliasik Strait, rocks lying 0.3 mile southwestward of the northwest part of Outer Iliasik appear to be in mid-channel, but as the course is continued the channel opens out north of them. Open out the channel well before passing through from either side. The best course is about south-southwest (mag.) through the middle of the strait, with the north point of the entrance to Dolgoi Harbor astern. The strait is 1.1 miles wide and has a clear width of nearly ½ mile. A partly bare reef extends 0.3 mile off the northwest side of the strait, and a shelving shoal extends 0.4 mile off the sand spit at the northwest end of Outer Iliasik Island.

This pass is marked by a light placed on the southern point of Inner Iliasik Island.

From Iliasik Strait steer 263° true (SW. by W. ¾ W. mag.) for 13.3 miles, passing ⅞ mile south of Bold Cape and ⅞ mile north and 0.3 mile beyond Stag Point, with the north tangent of Outer Iliasik astern. From Iliasik Strait to Stag Point there is from 10 to 50 fathoms (18.3 to 91 m.). The church at the village of Belkofski shows prominently on this course.

Stag Point to Cape Pankof.—Then steer 244° true (SW. mag.) for 5.1 miles to a point ½ mile off the northwest point of Fox Island and with a stern range on a large rock a few yards off Bold Cape. Then steer 227° true (SSW. ¾ W. mag.) for 13⅞ miles to Umga Island ⅞ mile abeam to the southward. This course passes about ½ mile northward of the black buoy off Thin Point. After passing Fox Island which is marked by a light on its northwest point, the

depths shoal to 8 and 9 fathoms (14.6 and 16.5 m.) smooth gravel bottom, abreast the buoy, then deepen gradually to 28 fathoms (44 m.) off Umga Island.

Then steer 226° true (SSW. ⅝ W. mag.) leading to a position 1¼ miles off Cape Pankof which is marked by a light placed on one of the rocks at the foot of the cape. On this course Pankof Breaker (which seldom breaks) should be left 2 miles on the starboard hand. In case of Cape Pankof being enveloped in fog, a good fix can often be obtained using Umga Island, Amagat Island, and Kenmore Head which shows as a vertical cliff and is unmistakable. This precaution is necessary, due to the danger of Pankof Breaker.

Cape Pankof through Unimak Pass to Cape Kalekta.—From a position 1½ miles 136° true (SE. by E. ½ E. mag.) of Cape Pankof Light make good at 253° true (SW. ⅞ W. mag.) course. The southernmost pinnacle rock at Cape Lazaref should be left about 3¼ miles on the starboard hand, and the coast of the southern end of Unimak Island should be given a berth of about 2 miles. This course made good for 58 miles should lead to a position with Seal Cape on the starboard beam distant 2½ miles.

When crossing Unimak Pass the tidal current with a maximum velocity at strength of about 4 knots will be on the bow or quarter, and allowance must be made for it to make the course good (see p. 227).

From a position 2½ miles southeastward of Seal Cape make good a 268° true (WSW. ¼ mag.) course for 36 miles, which should lead to a position 2 miles north-northwestward from Akun Head. The course should lead 2 miles northward of the eastern headland at the north end of Akun Island when 5 miles from Akun Head.

From a position 2 miles north-northwestward from Akun Head make good a 249° true (SW. ⅝ W. mag.) course for 14 miles to a position with the western head at the north end of Akutan Island bearing 141° true (SE. by E. mag.) distant 2 miles.

From this position make good a 224° true (SSW. ⅜ W. mag.) course for 18½ miles, which should lead to a position about 1 mile northwestward of Cape Kalekta. In crossing from Akutan Island to Cape Kalekta care should be taken not to be set off the course by the tidal currents setting to or from Akutan and Unalga Passes.

SHAW ISLAND TO TAKLI ISLAND

Shaw Island lies 10 miles northwestward from Cape Douglas and 1¾ miles from shore. It is ⅝ mile long, about 50 feet (15.2 m.) high, flat and grass covered. A depth of 12 fathoms (21.9 m.) was found midway between it and the shore. Ledges extend northwestward from the island to a greatest distance of ¾ mile from its northern end.

The two bluff points 1¾ miles southward and 5 miles southeastward of Shaw Island are the ends of two sharp, rocky ridges extending from the high land of Mount Douglas. Anchorage can be had in the bight between the points in 13 to 15 fathoms (23.8 to 27.4 m.), sandy bottom, with shelter from southerly and westerly winds, but the williwaws are bad during westerly gales. At the head of the bight is a short valley with a glacier. Just clear of the bluff point at

the southeast end of the bight is a pinnacle rock about as high as the bluff. The bight southeastward of this last point appears shoal.

Sukoi Bay, on the north side of Cape Douglas, is shoal and can be used only by small craft with local knowledge. There are rocks bare at low water in the middle of the entrance, and a ledge bare at low water between the rocks and the south shore.

Cape Douglas is a grassy peninsula about 3 miles long and 190 feet (58 m.) high. At its western end it breaks off in a bluff to a low, narrow neck which connects it to the mainland. Rocks bare at low water extend about ½ mile eastward from the cape.

The bight south of the neck back of Cape Douglas is an anchorage sheltered from northerly and westerly winds. There is some shelter from northeasterly winds, but if heavy, some swell rolls around the point. A stream enters the northeast end of the bight at the foot of the bluff, and this part of the bight is dry at low water nearly out to the southwest end of Cape Douglas. The anchorage is in the middle of the bight, with the two points on the south side of Cape Douglas in range, bearing 114° true (E. mag.), in 6 fathoms (11 m.), sandy bottom.

Douglas Reef, lying 5½ miles 187° true (S. by E. ½ E. mag.) from Cape Douglas, is about 2 miles long north and south. The reef is partly bare at low water, and near its middle is a rock 28 feet (8.5 m.) high. A sounding of 6¾ fathoms (12.3 m.) with 40 to 60 fathoms (73 to 110 m.) close-to was found 1 mile 81° true (NE. by E. mag.) from the rock, and vessels should not approach it closer.

Two rocks, close together and awash at high water, lie 2¾ miles southwestward of Douglas Reef and 1½ miles from shore. A reef bare at low water extends about ¾ mile southeastward from them.

About 10 miles southward of Cape Douglas is a point marked by a hill 673 feet (205 m.) high. There is a small glacier in the valley south of the point. Lying 1¼ miles from the point and 168° true (SE. ¾ S. mag.) from the hill there is a rock awash at about half tide. There is no kelp on the rock, and the sea seldom breaks on it when it is covered.

Two kelp patches lie about 1½ miles southward of the preceding rock and the same distance from shore. The kelp shows well at low water only, and the sea seldom breaks on the rocks. The eastern patch lies 193° true (S. by E. mag.) from the hill mentioned in the preceding paragraph.

Kiukpalik Island lies 17½ miles southward of Cape Douglas and 2 miles from shore. It is 1¼ miles long, 155 feet (47 m.) high, nearly level and grass covered. A shoal scantily marked by kelp lies about ½ mile 339° true (NW. mag.) from the north end of the island, and there is no safe channel between them. A temporary anchorage with shelter from easterly winds may be had in the bight on the west side near the south end of the island, in 8 or 9 fathoms (14.6 or 16.5 m.), muddy bottom. The shore of the mainland inside the island should be avoided, as there is a possibility of shoals on that side.

Shakun Rock, a prominent, dark pinnacle 50 feet (15.2 m.) high, lies 5 miles 232° true (SSW. ½ W. mag.) from Kiukpalik Island. From the rock a semicircular reef, partly bare at low water, extends southward and westward to the south end of a chain of grass-covered

islets. There is foul ground between Shakun Rock and the islets, and the latter are apparently connected with the shore northwestward by a reef.

Swikshak Bay is a lagoon which is practically closed at all stages of the tide. The entrance lies at the west end and is about 200 feet wide.

Kaguyak is a village behind a large, bare rock which is connected to the beach at low water. Approaching from southeastward, a vessel of the Coast Guard Service anchored in about 7 fathoms (12.8 m.), hard sand bottom, with Cape Chiniak bearing 205° true (S. ⅛ W. mag.), Shakun Rock 86° true (NE. by E. ½ E. mag.), and the settlement rock 346° true (NW. ⅝ N. mag.). Between Cape Chiniak and Shakun Rock the bottom was found to be uneven, depths 10 to 20 fathoms (18.3 to 37 m.), mud and hard sand at intervals.

Cape Chiniak, the north point of Hallo Bay, lies 7½ miles northward of Cape Nukshak. There is a high hill near its end.

Hallo Bay has not been examined except near Cape Nukshak.

Ninagiak Island, in Hallo Bay, has a knob with an estimated height of 200 feet (61 m.). A rock bare at low water lies approximately ¾ mile eastward of the island.

A reef, about 1¼ miles long east and west, lies in Hallo Bay approximately 1½ miles southeastward of Ninagiak Island and 1¾ miles northward of Cape Nukshak. The reef is bare in places at low water, is covered at high water, and has no kelp.

Cape Nukshak terminates in an island ½ mile long and 134 feet (41 m.) high, with two knolls. The cape is flat and grass covered to the foot of a sharp, prominent peak, but there is a break through the flat part of the cape forming a second island at high water.

Anchorage, sheltered from southerly and westerly winds, may be had about 400 yards off the north side of Cape Nukshak, with the foot of the eastern slope of the peak on the cape bearing 203° true (S. mag.), in 22 fathoms (40 m.), muddy bottom.

From Cape Nukshak to the entrance of Kukak Bay the coast is irregular cliffs, with detached rocks showing some distance off. A reef, partly bare at low water and marked by kelp, extends nearly 1 mile from shore 1½ miles southward of Cape Nukshak.

Kukak Bay is not surveyed, but a fair general idea of it is shown on chart 8851 taken from Russian charts. It is clear in mid-channel and easily entered. There is a stream in the valley on the west side about halfway up the bay, and a flat makes out possibly 300 yards from its mouth. From the valley at the southwest end of the head of the bay a flat makes out to an estimated distance of ½ mile, with deep water close-to. The bay has great depth, there are numerous pinnacle rocks near the steep shores, and the anchorage area is limited.

On the east side of the bay are two islands, Aguligik in its northern part and Aguchik in its southern part. The best anchorage in the bay is apparently in the bight south of Aguchik Island, where the depth is 30 fathoms (55 m.) in the middle, shoaling gradually northeastward toward its head. No dangers were noted in the bight, but it was observed at high water only.

The southern point at the narrow entrance to Kukak Bay is marked by a fixed white light. The master of a vessel which entered this bay in 1924, reports that mid-channel courses were used and that they appeared clear, but that the shores and especially the northern shore appear foul.

There is a wharf situated in a small cove. It is a difficult place from which to get away with easterly winds.

Cape Ugyak lies 8 miles southward of Cape Nukshak and 4 miles northward of Cape Gull. It is the east end of the mountainous peninsula south and east of Kukak Bay. There are some bare rocks close to the cape, and a breaker was seen at low water about in the position of the sunken rocks on the chart, 1¾ miles northwestward of the cape.

Kaflia Bay, between Capes Ugyak and Gull, has a narrow entrance, reported to be bare at low water. In the narrow entrance is an islet. The channel is south of the islet, apparently on either side of a rock bare at low water. The bay has two small basins, with 20 to 35 fathoms (37 to 64 m.) in the middle of each, joined by a very narrow channel. It is used by the small boats of the canneries.

Cape Gull is a bold headland, terminating in a cliff 503 feet (153 m.) high. Temporary anchorage can be had in the middle of the entrance to the cove on the south side of the cape, in 9 fathoms (16.5 m.), sandy bottom. The south point of the cove is marked by a rocky islet about 15 feet (4.6 m.) high.

Cape Kuliak rises gradually from a crumbling bluff at the end to high mountains inland.

Between Capes Kuliak and Atushagvik is an open bay nearly 4 miles long, which has not been sounded. A bare rock lies 300 yards off a prominent point on the north shore. A rock bare at low water lies 600 yards southeastward from the point, and another lies ½ mile westward from the point and ¼ mile from the northern shore.

Cape Atushagvik lies 4¼ miles 225° true (SSW. mag.) from Cape Kuliak. It has a low bluff at the water, and rises in a gentle slope to a prominent knoll, 900 feet (274 m.) high, with a decided saddle between it and the higher land farther back. There is a kelp patch nearly ⅜ mile southeastward from the southern end of the cape.

Between Capes Atushagvik and Ilktugitak there are two bays, the southwestern one of which is Amalik Bay. The northeastern bay is 8 miles or more long, 344° true (NW. ½ N. mag.), and nearly 3 miles wide at the entrance. It is clear of islands, except those off Amalik Bay on the southwest side of the entrance. On the northeast side of the bay, 1½ miles inside Cape Atushagvik, is a low peninsula ⅝ mile long, with a bluff 150 feet (46 m.) high near its end. **Russian Harbor,** the cove on the northwest side of the peninsula, is a good anchorage, 300 to 500 yards from shore, in 10 to 18 fathoms (18.3 to 33 m.), muddy bottom. Fresh water may be obtained by boat. The entrance of the bay to the anchorage has been sounded, and the only directions necessary are to give Cape Atushagvik and the islands on the southwest side of the entrance a berth of about 1 mile.

Amalik Bay lies on the north side of Cape Ilktugitak, and is separated from the bay northeastward by a high peninsula. No

sounding has been done, but there is secure anchorage at its head. Takli Island lies in its mouth. About 5/8 mile northwestward of Takli Island there is an inner chain of islands which extends 1½ miles southwestward from the high peninsula. On the north and west sides of this chain of islands is a basin 3/8 to ½ mile wide. The anchorage is at the north end of the basin. An inlet not surveyed makes inland from the western side of the basin.

The entrance to Amalik Bay on the southwest side of Takli Island is 5/8 mile wide and apparently clear. Thence the channel follows the western shore, and then northward through the basin along the western side of the inner chain of islands.

From the bay northeastward there is a channel along the shore of the high peninsula, passing northward of all the outlying islands, and then between Takli Island and the inner chain of islands.

Takli Island is nearly 2 miles long, its eastern part being low, broken, and rocky. At its extreme western end is a hill 455 feet (139 m.) high, from which there is a sheer cliff to the water. A chain of rocky islands extends 1½ miles eastward from Takli Island. Reefs extend about ½ mile eastward and southward from these islands, and the passage between them and the group of islands 1 mile northward has dangers and should be avoided.

TAKLI ISLAND TO CAPE IKTI

The coast from Amalik Harbor to Chignik Bay is unsurveyed with the exception of Jute, Portage, and Wide Bays. The following notes on the unsurveyed portion are from the most reliable sources available, but should be used with caution.

The bay east of Katmai Bay is foul.

Katmai Bay is an exposed and rocky roadstead which can only be used in northerly and northwesterly weather. The north part is foul, as represented on the chart. A shoal, showing kelp, on which a depth of 6 fathoms (11 m.) was obtained, is reported to lie about 3 miles off the coast and 9 miles eastward of Katmai.

Katmai River, previous to the eruption of Katmai Volcano in 1912, could be navigated by launches at high tide as far as the village. The bar at the entrance is bad and has heavy rips, except at slack water; high-water slack is the time to enter. The inhabitants of the village and of the neighboring villages were moved from their ash-covered homes to Perryville, on the peninsula north of Chiachi Island. From last reports, the river was choked with pumice which washes down from the higher slopes faster than the stream can dispose of it. Steam and smoke from Katmai Volcano generally hang over the vicinity, obscuring the higher ground in a murky haze.

The area in the vicinity of Katmai Volcano is now set aside as the **Katmai National Monument.** Part of this area is known as the **Valley of Ten Thousand Smokes.**

The upper part of **Kashvik Bay** is foul; there is no shelter in the outer part.

The southern and open part of **Alinchak Bay** is foul to the head. Although there are many reefs and probably pinnacles around the entrance to the north arm, this arm is reported to offer good anchorage and protection, after it has been entered; but it should not be attempted without local knowledge.

Cold Bay.—This bay is not surveyed and there is little reliable information concerning it. Anchorage with limited shelter is reported in the north end of the bay in 14 to 5 fathoms (25.6 to 9.1 m.). There is an abandoned village just west of Cape Aklek.

The following courses were run by the *Surveyor* in 1919:

With Cape Karluk 1 mile distant, steer 275° true (WSW. ½ W. mag.) to a position with the northern tangent of Cape Aklek bearing 336° true (NW. ¼ W. mag.), distant 4 miles. This course leads 2 miles southward of the outer end of the reef making southward from the northern entrance. Change to 0° true (NNW. mag.) and continue until the north side of Cape Aklek is a little abaft the beam, then haul to the westward and take up anchorage as desired. There is no information available for reaching the northern anchorage.

There is a breaker off **Cape Aklek** and for that reason it should not be approached too closely.

Reefs and rocky islets extend 3½ miles southward from the north point at the entrance of Cold Bay. There are bad tide rips off this reef, which is frequently the case along the west side of Shelikof Strait. The shore northward of Cold Bay is generally foul. The bay is open southward and offers poor protection from the frequent heavy seas from that direction.

Small boats, in southeasterly weather, anchor off a small sand beach in a shallow bight just inside the north entrance point, and are partly sheltered by the reef.

Jute Bay.—The bay between **Cape Unalishagvak** and **Cape Kanatak** is known as Jute Bay, and that portion of the bay inside Jute Islands is called **Island Bay.** Reefs marked by kelp and breakers extend to the southeast from Jute Islands and tend to break the swells during easterly winds. A reef extends from the eastern entrance point of Island Bay (the point northeast of Jute Islands) about halfway to Jute Islands. The channel into Island Bay between the end of this reef and Jute Islands has depths ranging from 11 to 5 fathoms (20.1 to 9.1 m.). The channel west of Jute Islands has depths of from 3⅓ to 5 fathoms (6.1 to 9.1 m.), but its south end is obstructed by the rocks and reefs extending southwestward from Jute Islands, and its use is not recommended except by boats with local knowledge. Indifferent anchorage, sheltered except from southeast winds, may be obtained northward of Jute Islands in Island Bay.

Small boats can go behind the kelp-marked reef and anchor in 2 or 3 fathoms (3.7 or 5.5 m.), but the holding ground is poor.

Like all of the bays in this vicinity, the williwaws are violent with westerly winds and are very disagreeable if not dangerous to small craft.

Directions.—Head into the entrance on a 321° true (NW. by W. ½ W. mag.) course, passing ¼ mile off the east end of the larger Jute Island. Anchor in 3¾ fathoms (6.8 m.), hard bottom, with about half of the small Jute Island showing beyond the east end of the large island, and the south tangent of the eastern entrance point bearing 100° true (E. by N. mag.).

Portage Bay (chart 8666) is a large open bay lying between Cape Kanatak and Cape Igvak. The bay is clear except for a reef and

a detached rock which makes out from the east side of the bay, 1 mile from its head. Portage Bay is open to southeasterly winds and is subject to northwest winds, which draw down from the mountains with great force.

Kanatak is a town and post office situated at the head of the bay. It is the headquarters of an oil development, and considerable freight has been landed by means of lighters. A road has been constructed to the oil fields, where drilling has been in progress.

The monthly mail steamer from Seward makes regular calls, and freight vessels call when business is offered. A limited amount of supplies may be obtained.

Dangers.—A kelp-covered reef extends ½ mile southwestward from Kelp Point. Just off the reef and separated from it by a narrow channel is a rock with 9 feet (2.7 m.) over it and marked by a red buoy on its western side, leaving a clear channel ¼ mile wide for entering the inner part of the bay.

Anchorage.—The best anchorage is in 10 to 12 fathoms (18.3 to 21.9 m.) just southeastward of the buoy. Coasting vessels often go to the inner anchorage northwestward of the buoy. The anchorage is subjected to violent williwaws with westerly weather, and at such times the inner anchorage should not be used. The wind is apt to shift from northwest to southeast with but little warning. In such cases, launches run to Kanatak Lagoon for shelter.

Vessels with passengers or freight usually anchor as far in as their draft permits. With northwesterly winds there is but little swell.

Kanatak Lagoon on the west side of the bay about 5 miles from Kanatak has a narrow entrance carrying less than 6 feet (1.8 m.) at low water, but there are depths of 6 to 12 fathoms (11 to 21.9 m.) mud bottom inside. It affords excellent anchorage in easterly weather, but is a regular maelstrom with northwest winds. Under such conditions the williwaws blow with almost hurricane force, and the water level at the eastern end is higher than that at the western end.

Directions.—In approaching from Shelikof Strait, careful track of the reckoning should be kept as the various headlands are similar and the bay is difficult to recognize from a distance. Enter on a mid-channel course and if bound to the inner anchorage pass 100 yards southwest of the red buoy marking the 9-foot (2.7 m.) rock then head for the town and take up anchorage as desired.

If anchoring outside, head for the buoy on course 338° true (NW. mag.) and anchor about ½ mile from the buoy.

Cape Igvak, a conspicuous headland separating Portage and Wide Bays, is the southern extremity of a ridge of mountains rising to heights of 2,000 to 2,600 feet (610 to 792 m.), and covered with clouds most of the time.

Wide Bay (chart 8666) is a commodious bay formed by a series of islands extending in a direction parallel to the coast. It is the only protected harbor along this section of the coast and affords secure anchorage in any weather. In 1925 there were no settlements in the bay, but a large number of oil claims had been staked. There are no known dangers southward of **Coal Point** except for the reefs extending off the various islands, and these do not extend far enough to be menaces. The northern part of the bay beyond Coal Point is foul.

The channel between Coal Point and the island to the southeastward is about 300 yards wide with a least found depth of 3 fathoms (5.5 m.), hard sand and rock bottom.

The **Lagoon** at the northern end of Wide Bay has an entrance which is very foul, and should not be used except at high water, and then by small launches only. With the exception of a small area where there is 7 fathoms (12.8 m.), the depths are shoal and the bottom is muddy.

Entrance.—Recent surveys indicate several clear channels leading into Wide Bay, but the only one recommended is that between Channel Rock and East Channel Island. The northern entrance is foul and should not be attempted.

Channel Rock, about 40 feet (12.2 m.) high, lies between the second and third island from Cape Igvak and is unmistakable. There are several rocks and reef extending seaward from Channel Rock, the outer one being about 1¼ miles distant. These reefs are marked by kelp and usually show breakers.

East Channel Island, low and flat, is the second large island from the north.

Local attraction.—Some local magnetic attraction has been observed in the vicinity of the entrance. For that reason navigators should depend on ranges more than on the compass.

Anchorage.—Inside the bay anchorage may be had at convenience, with excellent holding ground in any depth from 5 to 20 fathoms (9.1 to 37 m.). The williwaws are disagreeable with westerly winds, but are not dangerous to moderate-sized vessels. Small craft can anchor in the lee of the various islands. The best anchorage in easterly weather is close under **Titcliff Island.**

Weather.—Weather conditions are bad. Winds, fog, and rain are the rule. May, June, and July are supposedly the best months, but even during those months the conditions are only fair.

Directions.—From sea, a course of 290° true (W. ¼ S. mag.) to a mid-channel position between Channel Rock and East Channel Island clears all the reefs. Due to local attraction, it is preferable to steer 290° true (W¼ S. mag.) for the southern end of East Channel Island, picking up a range with a point on the mainland shore and holding this range until within about ¼ mile of the island. Then round the island at a distance of ¼ mile. When about midway between Channel Rock and East Channel Island, a 270° true (WSW. mag.) course will clear the reef on the west side of East Channel Island. Channel Rock should not be approached closer than 350 yards.

Kilokak Rocks, now shown about 15 miles south of Wide Bay and 2.5 miles off the shore line, are much farther seaward than shown on chart No. 8502. The position of the highest and most prominent of these rocks, which are not more than 100 yards apart, is latitude 57° 09.5′ and longitude 156° 17.0′. They should not be approached closer than 1 mile, as no examination has been made in their vicinity.

The coast from **Cape Kayakliut** at the south end of Wide Bay to Cape Kumlik, is unsurveyed and there is no detailed information concerning it.

Agripina Bay has been used to some extent by small local craft, and is reported to afford good shelter from all winds. A group of islands lies inside the bay, and a passage is indicated on both sides of them. Anchorages for small craft are indicated at the west end of the largest island, on the south side of the smaller island above it, and in the cove on the north side at the head of the bay. There is a glacier on the north side of the bay.

Port Wrangle.—A sketch of Port Wrangle is shown on chart 8851. There is an anchorage in 15 fathoms (27.4 m.) in the outer bay off the outer cascade. The entrance to the inner bay is wider than shown on the chart, and about 13 fathoms (23.8 m.) deep in the middle. There is considerable driftwood on the spit at the entrance to the inner bay.

Cape Kumlik, at the northern entrance to Kujulik Bay, is foul with reefs extending 2 miles southward of it. There are also detached rocks and reefs east of the cape, toward Sutwik Island. These rocks are seldom covered with kelp, and the area should be avoided.

Kumlik Island has an elevation of about 1,000 feet (305 m.) and is symmetrical with the highest point near the center of the island. The shores are steep and rocky with ledges and reefs making out. The island should not be approached closer than ½ mile. The channel between Kumlik Island and the mainland is apparently clear and is constantly used by the cannery tenders when running between **Aniakchak Bay** and Chignik.

Sutwik Island, 13 miles long and 4 miles wide, lies about 8 miles eastward of Cape Kumlik. The southern side of the island, low and marshy in places, is very foul for a distance of 1 mile from the beach. The north side is also foul with steep shores. This shore should be given a berth of at least 2 miles in passing.

Anchorage protected from south to southwest winds may be had in the small bay on the north side in 14 fathoms (25.6 m.) hard bottom, with the sharp rock on the point to the northwest in range with Kumlik Island. **To enter,** steer 210° true (S. ¾ W. mag.) for the middle of the bay.

Foggy Cape, the eastern end of Sutwik Island, is a prominent and important landmark for vessels passing along the coast. It rises to a height of 418 feet (127 m.), and is first raised as a detached island due to a low neck of land which separates it from the rest of the island. No sounding has been done around the cape, but tide rips have been observed, and mariners are advised to give it a wide berth. Foggy Cape and the south side of Sutwik Island are often covered with fog when the north side is clear. Blankets of fog have been observed when the entire outline of the island was indicated without any part of it being actually visible.

Rock.—A vessel drawing 10 feet (3 m.) has reported striking a rock about 3 miles 180° true (SSE. mag.) from Foggy Cape. The area has not been sounded, but tide rips were observed in this locality and it should be regarded as dangerous.

Cape Kumliun is a broad bold headland rising to a height of 1,671 feet (509 m.) in a peak near the southeastern part of the cape. This peak is the most conspicuous object in the vicinity, but it is often covered by clouds. The cape is foul with reefs and rocks extending a mile offshore at its eastern point. Some of these dangers do not

break even at low water and may not be marked by kelp. Vessels should keep well toward mid-channel in rounding the cape.

Unavikshak Island rises to a height of 465 feet (142 m.) near its northern side. The island is used as a fox ranch, and the home of the keeper is at its northwest point. There are numerous rocks and reefs along the shores, and they should be approached with caution. There is a group of 2 rocks about 1½ miles southward of the southern point of Unavikshak Island. The western one of these rocks is conspicuously flat-topped. There is a good channel between the rocks and the island, provided a mid-channel course is followed. Off the northeast point of Unavikshak Island there is a detached island 153 feet (47 m.) high.

An **anchorage** may be had on the northwest side of Unavikshak Island, ½ mile off the shack and boat skids at the head of a small bight, in 15 fathoms (27.4 m.), hard rocky bottom.

Kujulik Bay (known locally at **Sitkum Bay**) is a large open bay which affords good shelter in northwest winds. Reefs and rocks fringe the shores of the bay and the entrance is flanked by reefs on each side. The western arm of the bay is shoal for a distance of 7 miles from the head. The best protection is in the northern part of the bay.

To enter.—From a position 1½ miles off the detached island off the northeast point of Unavikshak Island, steer 316° true (NW. by W. ¾ W. mag.) to a position with the 35-foot (10.7 m.) rock 1½ miles northward of Cape Kumliun on the port beam, distant 1½ miles. Then steer 7° true (N. by W. ¼ W. mag.) to a position midway between the point on the west, and the rocky islet on the east, taking care to avoid a reef ¼ mile west of the islet and take up anchorage as desired.

Anchorage may also be had in the western part of the bay about 1 mile eastward of the 36-foot (11 m.) pinnacle rock near the north shore of the bay. To reach this anchorage, follow mid-channel courses taking care to avoid the rock awash which lies about 1¼ miles from the north shore. Anchor in 8 fathoms (14.6 m.).

CHIGNIK BAY

(chart 8710), in its southern part is deep and clear and the bottom is irregular. It is a large bay, and has important salmon fisheries. It may be entered either to the northward or southward of Nakchamik Island.

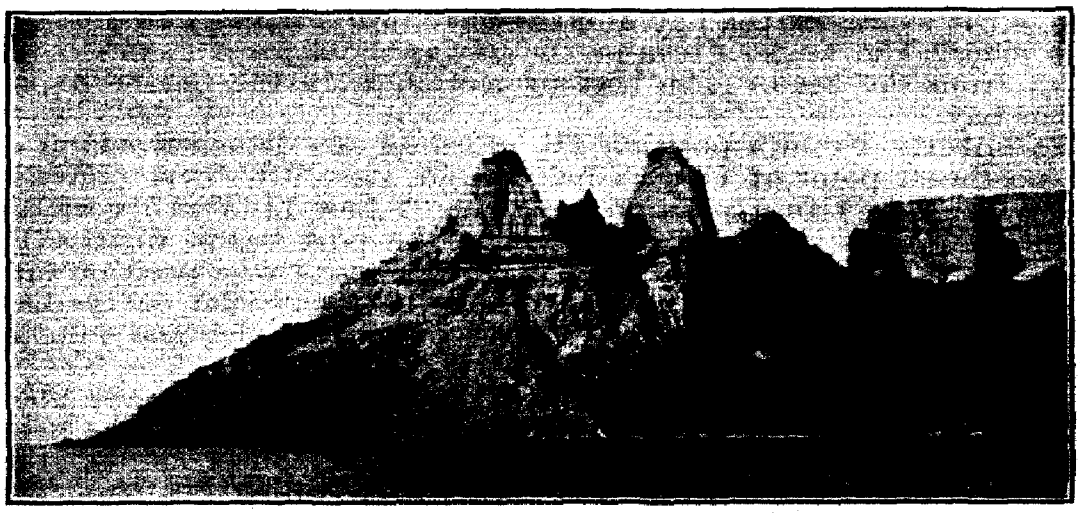
Nakchamik Island is a large circular island lying in mid-entrance to Chignik Bay. The conical peak east of the center of the island is a distinct landmark and prominent from all directions except an arc of about 90°, the middle of which is south, where the higher mountains obscure it.

The bight on the east side may be used as an anchorage. Enter the middle of the bight and anchor in 12 fathoms (12.9 m.), sand bottom. There is a fox ranch on the island, and the keeper lives on this bight. The extreme north end of the island is steep-to, and no anchorage is afforded. The western point of the island is fringed with reefs extending about 300 yards offshore. There are no off-lying dangers.

Kak Island, lying 1¼ miles southward of Nakchamik Island, is bold, high, and generally reddish or grayish in color, with grassy patches on the less steep slopes. The southern bluffs are of marked columnar structure. The island has deep water on all sides, and can be approached close to.

Atkulik Island is about 1 mile long and ¾ mile wide, with precipitous shores on its south side. There are no anchorages. There are two detached rocks, one at the northeast end about 25 feet (4.6 m.) high, and one at the southeast end about 80 feet (24.4 m.) high. Both these rocks are conspicuous when showing on the tangent to the island. There is a small rock awash on the west side, but it is off the track of vessels entering Chignik Bay.

Castle Cape, formerly called **Tuliumnit Point,** is on the south side of the entrance to Chignik Bay. The cape is narrow and the stratification is a conspicuous feature. The strata are of many shades of light-colored rocks varied by bands of black. The summit has been worn into many curious pinnacles and buttresses, which suggest its name.



Castle Cape from northward

Castle Bay.—The bay was surveyed during 1924. It is deep, with mud or clay bottom, and presents no outlying known dangers, excepting a reef near the head of the northwestern arm. In going to an anchorage at the head of this arm favor the northern shore passing this reef. A shoal with 4½ to 16 fathoms (8.2 to 29.3 m.) of water over it makes off the southern shore of the bay south of the forks. Small boats can anchor along the south shore about 4 miles westward of Castle Cape.

In Castle Bay the south shore has a gradual slope from the sea, and rises to an elevation of about 1,500 feet (457 m.). It has a sand and gravel beach except at Castle Cape which is very precipitous and pronounced, rising to needle peaks, two of which are very conspicuous, reaching an elevation of 1,200 feet (366 m.), and the other, between these two, being about 900 feet (274 m.) high. The remaining shore line is very rugged and precipitous and rises straight

up out of the water. The only vegetation in sight is grass and some scattering alders.

Anchorage Bay, chart 8822, lies west of the fourth ridge. This ridge terminates in vertical bluffs about 200 feet (61 m.) high, and rises to a rounded hill which is covered with grass and alders to a height of about 1,000 feet (305 m.). The ridge west of Anchorage Bay is irregular in form, with bluffs at the water. Off the western point at the entrance is **Eagle Rock,** a large, grass-covered rock 82 feet (25.0 m.) high, connected with the shore at low water, and having a lower rock 100 yards outside it. A reef extends about 200 yards farther out. Westward of the rock the shore is foul for some distance and should not be approached too closely. At the entrance a shingle spit projects from the eastern shore in a southwesterly direction. The bay is easily recognized by the bluff headland forming the west entrance point with the rock off it, and by the bluffs on the east side, and when nearly abreast of it the smokestacks of the cannery show over the shingle spit which is marked by a flashing white light. In entering give the outer shore of the shingle spit on the east side a fair berth and do not approach the spit too closely.

In thick weather care should be taken to avoid entering Mud Bay by mistake. By following the south shore of Chignik Bay, which is fairly clear, little difficulty should be experienced under such conditions.

Anchorage may be had at convenience in the bay, but dragging of anchors may be expected in most any location during the heavy winds and williwaws that are prevalent here. If the anchor remains down long, some difficulty may be experienced in recovering it. Care should be used in anchoring at high tide, for the flats make out for a distance, and drop off sharply. There is a good anchorage for small craft on the east side of the bay near the sand spit, with soft mud bottom.

Chignik is on the east side near the head of Anchorage Bay. There is a post office, and the monthly mail steamer from Seward makes regular calls. The Northwestern Fisheries Co. and the Columbia River Packers Association canneries both have wharves. The native village of Chignik is on the west side of the bay and has no wharf. The post office is at the cannery of the Northwestern Fisheries. Both companies maintain radio stations during the summer season.

Mud Bay is shallow and of no commercial importance. The bay is filled with eel grass which interferes with the operation of launches. The only anchorage is in the entrance.

Chignik Lagoon is a large body of water at the southwestern part of Chignik Bay. The entrance to the lagoon is marked by the **Nigger Head,** a high, round-topped, vertical bluff. From the Nigger Head the channel closely follows the shore and there is a least depth of 15 feet (4.6 m.) on the bar ½ mile westward of the Nigger Head. From here the channel deepens and a depth of 21 feet (6.4 m.) can be carried into the lagoon, and to the Alaska Packers Cannery 2 miles above the sand spit forming the lagoon proper.

The best anchorage is off the cannery wharf where the cannery company establishes mooring dolphins for the use of small boats. Beyond the wharf, which is dry at low water, the lagoon shoals and

only launches use the channels to the head. Chignik Lagoon has an important run of red salmon. Vessels of 14 feet (4.3 m.) draft enter the lagoon at all stages of the tide.

There is a frequently used portage from Chignik Lagoon to the head of Kuinkta Bay.

Reef.—A reef with 27 feet (8.2 m.) of water over it lies 3 miles 40° true (NNE. ½ E. mag.) from the Nigger Head. This is the only outlying danger in Chignik Bay found during the survey of 1924. The reef breaks in heavy weather.

Anguvik Island is bordered by a reef extending about 1 mile to the eastward and ¼ mile to the west, which breaks at all stages of the tide. The island is flat-topped, 50 feet (15.2 m.) high, and covered with soil and high grass. The sides are precipitous.

Northeast of this island the coast is foul for a distance of ¾ mile offshore, and should be avoided.

Hook Bay.—The bay was surveyed in 1924. It was found to be deep, excepting near the head, where the slope of the beach is very gradual, with the 10-fathom (18.3 m.) curve ⅓ mile off the high-water mark. The area behind the spit is shoal. Fair anchorage may be obtained for small craft just westward of the outer end of the spit in 3 fathoms (5.5 m.). Large vessels can find no protection from southeasterly weather.

Weasel Mountain, 2,410 feet (735 m.) high, standing 1 mile south of Hook Bay, is the most prominent mountain in this vicinity.

Gull Islands consist of a group of rocks about 1 mile south of the southern coast of Cape Kumliun. They are connected by reefs, but otherwise are apparently steep-to. The rocks are covered with grass and there is but little kelp bordering them. There is a clear passage between the rocks and the cape to the north, but the passage is of no importance and is rarely used.

Katmai Reef, lying 3¼ miles 9° true (N. by W. ⅛ W. mag.) from the north point of Nakchamik Island, is narrow and about 400 yards long in a northeast and southwest direction. A small rock on the reef bares at extreme low tide. There are usually breakers even with a smooth sea, but the breaks may occur at long intervals. There is a light growth of kelp on the reef. There is deep water between this reef and the detached rocks about 3 miles to the northeast in the direction of Unavikshak Island, but the passage is not recommended.

Directions.—With Foggy Cape on the starboard beam distant 4 miles and on course 216° true (S. by W. ¼ W. mag.) continue for 5 miles to avoid the position of the reported rock southward of the cape, then change to 263° true (SW. by W. ½ W. mag.) to a position 1 mile north of Nakchamik Island. Then steer 259° true (SW. by W. mag.) to a position with Chignik Head ½ mile on the port beam. Change to 247° true (SW. mag.) and when Eagle Rock bears 317° true (NW. by W. ¾ W. mag), change to 213° true (S. by W. mag.) passing Chignik Spit Light at a distance of about 600 yards. When the light is a little abaft the beam, haul to 169° true (SE. by E. mag.) and anchor off the Northwestern Fisheries Wharf as desired.

To enter from the south, round Castle Cape at a distance of 1 mile, and after crossing Castle Bay, give the shore a berth of

1 mile and enter Anchorage Bay by passing ½ mile off Chignik Head. From here follow the directions preceding.

Chankliut Island, as it opens out from Castle Cape, appears as three separate islands tangent to each other. The parts are connected by low necks of land; the eastern and central ones appear generally flat while the western part is conical. The slopes are grassy. There are six pinnacle rocks off the west point of the island, and a small rock 10 feet (3 m.) high lies 250 yards off this point.

There is a blue-fox ranch on the island, the keeper living in the eastern cove on the north side. Small craft can find good anchorage in the cove by running in on about a 180° true (SSE. mag.) course toward the lowest part of the neck and anchoring in from 7 to 10 fathoms (12.8 to 18.3 m.), sandy bottom.

The channel between Chankluit Island and the mainland has been surveyed and found free from dangers.

Necessity Cove, about halfway between Castle Cape and Cape Ikti, affords good anchorage with winds from the southwest through west to north. Small vessels anchor close to shore in 7 fathoms (12.8 m.) and it is a safer anchorage in northwest weather than Prospect Bay or Ross Cove.

Warner Bay, about 6 miles north-northwestward of Seal Cape, is also called **Prospect Bay** because of a copper prospect there. The entrance is 6 or 7 miles west-southwest of the west end of Chankluit Island. The bay runs inland for 1¼ miles to a shingle spit with a 20-fathom (37 m.) anchorage behind it and close under the shore, but the space is too narrow and water too deep when the wind is northwest and the williwaws are violent.

Ross Cove is on the western side of Warner Bay. It can be used only by small craft, and can not be seen until well up to the high bluffs. There is a shingle spit about ½ mile long at the entrance where there is a depth of 12 fathoms (21.9 m.), but the channel is very narrow. Inside the water is deep, 20 fathoms (37 m.) being found close to the shore. The cove is triangular in shape with bold rocky shores. From the head of the cove a long deep valley extends toward Virgin Peak. The depth of water, smallness of the cove, and strong winds make it a dangerous place during northwest weather, but during southeast or southwest winds it is very quiet.

Devil Bay is the first cove north of **Seal Cape.** There is a small anchorage on the eastern side in 12 fathoms (21.9 m.).

There is no anchorage in the cove between Cape Ikti and Seal Cape.

CAPE ITKI TO KUPREANOF POINT

Kuiukta Bay (known locally as **Dorai Bay**) is a large bay with a wide entrance and extending 14 miles inland in a northwesterly changing to a northerly direction. At the head of the bay there is a good anchorage in 21 fathoms (38 m.), mud bottom. The bay is a natural funnel for winds and has the reputation of being one of the windiest bays in Alaska. At its head is a valley with an easy portage leading to Chignik. The bay has an average width of 1.4 miles, and has several smaller bays and bights opening from it. The shores are extremely precipitous, and consist of bare cliffs of great height, strongly colored in shades of gray, red, and black. The rocks appear

to be well mineralized, and there is a prominent outcrop of iron ore, resembling a lava flow, on the eastern side 4.7 miles northwestward from Cape Ikti. The water is deep and it is difficult to find anchorage except close to shore in the heads of the smaller bays. There is a small, low islet, on the east side, at the elbow of the bay 9 miles inside Cape Ikti, and a higher sugarloaf islet near the northern end. About 1 mile above the sugarloaf the water shoals.

Cape Ikti lies on the eastern side of the entrance of Kuiukta Bay, and the unnamed point near Mitrofania village lies on the west side; both are about 1,500 feet (457 m.) high, and present an extremely rugged skyline of rocky spires, towers, and buttresses.

Foot Bay and **Windy Bay** are the only 2 which have names among the 12 which indent the shores of Kuiukta Bay. All of them are swept by strong squalls in bad weather. The anchorage in Foot Bay is in 20 fathoms (37 m.), with scant swinging room toward the beach.

Directions.—Kuiukta Bay has not been surveyed and no detailed information is available. The bay was entered in 1924 by the *Pioneer* using the following track: Enter the bay on a mid-channel course and pass westward of the first island which lies about 9 miles above the entrance. The course then leads to the eastward of the next island about 3 miles northward. From here mid-channel courses should be steered passing between the islands at the head of the bay. Anchor in 21 fathoms (38 m.) mud bottom about midway between the smaller island and the beach to the northward. There are no settlements on Kuiukta Bay, but a pilot can be obtained at Paul Island, Kupreanof Harbor.

Mitrofania, a former settlement, is now nearly abandoned and in the summer of 1924 there were only one or two families living there. There is an excellent anchorage in the inlet leading to the village in 19 fathoms (35 m.), mud bottom. From the anchorage the village can not be seen as it lies behind the point forming the entrance to a lagoon which can be entered by small craft only.

Mitrofania Bay includes all the sheet of water north of Mitrofania Island; in its northern part are two unnamed bays near Mitrofania village, and farther westward is **Ivan Bay.** These bays are surrounded by precipices and sharp peaks; but westward of Ivan Bay there is a flat river valley, and the coast stretches south-southwestward in a straight line forming Long Beach. In Ivan Bay and abreast of Long Beach the water is deep and there is no anchorage.

Long Beach is a steep black sand beach, which extends in a crescent form about 3 miles northeast and southwest. It is flanked on the northern end by a vertical cliff 600 to 800 feet (183 to 244 m.) high, made conspicuous by many strata of different colored rocks, and on its southern extremity by a precipitous mountain covered with a dense growth of alder bushes. An isolated rock lies near the base of the mountain about 300 yards back from the beach, nearly rectangular in form, the sides being vertical, about 100 feet broad by 60 feet (18.3 m.) in height, and the top slightly rounded and covered with grass, ferns, and small bushes. Seen from a distance it has the appearance of a huge, native sod house, with the roof overgrown with grass. An extensive valley lies back of the beach in which are several ponds of fresh or brackish water.

Temporary **anchorage** with offshore winds can be had near the southwest extremity of Long Beach, on the west side of Ivan Bay, but a heavy swell rolls in with southerly and southeasterly winds. Give due attention to the lead as the bank is steep.

Mitrofania Island is 6.5 miles long and 4.5 miles wide, and consists of many sharp peaks of nearly the same height; the highest is about 2,000 feet (610 m.). There is a secure harbor, except for northwesterly winds, in the bight on the west side of the north point of Mitrofania Island. **Spitz Island** and reef lie 1 to 2 miles southward of the southwest point; it is a small sugarloaf islet about 1,075 feet (328 m.) high, with a reef extending 0.6 mile southward from it.

Little Brother and **Big Brother Islands** lie in Mitrofania Bay, nearer to Mitrofania Island than the mainland; they are similar in size and shape, about 0.4 mile in extent and 390 feet (119 m.) high, with a flat profile. There are rocks awash and broken ground between them and Mitrofania Island, but toward the mainland the channel appears to be clear. The *Dora* has used the passage between the islands and the north end of Mitrofania, passing close to the latter on a 251° true (SW. ½ W. mag.) course.

Veniaminof Volcano sends out a spur in this direction, which is flanked both east and west by extensive plains, and this spur reaches the sea at **Coal Cape.** The cape is about 1,200 feet (366 m.) high, but soon reaches an elevation of 2,100 feet (640 m.); its sky line is extremely broken and serrated.

Chiachi Island (chart 8881) is 3 miles in extent, and lies 1 mile from the nearest point of the coast; it has several rugged peaks, the highest of which is about 1,675 feet (510 m.). The anchorage shown on the chart is not recommended. Four islands lie near its northeast shore; the southeasternmost is unnamed; **Pinusuk Island** is a long ridge with a reef and a tower rock eastward of it; **Shapka Island** is a sugarloaf 700 feet (213 m.) high; and **Petrel Island** is a small flat rock mass. In this locality the navigator should follow the mainland and leave all islands to seaward.

Perryville, an Indian village, was established to provide for the people who were driven away from the vicinity of Katmai Volcano by the eruption of 1912. It consists of a number of wooden houses and a small store standing on the flat beach 4.5 miles westward of Coal Cape. The landing is exposed, especially in southeasterly weather.

Three Star Point is formed by a low rocky outcrop in the flat plain; it is 1.6 miles southwestward of Perryville and 4 miles from the foot of Coal Cape mountain range. Westward of it there is a long beach. **Coal Point** marks the end of this beach, and the eastern side of another mountain range.

A rock with 15 feet (4.6 m.) over it is reported to lie about 1 mile eastward of Coal Point. This rock was on the charts of the early Russian pilot, Pavlof, and a local fisherman has seen it breaking and has fished on it.

Humpback Bay lies west of Coal Point between Egg Island and the mainland; there is a portage from Humpback Bay to Ivanof Bay.

Egg Island is 1.2 miles long by 0.5 mile wide, and consists of rounded hills, the highest of which is 478 feet (146 m.). A reef ex-

tends from Egg Island almost half way across the channel toward Paul Island. From the end of the reef a ridge of sand and gravel extends across the channel to Paul Island. Nothing less than 7 fathoms (12.8 m.) has ever been encountered in crossing this ridge.

Alexander Point lies on the west side of the channel westward of Paul Island. It is the extremity of a range of hills and is about 1,500 feet (457 m.) high.

Paul Island is a crescent-shaped range of hills, reaching an elevation of 1,568 feet (478 m.) in the northern portion of the island. **Jacob Island** is shaped like a leg of mutton, and is 1,666 feet (507 m.) high near the northern end; from the summit a sharp ridge extends southward to **Noon Point,** meeting the sea in an overhanging precipice.

Kupreanof Harbor is inclosed by Paul and Jacob Islands; it is circular in shape, 1.1 miles across, and free from dangers. It is sheltered from the sea and from all winds. The western entrance is 0.7 mile wide and free from danger; vessels have used the eastern entrance also; it is 0.4 mile wide. This harbor is the most accessible safe harbor in a wide region. For directions, see page 161. There is a cattle ranch here. Both islands were formerly stocked with foxes, which have now almost disappeared. There are goats on Jacob Island.

Ivanof Bay lies between Alexander Point and Kupreanof Peninsula; it is 1.5 to 1.1 miles wide and 7 miles long. There is an island in the middle of it 0.7 mile long, 0.2 mile wide and 350 feet (107 m.) high. Westward of the island the channel appears to be clear, but eastward of it there is a low-tide rock 0.3 mile off the island and another rock 0.2 mile off the east shore; between the rocks a careful mid-channel course leads through deep water. Ivanof Bay is a safe harbor in bad weather, and one may anchor anywhere above the island, avoiding the mud flats in the northeastern part and those near the lagoon.

It is reported that the bay is incorrectly shown on chart 8802. Strangers can usually obtain a pilot either at Kupreanof Harbor or at Squaw Harbor on Unga Island.

Westward of the north end of Ivanof Bay is a large lagoon, and **Granville Portage** leads across flat land to Stepovak Bay. The portage is an important one because it is easy, and because it avoids the danger of rounding Kupreanof Point.

For sailing directions for the inside passage from Cape Ikti to Kupreanof Point, see page 161.

KUPREANOF POINT TO CAPE ALIAKSIN

Kupreanof Point is a cluster of confused ridges and pinnacle peaks 1,600 feet (488 m.) high; its southern face extends in an east and west line for 4.8 miles. The ridge of the peninsula presents a series of peaks all the way between it and Granville Portage. On the western side is **Boulder Bay,** which offers good anchorage; and **Fox Bay,** which is said to be an excellent harbor for light craft. Farther north is **Island Bay,** and northward of this is a low flat islet near the coast. The shores all around Kupreanof Peninsula appear to be reasonably clear at a short distance offshore; the reef

which appears on chart 8802 off Kupreanof Point consists of a few broken rocks in the surf at the foot of the cliffs.

Stepovak Bay is inclosed on the east by Kupreanof Peninsula. Several widely spaced lines of soundings were run in the bay, which would indicate that the east central part of the bay is safe; and that the western part and the northwest shore from Bales Landing to Cape Swedania are more broken and may develop dangerous shoals.

Gull Rock lies 0.6 mile off the northern shore of the bay, and is a bare ledge about 40 feet (12.2 m.) high. From Gull Rock to Granville Portage there is flat alluvial land, through which flows **Big River,** discharging drainage from this part of the snow fields and glaciers of the Veniaminof range. Westward and southwestward from Gull Rock the coast is backed by a high snowy range of peaks and spires cut by narrow glacier-filled ravines. A spur of this range forms Cape Swedania, and the main range is cut by the portage leading from Balboa Bay to Port Moller.

Ramsey Bay is 3.5 miles west-southwestward of Gull Rock, and is reported to be filled with low-tide rocks, upon which one cannery ship has been lost. **Bales Landing** is close to Ramsey Bay, toward Gull Rock, and 2.6 miles westward of Gull Rock. There is anchorage off the house which stands here, on the eastern side of the valley; the locality is called **Louies Corner.** The house is occupied by the owner of a sulphur mine in the valley. Two small glaciers end about 4 miles up the valley from the beach, with icefalls down the cliffs upon the flat land.

When **approaching Bales Landing anchorage,** care should be taken to avoid a sand-spit shoal which runs about ½ mile a little westward of the flagpole. It is best to keep **Lookout Hill** (which is very prominent) a little on the port bow until close up to the land, then follow the shore and anchor in 7 fathoms (12.8 m.) about ¼ mile eastward of the flagpole.

The coast is foul from Ramsey Bay around the point as far as **Grub Gulch;** there are several low-tide rocks and some kelp. A vessel should keep 1 mile off the beach. The point westward of Grub Gulch is a sharp red mountain about 2,000 feet (610 m.) high; the soundings indicate a reef 1.5 miles long extending on the line of the ridge from the end of this point. There are 2 low grassy islets and some rocks in the entrance of Grub Gulch; but there may be a channel leading in westward of these.

Clark Bay is a large open bight backed by two valleys; the southern part is called Little Norway.

Orzinski Bay is marked on the northeast side by **Waterfall Point;** it is 2 miles long and 1 mile wide. The waterfall on Waterfall Point is on the extremity of the point, in a most unnatural position, and shows on the tangent in profile; the peak back of it is 1,895 feet (577 m.) high.

Elephant Point is a sharp ridge 655 feet (200 m.) high, with inclined strata breaking off in sheer cliffs on the southwest face; off the end of the point are reefs 0.4 mile long eastward and southeastward, partly dry at low water. A vessel should keep more than a mile off it.

There is a reef almost in the middle of Orzinski Bay, slightly nearer to the north shore, abreast of the peak on Waterfall Point. There is a fishing station in the southwestern corner of the bay, called **Orzenoy,** standing on the shore of the stream which drains the lagoon up the valley. The warehouse may be used as a leading mark for entering; steer for it bearing 295° true (W. ½ N. mag.), in range with a notch in the mountains behind it, and a rocky peak appearing through the notch on this bearing; beware of the reef off Elephant Point and favor Waterfall Point if in doubt. When abreast of the peak on Waterfall Point, beware of the reef on that side, and favor the other shore if in doubt; when past this reef, steer 332° true (NW. ¼ W. mag.) for the right-hand or northern part of the gravel beach at the head of the bay and anchor in deep water off the low rock cliffs adjoining the beach at its northeastern end, at the opposite corner from the fishing station.

American Bay or **Mobile Bay** is a narrow fiord between steep rocky mountain walls. The wind squalls are extremely severe in bad weather. The entrance is a hole in the wall, ½ mile wide, between two gravel spits. Parts of the inner bay are almost landlocked; there is a small rocky shelf projecting under water for a short distance at the head of the bay. It is necessary to anchor near the middle of the inner bay; otherwise there is no swinging room.

Between American Bay and Guillemot Island are **Windbound Bay, Chichagof Bay** (commonly called **Chicago Bay**), **Dorenoi Bay,** and **San Diego Bay.** These were not thoroughly reconnoitered.

Guillemot Island is locally called **San Diego Island.** It is crescent shaped, about 400 feet (122 m.) high, fairly level on top, and surrounded by almost impassable cliffs. Between it and the mainland there is a chain of oddly shaped rocks, islets, and reefs. There appears to be a partly protected anchorage in the bight on the southwest side of the island, inside the crescent. From here to Cape Swedania the shore has a narrow fringing line of rocks, but appears safe at a reasonable distance.

Lumber Bay, or Rough Beach as it is called locally, lies on the eastern face of Cape Swedania, 2 miles northeastward of its south end, and consists of a shallow bight at the entrance of a valley; the beach is a dike of cobbles thrown up by the sea, and is capped by a great windrow of driftwood.

Cape Swedania is the seaward end of a ridge 1,200 feet (366 m.) high; there are rugged cliffs at the extremity, and on the southwestern side there is a gravel spit at the foot of the cliffs. The profile and end slope of Cape Swedania are striking and unusual, resembling in magnified outline the end of an artificial earthwork or bunker, back of which the mountain rises steeply. There are strong williwaws in the lee of it.

Balboa Bay, known locally as Portage Bay, offers good shelter on the eastern side about 5 miles from Cape Swedania; there is a small bight here with a low gravel point south of it at the mouth of a large ravine containing a stream. The mid-channel into the north arm is deep. When the coal mine at Herendeen Bay was in operation supplies were landed here and carried across the trail by pack train, a distance of about 15 miles. The highest point on the trail,

less than 600 feet (183 m.), is near the south side of the peninsula. This portage is still used frequently.

The west shore of Balboa Bay from Cape Aliaksin to the entrance to Lefthand Bay, was surveyed in 1925 and a reef was found to extend 600 yards in a southeasterly (true) direction from Cape Aliaksin. The shore north of the cape is fringed by a reef extending not over 200 yards offshore except in the bight in the shore line ½ mile south of the entrance to **Lefthand Bay** where shoal water extends 450 yards offshore. Outside these reefs, the water deepens rapidly to the middle of the bay.

Albatross Anchorage (chart 8851) is a secure harbor near the head of the north arm of Balboa Bay. The best anchorage is in mid-channel abreast of **Ballast Island** (close to east shore) and has a clear width of 0.4 mile, with depths of 5 to 8 fathoms (9.1 to 14.6 m.). A reef extends well off from **Reef Point,** on the east side 0.6 miles southward of Ballast Island. Small craft may anchor in the bight on the west side opposite Ballast Island and secure better protection from the sea by keeping well over on the southern side to avoid a ledge which uncovers at half tide and extends 300 yards southeastward from Bassett Island. The depths are 8 to 12 feet (2.4 to 3.7 m.).

Lefthand Bay, known locally as Left Arm, on the west side of Balboa Bay affords temporary anchorage for small vessels. A shoal extends 200 or 300 yards off shore, then drops rather steeply. Low, marshy ground, known as **Kagayan Flats,** leads from the head of the bay to Beaver Bay.

Cape Aliaksin has no distinctive form; it is of a rounded outline and a low rounded profile; there is low land for some distance from the shore all round. The summit is broad and flat, and about 1,700 feet (518 m.) high. There is shoal water near shore all round, and a rock awash at high water about ¼ mile off the southwest side. A reef extends 600 yards off the cape in a southeasterly (true) direction.

The eastern part of Cape Aliaksin, rounding into Balboa Bay and Lefthand Bay, is called **Cape Kagayan.** Cape Aliaksin is distinguished with difficulty from westward, but it comes out clearly from eastward.

SHUMAGIN ISLANDS

The surveys include Unga Island, except the west coast; the coasts of Nagai Island from Wedge Cape to Eagle Harbor on the west side and from Wedge Cape to the bight south of East Bight on the east side; the islands between Unga and Nagai Islands; the four islands in East Nagai Strait; and the west coast of Big Koniuji Island from abreast of Peninsula Island to abreast of Bendel Island. The available information for the other islands is similar in character to other unsurveyed areas.

This group, lying southwestward of the Semidi Islands and separated from the mainland by Unga Strait, consists of 15 islands and many islets and rocks extending in an east-southeasterly direction. In general, the islands are bold and mountainous and the coasts are greatly broken by inlets that afford good anchorages. The shores are rock-bound close-to.

There are fishing stations and camps scattered throughout the group, and good fishing banks off the islands. Fox and cattle raising are carried on to some extent.

SIMEONOF ISLAND

(Chart 8881) the most easterly of the group, is about 4 miles long and 3½ miles wide. It is composed of two clusters of hills, the southeastern and higher ones being about 1,600 feet (488 m.) high. These hills are separated by a low plateau which is nearly cut in two by a very irregularly shaped harbor.

The coast of the island is fringed with reefs and shoals. Those on the south and southwest sides are variously reported to extend from 3 to 7 miles offshore; those on the east side, 3 miles; and those off the other shores, ½ mile.

A rock on which the sea breaks at low water has been reported half way between Simeonof and Chernabura Islands.

Simeonof Harbor is on the western side of the island. A reef extends about ½ mile westward from the north point of the entrance to the harbor. Off the south point of the entrance is a low, flat, rocky island fringed with reefs. The harbor is protected from all winds; the entrance is tortuous, with reefs on either side; the shores are rocky and the water very shoal. The inner anchorage is in 2½ fathoms (4.6 m.), with not over 2 fathoms (3.7 m.) at the lowest tide; the bottom is smooth gravel. Anchorage, exposed to westerly winds, may be had in the outer part of the harbor, in about 4 fathoms (7.3 m.), about ½ mile inside the entrance.

Twelve Fathom Strait separates Simeonof and Little Koniuji Islands. The strait is about 2¼ miles wide, with depth of 12 to 16 fathoms (21.9 to 29.3 m.). With the exception of a few kelp patches on the Simeonof side, no dangers are known.

LITTLE KONIUJI ISLAND

is very irregular in shape, consisting of three parts, 1,200 to 1,500 feet (366 to 457 m.) high, connected by raised sand beaches. The southern end terminates in a high, rocky, pointed cape, with a reef, marked by a breaker, extending about ¼ mile southwestward from it. The eastern coast is indented by two coves, and there is a large harbor on the western side.

Sandy Cove (chart 8851) is on the eastern side of Little Koniuji Island. It is about 1 mile wide at the entrance, and 1½ miles long. There are prominent granite cliffs on its western shore. The cove affords good anchorage in its southerly bight in about 10 fathoms (18.3 m.), sheltered from all but southeasterly weather.

Atkins Island is about 1½ miles long and about ⅝ mile wide, and is connected to the northeast headland of Little Koniuji Island by a shoal. The island rises to a height of 800 feet (244 m.) at its southeastern end. Anchorage is reported southward of the island.

Northwest Harbor (chart 8881), a bight in the northern side of Little Koniuji Island, southward of Herendeen Island, may be entered from either side. It affords fair anchorage and protection

from all but northeast winds in 5 to 10 fathoms (9.1 to 18.3 m.). The harbor is about ½ mile wide. There is an abandoned fishing station here.

Herendeen Island is triangular shaped, about ⅞ mile long and ½ mile wide. There is an islet off the western end.

Northeast Harbor (chart 8881), the large bay in the western side of Little Koniuji Island, has two bights and is approximately 4½ miles long. The east bight of the harbor is somewhat open to westerly winds and the holding ground is rocky and poor. The extreme southeast end of the harbor is more protected and is a favorite refuge for fishermen, though the bottom, being alternately patches of rock and sand, is not good holding ground. There is a small, well protected boat harbor here, at the head of which are several houses belonging to a fox farm.

CHERNABURA ISLAND

lies about 8 miles southwestward of Simeonof Island, and is the most southerly of the group. The entire island is high and mountainous and there are few breaks in its profile, the highest part being at the east end. A rocky islet, apparently connected with the main island by a bar, lies off its northern end. On the east side are three small bays, the middle one of which is reported to afford anchorage in westerly winds.

BIRD ISLAND

lies about 4 miles westward of Chernabura and is more irregular than that island, but several of its peaks are nearly as high. Passing well southward of Bird Island, it appears as four principal peaks connected by low valleys. Almost its entire southeast side is a series of cliffs. A rock above water lies a short distance off its southern end.

An **anchorage** is reported in the bight on the east side of Bird Island, just inside of Point Welcome, in 5 to 12 fathoms (9.1 to 21.9 m.). The wreck of a schooner is at the head of the bight. Temporary anchorage, exposed to all but winds from the southeast quadrant, may be had in the bight in the northwestern side of the island in about 12 fathoms (21.9 m.), sand bottom, southwestward of the reef making about 1 mile in a northwesterly direction off the northwest point of the island. There are rocks about ½ mile offshore in a westerly direction from the southerly point of this bight and a shoal about 1 mile in a northwesterly direction off the southwest point of the island. Sunken rocks are found lying about ½ mile off the northern shore of the large bight on the eastern side of the island.

Otter Strait, between Bird Island and Chernabura, is said to have depths between 20 and 35 fathoms (37 and 64 m.), sandy bottom.

BIG KONIUJI ISLAND

lies west-northwestward of Little Koniuji Island, from which it is separated by Koniuji Strait. It is about 11 miles in length and about 6 miles in width at its widest or southern end. It is rugged and very mountainous, with a well-defined central ridge and spurs projecting

toward the points. The coast is broken by many inlets and the points are rockbound close inshore. The highest peaks are frequently mist covered. Its northern point is comparatively low and its southwestern end terminates in a long narrow point with a high connecting ridge, which resembles an island from some points of view; it has been called Kungiugan.

Flying Eagle Harbor, on the east side of the island, about 5½ miles southward of Cape Thompson, offers well protected anchorage for small vessels, especially in southerly gales, in 7 to 10 fathoms (12.8 to 18.3 m.).

Hall Island, about ⅞ mile long and ⅜ mile wide, lies about 1 mile off the eastern shore. There are two rocks above water close to the southeast face of the east end of the island, and a reef extends about ¼ mile southwestward from the southwest point.

Murre Rocks are a group of three islets about ⅝ mile northwestward from Hall Island. A rocky ledge extends about ¼ mile southwestward from the southern islet.

Yukon Harbor (chart 8881) lies southwestward of Hall Island. It has a rocky ledge covered with kelp lying close around the eastern entrance point, and rocks close to the western point. Anchorage, protected from westerly weather, may be had in the center of the harbor, in about 7 fathoms (12.8 m.), but the bottom is poor holding ground.

There is a bay eastward of the southwestern point of Big Koniuji Island, but the depth is reported to be too great to afford anchorage. East of the bay is another one, larger and wider, in which vessels have anchored in 16 fathoms (29.3 m.), hard bottom, with protection from northerly and westerly winds. The holding ground is poor. East of this is a high headland on Koniuji Strait. A 3-fathom (5.5 m.) shoal extends from the south end of the island.

There are four prominent bights on the west side of the island. They are open and easy of access and their shores are clear, except close-to.

Anchorage in 24 to 26 fathoms (44 to 47 m.) may be had near the head of the bight 146° true (SE. ¾ E. mag.) from Peninsula Island. In approaching the anchorage it is necessary to keep northward of mid-channel to avoid a shoal extending 300 yards off the south shore about ½ mile from the head of the bight.

The other bights do not offer anchorage on account of the great depth of water. Anchorage for very small craft may be found in any of these bights, close in shore, and in the numerous indentations and small coves. The winds draw through the divides into the bights and the williwaws are very strong.

Koniuji Strait is about 1½ miles wide. Soundings of 16 to 28 fathoms (29.3 to 51 m.) are reported.

Castle Rock, lying about 1½ miles northward of the north point of Big Koniuji Island, is rugged and serrated, and its highest peak has an elevation of 825 feet (251 m.). It makes an excellent landmark. A 3-fathom (5.5 m.) shoal extends about ¾ mile off its southern end.

The bottom between Big Koniuji and Castle Rock is said to be even averaging 28 fathoms (51 m.).

separates Nagai and Big Koniuji Islands and has an average width of about 6 miles.

Peninsula, Spectacle, Bendel, and **Turner Islands** lie in a general north-northeasterly and south-southwesterly direction in this passage, and the waters between this chain of islands and Nagai on one side and Big Koniuji on the other are deep and clear and mid-channel courses may be safely steered.

Peninsula Island, the most northerly of this group, has a length of 1½ miles and a width of ¾ mile. It has a central peak 1,190 feet (363 m.) high. The shore is rugged, steep, and rock-bound. A long bowlder spit extends off the southeast end. The northeast end should not be approached closer than ¼ mile and the southeast end not closer than ½ mile. Exposed anchorage may be found on the tail of the shoal extending off the southeast point, in 7 to 12 fathoms (12.8 to 21.9 m.), a short ½ mile from the narrow point.

Spectacle Island, lying 3¼ miles southward of Peninsula Island, is 2½ miles long and 1½ miles wide at its southern part. It is rock-bound and has steep cliffs on the north, east, and south sides. The northern part is distinguished by two peaks about 900 feet (274 m.) high and the southern part reaches an elevation of 1,240 feet (378 m.). In general, the island may be approached within ⅛ mile.

There are **anchorages,** under favorable conditions, for small craft in the large bight on the east side of Spectacle Island in 6 to 9 fathoms (11 to 16.5 m.), in the bight on the west side in 4 to 5 fathoms (7.3 to 9.1 m.), and in the small cove in the south side in 3 fathoms (5.5 m.). The bights on the eastern and western sides are open and easy of access. The entrance to the small cove on the southern side is about 70 yards across with foul ground on either side for a distance of about ⅛ mile inside the entrance.

The passage between Peninsula and Spectacle Islands is about 3½ miles wide and is deep and free from dangers.

Bendel Island lies in a southwesterly direction from Spectacle Island and is separated from it by a passage ⅝ mile wide. It is about 2 miles in diameter and 1,250 feet (381 m.) high. The eastern end terminates in a narrow neck. There are high bluffs on the southern side and sloping valleys on the others. The coast line is rocky, with kelp, and the depths around the island are irregular.

A flat extends off the southwest side for a distance of about 1 mile with depths of 5 to 10 fathoms (9.1 to 18.3 m.) and with several shoaler spots. Depths of 7 to 8 fathoms (12.8 to 14.6 m.) are also found off the northwest and southeast sides. Exposed anchorages for small boats may be found in the bights and on the flats.

The passage between Spectacle and Bendel Islands is ⅝ mile wide and a mid-channel course leads through 21 to 11 fathoms (38 to 20.1 m.).

Turner Island is separated from Bendel Island by a passage from ¾ to 1½ miles wide. It is 2¾ miles long and about ⅞ mile wide, with a greatest elevation of 1,180 feet (360 m.). Its shore is rock-bound and the southeast coast is very foul for a distance of about ½ mile offshore. There is a low flat on the northwest end

with a 400-foot (122 m.) knoll on the point. The bluffs on the north, southeast, and south sides vary in height from 400 to 800 feet (122 to 244 m.)

The passage between Bendel and Turner Islands is deep at both entrances and shoals gradually to 4 fathoms (7.3 m.), in its narrowest part, about mid-channel off the southwest point of Bendel Island. Dense kelp grows on this shoal and small craft find difficulty in passing through. The use of this passage is not recommended for large vessels.

The Twins consist of three small islands, the highest of which has an elevation of about 200 feet (61 m.). Their sides are precipitous and bare. As no breakers were seen about them in heavy weather, it is presumed there are no outlying dangers.

Near Island is about 2 miles long and 600 feet (183 m.) high, with precipitous, rocky sides. The island is easily recognized by a regular serration, which cuts its crest into five little peaks. There are rocks close to the shore.

NAGAI ISLAND

is approximately 29 miles long and 9 miles wide. Its coast is irregular and indented by numerous inlets, several of which extend nearly through the island and have low, narrow isthmuses at the head. The island is mountainous and its shores rock-bound; near the center it reaches an elevation of 1,837 feet (560 m.) in a group of confused ridges.

Cape Wedge (chart 8700), the northern end of the island, is a narrow headland with a rounded, sloping hill 749 feet high (22.8 m.). The north end of the cape terminates in a double point, with elevations of 262 and 316 feet (80 and 96 m.) and a rocky bluff 150 feet (46 m.) high between. Its shores are rocky and forbidding, but may be approached within ¼ mile with depths of 14 to 25 fathoms (25.6 to 46 m.); closer in a vessel would be in danger. In general, however, a vessel should keep 1 mile offshore.

Cape Wedge is marked by an unwatched flashing white light, 60 feet (18.3 m.) high and visible 11 miles.

Mountain Point, the southerly end of the island, is narrow and about 500 feet (152 m.) in height. There are rocks surrounding the point at a distance of about ½ mile and a sunken rock about 1 mile offshore in a south-southwesterly direction.

Pirate Shake is a local name for the low neck, about 65 yards wide, of Nagai Island, 4 miles southward of Cape Wedge. The cove on the east side of the neck is a good anchorage for vessels, but is exposed to winds from about east-northeast to east-southeast. The outer points at the entrance are surrounded by reefs, and a reef, bare about 8 feet (2.4 m.) in places at low water, lies in the middle of the entrance. The better entrance is northward of the reef, heading for an islet on the north side of the cove on a 286° true (W. ¼ S. mag.) course. Pass 300 to 500 yards southward of the islet, and anchor in the middle of the cove west-southwestward of the islet, in about 8 to 9 fathoms (14.6 to 16.5 m.), bottom soft in places. **Anchorage** can also be selected in the entrance of the cove just eastward of the islet, in 7 to 8 fathoms (12.8 to 14.6 m), bottom generally rocky, taking care, however, to avoid the reef which extends

about 3/8 mile from the northeasterly shore of the cove. The flat islet 40 feet (12.2 m.) high on the north side of the cove, and a wreck just inside the outer point on the south side of the cove are good marks for the entrance.

Northeast Bight, on the east side of Nagai Island, about 6 miles southward of Cape Wedge, is about 4 miles long and 1 1/4 miles wide. It is open, deep, and free from dangers except close to shore. The main body of the bight is too deep for anchorage, but a vessel may anchor in the two coves at the head in about 20 fathoms (37 m.)

Mist Harbor (chart 8851) is a landlocked basin about 1 mile long and 3/8 mile wide, lying on the east side of Nagai Island, about 12 miles southward of Cape Wedge, and 314° true (NW. by W. 7/8 W. mag.) from the northeast end of Bendel Island. The depths in the middle of the basin are 27 to 35 fathoms (49 to 64 m.), but small craft can find a secure anchorage in the cove on the south side of the west end of the harbor, in 6 to 7 fathoms (10.9 to 12.8 m.). The south side of the harbor is formed by a long spit; the entrance is around the west end of the spit and is about 250 yards wide, and necessitates a sharp turn in entering. A mid-channel course should be followed through the entrance, and in entering the cove at the west end of the harbor to the anchorage. A flat fills the easterly end of the harbor, and otherwise there are no dangers away from the shores.

A fishing camp is usually located on the cove at the west end of Mist Harbor, and small temporary wharves may be found. Water may be had from small streams on the northeasterly side of the harbor. Strong williwaws draw down from the high mountains at times. A low neck of land, about 150 yards wide, separates the west end of the harbor from the head of Northeast Bight.

East Bight, on the east coast about 3 miles southward of the entrance to Mist Harbor, is about 3 1/4 miles long and 2 miles wide. It is deep, open southeastward, and the shores are clear except close-to. Anchorage for moderate-sized vessels may be found on the shelf on the northeast side in 15 to 20 fathoms (27.4 to 37 m.), about 1 mile inside the north entrance point and about 3/8 mile offshore.

The two west arms do not afford good anchorage on account of the depth, about 29 fathoms (53 m.). There is a 7-fathom (12.8 m.) spot, surrounded by deep water, in the northern of the two arms, lying 650 yards off the west shore and about 7/8 mile from the head of the arm.

The entrance to the south arm is restricted to about 450 yards by a shoal extending about 650 yards in an easterly, and 900 yards in a northerly direction off its south entrance point. In entering favor the north shore at a distance of 1/8 to 1/4 mile. Small boats may find protected anchorage behind the hook at the south entrance point, in 9 to 15 fathoms (16.5 to 27.4 m.). After passing well through the entrance to the arm, head 180° true (S. by E. 3/4 E. mag.) to pass about 100 yards westward of the west end of the hook spit. When abreast of the end of the hook, round into the cove and select anchorage about in its center.

Larsen Bay, about 3 miles southwestward of East Bight, affords good anchorage in 4 to 10 fathoms (7.3 to 18.3 m.), sandy bottom.

The bight is open and easy of access but is exposed to easterly winds. The western shore is low and is distinguished by white sand dunes. There is a bold headland about 100 feet (30 m.) high projecting from the south side.

There are several open bights on the east coast of the island between Larsen Bay and Mountain Cape.

John Island, in the large bay in the southwest part of Nagai Island, is 300 or 400 feet (91 or 122 m.) high.

South of John Island, Nagai Island consists of two clusters of rocky hills, about 1,000 feet (305 m.) high, united by low isthmuses.

The southerly isthmus is called **Saddlers Mistake,** due to a vessel attempting at night to pass through between the adjacent high parts of the island.

Falmouth Harbor, on the west coast of Nagai Island, about 6 miles northward of John Island, affords a secure, though limited, anchorage for a small vessel in the basin behind the spit at its head, in 7 to 8 fathoms (12.8 to 14.6 m.), sandy bottom. The entrance to the basin is not over 300 yards wide, has a depth of 6 fathoms (11 m.), and contains no known dangers. The basin is ½ mile wide and its north side is a broad sand flat which drops suddenly to 4 fathoms (7.3 m.).

A reef extends ¼ mile southwestward from the south head of Falmouth Harbor; and a rock, bare at low water and marked by a breaker and kelp, lies ¾ mile from that head in the same direction.

The south shore of Falmouth Harbor is low at the water's edge but slopes rather steeply. The northern headland rises some 500 feet (152 m.) in a perpendicular cliff. The shore is rocky and bold. A rock, 5 feet (1.5 m.) above water, stands ¼ mile from shore and 1¼ miles northwestward from this headland. Halfway up the bay on the south side is a low point, with a rock close-to, known as **Cape Horn.**

Wooly Head, between Falmouth and Eagle Harbors, is a promontory 1,200 feet (366 m.) high; there are rocks 0.2 mile from shore all around its face, some of them awash and others forming towers and pinnacles 50 feet (15.2 m.) high. A vessel may pass ⅜ mile off in 20 fathoms (37 m.). Violent williwaws are frequent here.

From Wooly Head to Cape Wedge the coast and adjacent waters have been surveyed and are shown on chart 8700.

Eagle Harbor, northward of Wooly Head, is about 4½ miles long in a southeasterly direction and 1¼ to ½ mile wide, and has a depth of 15 to 20 fathoms (27.4 to 37 m.), with no outlying dangers until approaching the spits which lie 1½ miles from the head of the harbor. In passing between the spits, favor the one on the southwest shore. There is good anchorage anywhere in the head of the harbor above the spits in 14 to 18 fathoms (25.6 to 33 m.), soft bottom. Small craft can anchor in the lagoon behind the north spit in depths of 5 to 7 fathoms (9.1 to 12.8 m.).

There is a fishing station, with a large warehouse and a boat wharf, on the southern side of Eagle Harbor, 1.3 miles inside the entrance, and a small abandoned fish station and boat wharf on the north shore 1.8 miles inside the entrance.

Sanborn Harbor lies about 3½ miles northward of Eagle Harbor. The pinnacle rock 103 feet (31 m.) high off East Head, the northern

entrance point, and the two waterfalls on the west face of the south entrance point, are conspicuous landmarks.

The harbor is 5 miles long and has good anchorage at its head. To secure good shelter in Sanborn Harbor, a vessel should pass between Macks Head and Granite point, and then anchor as desired, avoiding only the upper half of the northeast arm, which is shoal. There are no outlying dangers anywhere in Sanborn Harbor.

There is a fishing station in a small exposed bay on the north side of Sanborn Harbor, 2¼ miles southeastward of East Head; it has a warehouse and a boat wharf dry at low water.

Catons Cove lies on the north side of Sanborn Harbor, 3½ miles southeastward of **East Head;** there is shelter, in the Kitchen, for light craft, back of the sand spit. The channel, close to the spit until through the narrowest part of the entrance, has a least width of 100 feet and a least depth of 10 feet (3 m.).

Porpoise Harbor, about 3 miles northward of Sanborn Harbor, affords no useful anchorage on account of great depth.

The bight about 2½ miles northward of Porpoise Harbor has temporary anchorage in 8 to 15 fathoms (14.6 to 27.4 m.), giving the shore a berth of over 300 yards. **Porpoise Rocks** are a small cluster 10 feet (3 m.) high, with deep water close-to, lying 0.8 mile from the north shore in the approach to the bay.

The narrow bight west of **Pirate Shake** affords anchorage for small craft about ¼ mile inside the entrance and about on the middle line of the cove, in 4 to 6 fathoms (7.3 to 11.0 m.), rocky bottom. The bight is exposed to westerly winds and its eastern half is foul and shoal to the head.

WEST NAGAI STRAIT

(chart 8700), between Nagai and Andronica Islands, is 3.3 miles wide at its narrowest point between Porpoise Rocks and the Haystacks, with depths from 25 to 45 fathoms (46 to 82 m.) and no outlying dangers. A vessel should pass eastward and southward of the Haystacks and on these sides may approach as close as 0.3 mile in 25 fathoms (46 m.).

The currents in West Nagai Strait set with the wind and reach a velocity of 1½ to 2 knots in strong winds. Under ordinary conditions the prevailing set of the current is said to be southwestward in this vicinity.

The Haystacks are a formidable appearing group of four islets 265 to 293 feet (81 to 89 m.) high, and there is a broken chain of rocks running through them. Broken ground on which the least depth found in 9 fathoms (16.5 m.) lies 1¼ miles southwestward from the southwesterly bare rocks. A rock called **The Whaleback,** 1 mile west of the Haystacks, is 22 feet (6.7 m.) high, and 300 yards south-southwestward of it is a sunken rock. Temporary anchorage in 20 fathoms (37 m.) or less can be had in the bight eastward of the Haystacks. A landing can be made on the bowlder beach.

The soundings indicate clear passages between Andronica and the Haystacks, between The Whaleback and the Haystacks, and between the north Haystack and the rest of the group, but none of these passages are recommended.

ANDRONICA ISLAND

is 2 by 3 miles in extent and 1,175 feet (358 m.) high. It is bordered by rocks all around to a distance of 0.2 mile from the shore, and vessels should give the shore of the island a berth of ½ mile. There is a flat islet 22 feet (6.7 m.) high extending 0.4 mile off the southeast point toward the Haystacks.

The northern point of Andronica is a detached wedge of rock 280 feet (85 m.) high. There is a rock awash at low water 0.7 mile westward of the north point and 0.4 mile offshore, and this is the farthest outlying danger in the approach to Gorman Strait. There is another rock 5 feet (1.5 m.) high, and 0.2 mile off the western point of Andronica Island.

Temporary anchorage may be found ½ mile from shore in the bight on the northeast side of Andronica, off the sand beach near the northern point, in 20 fathoms (37 m.). Small vessels can anchor closer to shore in this bight and also in the bight on the southwest side of the island, and landing can usually be made in one of these bights.

GORMAN STRAIT

between Andronica and Korovin Islands, has a least width of 2¾ miles, and is clear if the shores be given a berth of ½ mile. In rounding Cape Devine it is well to avoid the broken ground which surrounds this point to a distance of about 1¼ miles in a northeasterly direction and about 1 mile in a southerly direction, until a more detailed development is made.

The currents in Gormon Strait set with the wind and reach a velocity of 1½ to 2 knots in strong winds. Under ordinary conditions the prevailing set of the current is said to be southwestward in this vicinity.

KOROVIN ISLAND

has two summits; low land and marsh occupies the middle portion; the eastern end is a rocky cliff 1,200 feet (366 m.) high, and the western end is 1,816 feet (553 m.) high.

Sounding has been completed on the south side of Korovin Island from Cape Devine to a point 2 miles southeastward of Henderson Island, and otherwise a few reconnaissance lines only have been run around the island.

Cape Devine, marking the northwest side of Gorman Strait, is a gray headland 855 feet (261 m.) high joined to the southeastwardly part of Korovin Island by a low neck. The shore is fringed with rocks, and a rock awash at low water lies 400 yards off the south side of the cape. A bank on which the least depth found is 11 fathoms (20.1 m.) extends ¾ mile southward from the cape.

Korovin Bay, the western bight on the south side of Korovin Island, affords good shelter in northerly weather, but the holding ground is poor.

Scotland Point, the north end of Korovin Island, has shallow water off it. **Scotland Rock,** awash at low water, exists in this locality and is supposed to lie about 1 mile northward of the point, but it has not been located.

Grosvold Bay, 2 miles southwestward of Scotland Point, may be used as an anchorage. The entrance is foul on both sides but safe in the middle, and there is foul ground inside off both the east and west shores. The Survey ship *Patterson* anchored in the center of the bay, in 8 fathoms (14.6 m.), sand and rock bottom.

The bay between Scotland Point and Grosvold Bay is not recommended.

Henderson Island is ¼ mile long, 58 feet (17.7 m.) high, and lies ¼ mile off the west end of Korovin Island. When approaching from westward it is hard to distinguish Henderson Island from Korovin until close-to. There is shallow water between the two islands and rocks off the western end of Henderson; it should be given a berth of over ½ mile.

There is **anchorage** either northward or southward of Henderson Island. The southerly anchorage is eastward of a bare rock about 5 feet (1.5 m.) high, and the anchorage should be approached from the southward.

Korovin Strait, between Korovin and Popof Islands, has a least width of about 2 miles and is deep and clear.

KARPA ISLAND

is 0.7 mile by 1.3 miles in extent and 1,373 feet (418 m.) high. It is grass-covered, with a smooth profile, and has a remarkable cliff 900 feet high at the northeast point. The island may be ascended only from the southwest point; 70 yards off this point is a tower rock 50 feet (15.2 m.) high, and a reef above water extends 140 yards off the southeast point. There is a narrow kelp field along the south and southeast sides of the island, and otherwise there are no known outlying dangers. A few reconnaissance lines of soundings have been run in the vicinity of the island.

POPOF ISLAND

is irregular and rough in shape, with hills ranging approximately 1,000 and 1,500 feet (305 and 457 m.) high. The highest point, 1,550 feet (472 m.), is a short distance northeast of the center of the island. The shores are generally rocky and steep and have many ledges, covered with kelp, extending 200 to 300 yards offshore.

The north and east shores of Popof Island have no outlying dangers, but the shore should be given a berth of about ½ mile. Between Andronica and Popof Islands the water is deep and clear. Temporary anchorage may be found ¼ mile off the north shore of Popof Island anywhere west of Pirate Cove, in 10 fathoms (18.3 m.).

Pirate Cove, 4½ miles east-northeastward of East Head, is an important cod-fishing station, with a wharf and an extensive plant; there is a berth at the wharf 100 feet long with 5 to 10 feet (1.5 to 3 m.) at low water. The cove is properly only a boat harbor and it is necessary to warp a vessel in and out. At low tide vessels of a greater draft than 10 feet (3 m.) lie in the mud. Vessels of 250 tons load cargo here.

There is a fixed white light on the bluff on the north side of the entrance. The fishing company operates a radio station, call letters

KOXN. The radio towers are visible from the channel, but most of the buildings are obscured.

High Island, 3/8 mile off the northeast part of Popof Island, is 1/4 mile long and 310 feet (94 m.) high, with its greatest height near its north end. It is grass covered but has reddish cliffs showing westward and grassy slopes on the other side. There are 30 fathoms (55 m.) and more 200 yards from it all around, and the passage between it and Popof is clear. The island can be passed fairly close-to and is a useful mark for making Gorman Strait in thick weather.

Little Harbor, also called **Fox Hole,** is on the east side of the north end of Popof Island, and is about 1 1/4 miles long in a south-southwesterly direction. It affords a well-sheltered anchorage for a small vessel, the depths ranging from about 15 fathoms (27.4 m.) at the entrance to 6 fathoms (11 m.) near the edge of the flat which extends 0.3 mile from the head. The harbor has a clear width of about 400 yards; foul ground extends over 100 yards in places from the shores, and a reef extends about 250 yards northward from the point on the south side of the entrance of the narrow part of the harbor. The north point of entrance is a sheer cliff about 150 feet high. The only directions necessary are to keep in mid-harbor.

Popof Head, 980 feet (299 m.) high, is connected to the southeast part of Popof Island by an isthmus. It is a high precipitous headland with a steep slope of talus. There is 20 fathoms (37 m.) 200 yards south of it and the depths increase southward; the 100-fathom (183 m.) curve is 2 miles off. Vessels should give it a berth of 1/2 mile, although in fog it might be approached more closely.

There are two large bights, with sand beaches, the westerly one known as **Red Cove,** on the south side of Popof Island halfway between Egg Island and Popof Head. Both of the bights furnish anchorage in northerly weather, in 8 to 10 fathoms (14.6 to 18.3 m.), sandy bottom. Landing with keel boats is difficult on account of considerable surf and shoal water near the shore. The point separating the bights is a narrow, rocky projection fringed with foul ground to a distance of about 300 yards; rocks awash at low water lie 600 yards from shore and 0.4 and 0.7 mile westward of the point.

POPOF STRAIT

(chart 8700), between Popof and Unga Islands, is wide and deep at its southern end but is narrow and contains several ledges in its northern part. The principal outlying dangers are as follows:

There is 8 feet (2.4 m.) on a dangerous pinnacle rock which lies 1.1 miles 207° true (S. 3/4 W. mag.) from the point east of Red Cove; 3 miles 109° true (E. mag.) from Egg Island; and 3.6 miles 291° true (W. 1/8 N. mag.) from Popof Head. It is on a line from the north tangent of Egg Island to the tangent to Popof Head, bearing 111° true (E. 1/2 S. mag.). Kelp seldom grows sufficiently long to be seen at the surface.

There is about 5 fathoms (9.1 m.) on a rocky shoal 1,000 yards 110° true (E. 1/8 S. mag.) from the first pinnacle rock on the beach south of the entrance to Squaw Harbor; there may be less.

The bottom of the southern part of the strait is broken and irregular, but no other hidden dangers were found. A vessel should keep

½ mile off either shore. There are a few settlers along the Unga Island shore.

Directions.—From eastward pass 1 mile southward of Popof Head and steer 288° true (W. ⅛ S. mag.) for about 5 miles for Hardscratch Point, which leads 1.1 miles southward of the 8-foot (2.4 m.) rock. When Egg Island bears 323° true (NW. by W. mag.) steer 337° true (NW. ¼ N. mag.) for 4.2 miles, passing 700 yards eastward of Egg Island and round Sand Point, ¼ mile off.

Entering from southwestward.—From a position ½ mile off Kellys Rock steer 337° true (NW. ¼ N. mag.) for 8 miles, passing 700 yards eastward of Egg Island and round Sand Point ¼ mile off, as before.

After rounding Sand Point at a distance of ¼ mile steer 52° true (NNE. ⅞ E. mag.) for Sand Point Wharf for about ⅝ mile, until Egg Island begins to close on the bottom of the hillside at Sand Point.

Then steer 0° true (N. by W. ¾ W. mag.) passing midway between the red and black buoys, and heading a little to the left of the black can buoy No. 1. This course should head just inside the point opposite Range Island. When up to the black can buoy, change to 27° true (N. ¾ E. mag.), passing midway between Range Island and the point opposite it. When the northwest point of Range Island comes in range with the point where Sand Point Wharf is located, change to 0° true (N. by W. ¾ W. mag.).

Bound westward.—After passing West Head, at the north end of Popof Strait, 0.4 mile distant, on a 0° true (N. by W. ¾ W. mag.) course, run 1.1 miles, and change course to 289° true (W. mag.) with High Island astern and the tangent to Cape Aliaksin ahead; run 4.7 miles to a position 0.9 mile northward of Gull Island. Then follow directions on page 161.

Bound eastward.—After passing through the strait as above directed, pass about ⅝ mile off East Head and steer 86° true (NE. by E. ⅞ E. mag.) to pass 0.9 mile northward of High Island.

It is difficult to enter Popof Strait from northward at night as there are no prominent landmarks, and the entrance is hard to distinguish on account of higher land in the background.

Egg Island lies in the middle of Popof Strait 2½ miles southward of Sand Point. It is 160 feet (49 m.) high, 600 yards across, and grassy on top. **Little Egg Island,** close westward of it, is grassy-topped, 25 feet (7.6 m.) high, and 130 yards across. There are a few detached rocks about these islands. A vessel should not approach closer than 400 yards, where 15 fathoms (27.4 m.) or more will be found.

Sand Point is a flat sand spit 0.4 mile long. Its south shore is fringed close-to by rocky ledges and its north shore has sandy bottom. A shoal shelves off about 150 yards westward from the point and then drops off abruptly to deep water.

There are slipways for hauling out launches and scows on the north side of Sand Point.

Humboldt Harbor furnishes excellent shelter and good holding ground. Occasional strong southwesterly winds necessitate the use of a second anchor to prevent dragging in this harbor. Passing ¼ mile off Sand Point steer for Sand Point Wharf on a 52° true (NNE.

⅞ E. mag.) course; anchor in about 10 fathoms (18.3 m.) about ¼ mile from the shore northward and eastward, with the end of Sand Point bearing 220° true (S. by W. ⅞ W. mag.), and Range Island 30 yards open from the land.

Sand Point Wharf, at the head of Humboldt Bay, is 1¼ miles northeastward of Sand Point. It has a frontage of 42 feet and ample depth alongside. Fresh water is piped to the dock. There is a general store which handles ship chandlery and fishermen supplies. Blacksmiths, carpenters, and machinists are available, and minor repairs can be made.

The post office is known as **Sand Point.** The monthly mail steamer from Seward makes regular calls. It is an outfitting point for big-game hunters, and gas boats can usually be chartered.

A large white structure, built as a hotel, and located just back of the wharf makes a prominent landmark from the southern part of the strait.

Popof Reef lies in Popof Strait, westward and southwestward of Sand Point Wharf. Its northern part has a least depth of 8 feet (2.4 m.), and lies 300 to 700 yards westward of the point just northwestward of Sand Point Wharf. The 2¼ fathom (4.1 m.) spot ¼ mile south-southwestward is marked by a black can buoy.

Unga Reef is described with Unga Island.

A small rocky shoal with 17 feet (5.2 m.) over it lies in the middle of Popof Strait ½ mile southward of Range Island. It is marked by a black can buoy placed 400 yards southwest of the 17-foot (5.2 m.) spot.

Range Island is 30 feet (9.1 m.) high and 300 yards across; it is round and grassy over the summit. There is 8 fathoms (14.6 m.) 100 yards from the northwest end. There is no passage between it and Popof Island.

East Head, on the east side at the north entrance to Popof Strait, has foul ground and kelp for a distance of ¼ mile off its west side and extending southward to Range Island.

In 1924 a vessel reported striking an obstruction, about halfway between the present location of the buoy and the 17-foot (5.2 m.) spot. Vessels should not pass eastward of the buoy.

UNGA ISLAND

(chart 8700), the largest and most important of Shumagin group, has several large identations, among which are Zachary Bay, on the north side and Delarof Harbor and Baralof Bay (Squaw Harbor) on the east. It is quite mountainous, especially the eastern half. The western half is comparatively low, that part west of Zachary Bay having somewhat rolling topography. The highest mountains are just south of Zachary Bay, where a maximum elevation of 2,270 feet (692 m.) is found. In general, the shore line is rocky and precipitous. The south and west coasts are particularly foul. Near the west end of the north shore is a sand beach 3 miles long with sand dunes immediately back of it. The west shore of the island is not surveyed.

A sailing vessel should avoid approaching the south coast of Unga Island, except in fine weather. There is no shelter or protection, and often a southeast storm comes on suddenly, making it a bad lee

shore. It is a bad landfall when approaching from seaward in bad weather, and the currents can not be foreseen. However, all dangers on this side are within ½ mile of the shore.

West Head, the point of Unga Island at the north entrance of Popof Strait, is a black cliff 40 feet (12.2 m.) high, and ½ mile south of it are cliffs 300 feet (91 m.) high. Westward from West Head the cliffs are higher, broken, however, by numerous valleys. There is 10 fathoms (18.3 m.) 300 yards off West Head.

Unga Reef, the eastern side of which is marked by a red buoy, extends 0.7 mile south-southeastward from the western shore of Popof Strait, in the narrowest part opposite Sand Point wharf. A small patch lying about ¼ mile off the point is bare about 2 feet (0.6 m.) at low water, and has ribbon kelp around it. The south end of the shoal, with depths of 3 to 4 fathoms (5.5 to 7.3 m.) lies about ½ mile northwestward from the end of Sand Point. The southern part is known as Caton Shoal.

Baralof Bay, locally known as Squaw Harbor, on the eastern coast of the island, about 6½ miles northward of Unga Cape and about the same distance westward from Popof Head, is a good anchorage except in heavy easterly weather. In approaching from southeastward, keep 0.8 mile or more offshore, and in entering the harbor, favor if anything, the north side. Anchor in the middle of the bay in 16 to 18 fathoms (29.3 to 33 m.), sticky bottom. Small vessels anchor nearer the head of the harbor, in not less than about 6 fathoms (11 m.). The bottom appears to be good holding ground, but a number of vessels have dragged here and mariners are warned not to have too much faith in its holding qualities. There is a salmon cannery on the north side about ½ mile within the entrance. In entering the bay, the cannery does not open up until nearly abreast of it. There is a dock with 24 feet (7.3 m.) alongside with fresh water piped to it. The dock is protected from all winds. Vessels should drop an anchor and warp in. During the season, from about March to September, vessels of the Pacific American Fisheries sailing from Bellingham call at Squaw Harbor on their semimonthly trips. There is a codfishing station with a wharf opposite the cannery. There is a trail leading overland to Unga.

In the middle of the bay and 1,000 yards from its head is a sandy shoal having a least depth of 24 feet (7.3 m.). Fishing vessels use this shoal for a winter anchorage and consider it safe. There is a sandy shoal extending ¼ mile off the south side at the entrance.

Northward of Baralof Bay the shore is more or less foul. A few settlers live along this coast. There is a fishing station in the bight west of Hardscratch Point.

Kelly Rock marks the southwest side of the southern entrance to Popof Strait. It is a flat-topped, grassy islet 65 feet (19.8 m.) high, 160 yards across and 200 yards offshore. There is 14 fathoms (25.6 m.) 175 yards offshore from it. Vessels should give it a berth of ½ mile or more. There is an unused fishing station in the bight a mile west of Kelly Rock.

A fish trap extends from the beach toward Kelly Rock, but there is a passage between the end of the trap and the rock. There is kelp between the rock and the shore. A light is maintained on the end of the trap.

A **rock awash** at extreme low tide is reported to lie about 1.7 miles 323° true (NW. by W. mag.) from Kelly Rock, and about ¼ mile offshore.

Delarof Harbor (chart 8700), 3 miles northward of Unga Cape, is not sheltered except in northwesterly weather, and the holding ground is bad. The depths in the outer harbor range from 15 fathoms (27.4 m.) at the entrance to 5 fathoms (9.1 m.) about 300 yards outside the entrance to the inner harbor. It is not safe to anchor in less than about 6 fathoms (11 m.).

Approaching the harbor from either direction, several rocks and islets are found close inshore. **Halfway Rock,** 70 feet (21.3 m.) high and 90 yards in diameter, lies 0.9 mile east-northeast of Cross Island. **Cross Island,** 265 feet (81 m.) high, lies midway of the north shore. **Elephant Rock,** 155 feet (47 m.) high, is a small projecting point a short distance inside the south entrance point. A rock 40 feet (12.2 m.) high lies 300 yards off Elephant Rock, to which it is connected by a reef.

A dangerous shoal known as the **Blind Breaker,** which is bare at extreme low water, lies in the entrance 850 yards 180° true (S. by E. ¾ E. mag.) from the southeast end of Cross Island, and about 1 mile 119° true (E. ⅞ S. mag.) from the south entrance point of the inner harbor. The rock is closely surrounded by depths of 12 to 14 fathoms (21.9 to 25.6 m.) and is marked by a black buoy placed just north of it.

A shoal with 20 feet (6.1 m.) at mean lower low water lies in the center of the anchorage off the town, about 650 yards 122° true (ESE. ⅞ E. mag.) from the south entrance point of the inner harbor.

Delarof Harbor, due to its exposed position, close quarters, and rugged shores, is a forbidding looking place and can not be recommended as an anchorage.

Enter Delarof Harbor on a 287° true (W. ⅛ S. mag.) course, heading for the point on the south side of the entrance of the inner harbor, which leads ¼ mile northward of the Blind Breaker.

A mile from the entrance is a narrow constricted passage beyond which the bay is shoal. In the center of this inner harbor is a large reef which is exposed at extreme low water. **Flagstaff Hill,** 80 feet (24.4 m.) high, is the rounded point, surmounted by a flagpole, at the north side of the narrow passage to the inner harbor.

Unga, the largest settlement in the Shumagin group, lies back of this hill and consists of a fishing station, several stores, a post office, school, church, and about 30 houses. There is no wharf except for launches.

There is a **United States commissioner and marshal** at Unga, and an amateur radio station is operated by the commissioner. It is a port of call of the monthly mail steamer from Seward. Cargo is lightered ashore from the outer harbor. At the head of the shallow inner basin are the abandoned workings of the Apollo Mine. A ledge, bare at low water, extends 400 yards southward from the Unga Wharf, which is suitable for small craft only at high tide.

Unga is the center of a considerable codfishing industry.

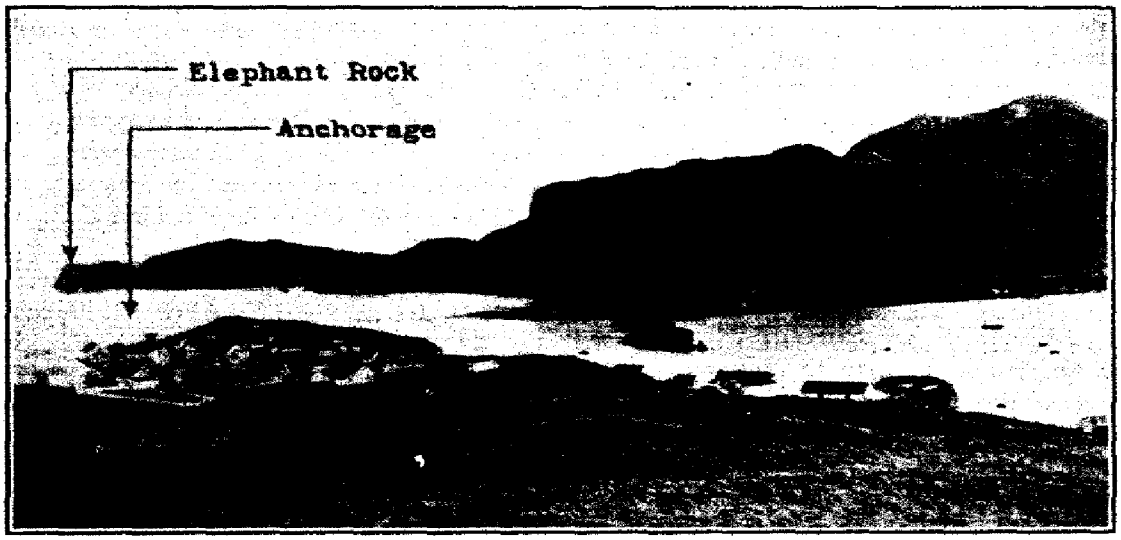
Unga Cape, the southeast point of Unga Island, is a bare, gray, rugged cliff 855 feet (261 m.) high. A wall-like slab of rock 500 feet (152 m.) high, connected to the cape by a narrow bar, stands just

south of the cliff and perpendicular to it. There are ledges at the foot of the cliff. A vessel may pass ½ mile off in 25 fathoms (46 m.).

Sealion Rocks, 3 miles south-southeastward of Unga Cape, are 0.2 mile in extent, 130 feet (40 m.) high, flat-topped and grassy. There is a breaker 0.4 mile northeastward of them. A vessel may pass ½ mile off in 26 to 32 fathoms (47 to 58 m.) but should give them a greater berth. There is a clear width between Sealion Rocks and Unga Cape of 2½ miles, with depths from 20 to 30 fathoms (37 to 55 m.) and no outlying dangers.

Acheredin Bay is a large open bight in the south shore of Unga Island. It is 3 miles across and 2 miles deep. Its shore is a sand and pebble beach, behind which is a lake 7 feet (2.1 m.) above high water. A vessel may approach to 0.6 mile off the sand beach in 8 fathoms (14.6 m.).

Acheredin Point, the southwest end of Unga Island, is a black mountain 1,400 feet (427 m.) high, with an exceedingly rough sur-



Unga—Delarof Harbor

face and serrated profile. At the end of the point is a separate hill 500 feet (152 m.) high. A vessel should keep 1 mile off.

Acheredin Point to Dolgoi Island.—For a description of this direct route to the westward, see page 205.

The west side of Unga Island is unsurveyed.

Bay Point, or **Nigger Head,** is a rocky headland of rounded profile, 325 feet (99 m.) high, which forms a good landmark all around, and shows over the land in Unga Strait. There is said to be anchorage in 7 fathoms (12.8 m.) northward of Bay Point affording good shelter for northeasterly winds.

The northern point of the island known as **Unga Spit** is a sand spit surrounded by shoal water extending ¼ mile offshore. This spit is marked by a flashing white light 40 feet (12.2 m.) high and visible 11 miles.

Under favorable weather conditions a fair **anchorage** may be found in 5 to 7 fathoms (9.1 to 12.8 m.), sand bottom, ¾ mile 280° true (W. ¾ S. mag.) from the sand spit on the north shore of Unga

Island. Small vessels can anchor closer to shore off the western side of this spit in as little as 4 fathoms (7.3 m.) in places. About 2 miles southwestward of this spit to the beginning of the rocky shore line the 5-fathom (9.1 m.) curve is about 1 mile offshore.

Gull Island is a flat-topped, grassy islet about 50 feet (15.2 m.) high and 80 yards across. It is 0.9 mile off the west side of the entrance of Zachary Bay. The island has deep water all around it as close as 200 yards. There is a passage with a clear width of ½ mile inside of the island, but care should be taken to avoid the reef extending from the west entrance point of Zachary Bay.

ZACHARY BAY

(chart 8700), on the north side of Unga Island, is 6 miles long and 2 miles wide at the entrance, narrowing to about 1 mile in the middle of the bay. It is open and easily entered. The outer part of the bay has depths of 10 to 20 fathoms (18.3 to 37 m.), sticky bottom, affording anchorage, but is exposed to northerly and northeasterly winds. The principal dangers are as follows:

Two small reefs, known as **Weedy Shoals**, which show well at low water, lie ¼ mile from the eastern shore halfway from the entrance to North Head. A kelp-marked ledge, bare at low water, extends nearly ⅝ mile northeastward from the western shore at the entrance; the end of the ledge lies 1.1 miles 162° true (SE. ¾ S. mag.) from Gull Island.

The best **anchorage** for vessels in Zachary Bay is about ¼ to ⅜ mile from the eastern shore and ½ to 1 mile southward of Round Island, in 8 to 12 fathoms (14.6 to 21.9 m.), sticky bottom. **To enter,** pass North Head on a 178° true (S. by E. ⅞ E. mag.) course for the west end of Round Island in range with the middle of a sawtoothed mountain, which leads ¼ mile westward of North Head. Then pass about 200 yards westward of Round Island and follow the eastern shore southward at a distance of ¼ to ⅜ mile. The principal dangers are as follows:

A rock with 20 feet (6.1 m.) over it lies 300 yards westward of **North Head.** An extensive shoal makes out from the western shore from northward of North Head to the head of the bay, the 5-fathom (9.1 m.) curve, on the eastern edge of the shoal, passing 700 yards westward of North Head and 350 yards westward of Round Island; southward of Round Island the edge of the shoal is steep-to. The head of the bay is shoal southward of the point on the east shore 1.4 miles southward of Round Island.

Coal Harbor is the best anchorage for small vessels in Zachary Bay. The berth with best swinging room is ¼ mile north-northeastward of **Quartz Point,** with North Head just open from the western entrance point of the bay, and **Range Islet** bearing 260° true (SW. by W. ⅜ W. mag.), in 7 fathoms (12.8 m.), sticky bottom. The best entrance is in mid-channel northeastward of Round Island, and then follow the northeast shore at a distance of 300 yards. The principal danger is a spit, bare only at extreme low water, which extends 600 yards 120° true (E. by S. mag.) from Round Island; the range of North Head and the western entrance point of the bay leads

over the easterly edge of the spit, and vessels should keep eastward of this range when Range Islet bears 230° true (SSW. ¾ W. mag.). The head of the harbor southeastward of Quartz Point is shoal.

There is an abandoned coal mine on the west side of Zachary Bay.

UNGA STRAIT,

separating Unga Island from the Alaska Peninsula, is 2¾ miles wide in its narrowest part, between the sand spit on the north side of Unga Island and Cape Aliaksin on the peninsula. Depths of 16 to 30 fathoms (29.3 to 55 m.) are found in this part of the strait. A vessel should keep ¾ mile off either shore.

A patch of what looked like growing kelp was seen 1.1 miles 0° true (N. by W. ¾ W. mag.) from the sand spit on the north shore of Unga Island. The least depth found in the locality is 22 fathoms (40 m.), and no trace of this kelp was found in 1915 by a surveying vessel. However, as a precautionary measure, this spot should be avoided by deep-draft vessels.

Currents.—In general, currents set in the direction of all courses from Sand Point to Pavlof Bay. In Unga Strait a 0.4-knot current will generally be found setting westward; it does not change with the tide except between Unga and Popof Reefs, where a tidal current with a velocity of 1 knot, at strength, sets northward on the flood tide and southward on the ebb.

CAPE ALIAKSIN TO BELKOFSKI

The surveys of this region consist of a few lines of soundings in the channel from Cape Aliaksin to Cape Tolstoi and of complete surveys from there along the steamer route to Cape Pankof.

Beaver Bay lies west of Cape Aliaksin and is 3½ miles wide at the entrance. It was not examined, but a narrow opening or "hole in the wall" was seen at the head of it, which probably leads to Otter Bay. **Otter Bay** is reported to be closed by a shingle spit. On the western side of Beaver Bay the land is low, and rises gradually for 12 miles west-southwestward. The shore is not much indented and consists of a line of low cliffs with occasional waterfalls. The point on the west side of Beaver Bay is called **McGinty Point.**

A single line of soundings at a distance of 2 miles from the shore showed depths less than 10 fathoms (18.3 m.), irregular bottom, for a distance of 5 miles southwestward of the southwest point at the entrance of Beaver Bay. The least depth found was about 4 fathoms (7.3 m.) at a point 2 miles from shore and 7.4 miles 300° true (W. by N. mag.) from Bay Point (Nigger Head), Unga Island.

Seal Cape, at the entrance to Pavlof Coal Bay, is low and difficult to recognize. It terminates in a flat-topped mound 100 feet (30 m.) high connected to the mainland by a low neck of land. Lying 3 miles eastward of it is a southerly projecting point which appears to be cut off to form an island; and 1 mile east-northeastward of this in turn is a rocky ledge 0.8 mile offshore and showing 8 feet (2.4 m.) above water. Both these may be picked up when skirting the shore in foggy weather; a vessel following the shore will be in 18 fathoms

(33 m.) when heading for the ledge as she proceeds westward. Abreast of this ledge, about ½ mile inshore from the beach, is a hogback mountain 1,100 feet (335 m.) high.

Moses Rocks consist of two breakers about 0.3 mile apart, which lie 0.6 mile southward and south-southwestward from Seal Cape and 270° true (WSW. ⅜ W. mag.) from the end of the point 3 miles eastward of Seal Cape. The lead gives no warning of these breakers. A depth of 10 fathoms (18.3 m.), irregular bottom, and no development was found 1 mile south-southeastward of Seal Cape.

Pavlof Coal Bay is a good shelter for small vessels in northerly weather. It looks east-northeastward up a broad valley behind the 1,100-foot (335 m.) hill already mentioned, and is entered on a 65° true (NE. ⅛ E. mag.) course. To avoid Moses Rocks when entering round the cape at a distance of 0.3 mile in 11 fathoms (20.1 m.), or at a distance of 1¼ miles in deeper water, following the shore from Cape Tolstoi. A depth of 4 fathoms (7.3 m.) was found near the middle of the bay north-northwestward of Seal Cape, and no sounding was done farther northward and eastward.

PAVLOF BAY

(chart 8704) is a large open bay with deep water extending to its northern shores. Except for two fish traps operated during the salmon season, there are neither commercial enterprises nor settlements in Pavlof Bay. There are several cabins along its shores that are occupied by fur trappers during the winter.

Cape Tolstoi at its eastern entrance is high and bold with eroded bluffs from 200 to 600 feet (61 to 183 m.) in height. The cape is marked by two peaks of about 1,800 feet (549 m.) elevation and separated by a deep narrow valley. Abutting the western face of the cape are two prominent pinnacle rocks. Deep water extends close up to Cape Tolstoi. About 1 mile eastward of the cape is a small flat rocky island about 20 feet (6.1 m.) in height. At low water the island is connected to the mainland by a reef awash.

Northward of Cape Tolstoi to Canoe Bay the country is mountainous and the shore is bold and strewn with many rocks and reefs.

Settlement Point, 6½ miles northward of Cape Tolstoi, is a low narrow table-land with a prominent green (in summer) hill, 208 feet (63 m.) in height, just back of it. Shelter for small craft may be had on either side of the point in all except southwest winds. A dangerous reef, bare at about half tide, exists ¼ mile southward of the point. There is a long fish trap just north of the base of the point.

Black Point, forming the western entrance to Pavlof Bay, is low and indefinite. It is composed of black cinders and ashes, and has deep water close-to. In 1924 the point was marked by a surveying tripod.

Black Rock, about 15 feet (4.6 m.) in height, lies 1⅓ miles offshore about 3 miles southwestward from Black Point. It is surrounded by deep water, and can be passed close-to on either side.

Flat Island is the large flat-topped island in mid-entrance to Pavlof Bay. It is 62 feet (18.9 m.) high and has precipitous shores. A detached reef, bare at low tide and of considerable size, extends

½ mile south of the island. There are also detached reefs to the northward and westward of it, but the east side of the island is clear with deep water close-to.

Lump Island is a small rocky islet 45 feet (13.7 m.) in height 2 miles eastward from Black Point. There is a detached rock 20 feet (6.1 m.) high just south of the main islet and connected to it by a reef which bares at low water.

Gull Island, 9 miles westward from Settlement Point, is a small rocky island with a rocky reef extending ¼ mile westward from it. It is a bird rookery.

Ivan Island (known locally as **John Island**), is the largest island in the bay. It is flat-topped and about 200 feet (61 m.) in height with vertical cliffs arising abruptly from the water. On the eastern side of the island there is a shallow basin with two entrances which forms a good launch harbor. About 6 feet (1.8 m.) can be carried through here at ordinary high water. Between Ivan Island and the mainland the water is shoal with scattering growths of kelp.

Foul ground.—For about 7 miles northeastward from Ivan Island there is considerable foul ground, with several dangerous rocks and reefs. Due to the irregularity of the bottom, it is not assured that all the dangers were found in the survey of 1924, and the area should be avoided by deep-draft vessels.

Irregular bottom also extends 3 miles southward from Flat Island. No dangers were found in the survey, but vessels are cautioned to avoid the area of broken bottom.

Round Island is a small round-topped island 90 feet (27.4 m.) in height, located in the upper part of the bay. To the northeast there are two unnamed rocky islets about 25 feet (7.6 m.) high. As stated above, the broken area to the northeast of Round Island should be avoided.

There is a dangerous rocky shoal 2 miles northwestward from Round Island, with a least depth of 4 feet (1.2 m.).

The northern shore of the bay consists of reddish eroded bluffs 50 to 70 feet (15.2 to 21.3 m.) high, giving way to low flat shores near the entrance to Canoe Bay. This shore is strewn with boulders and rocks inside the 6-foot (1.8 m.) curve.

Anchorage.—In northerly weather, anchorage may be selected at any place in the northern part of the bay. The bottom consists of mud and ashes, and has good holding qualities. In southeasterly weather good protection may be had just northward of Cape Tolstoi, in 15 fathoms (27.4 m.), sticky mud bottom. In westerly weather anchorage may be found near the western shore about 2 miles south of Ivan Island.

Weather.—In the early spring and fall, northwest winds sweep out of Pavlof Bay with great force. The prevailing winds in summer are southeast to southwest, and they draw up the bay with considerable force and at times cause a heavy sea in the upper part of the bay. Fog is more prevalent in the entrance than in the upper part of the bay.

Canoe Bay is a deep body that joins Pavlof Bay at its northeastern part. The entrance has a width of only 175 yards with a depth of 13 fathoms (23.8 m.) between the entrance points, which are

of rock formation and about 50 feet (15.2 m.) in height. The maximum current here is estimated at from 5 to 7 knots, and slack water occurs at about the time of high and low water in Canoe Bay. Local vessels of sufficient power enter the bay at any stage of the current, but vessels of more than 100 feet in length should not attempt the entrance except at slack water. The survey of 1924 showed 23 feet (7 m.) to be the limiting depth for entering the bay. This depth occurs just within the entrance, from whence the depths gradually increase to 10 fathoms (18.2 m.); then deepen abruptly to 30 to 40 fathoms (55 to 73 m.).

At the head of the bay is a shallow lagoon which extends for 3½ miles. Canoe Bay is bordered on the north by a mountainous ridge which culminates in a remarkable volcano with an extinct crater, circular in shape. On the south side of the bay there is a prominent sharp peak which shows well from Pavlof Bay.

Northwesterly winds do not blow home in Canoe Bay, but it is reported that the northeasterly winds of winter sweep down the bay with great violence.

Anchorage.—Anchorage may be selected just inside the entrance in 4 to 10 fathoms (7.3 to 18.3 m.), hard bottom. For large vessels the best anchorage is in the eastern part of the bay in 23 fathoms (42 m.) sticky bottom.

No directions are necessary. The chart is the guide.

Long Beach is the long low sandy beach between Black Point and Arch Point. Back of this beach the ground rises gradually, culminating in the three peaks of Pavlof Volcano. The center peak, which is active, has been in eruption several times in recent years. About 3½ miles southwestward from Black Point a flat makes out, affording a good anchorage for vessels waiting for the weather to clear before attempting the passage through the islands. The anchorage was marked in 1924 by a tripod erected on a small dune at the southwestern extremity of the flat.

Ukolonoi Island lies opposite the entrance to Pavlof Bay. It is high and mountainous. Its northern shore is clear and should be given a berth of ½ to 1 mile.

Arch Point, the northern entrance to Volcano Bay, is moderately low with cliffs about 100 feet (30 m.) high, and is joined by a low neck to the high land farther back. The cliffs are undercut in several places forming caves and arches. The rock is black near the water, changing to light brown above with grassy land back of it. Deep water extends close to the south side of the point.

Arch Point is marked by an unwatched flashing white light and a white day beacon a short distance to the northeast of the light.

A rock with 11 feet (3.4 m.) over it lies a little southward of a line from Arch Point to the north end of Dolgoi Island, and on the range of Bluff Point and the southeasterly tangent of Moss Cape. It is marked by a red and black nun buoy. Broken ground, on which the least depth found is about 6 fathoms (11 m.) and which should be avoided, extends ½ mile eastward from the 11-foot (3.4 m.) spot.

Local magnetic attraction.—In 1911 a variation of 28° 20′ east was observed near Arch Point. This would indicate some local disturbance, for the mean of this locality is about 18° east.

Volcano Bay (chart 8703) is free from rocks and shoals, except near the shores, which should be given a berth of ⅜ mile. The shoaling is abrupt from about 30 fathoms (55 m.) to the north side of the bay. Good anchorage and shelter from all except southeast winds, may be had near its head in 10 fathoms (18.3 m.), sticky bottom. Shelter for small craft from southeasterly wind may be had in 2 fathoms (3.7 m.) behind the sand spit which makes out from the northwest side of the bay. Fresh water may be had here. Rocks and ledges extend 500 to 700 yards offshore between this spit and Bear Bay.

Bear Bay is a small inlet affording a fair anchorage in the middle of the entrance. The inner part of the bay can be entered only by pulling boats.

Bluff Point is a rocky headland forming the northwest end of Dolgoi Island. It rises abruptly to a height of about 50 feet (15.2 m.), with a gentle grassy slope to the eastward.

The outer ends of the low sand spits making out from Moss Cape and the northwest end of Goloi Island are marked by day beacons.

The southwest end of Inner Iliasik Island is marked by an unwatched flashing white light.

Caution should be used in making the passage between the Iliasik Islands because of reefs which make out from each island, constricting the navigable channel to a width of ⅝ mile.

PAVLOF ISLANDS

This group consists of Wosnesenski, Ukolonoi, Poperechnoi, Dolgoi, Goloi, and the two Iliasik Islands. Between Unga Island and Dolgoi Island, the rocks and islands have been fairly well located, but only by reconnaissance methods. The inside route has been surveyed completely from Cape Tolstoi to Cape Pankof on Unimak Island and this area on the chart can be used with confidence.

A single line of soundings has been run from Unga Island direct to Cape Dolgoi, and the visible dangers were located. This route is used considerably by small fishing and whaling craft and has been used by cannery steamers drawing about 20 feet (6.1 m.). The following **directions** may be useful: From a point off Acheredin Point a course should be laid to pass 1 mile south of Poperechnoi Island and Dolgoi Cape, then head up to pass between the Iliasiks. There are several low rocks and islets southward of Poperechnoi and Dolgoi Islands, and a particularly **dangerous breaker** lies 2 miles southward from Dolgoi Cape. This track should not be attempted except in clear weather. If caught in a fog off Poperechnoi Island, a vessel will have to anchor and wait for clear weather.

Jude Island is about 150 feet (46 m.) high, and about ½ mile across, round in profile, grassy on top, and rocky at the shore. There was a herd of about 200 sea lions on it in 1913. Deep water extends close to the northwest side of the island. Dangerous rocks may be found on a line from Jude Island to Bay Point and from Jude Island to Wosnesenski Island. Breakers were seen in these localities, and a vessel should keep 1 mile or more to the northward.

Wosnesenski Island has a rocky, flat-topped peak 1,200 feet (366 m.) high near the southeast point, and the remainder of it is lower; there is a lagoon occupying the northwest portion and a small

settlement on the north shore. A vessel may anchor in the bight on the north shore ½ mile westward of a bare ledge. Otherwise the shore seems foul all around, and depths of 10 to 15 fathoms (18.3 to 27.4 m.) are found northeastward for 2 or 3 miles and probably dangerous rocks exist also.

On the southwestern side of Wosnesenski Island there is a remarkable pear-shaped pinnacle rock, several hundred feet in height.

Ukolnoi Island is steep and bold at the northwest point. East of the island are several rocks and ledges showing above water as far as the longitude of Wosnesenski Island, and there appears to be foul ground right across. In case it should be necessary to pass through a channel might be found by skirting Wosnesenski Island. Along the south shore of Ukolnoi Island there are several breakers 0.3 to 1.8 miles offshore.

The channel north of Ukolonoi Island has been surveyed and found safe. There is a rocky islet about ⅝ mile westward from the most northerly point of the island. This rock should be given a berth of ¾ mile to avoid the broken ground in its vicinity.

Poperechnoi Island has rugged cliffs 1,300 feet (396 m.) high along its northeast shore. There is a rock awash at half tide 1.3 miles from the northwest point of it, on a line toward Wosnesenski Island, and another breaker 1.3 miles east-northeastward of this rock. Still farther east is a pinnacle rock well above water, in the middle of the strait. No sounding has been done.

Dolgoi Island, 11 miles across and grass covered, is divided into two mountain masses by Dolgoi Harbor and the lowland at its head. The greatest heights at the east and west ends of the island are 1,450 and 1,510 feet (442 and 460 m.), respectively. The shore is generally abrupt and high. The north point of the island is an overhanging cliff. Deep water extends fairly close to the northwest end of the island. The south part of the island is particularly bold, the cliffs being several hundred feet high. At the middle of the southeast side is a headland with a cliff 920 feet (280 m.) high.

Dolgoi Cape, the south point of Dolgoi Island, is marked by several large, detached rocks a few yards off the shore line.

A reef of small extent which breaks in southerly weather lies 2 miles southward from the cape. The depth over it has not been determined.

Dolgoi Harbor (charts 8703 and 8851) is the safest and most commodious harbor in this part of Alaska, giving perfect shelter and freedom from williwaws. There are two islets on the west side of the entrance and two larger islands inside the harbor.

To enter Dolgoi Harbor, steer 20° true (N. ⅛ E. mag.) for the highest point [500 feet (152 m.)] of the ridge at the head of the harbor showing westward of the two islands in the harbor, and pass 200 yards or more eastward of the outer one of the two islets on the west side of the entrance. Pass westward of the first island in the harbor, favoring if anything the island side.

The deeper passage then leads between the two islands in Dolgoi Harbor, taking care to give the north end of the south island a berth of over 150 yards, and the southeast end of the north island a berth of over 300 yards; the best course through is about 109° true (E.

mag.). Or, vessels can take the passage west of the upper island, which has a depth of about 4 fathoms (7.3 m.), by keeping the island aboard at a distance of about 200 yards. In 1924 the U. S. S. *Cuyama*, drawing 24 feet (7.3 m.), entered Dolgoi Harbor, using the channel west of the north island in departing. The soundings showed nothing less than 4½ fathoms (8.2 m.) on a 208° true (S. ¾ W. mag.). This channel obviates the turn between the two islands, which is somewhat difficult for long ships, especially during southeast winds.

Anchorage can be selected anywhere inside the island, the depths being 7 to 10 fathoms (12.8 to 18.3 m.), mud bottom, with no outlying dangers. Water can be had from the waterfall on the eastern shore abreast the first island. The passage eastward of the first island is not recommended.

Dolgoi Harbor is easily approached with the aid of the chart, passing on either side of Goloi Island. The principal outlying dangers in the approach are two rocks with 1 foot (0.3 m.) over them, which lie about on the range of the east point of Goloi Island and the end of the spit at the west end of Dolgoi. One rock lies 0.7 mile 135° true (SE. by E. ⅝ E. mag.) from the east end of Goloi Island; the other rock lies 0.9 mile 222° true (SSW. ⅛ W. mag.) from the cluster of rocks at the southeast side of the entrance of Dolgoi Harbor.

Goloi Island is 970 feet (296 m.) high and the sides are generally abrupt except at the two sand spits, one at the west end, the other at the middle of the northeast side of the island. The end of the spit making out from the west side is marked by day beacon (white tripod, boarded up).

Iliasik Islands are each about 2.7 miles long and 0.7 mile wide. They are both high and generally have cliffs at the water. Viewed from Cape Bold they appear as three islands, as **Inner Iliasik** is nearly divided by a low neck of land into parts about 800 feet (244 m.) high. The high north end of **Outer Iliasik** is also separated by low ground from the rest of the island. There are ledges and kelp extending about 200 yards from the east side and about ¼ mile from the west side and southeast end of Inner Iliasik. Outer Iliasik is surrounded by ledges and kelp to a distance of ¼ mile in places; bare rocks and foul ground extend ½ mile west-southwestward from the west end of the island. Growing kelp was seen midway between the islands in midsummer.

The southwest point of Inner Iliasik is marked by an unwatched flashing white light. On the extreme northwestern slope of the inner island there is a house occupied by a fox farmer.

From the north point of Inner Iliasik Island there is a reef extending to the mainland. Just east of the mainland end of the reef and close to the shore is a large bowlder which is easily recognized. There is little depth on the reef near the island, and about 8 feet (2.4 m.) on the greater part of it. Near the mainland a depth of 11 to 12 feet (3.4 to 3.7 m.) can be taken across the reef by passing 100 to 300 yards off the large bowlder on a course parallel to the shore. The passage is used by local fishing vessels of about 6 feet (1.8 m.)

or less draft and is not recommended for any but light-draft vessels; the tendency is to cross too far from the large bowlder.

Sandman Reefs, a large area of foul ground with numerous islands, islets, and rocks, extends in a southerly direction from Deer and Outer Iliasik Islands almost to the Sanak Islands, and in an easterly direction to beyond Pinnacle Rock. This area is unsurveyed and the passage between them and the Sanak group should be avoided. From Deer Island these reefs appear as an unbroken series from the north around to Sanak Island.

BELKOFSKI TO IKATAN BAY

Belkofski, a native settlement, consists of a church and about 25 houses. The church is painted white and is prominent. Vessels anchor off the village in 10 fathoms (18.3 m.) and land goods on the sand and bowlder beach unless southerly weather makes the surf too heavy.

It is a post village and the monthly mail steamer from Seward makes regular stops. In the summer the village is nearly deserted, and most of the natives work in near-by salmon canneries, at which time the post office is moved to King Cove.

Cape Belkofski, the prominent point southwest of the village, is a cliff 40 feet (12.2 m.) high marked by a fixed white light on a small wooden house. A reef extends 600 yards to the southwestward from this point, and the shore for ½ mile on either side is fringed by a reef extending from 100 to 200 yards offshore. In view of the broken and uneven bottom here, the cape should be rounded at a distance of not less than ¾ mile.

Belkofski Bay (chart 8703) is deep and free from hidden dangers, except for reefs and ledges near the shore.

Kitchen Anchorage, on the east side of Belkofski Bay, is easy to reach and affords good shelter in all except northwesterly winds. In strong southerly weather, the williwaws become frequent and violent. The bottom is soft volcanic mud and its holding quality is good. A large fresh water stream flows into the head of the harbor and a fish trap is located at about the middle of the southern shore.

From the northern entrance point of Kitchen Anchorage for a mile to the entrance to the outer portion of Captain Harbor, the shore is a steep-to cliff, and may be approached within 200 yards.

Captain Harbor is the indentation at the extreme northeastern end of Belkofski Bay. It extends for nearly 2 miles in a northerly direction with an average width of ⅜ mile, and is divided into an outer and inner anchorage by a shingle spit extending from the western shore. The outer portion is narrowed to a width of 300 to 450 yards between the 3-fathom (5.5 m.) curves, and the anchorage is in 10 fathoms (18.3 m.) in the center with the eastern end of the shingle spit bearing 33° true (N. by E. ¼ E. mag.), distant 600 yards. The holding ground is poor, being soft volcanic ash over a hard substratum.

The northern shore of the outer anchorage is a low cliff, with shoal water extending 300 yards offshore from the western entrance point to the shingle spit separating the two basins.

The western entrance is formed by two low sand and gravel islets, with flats extending 250 yards to the eastward and similar flats extending 400 to 600 yards off the beach for 2 miles to the westward.

The entrance to the inner basin is about 350 yards wide, with 9 fathoms (16.5 m.) in mid-channel. The inner anchorage is entirely landlocked and is a secure anchorage for small craft in 7 fathoms (12.8 m.), mud bottom, with the end of the shingle spit bearing 185° true (S. by E. ⅛ E. mag.), distant about 600 yards. This is the best small-boat harbor along this section of the coast.

Directions for Captain Harbor.—Round the prominent point at the southern entrance to Kitchen Anchorage at a distance of ⅜ mile, and steer 30° true (N. by E. mag.) to a point 250 yards off the southeastern entrance to Captain Harbor. Then steer 54° true (NE. ¾ N. mag.) and take up anchorage as desired.

To enter the inner harbor, continue on the 54° true (NE. ¾ N. mag.) course until midway between the end of the shingle spit and the opposite shore; round the spit and steer 3° true (N. by W. ¼ W. mag.) for a small stream. Anchor as indicated in previous paragraphs.

Indian Head is a very noticeable promontory about 200 feet (61 m.) high, projecting ½ mile into Belkofski Bay on its western shore. It is distinguished by several pinnacles near the outer end; a reef extends 250 yards off the point.

The bight north of Indian Head is of even bottom, with the 3-fathom (5.5 m.) curve about 600 yards offshore. Vessels of any size will find excellent shelter from all except southerly winds in this bight. Anchorage can be made in from 10 to 20 fathoms (18.3 to 37 m.) sticky bottom. In the severe northerly winds anchorage can usually be found in some section free from the wind.

In 1925 the survey ship *Pioneer* found this anchorage by far the best in this section except for southerly weather, and the Fox Island Anchorage the best for southerly winds.

Slavna Point is the high rocky point at the western entrance to Belkofski Bay, about 1¾ miles southward of Indian Head. It is steep-to, with depths of 8 fathoms (14.6 m.) 200 yards off the point.

Sarana Island, about 135 feet (41 m.) high, is a rocky island lying off the southern point of Outer Iliasik Island. The island is fringed with reefs and should be avoided. The passage between it and the Outer Iliasik appears foul. A reef, bare at low water, was seen about 1 mile eastward of Sarana Island, and an extensive reef with occasional bare rocky islets appears to extend to the southward from the south point of Outer Iliasik Island.

A rock with 2 feet (0.6 m.) over it lies about midway between the south end of Outer Iliasik Island and Deer Island. Vessels should keep well to the northward of this rock, as the area to the southward has not been sounded and is known to be very foul.

Bold Cape is a rugged headland faced with vertical cliffs, above which the mountain rises in steep, rock-strewn slopes. Several prominent bowlders stand a few yards off the shore.

King Cove is at the head of a deep, narrow valley stretching inland between high ridges which rise from the shore on either side of the cove. The outer bay is deep and free from dangers except

those close to shore. Vessels may anchor in 16 fathoms (29.3 m.) ½ mile off the wharf and about midway between the two shores. The anchorage is subject to violent williwaws, which are apt to sweep across the bay from all points of the compass, but the holding ground is excellent.

There is a salmon cannery here and a wharf belonging to the cannery company. Vessels of considerable size (2,000 tons or more) can lie across the two faces of the wharf. In going alongside this wharf vessels should always drop a bower anchor to enable them to get away in case of the wind being from the southward. There is fresh water on the dock, but as the supply is limited it is not always available for vessels.

The cannery company maintains a slipway for hauling out their own boats, and this slipway is available during the cannery season for emergency repairs. Vessels up to about 100 feet in length can be hauled out. A good machine shop is operated in connection with the cannery, and carpenters are usually available. A small amount of coal and gasoline is kept on hand and might be available in emergencies.

Communication.—During the summer season (April to September) steamers of the Pacific American Fisheries sail from Bellingham on about the 1st and 15th of each month, calling at King Cove, Ikatan, and Port Moller. These vessels carry passengers and freight, but do not carry mail. The monthly mail steamer from Seward calls at King Cove only when business is offered.

To enter, steer for the wharf on a mid-channel course. On the ebb tide a strong current parallel with the shore sets eastward along the face of the dock. This current is caused by the discharge of water from the lagoon.

A radio station is maintained here during the cannery season, usually from April to September, and there is a post office during the summer season.

King Cove Lagoon.—At the head of King Cove a long spit on which the cannery is located, projects from the eastern side. This spit is slightly overlapped by a similar spit extending from the western side. Between the spits, just westward of the shipyard, is the narrow entrance to the lagoon. The lagoon extends in a north-northeasterly direction for nearly 2 miles with depths of from 5 to 8 fathoms (9.1 to 14.6 m.) over most of the area. There is a basin at the southern end of the lagoon with depths of 5 to 7 fathoms (9.1 to 12.8 m.), where the floating equipment of the cannery is usually moored. An extensive shoal separates this basin from the deep water in the northern section.

There is a depth of about 4 feet (1.2 m.) in the narrow entrance, and vessels of 6 feet (1.8 m.) draft and less than 100 feet in length can enter at high water. Boats drawing not more than 3 feet (0.9 m.) can continue to the northern basin at high water.

There is a good sand beach for beaching small craft on the sand spit forming the northern shore of the entrance to the lagoon. The beach slopes evenly and is smooth.

Due to the extensive flats which block the entrance to the upper basin of the lagoon, the plane of mean lower low water in that part

of the lagoon is about 2 feet (0.6 m.) higher than the corresponding plane in the cove, and there is a considerable lag in the times of high and low water.

Deer Island is a series of high conical peaks, many of which are so nearly of the same elevation as to be recognized with difficulty from different positions. The north shore is determined by a good reconnaissance, but the limits only of the other sides are shown. **Stag Point,** at its north end, is a short sand spit, except for which the shore is rocky and steep. Back of the point is a high sugar-loaf peak. The point may be recognized by a steep, high, triangular-shaped bluff at the end of a shoulder of the peak which is conspicuous in the otherwise sloping sides. **West Cape** is a ridge of bare rock ending in sheer faces at the western extremity and at the two sides.

Approaching Deer Island from westward Fox Island shows up low and irregular and is not very distinct until some time after passing Umga Island, unless the weather is exceptionally clear. **West Cape** of Deer Island shows as a flat-topped sugar loaf, apparently a detached island, but later is seen as a part of Deer Island, while at the same time Stag Point shows as a high sugar loaf beyond West Cape. Southward of West Cape are two barren, craterlike peaks, which form an excellent landmark.

Fox Island is marked by an unwatched white flashing light on its northwestern point. The light is on a white box, 40 feet (12.2 m.) above the water. Just back of the light is a prominent knob, which is separated from the rest of the island by a low neck of land. The southeastern part of the island is high and nearly flat-topped.

Fox Island Anchorage on the east side of Fox Island offers a good anchorage in 10 to 16 fathoms (18.3 to 29.3 m.), soft bottom, well sheltered from the wind and sea from northeastward to southwestward.

A rock with 3 fathoms (5.5 m.) over it exists in the channel about midway between Fox Island and West Cape.

The **passage between Fox Island and Deer Island** is clear except for the 3-fathom (5.5 m.) spot mentioned above. In leaving the anchorage through this passage, round the southern end of Fox Island at a distance of 500 yards and lay a course to pass midway between the buoys off Thin Point.

About 2 miles from Fox Island and a little westward of a line to Sozavarika Island is a rock with 3 fathoms (5.5 m.) over it. The southwest side of Deer Island has not been surveyed, but it appears to be very foul.

Current.—Eastward of Deer Island the flood current sets northward and the ebb southward.

North of Fox Island the flood current sets northeastward and the ebb southwestward. The tidal currents here are not strong.

Deer Passage is marked by a red buoy on the north and a black buoy on the south. The bottom is smooth and regular and consists of sand, shells, and gravel. By passing ½ mile northwestward of the black buoy, least depths of 9 to 10 fathoms (16.5 to 18.3 m.) can be carried through. In thick weather vessels coming from the westward if unable to pick up the buoys, should anchor and wait for the weather to clear, for there are dangers on each side of the pass.

(chart 8703) is a spacious body of water, navigable by ships of any draft. There are neither settlements nor commercial enterprises located in the bay. There are a few cabins occupied by fur trappers during the winter.

Weather.—Weather conditions here are bad, as the bay forms a natural draw through which strong breezes are usually found sweeping in or out. Often when there is little wind elsewhere, a strong wind will be found blowing out of Cold Bay.

Vodapoini Point at the eastern entrance to Cold Bay is low and flat-topped, with high mountains immediately behind it. In 1911 the magnetic variation here was observed as 29½° E., which would indicate some **local attraction,** as the mean variation here is about 18° E. The variation in 1923 at Thin Point, across the bay, was normal.

From Vodapoini Point to Lenard Harbor the country is high and mountainous, with the shores bold and rocky.

Bear Rock is a black jagged rock about 25 feet (7.6 m.) in height situated 300 yards offshore at a point 2 miles northwestward from Vodapoini Point. It shows up prominently from the eastern entrance to the bay.

Kaslokan Point is the end of a low spit composed of sand and gravel and covered with grass.

Kelp Point is low and rocky and marks the entrance to Lenard Harbor.

A **reef,** marked by a heavy kelp patch, lies ¾ mile westward from Kelp Point. From this patch a ridge with 2 to 5 fathoms (3.7 to 9.1 m.) over it extends across the bay to the western shore. This area is foul and should be avoided. A natural channel carrying depths of 11 to 15 fathoms (20.1 to 27.4 m.) exists between this kelp patch and Kelp Point. This channel is recommended for all vessels ascending the bay. During the big tides there is a strong current (probably 4 knots) in this channel, and with an adverse wind, tide rips dangerous for small boats are formed.

Directions.—Upon entering the bay, shape the course so as to pass 350 yards off Kasolakan Point, then steer 3° true (N. by W. ½ W. mag.), which should lead the vessel through the natural channel to the deep water 1 mile north of Kelp Point. From this point chart 8703 may be followed.

The northern shore of Cold Bay is bordered by many bowlders close in and should be navigated carefully, even by launches. The western shore of the bay consists of low bluffs and sand beaches with many bowlders strewn here and there, backed up by the rolling tundra land.

In the vicinity of the old saltery opposite Kelp Point the water is shoal and the bottom foul, with many bowlders and reefs scattered over it.

Lenard Harbor is a small but well-protected harbor formed by an arm of Cold Bay. The anchorage is in 16 to 22 fathoms (29.3 to 40 m.), protected from all seas. It has exceptionally good holding bottom, but during stormy weather it is subjected to the usual williwaws common to this section of the country. An extensive reef which is awash at ordinary high water exists ¼ mile off the south-

ern shore of Lenard Harbor. This reef constricts the anchorage to an effective width of about ½ mile. In the eastern end of the harbor the water shoals abruptly to form the extensive mud flats at its head.

A fine stream of water flows into Lenard Harbor from its northern shore.

From Lenard Harbor north the mountainous country gradually gives way to the low rolling tundra country that borders the northern and western sides of the bay.

Kinzarof Lagoon, at the head of Cold Bay, is large and irregular in shape. While it consists mostly of mud flats, it may be entered at high tide by small launches, and with local knowledge such boats may be taken to the cabin on the north shore of the lagoon. Just inside the western entrance there is a cabin and a small area of deep water.

Anchorages.—In northerly weather, comfortable anchorage may be selected at any place in the upper bay with mud bottom and good holding ground. In southeasterly weather good protection with excellent holding ground, may be had behind **Delta Point.** The only anchorage protected for all directions in Lenard Harbor.

Thin Point, forming the western entrance to Cold Bay, is a low grassy and gently rolling point. The extremity is a yellow eroded bluff with reefs, bare at low water, extending from its southwest and southeast points. Shoal water extends 1¼ miles southward from the point. A red buoy marks the outer end of this shoal.

Telegraph Hill, 340 feet (104 m.) in height, lies about 2½ northwestward from Thin Point. It is a grassy, symmetrical dome-shaped hill which stands out conspicuously as the only high ground near the point. It is a valuable landmark, for it is often visible when the higher hills are in the clouds.

Frosty Peak is the sharp rocky summit of a snow and ice covered mountainous mass lying between Cold Bay and Morzhovoi Bay. It is 5,820 feet (1,774 m.) in height and prominent from seaward, although its snow-capped summit is seldom visible through the low-hanging clouds.

Walrus Peak, a ragged summit of 2,927 feet (892 m.), usually shows prominently to vessels passing by when the peak is clear. All other peaks are so blended in the general mountain mass as to be of little use to the navigator.

Thin Point Cove lies westward of Thin Point. The eastern part of the cove is foul and should be avoided. Numerous kelp-marked reefs extend into the bay for a distance of 2¼ miles westward from Thin Point. The western half of the cove is clear except for reefs fringing the shore. At the head of the cove a series of shallow lagoons extend for several miles in a northerly direction and connected with Thin Point Cove by a small stream which can be entered by small launches at high tide.

This cove affords excellent shelter for small craft in northerly weather, but care should be exercised in entering to avoid the reefs to the south and west of Thin Point.

The **coast from Thin Point Cove to Morzhovoi Bay** is rather rocky, with an occasional sand beach and grassy bluffs rising from the water. The shore is fairly steep-to, and the shore reef, extending 200 to 500 yards offshore, is heavily marked with kelp.

Sandy Cove is a small bay 3 miles eastward of Egg Island. The head of the cove, which is at the foot of a deep valley making through the mountains, is clear. The eastern entrance point is steep-to. A reef extends nearly ½ mile in a southerly direction from the western entrance point. Good shelter in northerly weather is afforded small craft.

Sozavarika Island (known locally as **Grassy Island**) is low and grassy and lies 3 miles southwestward from Deer Island. The island is composed of shells deposited on rock. The island may be approached close-to on its northwestern side. Between this island and Deer Island there are many rocks and reefs.

Umga Island is a small, grass-covered, and rocky island about 250 feet (76 m.) in height. It is surrounded by deep water.

Rush Rock, with 10 feet (3.0 m.) over it, lies 1½ miles northeastward from Umga Island. It is nearly on range with the south side of Umga Island and Cape Pankof. This reef is of small extent, and breaks only with a heavy swell.

Amagat Island is high, bold, and shows as two parts; the southeast part is 1,030 feet (314 m.) high and has a dome-shaped peak, while the other part is 600 feet (183 m.) high, broader and flat-topped. The island is the nesting places for thousands of birds. A fair anchorage may be had in 16 fathoms (29.3 m.) just northeast of the island. There is a deep water passage between the island and Cape Tachilni.

Two miles south-southwestward from Amagat Island is a shoal spot of small extent with a least known depth of 5¼ fathoms (9.6 m.). Deep-draft vessels should avoid this spot.

Kenmore Head, forming the western entrance to Morzhovoi Bay, shows prominently from the usual coasting track. There is a small summit just west of the point which drops off with a vertical cliff to the water.

MORZHOVOI BAY

(chart 8701) is a broad pear-shaped bay with deep water extending to its northern shores. It has a broad deep entrance with no known dangers except a rock with 5 feet (1.5 m.) over it, 400 yards eastward of Kenmore Head. The land bordering the entrance is very mountainous, giving way to rolling tundra land at the head of the bay.

Tachilni Point, forming the eastern entrance to the bay, is an indefinite rounding point with grassy bluffs.

Egg Island, 325 feet (99 m.) high, is a rocky precipitous island with a fairly definite summit. Shoal water covered with kelp extends from the island to the mainland. The south side of the island has afforded temporary anchorage for small vessels while waiting for the northwest winds to moderate before crossing the bay. Morzhovoi Bay forms a natural draw for the wind which sweeps in and out of the bay with great violence. The cannery, which was once built near Littlejohn Lagoon, was moved to Isanotski Strait because of the severe winds and lack of protection in Morzhovoi Bay.

Littlejohn Lagoon, marked by a grassy islet off its entrance, offers excellent protection in all weather, but can be entered only by small craft. About 5 feet (1.5 m.) at low water can be carried through the crooked channel leading through the entrance, but once

inside, there are depths of 4 fathoms (7.3 m.) sticky mud bottom. In 1924 there were several dolphins near the entrance strong enough to moor vessels up to about 100 tons. Littlejohn Lagoon is occasionally used as a refuge for pile drivers and tenders used in driving fish traps in various parts of the bay.

The cannery formerly located just northwest of the lagoon, is abandoned and the buildings are rapidly becoming ruins.

Big Lagoon is the large irregular lagoon at the head of the bay. There is no entrance channel, and the lagoon is full of mud flats.

Middle Lagoon leads to a large lake which is a spawning place for a large run of salmon. There is a cabin, and usually a boat at the eastern entrance point. There is no channel, and with a southerly wind breakers extend across the entrance. During the autumn months there are great flocks of wild geese in the lagoon. From Middle Lagoon it is about 7 miles by the easiest route to the Bering Sea shore.

A short distance to the westward is **Little Lagoon.**

Boiler Point, on the southwestern side, marks the end of the mountain ridge which extends from the entrance. In the cove just northwest of the point there is a good anchorage, protected from all except northeast winds, with mud bottom.

Anchorages.—In northerly weather good anchorage with mud bottom may be had at any place along the northern shores. In southwesterly weather, the cove near Boiler Point offers good protection, while in easterly weather fair anchorage may be had off Littlejohn Lagoon. An indifferent anchorage may be had in the cove just northwest of Kenmore Head.

From **Kenmore Head to Kabuch Point** the shores are bold and mountainous, with deep water extending close-to.

IKATAN BAY AND ISANOTSKI STRAIT

(chart 8701) separate Unimak Island from the Alaska Peninsula. Isanotski Strait (known locally as False Pass) is in general use for fishing boats and other craft of less than 10 feet (3 m.) draft when bound for Bering Sea points. Vessels up to 419 feet in length have entered the strait and docked at the False Pass cannery which is on the Unimak side, 3½ miles within the entrance.

Ikatan Bay, on the north side of the Ikatan Peninsula, is deep and free from dangers except for the area north of Sankin Island. There is a cannery with a wharf at the southwest corner of the bay. The wharf is suitable for vessels of 2,000 tons, and has 24 feet (7.3 m.) along its face. There is a plentiful supply of fresh water piped to the dock. The cannery company operates a radio station during the season from April to September.

With strong northwest winds, vessels are unable to lie at this dock. During such times the cannery floating equipment seeks anchorage across the bay under Palisade Cliffs west of Sankin Island. Due to the steepness of the slope and the depth of water, only temporary anchorage can be had off Ikatan.

Ikatan Point, known locally as **Cape Horn,** is bold and rocky. There is an indifferent anchorage just west of the point, but vessels are apt to drag off into deep water.

Sankin Island, lying 1 mile from the north shore of the bay, is high and rocky. There is a reef awash at low water in the passage between the island and the mainland. It lies about ¾ miles 357° true (N. by E. ¾ E. mag.) from the west side of Sankin Island.

The southwest side of Ikatan Bay is separated from Otter Cove by a sandy isthmus 20 to 30 feet (6.1 to 9.1 m.) high; a shifting river enters the bay at the middle of this lowland and the flat off its mouth drops off abruptly to deep water. Several fish traps will be seen along this shore.

Isanotski Strait (False Pass) has its southerly entrance at the northwest end of Ikatan Bay.

Kabuch Point, at the eastern entrance of the strait, is high and rocky and is marked by a flashing white light 128 feet (39 m.) above the water. The western side of the entrance is a low sand beach and may be passed close-to. A reef, bare at low water, makes off a short distance from Kabuch Point.

Whirl Point, on the Unimak side about 1 mile within the entrance, is bold. A reef, bare at low water, makes off a short distance from the point, then drops abruptly to deep water. At high water the end of this reef is made evident by the swirls of the current.

A salmon cannery is located on the Unimak Island side 3½ miles northward of the Pacific entrance. There is a good dock here with a 200-foot face and 30 feet (9.1 m.) alongside. A good general store and a post office is maintained the year around. The official name for the post office is **False Pass.** The monthly mail steamer from Seward calls on both the outward and homeward trips. The cannery company maintains a radio station from about April to September each year. Limited supplies of gasoline, distillate, and fuel oil may usually be had. A plentiful supply of excellent water is piped to the dock. There is also a small oil dock with 13 feet (4 m.) along its face. The ebb current (flowing southward) sets toward the low flat point just south of the cannery, and with such a tide care must be taken to avoid being set onto this point on leaving the dock. Due to the strong currents and changeable eddies this dock must always be approached with caution. Often it will be slack water at the face of the dock with a strong current running a hundred feet out in the stream.

Directions, Ikatan Bay to the cannery.—In entering from Ikatan Bay the Unimak side should be favored to avoid the reef off Kabuch Point. Follow this shore to Whirl Point, which drops off abruptly and can be passed close-to. During the ebb current this reef deflects a violent current directly against the axis of the pass, tending to turn a northbound vessel toward the eastern shore. Careful steering is required to offset the effect of this current. After rounding Whirl Point stand directly for the cannery, taking care to avoid being set too near either shore. If unable to go alongside, a temporary anchorage may be had in the cove just northward of the dock.

A vessel must be able to make 11 knots to be able to stem the maximum current.

Times of slack waters.—The predicted times for slack waters here will be published in the current tables, starting with the 1927 edition. Although the times of slack water are somewhat irregular,

7½ hours added to the times of high and low water at San Diego gives the corresponding times of slack water at the cannery dock in one hundred and fiftieth meridian standard time.

Directions, Cannery to Bering Sea.—North of the cannery the depths gradually shoal to Chunak Point, where the limiting depths are 7 to 9 feet (2.1 to 2.7 m.). From abreast the cannery the Unimak shore should be followed at a distance of about ½ mile until abeam of Rocky Point. Just before reaching this point a cabin will be seen in a little cove on the Unimak shore. From Rocky Point head for the beacon, which is located on a prominent sand dune. Continue this course until the end of Chunak Point comes in range with the westerly end of the spit of Cape Krenitzin. Keep this range until near Chunak Point, then round the point at a distance of about 200 yards from the grass line. The channel diverges slowly from the shore until it is ½ mile offshore when abeam of the beacon. The channel then passes between two shoals that are usually breaking and deepens gradually to the open sea.

Vessels passing northward through Isanotski Strait should call at the cannery to obtain further information concerning the Bering Sea entrance.

Ice.—As a usual thing, the strait is open to navigation throughout the winter season, but during the winter 1923–24 the pass was entirely blocked with ice and the mail steamer could not get beyond Sankin Island. At this time there was drift ice from Cape Pankof to Sanak Island, a very unusual condition.

Traders Cove, on the eastern side of Isanotski Strait, is a good anchorage. There is a church and a small native village known as **Morzhovoi.** The village is deserted during the summer when the inhabitants are employed in the canneries.

Bechevin Bay, which is an enlargement of the northern end of the strait, is shoal and full of sand and mud flats. A blind channel leads from Traders Head toward the Isanotski Islands.

St. Catherine Cove is the eastern bight in the northern end of the strait. In former years there was a channel leading into the cove affording anchorage for small schooners, but of recent years it has shoaled and the cove is nearly bare at low water.

About 2¾ miles northwestward from Rocky Point and ½ mile offshore is a **reef** bare at extreme low water. Several local boats have struck this reef.

IKATAN PENINSULA

(chart 8701), the southeastern extremity of Unimak Island is about 13 miles long and is divided into three mountain masses and from Unimak Island by low depressions which extend from West Anchor Cove to East Anchor Cove, and from Dora Harbor and Otter Cove to Ikatan Bay.

Cape Pankof, the eastern end of the Ikatan Peninsula, is a bold rocky headland terminating in a ridge about 1,200 feet (366 m.) high and showing as a sharp peak from the northward and southward. It is marked by a flashing white light placed on a rock at the foot of the cape. The light is about 82 feet (25 m.) above the water.

Pankof Breaker is a sharp pinnacle rock with 3 feet (0.9 m.) over it, lying a little over 2 miles 53° true (NE. ⅞ N. mag.) from

the southeast point of the entrance to East Anchor Cove. During the summer season the rock seldom breaks. There are 12 to 14 fathoms (21.9 to 25.6 m.) close to the rock.

East Anchor Cove, on the north side of Cape Pankof, is a good anchorage except for winds from the north to southeast through east. The cove is large and easily entered, and the only danger in the approach is Pankof Breaker. There is a fish trap just inside the southeast entrance point. Anchorage may be selected as desired in 7 to 10 fathoms (12.8 to 18.3 m.).

Westdahl Reef, with 2¼ fathoms (4.1 m.) over it, lies 7¾ miles 104° true (E. ¼ N. mag.) from Cape Pankof Light. It is a rocky patch of small extent, and is the only danger found in this vicinity by the survey of 1923. Surveys were extended westward to a line joining the north end of Sanak Island with Cape Pankof and southward to a line connecting the north point of Sanak Island with Sozavarika Island.

Bird Island, about ½ mile in extent, 750 feet (229 m.) high, and precipitous, lies 2 miles from the south coast of Ikatan Peninsula, off the entrance to Dora Harbor, and 8 miles westward from Cape Pankof. A sunken reef connects the island with the western point at the entrance to Dora Harbor, and there is no safe passage for vessels between. The western end of the island should not be approached closer than ½ mile.

West Anchor Cove is a safe and commodious anchorage for any kind of vessel, easy of access and departure at any time. The cove is exposed to southerly weather, but with East Anchor Cove on the other side of the cape, safe and sheltered anchorage from any ordinary weather can be found in one or the other. The bottom is fine dark sand in which the anchor holds well. There is a narrow shelf of rocks along the shore at the east point of entrance, the outer edge of which shows at half tide and probably breaks all the time. There is 6 fathoms (11 m.) 70 yards off the visible end of the reef, with rapidly deepening water outward from there. The rock, 15 feet (4.6 m.) high, inside the cove marks the western limit of dangers on this side. Inside the cove rocky ledges extend not over 200 to 300 yards from the north and south shores. Near the head of the cove, on the southeast side, a rock column stands out prominently from the shore, marking the upper limit of the anchorage for all but small craft.

Dora Harbor, on the south side of Ikatan Peninsula, 2 miles north of Bird Island, affords good anchorage for small vessels with protection from all winds and seas, especially for vessels of 9 feet (2.7 m.) draft or less, which can anchor near the head. The entire shore of the harbor is fringed by ledges, partly bare at low water, to a distance of about 300 yards. The reef extending ¼ mile westward from the eastern point of the entrance and that projecting from the western point toward Bird Island afford protection from ordinary southerly and westerly swell at the outer anchorage, but a heavy swell from southward is uncomfortable. The inner harbor is a slight expansion at the head with depths of 10 to 12 feet (3 to 3.7 m.) in the middle; there is a fishing station and stream on its west side.

To enter Dora Harbor, steer for the west point of the entrance on a 334° true (NW. ⅛ N. mag.) course, passing ¾ mile northeastward of Bird Island. When the north end of Bird Island bears abeam steer 350° true (NNW. ⅜ W. mag.). Keep in mid harbor and anchor with the east point at the entrance bearing 154° true (SE. ⅛ S. mag.) and the west point 249° true (SW. ⅝ W. mag.) in about 5 fathoms (9.1 m.). This anchorage is about midway between the east point at the entrance and a projecting point on the west side halfway up the harbor, and the clear width of the anchorage is ¼ mile. Vessels of 9 feet (2.7 m.) or less draft may follow a mid-harbor course and anchor in the middle of the inner harbor, off the fishing station, in 12 feet (3.7 m.) of water.

Otter Cove is an open bight at the northwest end of Ikatan Peninsula. It is exposed to southerly winds and to the Pacific swell, and there is always a heavy surf. Northerly winds blow with great violence over the low isthmus separating it from Ikatan Bay. The only safe boat landing is in its eastern corner. A **rock awash** at low water lies over ½ mile from the shore of Ikatan Peninsula and 3½ miles northwestward from Bird Island.

The story has been handed down amongst the natives that a channel once existed between Otter Cove and Ikatan Bay and that the Russian vessels once sailed through here.

SANAK ISLANDS

are the southwestern islands of the groups off the southern side of the Alaska Peninsula. They consist of two large islands, Sanak and Caton Islands, and a great number of small islands and rocks southward of the former, 20½ miles long and 10½ miles wide, and all bare of trees. **Sanak Mountain,** at the northwest end of Sanak Island, is the prominent object seen in approaching the group and is about 3 miles long and 1 mile wide. It is a central peak (Sanak Peak) 1,700 feet (518 m.) high, with a lower peak on its western side about 700 feet (213 m.) high. This peak is often visible when the main peak is in the clouds. At about 4½ miles eastward of Sanak Peak this ridge again rises to over 200 feet (61 m.), but all the remainder of the group is but little over 100 feet (30 m.) on the northern side, decreasing to less than 40 feet (12.2 m.) high among the islands and rocks forming the southern side.

From time to time sunken rocks and breakers have been reported to the northwest of Sanak Island; no definite information can be given about them, but their reported positions are shown on chart 8860. Captain Johanson of the mail steamer *Starr*, who makes harbor regularly, winter and summer, states that he has never seen any signs of the two rocks marked (ED) about 5 miles northwestward of Sanak Light.

Crowley Rock, lying 1½ miles off the north side of Sanak Island and 348° true (NNW. ¾ W. mag.) from Sanak Peak, is several small pinnacles very close together. The least depth found was about 11 feet (3.4 m.), though there may be less, and there are depths of 9 to 15 fathoms (16.5 to 27.4 m.) close-to.

The western end of Sanak Island is fringed with rocks. The westernmost known break lies 1 mile 267° true (WSW. 1/8 W. mag.) from the northwesternmost bare rocks of the group and nearly 2 miles 281° true (W. 5/8 S. mag.) from the west point at the entrance to Sanak Harbor.

A reef, with five rocks which show above water, lies between 4 and 5 miles southwestward of Clifford Island. What is supposed to be **Hennig Rock** is the northernmost rock of the reef, and is nearly on the range of Sanak Peak and the western end of **Troitz Island,** the middle and largest Trinity Island and distant 3½ miles from Troitz Island. **Oneida Rock,** 4 miles 162° true (SE. ¾ S. mag.) from Hennig Rock, is the southernmost rock of the reef. It lies 5 miles from Clifford Island and 224° true (SSW. ¼ W. mag.) from Sanak Peak.

A narrow bank about 5 miles long in a 120° true (E. by S. mag.) direction is reported to lie 7 miles southwestward of Clifford Island. Depths of 2 to 7 fathoms (3.7 to 12.8 m.) were found on it, and it is marked by kelp at slack water. The least depth was found at its northwest end, which lies 12 miles 238° true (SW. ½ S. mag.) from Sanak Peak.

Aleks Rock is in latitude 54° 20′ N., longitude 163° 10′ W., and lies 16¾ miles 241° true (SW. ¼ S. mag.) from Sanak Peak. It is the farthest outlying known rock southwestward of Sanak Island. The least depth found was 9 fathoms (16.5 m.), but it is reported to break with an ordinary swell.

Anderson and Leonard Rocks on Davidson Bank, southwest of Sanak Island, long of doubtful existence, have been removed from the charts. Repeated systematic searches of several months' duration, in all weathers, have failed to indicate shoals in the vicinity where these rocks were reported. All reported positions of them are along the edge of the bank. The bottom is extremely level and regular to the 100-fathom (183 m.) curve and drops abruptly there. The vessels making the survey carried submarine sentries set at 30 to 40 fathoms (55 to 73 m.), but no dangers were found. The current runs westerly; with an easterly wind it reaches a strength of ¾ knot. It runs south of west when the wind is north of east, and runs north of west when the wind is south of east. Along the 100-fathom (183 m.) curve it reaches a strength of more than 1 knot. Tide rips are often seen here.

The anchorages at Sanak Islands are suitable for small or moderate sized vessels only, and with the exception of Caton Harbor there are no harbors affording shelter from all winds.

Sanak (Acherk) Harbor, at the northwest end of Sanak Island, is ¾ mile long and about ¼ mile wide, and affords a contracted anchorage for small vessels with protection from southerly and westerly winds, but is exposed to winds from northwest to east, and a swell makes in with strong westerly winds. There is a small settlement at the southeast corner of the harbor, at which there is a boat landing, and water can be obtained by boats. The mean rise and fall of the tide is about 4½ feet.

There is a flashing white light on the point on the east side of the middle part of the harbor. A beacon is established on a hill on the western shore of the harbor. The beacon is 184 feet (56 m.)

above the water. The following shoal spots have been reported in the harbor: An 11-foot (3.4 m.) shoal 50 yards 326° true (NW. 5/8 W. mag.) from the 2½ fathom (4.6 m.) spot near the head of the harbor; a rock marked by heavy kelp with a least depth of 7 feet (2.1 m.) 235 yards 277° true (W. 7/8 S. mag.) from Sanak Light. Caution should be used in this harbor, as there may be other unknown dangers.

A monthly mail steamer calls at Sanak, and there is a store and a post office. It is the center of a cod fishery. There are cattle raised on the island.

Approaching Sanak Harbor from northward and eastward there are several reported dangers, the positions of which are shown on chart 8860, but the only known dangers are Westdahl Reef and Crowley Rock; the safest way to avoid Crowley Rock in coming from the eastward is to keep within ¾ mile of the north shore of Sanak Island from abreast of Northeast Point.

Approaching from the northwestward steer for the western hill of Sanak Mountain on any bearing between 140° true (SE. by E. 1/8 E. mag.) and 176° true (SSE. mag.), taking care to avoid Westdahl Reef. When off the entrance, steer 193° true (S. 3/8 E. mag.) for the middle of the entrance, and anchor a short distance to the northward of the light, taking care to avoid the 7 foot (2.1 m.) spot which lies in line between the light and beacon. There are sunken rocks off the points at the entrance, but they are marked by kelp and can readily be avoided.

Murphys Crack is a small indentation about 1¼ miles east of Sanak Harbor. It is protected by a reef and affords shelter for the boats of the fishermen who live here.

Pavlof Harbor is a small bay about 1 mile east of the eastern base of Sanak Mountain. It is reported to be a good harbor for small craft, but requires local knowledge because of the protecting reefs at the entrance, and vessels drawing more than 7 or 8 feet (2.1 or 2.4 m.) can not use it. There is a fishing station here.

Unimak Cove, 1¼ miles east of Pavlof Harbor, is an open bight, and unimportant.

Johnson Bay, 1½ miles west of Northeast Point, has an inner harbor for boats and small craft, where there is a fishing station, and vessels may anchor just inside the entrance to the bay, favoring the east side, in about 9 fathoms (16.5 m.), with protection from southerly and westerly winds. There are some rocks close to the west point at the entrance.

Northeast Bay, at the northeast end of Sanak Island, affords anchorage with shelter from northwest and southwest winds, but is exposed to easterly winds. **Northeast Point,** forming the north side of the harbor, is about 100 feet (30 m.) high. **Eagle Rock,** about 50 feet (15.2 m.) high, lies near the middle of the harbor; it is surrounded close-to by a ledge which covers, and a sunken reef connects it with the head of the harbor. Water can be obtained by boats at the head of the harbor.

To enter give Northeast Point a berth of about ¼ mile and anchor between the point and Eagle Rock, slightly favoring the point, with Chernabura Island just open of Northeast Point, in 6 to 9 fathoms (11 to 16.5 m.), sandy bottom.

Lida Anchorage is a temporary anchorage in southerly winds, at the west end of Caton Island, south of Lida Island, and which may be entered on either side of the latter.

Approaching from eastward stand in near the visible rocks off the east end of Lida Island, taking care to avoid the partially covered reef, nearly ½ mile eastward of **Lida Island,** which extends in a northerly direction from Caton Island. Anchor about ¼ mile from Caton Island, and ¼ to ½ mile southward of Lida Island, in 6 to 7 fathoms (11 to 12.8 m.), sandy bottom; care should be taken not to approach the south side of the anchorage.

Approaching from westward steer for the southwestern side of Caton Island on a 144° true (SE. ¾ E. mag.) course, passing about ⅜ mile southward of Lida Island, and leaving a rock awash, lying ½ mile northward from Wanda Island, about ⅜ mile on the starboard hand, and anchor as directed above. The western end of Lida Island should not be approached closer than ½ mile.

Caton Island, the eastern end of the group, is fringed with reefs and breakers to a distance of 1 mile. With perhaps the exception of Peterson Bay, the entire south side of Sanak Islands is dangerous for a stranger to approach.

Caton Harbor is a large area with general depths of 2 to 3 fathoms (3.7 to 5.5 m.), sandy bottom, on the southwest side of Caton Island, protected on the south by **Elma Island** and on the northwest by the islands and reefs, above water in many places, between Caton Island and Sanak Island. It is protected from all swells, and schooners of considerable size have wintered here. The entrance is narrow and is close to the west end of Caton Island; there is another entrance, crooked and very narrow, between Elma Island; and the southeast end of Sanak Island, but its approach from southward is full of rocks and reefs, and it should not be used except with local knowledge.

To enter Caton Harbor from northward proceed as directed for entering Lida Anchorage from westward, and when well past the rock awash, mentioned under Lida Anchorage, bring the south side of the rock awash in range with Northeast Point astern, and stand in, keeping the range astern, course 125° true (ESE. ½ E. mag.), until close to Caton Island. Then keep the bare rocks and kelp projecting from Caton Island close aboard on the port hand, but do not approach the kelp on the starboard hand; the least depth found in the narrowest part of the passage was 4½ fathoms (8.2 m.), shoaling inside to 3½ and 3 fathoms. When past the rocks on the port hand steer about 193° true (S. ⅜ E. mag.) about ½ mile, and anchor in about 3 fathoms (5.5 m.) with **Princess Rock** (high, grassy on top, extensive surrounding reefs covered at high water) in line with Sanak Mountain, bearing 294° true (W. ⅝ N. mag.). This anchorage is about ½ mile from Caton Island, and the same distance from the nearest reef on the western side. Anchorage, with probably better shelter from northeast gales, can be made off the sand beach on Caton Island, just inside the narrow entrance.

Peterson Bay, on the south side of Sanak Island, is well protected from all but southeast winds, especially for small vessels, of 12 feet (3.7 m.) or less draft, which can anchor well inside the bay abreast

the village which is on the north side. The people living here say that in heavy northeast winter gales a heavy swell makes into the bay. The bay is over 1½ miles long 300° true (W. by N. mag.), nearly ½ mile wide at the entrance and ¾ mile wide at the head, with about 5 fathoms (9.1 m.) at the entrance and shoaling gradually toward the head, where there is 12 to 14 feet (3.7 to 4.3 m.) in the widest part of the bay. There is a spot with 11 feet (3.4 m.) over it 350 yards off the south side and 344° true (NW. by N. mag.) from the south point at the entrance. The mean rise and fall of the tide is about 4½ feet (1.3 m.).

To enter, in approaching from eastward give the east and southeast sides of Caton Island a berth of about 2 miles to the clear the reefs and the breakers which extend more than 1 mile offshore, and steer 262° true (SW. by W. ⅝ W. mag.) passing 1 mile southward of Umla Island and Telemitz Island. When the latter island is abeam bring the tangent of the north side of Peterson Bay in line with the slight saddle between Sanak Peak and the eastern shoulder of Sanak Mountain, and run in on this range course 318° true (NW. by W. ⅜ W. mag.). When the south point of the bay is about ¾ mile distant, haul northward a little so as to bring the north side of the bay in line with the extreme southwest tangent of Sanak Mountain, and run in on this range, course 311° true (WNW. mag.), until the south point at the entrance bears 187° true (S. by E. mag.). Then steer 294° true (W. ½ N. mag.) for the middle of the bay and select anchorage according to draft.

Hague Rock, 9 miles north-northeastward from Sanak Island, is a rocky islet with deep water on its southern and eastern sides. The channel between Hague Rock and Sanak Island has been used several times by large steamers proceeding directly to sea from Ikatan Bay. The area has not been surveyed and no information can be given.

Chernabura Island, 14 miles north-northeastward from Sanak Island is grass-covered and composed of gently rolling hills about 100 feet (30 m.) in height. It is reported that there are cattle on the island.

UNIMAK ISLAND, OTTER COVE TO CAPE SARICHEF

This coast, having a length of about 70 miles, has cliffs in places, with lower land and sand beaches between, and is backed by the high mountain masses of the central part of the island. The coast is fairly regular, with no indentations of any extent, and there are no harbors nor sheltered anchorages. The coast is exposed to the ocean swell, and there is generally a heavy surf, which makes landing dangerous. From the few soundings made, the 10-fathom (18.3 m.) curve is less than ¾ mile from the beach in most places, and there are no known outlying dangers.

Cape Lazaref is the southwesternmost of three high cliffs, with sand beaches between them, and is 1,000 feet (305 m.) high. From the sharp point of the cape a reef extends 1⅛ miles southeastward. On this reef are the north and south pinnacle rocks, 150 feet (46 m.) high, with a 70-foot (21.3 m.) rock between them. **Anchorage,** with fairly good protection from westerly winds, can be had north-

eastward of this reef, about ½ mile southward of a bunch of rocks lying ⅜ mile off the eastern side of the cape, in 10 fathoms (18.3 m.) sandy bottom. A rocky islet about 130 feet (40 m.) high lies 1½ miles westward from the cape and ⅝ mile from the beach.

From Cape Lazaref the coast trends westward, curving gradually southward for about 30 miles, forming a broad, open bight called **Unimak Bay,** having a sandy beach. This sand beach is broken by a lava bed 8½ miles westward of Cape Lazaref, and by three conical hills, the southernmost reaching the water and formed into several columns, making a small projection (**Rukavitsie Cape**), 15 miles westward of Cape Lazaref. At the southern end of the sand beach there is a broad valley, the south point of which is a sharp projection, with steep sides and about 350 feet (107 m.) high, which forms a small cove (**Promontory Cove**) open northward, which is reported to afford anchorage with protection from southerly winds but not from the swell. The bottom is sandy and the shoaling toward the beach gradual.

Cape Lutke, 2½ miles southward of Promontory Cove, is a cliff 538 feet (164 m.) high, joined by a lower ridge to the higher land farther back, and is the southwestern head of Unimak Bay. At this point the coast changes direction to southwestward and then westward for 13 miles to Seal Cape.

Arch Point, 3 miles northeastward of Seal Cape, is a rocky projection 40 feet (12.2 m.) high with an arch through the extremity of the point.

Promontory Hill, 5 miles northeastward from Seal Cape, is a short ridge, about 1,130 feet (344 m.) high, having a northwest and southeast direction, and detached from the interior highland. Its outlines are smoothly rounded and there is a slight saddle in the ridge, the whole having a bare, brown appearance. It is isolated and prominent, and together with Scotch Cap is a good landmark for the eastern entrance to Unimak Pass.

Seal Cape is not particularly noticeable, but the locality is well marked by Promontory Hill, Arch Point, and Scotch Cap.

From Seal Cape around to Cape Sarichef, a distance of 19 miles, the coast of Unimak Island has a number of projecting points, is low in appearance, and slopes gradually upward to the highland of the island. There are low bluffs in places, but none so high as Scotch Cap or which can be mistaken for it. There are no dangers if the coast be given a berth of ½ mile.

Scotch Cap Lighthouse is about 1¾ miles eastward of Scotch Cap. The structure is a white building with an octagonal tower and there are a number of buildings near it. The light is 90 feet (27.4 m.) above high water and is fixed white with an obscured sector from 107° true (E. mag.) to 274° true (W. by S. mag.). The fog signal is an air diaphone, blast 4 seconds, silent 56 seconds. If the diaphone is disabled the air whistle will sound the same characteristics. The light and fog signal are in operation throughout the year. The mail steamer calls if the sea is smooth enough to permit a landing.

Scotch Cap is a precipitous cliff of rock which extends along the beach nearly 1 mile. It is 420 feet (128 m.) high at its highest point and becomes lower at either end. Back of the face of the cliff the

land slopes downward for nearly 1 mile, and then rises by a uniform slope to the higher land of the island. Scotch Cap can be seen many miles in clear weather and is unmistakable.

Scotch Cap Pinnacle is a pinnacle rock 172 feet (52 m.) high, located in front of the cliff 50 yards from the cliff.

Cape Sarichef, the western end of Unimak Island, is the eastern point at the northwestern entrance to Unimak Pass. The cape is about 100 feet (30 m.) high, with steep grassy sides, and the land back of the cape slopes gradually upward to Pogromni Volcano. There is a black lava bed along the beach south of the cape, and 2 miles south of the cape there is a flat rock barely detached from the coast.

A bank of black sand extends 2.9 miles 267° true (WSW. ¼ W. mag.) from Cape Sarichef; there are depths of 10 to 15 fathoms (18.3 to 27.4 m.) over it, and there are heavy tide rips, overfalls, and eddies; the current reaches an estimated force of 2 knots. The banks

Cape Sarichef Lighthouse bearing about northeast by east (magnetic)

appear to be an extension in a west-northwesterly direction of the old lava flow which may be seen 1 mile southward of Cape Sarichef Lighthouse. No dangerous rocks were found. In 1924 the survey ship *Pioneer* anchored on this bank with calm weather while strong winds were blowing a short distance both to the north and south. A reef is reported to extend about ¾ mile from the shore about 1 mile northwestward from the lighthouse.

Cape Sarichef Lighthouse, an octagonal tower on a white structure, is located on the summit of the cliff. There are a number of buildings near it. The light is occulting white, light 25 seconds, eclipse 5 seconds, 126 feet (38 m.) above high water, and visible 17 miles. It is obscured from 223½° true (SSW. ⅜ W. mag.) to 18½° true (N. ¼ E. mag.), the bearings being from seaward. The fog signal is a first-class air siren, blast 3 seconds, silent 5 seconds, blast 3 seconds, silent 49 seconds. The light is discontinued from December 1 to March 1, except when vessels are known to be in the vicinity.

ALEUTIAN ISLANDS

This chain extends from Unimak Island to Attu Island, a distance of over 900 miles. The islands fall into various groups, of which the Fox Islands, Islands of the Four Mountains, Andreanof Islands, Rat Islands, and Near Islands are the most important.

The topographic features are uniformly rugged; the islands are mountainous, and the shores bold, with numerous offlying islets, rocks, and reefs. In the absence of surveys, the only safe assumption is that these features are duplicated beneath the surface of the water. At all times in approaching the land, therefore, vessels should be navigated with great caution.

Aside from the lack of surveys, the greatest difficulties in navigating this region are due to a combination of prevailing thick weather and currents which, largely influenced by weather conditions, attain considerable velocity at times. A statement embodying all available information regarding these currents, is given on page 13.

FOX ISLANDS AND PASSES

The three large islands, Unimak, Unalaska, Umnak, and their associated islands, lying westward of Alaska Peninsula, are known as the **Fox Islands.** The islands of this group are high, bare of trees, and generally grass covered, and terminate generally at the water in precipitous cliffs. Most of them have numerous pinnacle rocks close to the shore. They are frequented by birds in enormous numbers, and immense flocks of them are frequently met with when in their vicinity. The highest peaks which, in clear weather, are prominent landmarks for mariners are:

Roundtop Mountain, on Unimak Island, in latitude 54° 48′ 09″ N. and longitude 163° 35′ 35″ W. is a rounded summit 6,155 feet (1,876 m.) high, surrounded by snow fields.

Shishaldin Volcano, on Unimak Island, 9,387 feet (2,861 m.) high, in latitude 54° 45′ 23″ N. and longitude 163° 58′ W., is cone shaped and very regular in outline, with faint wreaths of smoke and vapor at times drifting from its summit. It is for the most part snow clad, except where the rocky cliffs and projections afford no lodgment.

Isanotski Peaks, on Unimak Island, in latitude 54° 46′ N. and longitude 163° 43′ 30″ W., is seen close eastward of Shishaldin, very rugged, and having a broken or castellated double summit, the highest 8,088 feet (2,465 m.) high. The summit is bare and looks as though composed of great vertical rock masses.

This mountain is known locally as **Ragged Jack.**

Pogromni Volcano, about 8 miles from the western end of Unimak Island, in latitude 54° 34′ 16″ N. and longitude 164° 41′ 30″ W., is 6,500 feet (1,981 m.) high, a snow-clad, conical peak, vertical ridges cropping through the snow. Pogromni is a guiding landmark in clear weather in making Unimak Pass, both from southward and from Bering Sea.

Makushin Volcano, on the northwestern side of Unalaska Island, in latitude 53° 52′ 20″ N. and longitude 166° 50′ 40″ W. (approximately), is 5,691 feet (1,735 m.) high, and in clear weather is a prominent landmark for vessels bound to Dutch Harbor from Bering Sea.

These mountains are excellent landmarks if they can be seen, but in summer they are usually obscured by fogs or low-lying clouds. The lower hills and islands and objects near the sea level generally furnish the available landmarks.

From southward and eastward, bound for Bering Sea, there are three passes used by deep-draft vessels, known collectively as the **Fox Islands Passes,** and respectively as Unimak, Akutan, and Unalga Passes. The largest and most desirable one to use in thick and foggy weather is the eastern one, Unimak Pass. This is clear of hidden dangers, the widest of the three, and is comparatively free from tide rips. It is especially recommended for sailing vessels, and for steamers bound northward direct. Akutan and Unalga Passes are convenient, with daylight and clear weather, for steam vessels bound to Unalaska Bay, but, being narrow and having strong currents and tide rips at times, are not recommended for sailing vessels bound north. A fair wind is almost necessary for the passage, and from southward this would bring thick weather. The minor passes between the islands westward of Unimak Pass are described under their several headings following.

Soundings.—Southward of the passes the 100-fathom (183 m.) curve is 20 to 40 miles offshore, and when inside of this depth the color of the water will have changed from dark blue to light green. This change in the color of the water is the best indication the mariner has in thick weather to warn him of his approach to land and that he is on soundings. Southwest of Unimak Pass the 50-fathom (91 m.) curve is 3 to 5 miles offshore, and in thick weather the greatest caution should be used in approaching inside of this depth. Southeast of Unimak Pass the water shoals rapidly from 100 fathoms (183 m.) to Davidson Bank, on which a least depth of 36 fathoms (66 m.) is marked 27 miles from Ugamak Island.

Tidal currents and tide rips.—In the vicinity of the passes the tidal currents have considerable velocity, and their direction and times of change are uncertain; they are also greatly influenced by winds. In navigating near the entrances to the passes the current should be kept in mind and precautions be taken to guard against being carried into dangerous localities, especially in thick weather.

In **Unimak Pass** the current at strength of flood and ebb averages about 2 knots and its velocity is greater near Scotch Cap and Ugamak Island than in the middle of the pass. The northerly (flood) current begins about three hours before the time of high water at Kodiak and the southerly (ebb) current begins about three hours before the time of low water at Kodiak as taken from the Coast and Geodetic Survey Tide Tables. Strength of flood and ebb occur about the times of high and low water at Kokiak. The tide rips, during the largest tides and when a strong wind opposes the current, are strong but not dangerous to well-found sailing vessels or steamers.

Instances have been reported of vessels hove to off the entrances waiting for clear weather being carried through the pass by the current and finding themselves on the opposite side when the fog lifted.

In **Akutan Pass** the currents have an estimated average maximum velocity of about 4 knots. The northerly (flood) current be-

gins about three hours before the time of high water at Kodiak and the southerly (ebb) current begins about three hours before the time of low water at Kodiak as taken from the Coast and Geodetic Survey Tide Tables. Strength of flood and ebb occur about the times of high and low water at Kodiak. There are strong tide rips during the periods of largest tides; but the strongest rips are not generally found in the middle of the pass. With a current setting northward the rips will be strongest in the northern entrance from Cape Kalekta and Akutan Island to Unalga Island, and with a current setting southward the strongest rips will be found at the southern entrance to the pass. When the current setting north is opposed by a strong northerly wind the tide rips in the northern entrance to the pass are dangerous, and it is advisable not to use this pass in a gale. Under ordinary conditions, when there are no strong winds, this pass can be used by full-powered steamers at any stage of the current, but sailing vessels should not use it unless they happen to enter at or near slack water. It is stated that the most dangerous rips occur at the north entrance to the pass.

In **Unalga Pass** the currents have an estimated maximum velocity of about 6 knots, and the times for the beginning of flood and ebb currents are about the same as for Akutan Pass. The tide rips prevail under the same general conditions as in Akutan Pass, except that they are, if anything, heavier and more dangerous in a gale.

The duration of both flood and ebb is subject to considerable variation in these passes, so that too much reliance should not be placed upon the times given above.

Capt. J. J. Gilbert, commanding the Coast and Geodetic Survey ship *Pathfinder*, who surveyed the Fox Islands Passes in 1901, states that "they [tide rips in Akutan and Unalga Passes] occur during spring tides, when the currents are strong, and usually when there is a strong wind or swell from the other direction; this condition is not indispensable, for, on one occasion, there was neither wind nor sea, when suddenly we were in the midst of the rips, and had wet things pretty thoroughly before the hawse pipes could be closed."

When the tide rips are heaviest in Akutan and Unalga Passes, the water is broken into heavy choppy seas from all directions, which board the vessel and make it difficult to keep control even of large, powerful steamers.

The general conditions of **fog** and **weather** described on page 262 apply also to the vicinity of the Fox Islands Passes.

UNIMAK PASS

is the widest of the Fox Islands Passes, being about 10 miles wide at its narrowest part, between Ugamak Island and Scotch Cap. It is free from outlying dangers and dangerous tide rips, and the tidal currents have less velocity than in the other passes. Except near the shores, it is free from williwaws. It is the most desirable pass for sailing vessels and for vessels not calling at Dutch Harbor. The directions for approaching this pass are also good for vessels desiring to pass through Akutan and Unalga Passes.

DIRECTIONS, UNIMAK PASS

Directions from Cape Pankof through Unimak Pass to Cape Kalekta are given on page 164.

In the directions following no allowances has been made for the tidal currents, which have considerable velociety in Unimak Pass; this should be kept in mind in order to make the courses good.

When approaching the passes from southward and eastward care must be taken to avoid the Sanak Reefs and Aleks Rock. A good rule is to make longitude 164° W. while still south of latitude 54° N. and then stand northwestward to make Seal Cape. If the weather is very clear the mountains of Unimak Island may be seen and recognized and the course shaped for Unimak Pass; but under ordinary conditions Promontory Hill back of Seal Cape, Tigalda Island, or Ugamak Island, will be the first land sighted.

If Tigalda Island is sighted at a distance when approaching Uuimak Pass, it will appear as a number of small detached islands, but when seen closer to it is one island with six distinct mountain ridges.

A 355° true (N. by W. ⅞ W. mag.) course heading for Pogrommi Volcano will lead nearly for Seal Cape, passing about 4 miles eastward of Ugamak Island.

If the weather is thick, soundings on Davidson Bank may be of use in feeling the way in to the land. In the vicinity of Seal Cape the coast is bold and may be approached with caution close enough (from ½ to ¾ mile) to be seen and to be followed until some point is recognized by which the vessel's position may be known. A vessel should first be sure of her position before attempting to enter Unimak Pass and in thick weather should not attempt the other passes.

In thick weather, if the land is made in the vicinity of Seal Cape, a vessel may stand westward, following the beach at a distance of ¾ mile or more until Scotch Cap Lighthouse or Scotch Cap is made and recognized. With Scotch Cap Lighthouse bearing 17° true (N. mag.), distant 1 to 2 miles, steer 287° true (W. mag.) for 6 miles, and then steer 332° true (NW. mag.), which should give the coast of Unimak Island a berth of about 2½ miles, and the course made good for about 12 miles should lead to a position 6 miles 253° true (SW. by W. mag.) from Cape Sarichef Lighthouse. Or, if bound to Unalaska Bay, when Scotch Cap Lighthouse bears 17° true (N. mag.), distant 1 to 2 miles, a 266° true (W. by S. ¾ S. mag.) course made good for 31 miles should lead about 2 miles northward of Akun Head. A possible strong set by the current on this course should be guarded against.

In coming from southeastward, when Ugamak Island is sighted, shape the course to pass about 2 miles northeastward of it, and then:

From a position 2 miles 62° true (NE. mag.) from the northeast end of Ugamak Island make good a 321° true (NW. by W. mag.) course for 10 miles to a position with Scotch Cap Lighthouse bearing 72° true (NE. by E. mag.), distant 5½ miles. Then steer 332° true (NW. mag.), with the northeastern end of Ugamak Island astern, and give the coast of Unimak Island a berth of about 2½ miles; this course made good for 13½ miles should lead to a position with Cape Sarichef Lighthouse bearing 72° true (NE. by E.

mag.), distant 6 miles. Then follow the directions for Bering Sea on page 307.

Or, if bound to Unalaska Bay, from a position 2 miles 18° true (N. mag.) of the northeast end of Ugamak Island, make good a 280° true (W. ½ S. mag.) course for 26 miles, which should lead to a position 2 miles northward of the eastern head at the north end of Akun Island. Then steer 268° true (WSW. ⅜ W. mag.) about 5 miles to a position 2 miles 351° true (NNW. ¼ W. mag.) from Akun Head. Then follow the directions on page 164.

UGAMAK ISLAND,

on the southwest side at the southeast entrance to Unimak Pass, lies 10 miles southward of Unimak Island, and its southeast point is in latitude 54° 13′ N., longitude 164° 46′ W. The island is rugged, with cliffs at the shore, and 1,000 feet (305 m.) high at the eastern end, where there is a sharp peak. Near the middle of the island there is a knob nearly as high as the eastern end. The island is fringed with kelp and bare rocks close-to, but there are no known outlying dangers. There is no harbor at the island. **Aiktak Island** lies ½ mile southward of Ugamak Island; its south side is a cliff about 600 feet (183 m.) high.

Ugamak Strait, between Ugamak and Aiktak Islands on the north and Kaligagan Island on the south, has a width of 3 miles, and there are no known hidden dangers. Passing 1 mile southward of Aiktak Island, a 290° true (W. ⅜ N. mag.) course, heading for the north end of Akun Island, is considered safe, and carries through the passage in mid-channel.

TIGALDA ISLAND,

the south side of which is in latitude 54° 04′ N. is separated from Ugamak Island by Ugamak Strait. The island is 11 miles long and about 3½ miles wide, and consists of six mountain ridges 1,200 to 1,800 feet (366 to 549 m.) high, separated by low valleys having a northwesterly direction. The western end of the island is comparatively low. **Kaligagan Island,** lying in Ugamak Strait ¾ mile off the northeast end of Tigalda Island, is ¾ mile long and about 300 feet (91 m.) high. A large number of high, bare rocks extend 2½ miles westward of Kaligagan Island, and the outermost lies 1¾ miles from Tigalda Island. Two rounded rocks lie ½ mile off the south side of Tigalda Island, and an islet 100 feet (30 m.) high lies close to the island midway between these rocks and the western end of Tigalda Island.

Tigalda Bay, on the north side of Tigalda Island, 3 miles from its eastern end, is a sheltered anchorage except from northwest winds. The bay is about ⅝ mile wide and 1½ miles long in a 107° true (E. mag.) direction, and has depths of 8 to 10 fathoms (14.6 to 18.3 m.), rocky bottom. The mean rise and fall of tides is 1.6 feet (0.5 m.).

To enter Tigalda Bay from Ugamak Strait, pass ½ mile or more northward and westward of the outermost bare rock, lying 2½ miles westward of Kaligagan Island, and steer 204° true (S. ¾ W. mag.)

for 2¼ miles. Tigalda Bay should then be opened on the port beam. Enter the bay in mid-channel and select anchorage near the middle, taking care not to approach the head nearer than about ⅜ mile.

Approaching from southwestward through Avatanak Strait, follow the north side of Tigalda Island, giving it a berth of about 1 mile until heading about 112° true (E. ½ S. mag.) for the entrance to the bay; on this course Tanginak Islet, about 80 feet (24.4 m.) high, should be astern and the highest peak (1,400 feet (427 m.) close to the east end of Tigalda Island should be ahead. Enter the bay and anchor as directed in the preceding paragraph.

Derbin Strait, separating Tigalda and Avatanak Islands, is a little over 1 mile wide, and there are no known hidden dangers. A mid-channel course through the strait, 326° true (NW. ½ W. mag.), with the northeast headland of Akun Island ahead, is considered safe.

AVATANAK ISLAND,

lying southwestward of Tigalda Island, is separated from Akun Island by Avantanak Strait. The island is about 9 miles long and over 3 miles wide at its eastern end, but the western half of the island averages less than ¾ mile wide. The middle of the island is a great depression whose sides slope gently upward to the mountains at its eastern and western ends, which are about 1,700 and 1,500 feet (518 and 457 m.) high, respectively. Clusters of bare rocks extend about ⅜ mile off the southeast and west ends of the island, and Basalt Rock, about 30 feet (9.1 m.) high, lies in Avatanak Strait, about 1 mile off the north side of the island. There is no secure anchorage.

Rootok Strait, separating Avatanak Island from Rootok Island, is a little over 1 mile wide in its narrowest part, but the clear channel is reduced by rocks on both sides to a width of about ½ mile; there are no known hidden dangers when passing through in mid-channel. The directions following are considered safe and lead in mid-channel.

Approaching from southeastward, steer for the north end of Rootok Island on a 298° true (W. by N. mag.) course, leaving the east end of the island ⅝ mile on the port hand. When the west end of Avatanak Island bears abeam, steer about 331° true (NW. mag.) and pass in mid-channel between the bare rocks off the west end of Avatanak Island and those close to the north end of Rootok Island.

ROOTOK ISLAND

is the western island on the southeast side of Avatanak Strait, and lies 3 miles southeastward from the southern end of Akun Island. The island is 3 miles long and about 2 miles wide. There are three peaks on its southern side, the highest 1,760 feet (536 m.), and the island terminates at the shore in cliffs. There is no secure anchorage. The southern ends of Tigalda, Avatanak, and Rootok Islands are nearly in line, bearing 262° true (SW. by W. ⅞ W. mag.).

Avatanak Strait is a broad channel separating Avatanak and Rootok Islands from Akun Island, and leads from Unimak Pass for

Akutan Pass. The strait has a general 245° true (SW. ¼ W. mag.) direction, and is 3 miles wide at its narrowest part. A few reconnaissance lines of soundings in this channel indicate that the bottom is irregular, but the strait is considered safe by most navigators, and its navigation is not difficult in clear weather. Strong northwesterly winds draw heavily through Akun Pass.

Current observations have not been made in Avatanak Strait. The flood current sets northeastward and the ebb southwestward through the strait.

AKUN ISLAND

lies 23 miles southwestward of Unimak Island, and is separated from Akutan Island by Akutan Bay and Akun Strait, and from Rootok and Avatanak Islands by Avatanak Strait. It is about 12 miles long, but is very irregular in shape, being nearly divided by Akun Cove and Lost Harbor and a low depression joining them. The island is high and rugged, particularly its northern part, which reaches an elevation of about 2,500 feet (762 m.) in an extinct crater at its northwest end on the north side of Lost Harbor. The northern end of Akun Island is two massive heads about 4 miles apart, separated by Little Bay with a moderately low divide at its head, the whole forming a large valley. Both heads have precipitous sea faces about 1,200 feet (366 m.) high, and have grassy saddles southward of them.

Akun Head, the western headland, is one of the most important landmarks in the vicinity. It has a long lozenge-shaped horizontal strata with a red iron-rust color in the face of the cliff.

Tanginak Islet, about 80 feet (24.4 m.) high, with steep sides, lies 2¼ miles off the east end of Akun Island, and there is a deep passage between, if the east end of Akun Island be given a berth of over ⅝ mile.

Tangik and **Poa Islands,** about 200 feet (61 m.) high, lie in Avatanak Strait about ¾ mile off the southern side of Akun Island. Two low islets surrounded by kelp lie on the eastern side at the northern end of Akun Strait close to the southwest end of Akun Island. There are a number of **anchorages** around the island with offshore winds. The best are:

Seredka Bay, on the south side of Akun Island 2 miles westward of Round Head, the southeast point of the island, and 1½ miles northward of Tangik Island, is about 1 mile wide and the same long, open southeast, and has two bights at the head. The bay is easy of access, and a safe and roomy anchorage except with southeast winds. There is considerable kelp on the southwest side of the bay. The *Pathfinder* anchored in the bight at the north end of the bay, with the east end of Tangik Island shut out by the south point at the entrance to the bay.

Akun Cove is the broad indentation in the northeast side of Akun Island; it affords anchorage at its head except with winds from southeast to northwest, but heavy williwaws are experienced with offshore winds. The bay is 5 miles wide at its entrance and about 4 miles long. At its head, where the bay is 2½ miles wide, there are two large bights. Anchorage may be made in either of the bights, about ½ mile from shore, in 10 to 15 fathoms (18.3 to 27.4 m.).

There are no known dangers in the bay except close to shore. There are fresh-water lakes at the heads of the bights, about 10 feet (3 m.) above high water, and there is a very low depression from the head of the northern bight to Lost Harbor.

Lost Harbor has its entrance from Akutan Bay on the western side of Akun Island about 6 miles southward from Akun Head. A heavy swell often rolls into the harbor and it is not considered good. There are some buildings of an abandoned sulphur mine located on shore here.

Approaching Lost Harbor from westward pass about 1 mile northward of North Head (of Akutan Island) and make good a 102° true (E. ⅜ N. mag.) course for 10 miles, which should lead to the middle of the entrance. Then steer about 56° true (NE. ½ N. mag.), following a mid-channel course into the harbor, and taking care to give the northwest shore of the harbor a berth of ⅝ mile or more until near the head. When about ¾ mile from the head of the harbor haul up to about 331° true (NW. mag.) and anchor about ½ mile from shore at the northwest end of the head of the harbor, in about 10 fathoms (18.3 m.)

Approaching from northward, around Akun Head, follow the western shore of Akun Island at a distance of about 1 mile until in the middle of the entrance to Lost Harbor, and then proceed as directed in the preceding paragraph to the anchorage.

AKUTAN ISLAND,

the largest between Unalaska Island and Unimak Pass is about 15 miles long in a general east and west direction, and its greatest width in a north and south direction is about 10 miles. The island lies about 9 miles northeastward from Unalaska Island and is separated from the latter by Akutan and Unalga Passes. **Akutan Peak,** 4,100 feet (1,250 m.) high, is a little west of the middle of the island and is its highest point. On the northeast side the island is separated from Akun Island by Akutan Bay and **Akun Strait;** the latter is about ¾ mile wide, but the ledges on both sides leave a channel about 600 yards wide at its narrowest part, with a depth of about 7 fathoms (12.8 m.). There are strong tide rips in this channel, and it is not recommended. As far as known there are no dangers over ½ mile from the shore of the island, except the reef on its northwest side.

North Head is a high, bold cliff, with a large, deep, grassy valley in the otherwise high shore on its east side. About 2 miles southwestward of the cape there is a narrow, grassy valley which separates the high ridge of North Head from another high ridge; the western side of the valley is a bluff.

Lava Point, 6 miles southwestward of North Head, is moderately low lava beds. At the end of the point is a flat rock having the same height as the point and slightly detached from it. In foggy weather low points will sometimes be seen below the fog, and the lava flow terminating in Lava Point often enables the navigator to identify this point. Due to the similarity of the headlands along these islands, this area is one where the navigator has unusual difficulty in identifying landmarks.

A reef, bare at low water and covered with kelp, extends 7/8 mile from the western side of Akutan Island at a point 2½ miles southward of Lava Point.

Cape Morgan, the southwest end of the island and on the north side of Akutan Pass, is steep and high. Three pinnacle rocks, 4 to 8 feet (1.2 to 2.4 m.) high, lie in the pass 600 yards off the cape, and other bare rocks extend the same distance off its southeast side. The cape should be given a berth of over ½ mile.

Battery Point, the south end of Akutan Island, is prominent, steep, and high, and is surrounded by bare rocks close-to.

There are a number of places where vessels may anchor with an offshore wind; but they are open seaward and are not recommended. Akutan Harbor is the only secure anchorage.

Vulcan Cove, about 3 miles northeastward of Battery Point, affords shelter in northerly weather, but is open to the Pacific swell.

Hotsprings Bay is a wide indentation in Akutan Island open northward between North Head and Akutan Harbor. The north point at the entrance is a high, rocky cliff. The south point at the entrance, **Ridge Point,** lying about 2½ miles southeastward from the north point at the entrance, is a narrow ridge about 150 feet (46 m.) high, which has bare rock cliffs on its west side, but slopes rapidly on its east side into a grassy valley and sandy cove. At the head of the bay are three bights having streams, and the southernmost has hot springs about 1 mile up the stream. No directions can be given for anchoring in the bay, except that the anchorage is reported to be in 15 to 20 fathoms (27.4 to 37 m.), sandy bottom. A kelp patch extends a short distance into the bay from the south point at the entrance.

Akutan Harbor is on the north side of the island near its eastern end. The harbor is entered from northward through Akutan Bay; it is nearly 3¾ miles long and ½ to 1¾ miles wide. There are no known dangers over 300 yards from the shore. There is anchorage off the north shore abreast an Aleut village about 1⅝ miles westward of the north point at the entrance and about 300 yards from the shore in about 22 fathoms (40 m.). A vessel may also anchor in the broad bight in the south shore in 15 fathoms (27.4 m.), with the north point at the entrance bearing about 17° true (N. mag.) and taking care to keep clear of the kelp.

A flashing white light is established on the southeastern end of the northern entrance point. The native village of **Akutan** is located on the north side of the harbor. There is a post office, and the monthly mail steamer from Seward makes regular calls. There are hot springs that can be reached by trail from the head of the harbor.

On the south side of Akutan Harbor is located a whaling station, from which steam whalers are operated. The whaling company has a supply of fuel on hand, but it is reported that none is for sale.

Approaching Akutan Harbor from Akun Head, follow the northwest shore of Akun Island giving it a berth of about 1 mile until abreast the old crater on the island, and then steer about 178° true (S. by E. ¾ E. mag.) with Akun Strait on the port bow. The north point at the entrance to Akutan Harbor will be a little on the starboard bow (this point is a grassy hummock over 100 feet (30 m.) high and is connected with the mainland of Akutan Island by a low, grassy spit). Steer so as to leave this point over ¼ mile on the star-

board hand, round it at this distance, and then steer 251° true (SW. ¾ W. mag.) into the harbor, giving the shores a berth of over 300 yards. Anchor off the village, taking care to allow the vessel swinging room.

Passing north of North Head (of Akutan Island) leave it about 1 mile on the starboard hand and steer about 107° true (E. mag.), giving the shore of the island a berth of 1 mile on the starboard hand. Having stood on this course about 6 miles and when Ridge Point bears on the starboard beam distant 2 miles, steer 150° true (SE. ⅛ E. mag.) about 4 miles; the north point at the entrance to Akutan Harbor should then be forward of the starboard beam distant nearly ¾ mile; steer so as to leave the point over ¼ mile on the starboard hand and enter the harbor as directed in the preceding paragraph.

Akun Strait is contracted by reefs from both sides and is not recommended. However, small steamers with local knowledge have used it. Captain Johansen of the mail steamer *Starr* says: "Pass not more than 150 feet east of the rocky islet and favor the west shore. Reefs extend off both shores farther than is shown on chart 8860."

AKUTAN PASS

is 2½ miles wide in its narrowest part. There are six small islets, Baby Islands, on the western side of the pass, with many detached rocks above water in the same group, but not extending beyond the islets into the pass. **Cape Morgan,** on the north side of the pass, should be given a berth of over ½ mile. The breaker reported in the middle of Akutan Pass was searched for and does not exist. The current and tide rips (see p. 227) are not so strong as in Unalga Pass. On this account, and because of its greater width and the fact that a straight course will carry through, this pass is preferred by many to Unalga Pass.

Akutan Pass is recommended, in the daytime with clear weather, for steamers bound to or from Unalaska Bay, and for sailing vessels from Unalaska Bay with a fair wind. From southward it is recommended to make the land in the vicinity of Tigalda Island and Avatanak Island and follow along the south side of these islands until the course is shaped from Rootok Island to Cape Morgan. A mid-channel course through the pass is recommended as the most prudent one.

DIRECTIONS, AKUTAN PASS

From a position 3 miles southward of Rootok Island a course 280° true (W. ⅝ S. mag.) made good for 17 miles will lead 1⅝ miles southward of Battery Point and to a mid-channel position in the pass between Cape Morgan and Baby Islands. Continue the course 5 miles past Cape Morgan to a position 2 miles off the north side of Unalga Island, and then steer 269° true (WSW. ⅜ W. mag.) with Battery Point astern. This course made good for 7 miles will lead to a position 1¼ miles northward of Cape Kalekta.

UNALGA ISLAND

lies northeastward of Unalaska Island nearly halfway to Akutan Island; Akutan Pass leads between Unalga Island and Akutan Island, and Unalga Pass leads between Unalga Island and Unalaska Island. Unalga Island is about 4½ miles long east and west, about 2½ miles wide and 650 feet (198 m.) high, covered with high grass. Lying north of the eastern end of the island is a group of six small islands known as **Baby Islands;** between these and Unalga Island there is a kelp-bordered passage (**Baby Pass**) about ¾ mile wide with a reported depth of 11 fathoms (20.1 m.). The southern and western shores of Unalga Island bordering on Unalga Pass are free from outlying dangers; but it is advisable to give them a berth of at least ½ mile.

Malga Bay, also called Unalga Cove, on the northwest side of Unalga Island, is about ⅝ mile in diameter and affords shelter in southerly weather. No directions are necessary except to keep in the middle of the cove and well clear of the kelp. The mean rise and fall of the tides is 1.8 feet (0.5 m.).

UNALGA PASS

between Unalga and Unalaska Islands, is the narrowest of the three principally used passes, and has the strongest tidal currents. It is about 1¼ miles wide in its narrowest part, and, with the exception of rocks above water, which make out a short distance from the points of Unalaska and Unalga Islands the pass is considered free from dangers. In the middle of the pass there are depths of 24 to 40 fathoms (44 to 73 m.), with deeper water northwestward and southeastward. Its worst features are the strong tidal currents and tide rips, both of which are generally considered worse in this pass than in either of the other two; williwaws of great force are also experienced. The advantage of using this pass in thick weather is that the shore of Unalga Island is clear of outlying dangers, and when made can be followed close enough to keep it in sight while going through.

The Signals, Egg Island, and Oldman are the prominent landmarks for making Unalga Pass from southeastward.

For currents and tide rips in the pass, see page 228.

DIRECTIONS, UNALGA PASS

From southeastward.—Passing 3 miles southward of Rootok Island a course 261° true (SW. by W. ¾ W. mag.) made good for about 20 miles will lead to a position 2 miles off the south side of Unalga Island. Then steer about 292° true (W. ½ N. mag.) to a position about ¾ mile off the southwest end of Unalga Island in the narrowest part of the pass.

Or, when Egg Island is recognized, pass 2 to 3 miles northward of it, about midway between it and Unalga Island, and steer about 292° true (W. ½ N. mag.) to a position about ¾ mile off the southwest end of Unalga Island in the narrowest part of the pass.

From a position about ¾ mile off the southwest end of Unalga Island make good a 329° true (NW. ¼ W. mag.) course for 3 miles to a position with Erskine Point 1 mile on the port beam. Then

steer 297° true (W. 7/8 N. mag.) for 4 miles and pass 1 mile northward of Cape Kalekta.

The above directions lead through the middle of the pass, and this is the safest course for any vessel to follow on account of the tide rips and strength of the current. The shore of Unalga Island, bordering Unalga Pass, as far as known, is free from dangers at a distance of 1/4 mile from shore. On the southern side of the pass there are some rocks showing out of water, but not over 1/4 mile from the shore.

UNALASKA ISLAND

lying southwestward of Akutan Island and separated from the latter by Akutan and Unalga Passes, is one of the three largest of the Aleutian Islands. The island is about 67 miles long, about 23 miles wide at its widest part, mountainous, and during the greater part of the year the mountains are covered with snow. **Makushin Volcano,** 5,691 feet (1,735 m.) high, the highest point on the island, is near its northwestern side about 25 miles from the eastern end of the island. The eastern end of Unalaska Island was surveyed in 1901, but the island west of Sedanka Island and Unalaska Bay is still imperfectly known.

Sedanka Island, close to the northeastern end of Unalaska Island and separated from the latter by a narrow, deep strait (Udagak Strait appears as a part of Unalaska Island. A number of rocks lie 1 to 2 3/4 miles eastward of the eastern end of Sedanka Island.

Egg Island is about 3/4 mile in diameter, 550 feet (168 m.) high, and lies about 1 1/2 miles northeastward from the north point of Sedanka Island. Lying a little over 3/4 mile west of Egg Island are **Oldman Rocks,** two rocks surrounded by deep water; the higher is about 60 feet (18.3 m.) high and flat-topped, and the smaller is round-topped and lies a short distance north of the higher rock.

Egg Island Passage leads between Egg Island and Sedanka Cape and southward of Oldman Rocks. This pass is nearly 1 1/2 miles wide and has a depth of about 35 fathoms (64 m.) in the middle. A 309° true (WNW. mag.) course passing midway between Egg Island and Sedanka Cape leads through the middle of the pass.

The Signals are three small rocks. The outer is 50 feet (15.2 m.) high and lies nearly 3 miles southward from Egg Island. A small rock, 10 feet (3.0 m.) high and over which the sea washes, lies a little over 1/4 mile eastward of the **Outer Signal.** The **Inner Signal** is 180 feet (55 m.) high and lies 7/8 mile from the shore of Sedanka Island and 4 1/2 miles south of Egg Island. There is apparently deep water between the Inner Signal and Outer Signal, but they should be approached with caution.

BEAVER INLET

makes in 17 miles in a 235° true (SW. 5/8 S. mag.) direction in the northeastern end of Unalaska Island. Its entrance lies between Sedanka Cape on the southeast and **Brundage Head** on the northwest and is approached from southward and eastward between Egg and Unalga Islands. The least width of the inlet is 1 5/8 miles near its head and it has a clear and unobstructed channel its full length.

Udagak Strait separates Sedanka Island from Unalaska Island; its entrance in Beaver Inlet is 9¾ miles southwestward from Old Man. This strait has a least width of ¼ mile, but has good water; there are some rocks off the south spit of the narrows which mark three points of a reef the limits of which are marked by kelp; one or more of the rocks are always visible. To pass through the strait follow a mid-channel track, giving the two gravel spits a good berth. There is an anchorage, sheltered from all winds, in **Udagak Bay,** an indentation in the west shore of the strait about 3¼ miles from its entrance in Beaver Inlet.

There are a number of bays making off from Beaver Inlet in which vessels may anchor, but those on the south side of the inlet are open northward and northwestward and those on the north side are open southward and eastward.

Udamat Bay, on the northwest side of Sedanka Island, 5½ miles southwestward from Old Man, extends 2¾ miles in a 186° true (S. by E. mag.) direction, has a general width of ¾ mile near its head, and has a deep and unobstructed channel. There is a small native village on the north side of the point at the east side of the entrance to the bay. Vessels may anchor in the southeastern end of the bay, taking care to have room to swing.

Strait Bay makes into Sedanka Island from Beaver Inlet just east of Udagak Strait; the *Pathfinder* anchored in the head of this bay.

Amugul Bay makes southward from Beaver Inlet about 3 miles southwestward of the entrance to Udagak Strait. The *Pathfinder* anchored in a cove in the southwestern and broadest part of the bay. There is a small island on the eastern side of the entrance to the bay.

At the head of Beaver Inlet there are four small bays; named in order, following the south shore around to the north shore, they are **Tanaskan, Final, Kisselen,** and **Erskine.** The *Pathfinder* anchored near the head in Final and Erskine Bays.

Uniktali Bay makes into the north shore of Beaver Inlet about 15 miles above its entrance; this bay is nearly 3 miles long in a westerly direction and ¼ mile wide at its narrowest part near its head.

Agamgik Bay and **Ugadaga Bay** are two indentations in the north shore of Beaver Inlet 5½ and 8 miles, respectively, above the entrance of the inlet. From the head of Ugadaga Bay a trail leads to the village of Iliuliuk. There are rocks off the western point at the entrance to Agamgik Bay.

Deep Bay is the bight on the north side of the entrance to Beaver Inlet, and is protected from northeastward by a long ledge and several small islets which make off about ½ mile from the shore. The *Pathfinder* anchored in the northwestern corner of the bay.

The places in Beaver Inlet where the *Pathfinder* anchored were used only as anchorages for the night while that vessel was engaged in surveying in the locality.

ENGLISH BAY

is a secure anchorage in the north side of Unalaska Island, directly south of the west end of Unalga Island. The best anchorage is nearly 2 miles above the entrance in about 6 or 7 fathoms (11 or 12.8 m.); the width of the anchorage between the 5-fathom (9.1 m.) curves is here about 300 yards. There are bare rocks off both points

at the entrance, between which the channel has a width of about ⅜ mile. When about 1¼ miles above the entrance the western shore should be given a berth of over 400 yards to avoid a shoal with 1 to 3 fathoms (1.8 to 5.5 m.) over it which stretches along the shore ½ mile. **In entering** care must be taken not to be set off the course by the strong currents in Unalga Pass, which have a maximum velocity of about 9 knots; follow a mid-channel track or favor the eastern shore and anchor in 6 to 7 fathoms (11 to 12.8 m.) in the middle of the bay nearly 2 miles above the entrance. Good holding ground in depths of 12 to 17 fathoms (21.9 to 31 m.) will be found ¾ to 1½ miles inside the entrance. There is a small fishing village on the eastern point **(Fisherman Point)** at the entrance to the bay. From Fisherman Point eastward a little over 1 mile to **Brundage Head** there are ledges and rocks which lie some distance from the shore.

KALEKTA BAY

is a broad, open bay in the north end of Unalaska Island just east of Unalaska Bay; it has no known dangers over 400 yards from the shore, and there are a number of places where a vessel may anchor; but as this bay is open northward, and English Bay and Dutch Harbor are better harbors, it is not recommended. There is a pinnacle rock off Erskine Point, the eastern point at the entrance, somewhat similar to Priest Rock; but this rock is distinguished by a smaller one between it and Erskine Point.

UNALASKA BAY

is the indentation making into the north end of Unalaska Island between Cape Kalekta and Cape Cheerful. Commercially it is one of the most important bays in western Alaska. Its shores are generally mountainous, with precipitous sea faces. **Amaknak Island** lies in its southern end. Westward of the island the water is deep, but there is no good harbor in this part of the bay; eastward of the island are the important anchorages of Iliuliuk Bay, Dutch Harbor, and Iliuliuk Harbor. The channel to Iliuliuk Bay and Dutch Harbor is free from dangers, except along the shores. Iliuliuk Harbor is obstructed at its entrance by ledges, but with the aid of the buoys is not difficult to enter with a vessel under 250 feet in length.

Cape Kalekta, 500 feet (152 m.) high, is the eastern point at the entrance to Unalaska Bay. The extremity and western side of the cape are rugged, precipitous cliffs, with a few rocks, but no beach at the water line. From the summit of the cape the land falls to the break at Constantine Bay, and then rises to higher land farther south. A dangerous ledge, usually marked by breakers, lies nearly ⅜ mile northward of the cape. The cape should be given a berth of 1 mile or more to clear the ledge, as the strong tidal currents may tend to carry a vessel on it.

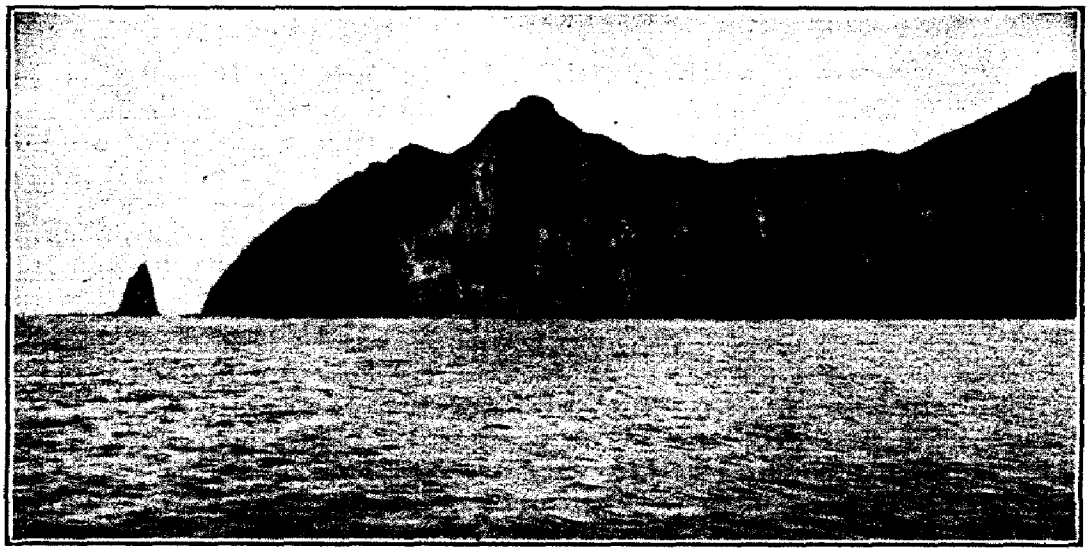
Priest Rock, close-to off the northwest side of Cape Kalekta, is a pinnacle about 175 feet (53 m.) high. It is one of the most important landmarks in making Unalaska. It is marked by an unwatched flashing white light on a skeleton tower at the base of the rock on its northern side. A large square on the base of the rock has been whitewashed to aid in its identification.

Cape Cheerful, the western point at the entrance to Unalaska Bay, is made up of bold, high headlands, rounded on top and intersected by deep, grassy valleys.

A **cascade,** 125 feet (38 m.) high, south of the cape, makes a good landmark in foggy weather when only the lower part of the cascade can be seen.

Ulakta Head, the north end of Amaknak Island, is 900 feet (274 m.) high. It has a flat top, and in clear weather it is one of the best landmarks for fixing the position of Unalaska Bay. From its northwest point a reef extends 1/8 mile, marked by Needle Rock, similar in appearance to Priest Rock, but not so large.

Spithead is the end of the long, low sand spit which forms the eastern side of Dutch Harbor. It is marked by a day beacon and an unwatched fixed white light.



Cape Kalekta and Priest Rock bearing northeastward

Princess Head, 2 miles from Cape Kalekta, is a large, square-headed rocky point that projects from the shore far enough to be seen, even in thick weather, when following the east shore.

Constantine Bay, about 4 miles from Cape Kalekta, is obstructed by numerous ledges, many of which are only evident from the attached kelp. It is of no importance and should be avoided by all vessels.

Summer Bay, the large, shallow bight 3 miles from Constantine Bay and opposite Ulakta Head, is shoal, and its shores are lined with kelp-marked rocks and ledges. At its southern headland is Second Priest, about 60 feet high. The bay should be avoided by vessels.

Iliuliuk Bay extends from Second Priest and Ulakta Head to Iliuliuk. Northward of Spithead there is a ridge extending across the bay, on which the least depths found are 7 to 8 fathoms (12.8 to 14.6 m.); kelp has been seen on this ridge in about mid-channel. South of this ridge the depths increase to 16 to 19 fathoms (29.3 to 34.7 m.). There is anchorage anywhere in the bay. The usual anchorage is at the head in 14 to 16 fathoms (25.6 to 29.3 m.), muddy

bottom, where, even with northerly winds, the force of the sea does not seem to reach home. At the head of Iliuliuk Bay, behind the village, there is a ravine or break in the mountains, which extends through to the water southward. This is sometimes useful as a guide in entering the bay. A conspicuous landmark in entering the bay is the 80-foot steel radio mast of the United States Coast Guard. This mast is located 282° true 320 yards from Tuscarora Rock buoy.

DUTCH HARBOR

(chart 9008) is on the west side of Iliuliuk Bay. Its entrance is between Spithead and Rocky Point. The water is deep close to the shores and in all parts of the harbor, except off Rocky Point, where there is a reef making off a little less than ¼ mile, marked at its end by a black can buoy. The entrance between Spithead and the end of the reef off Rocky Point is about ½ mile wide, with a depth of 18 fathoms (32.9 m.). Anchorage may be had throughout the harbor in 14 to 19 fathoms (25.6 to 34.7 m.). Violent williwaws are experienced during gales, especially from southwest, and the best shelter will be found under the high part of the island well northward of the wharf.

A fuel-oil station of the Alaska Commercial Co. is located at Dutch Harbor. The tanks have a capacity of 40,000 barrels and a supply of Diesel oil is available. A T-shaped wharf which has been recently repaired and enlarged extends out to deep water. Large vessels can lie along the outside face, and there is room for smaller vessels on the inside of the T. Large vessels should lay out an anchor to assist in getting away in case of an onshore wind. Fresh water is piped to the dock. In dry years this supply gets low, and the water runs slowly.

The numerous buildings of the former Northern Commercial Co. station are kept in repair.

A **naval radio station,** call letters NPR, is operated at Dutch Harbor. Broadcasts of local weather conditions are made twice daily, followed by a rebroadcast of the major weather bulletin as received from San Francisco. This station handles commercial messages.

ILIULIUK HARBOR

(chart 9008) is joined to the head of Iliuliuk Bay by the narrow passage between Iliuliuk Reef and the village of Unalaska. The harbor is small and the channel leading into it is suitable for moderate sized vessels only, although vessels of 6,000 tons have been taken in and out, but with assistance.

Channels.—The channel in general use is the one passing southward of Iliuliuk Reef and southeastward of Tuscarora Rock, which is marked by a red gas buoy showing a flashing white light. Southward of the gas buoy and marking the southern side of the channel is a black can buoy. The channel is narrow, but there is a least depth of about 5 fathoms (9.1 m.).

There is a channel northwestward of Illiuliuk Reef with a least-known depth of 3 fathoms (5.5 m.), but it should not be attempted without local knowledge.

Anchorage.—Iliuliuk Harbor is small, but landlocked, with good holding ground, and an average depth of 10 fathoms (18.3 m.). Violent williwaws are experienced with southerly gales. Vessels under 200 feet in length have ridden out gales here, but the short scope of chain allowable usually causes the anchors to drag slowly through the mud. The Alaska Commercial Co. maintains a wharf with depths of 4½ to 6 fathoms (8.2 to 11 m.) along its north and west face, at the northern end of the spit on which the village of Unalaska is located.

Unalaska is the largest settlement in the Aleutian Islands. The original Russian settlement was known as Iliuliuk. There is a Greek Church, and this with the buildings of the Alaska Commercial Co. shows up prominently in approaching. There is a deputy collector of customs, a deputy marshal, and a United States commissioner located here. There is a post office and a monthly mail from Seward. Unalaska is the headquarters for the Coast Guard fleet engaged in the summer patrol of the Bering Sea.

Supplies.—The Alaska Commercial Co. has a well-stocked general store and warehouses at Unalaska. Coal is kept on hand and can be handled at the rate of about 200 tons per day. Some lumber, gasoline, and distillate are usually obtainable. Vessels are usually required to go to the wharf at Dutch Harbor for water.

Tides.—The mean rise and fall in Dutch Harbor is about 2 feet (0.6 m.). The tidal current in Dutch Harbor is inappreciable, and in Iliuliuk Harbor the velocity does not exceed 1 knot.

Ice.—The bay is open to navigation at all seasons. It is reported that on two occasions the drift ice of Bering Sea entered Unalaska Bay, but such an occurrence is so rare that it need not be considered. Ice often forms in the sheltered coves and harbors in cold, calm weather, but it never attains any thickness or interferes with navigation.

The remaining portions of **Unalaska Bay southward and westward of Amaknak Island** are not important to navigators, but may be briefly described as follows: The portion south-southwestward of Amaknak Island is a long narrow inlet called **Captains Bay;** it has not been accurately surveyed, but vessels have entered it on occasions. There is a shoal with 14 feet (4.3 m.) over it near the head of the bay in latitude 53° 50′ 45″ N. and longitude 166° 35′ 38″ W. The narrow passage from it to Iliuliuk Harbor is not recommended. There are a few houses along the eastern shore, and a ranch at the head of the bay. On the western side of Unalaska Bay are **Nateekin Bay, Broad Bay,** and **Eider Point Anchorage,** none of which are of any importance. This coast is high, with valleys at the heads of the bays, and several conspicuous waterfalls over the cliffs between them. **Hog Island** lies off the western side of Amaknak Island; rocks and reefs have been reported all round it extending to a considerable distance, and the locality between it and Amaknak Island is reported foul right across. A long reef is charted, extending south-southeast from Eider Point.

DIRECTIONS, UNALASKA BAY

When bound for Unalaska Bay from any part of Bering Sea, it is recommended to shape the course for Cape Cheerful. In thick weather

it is better to fall westward of Cape Cheerful and then round it than to fall eastward of it and get down into the passes. **Makushin Volcano,** 5,691 feet (1,735 m.) high, can generally be seen in clear weather, and is prominent. An extinct **crater,** 2,314 feet (705 m.) high, back of Cape Cheerful and west of Eider Point, gives a distinct point for which to steer until close enough to distinguish the surrounding features. On getting close to the island, when the fog hangs over the land but leaves a clear space just along the water's edge, **Wislow Island** forms a good mark. It is in a small bay about 2 miles westward of Cape Cheerful, and is a small, rounded island, regular in shape, and stands far enough from the land to be seen as not a part of the main island. Westward, under similar conditions, **Makushin Cape** can be seen at times. The land slopes gently to the cape from Makushin Volcano, and ends in a small peak-like formation. From eastward the **cascade** south of Cape Cheerful is also useful as a mark. Strangers, when in the vicinity and uncertain of the identity of the bay and its landmarks, should endeavor to pick out **Ulakta Head.** Looking into the bay, its flat top breaking off abruptly to sloping sides presents an appearance unlike any other in the vicinity, and shows up well against the background of mountains. When sighted, steer for it, leave it on the starboard hand, and follow around, keeping out of kelp.

Cape Kalekta to anchorage.—Having arrived in the vicinity of Cape Kalekta, give it a berth of over 1 mile in rounding it to avoid the reef extending northward from the cape, and steer for Ulakta Head, course 214° true (S. by W. ½ W. mag.), about 4 miles. When the south point at the entrance to Constantine Bay is abeam, distant 1 mile, change course to 195° true (S. ¼ E. mag.) for about 3½ miles to a mid-channel position in Iliuliuk Bay eastward of Ulakta Head. Then follow a mid-channel course through Iliuliuk Bay, course about 220° true (SSW. mag.), and anchor ¼ to ½ mile from the head of the bay in 14 to 16 fathoms (25.6 to 29.3 m.), muddy bottom.

To enter Dutch Harbor pass between Spithead and the buoy off Rocky Point, and anchor in the harbor, as desired, in about 18 fathoms (33 m.), muddy bottom.

To enter Iliuliuk Harbor stand southward on the 220° true (SSW. mag.) course until the buoys are picked up, then pass between the red gas buoy and the black can marking the southern edge of the channel. Vessels should approach the gas buoy on a course to enable them to make the turn safely. After rounding the gas buoy, stand directly for the outside face of the wharf. If unable to get alongside the wharf, anchor in Iliuliuk Harbor in about 10 fathoms (18.3 m.).

Remarks.—Sailing vessels entering Dutch Harbor should carry sufficient sail to keep good way on until past the beacon on Spithead. It has frequently occurred that vessels shortening sail at Ulakta Head have been set toward the shoal on the east side of the spit owing to little headway and the wind drawing ahead. They are then obliged to anchor in an exposed place, and steam assistance is not always available.

The 214° true (S. by W. ½ W. mag.) course from Cape Kalekta follows the shore northward of Constantine Bay at a distance of

about 1 mile. In thick weather, when following the east shore, care must be taken not to enter Constantine or Summer Bays by mistake. This has sometimes occurred when the opposite headland could not be made out. When passing southward of Tuscarora Rock, vessels are obliged to make a sharp turn westward, and care should be observed.

Dangers.—A large cluster of rocks, mostly awash, and usually marked by breakers, extends nearly 200 yards westward of the south head of **Constantine Bay.**

Second Priest, near the south point of Summer Bay, is surrounded by reefs, awash and under water, for a distance of 300 yards. Between Second Priest and a point opposite the entrance to Dutch Harbor the east shore is fringed with rocks, and should not be approached closer than ¼ mile.

The **spit** has a kelp-marked shoal on its east side which extends its whole length; at its middle point the shoal extends ¼ mile from shore, and from it a ridge on which the least depth found is 7 fathoms (12.8 m.), extends east-southeastward across the bay. Kelp has been seen on this ridge about in mid-channel. Spithead is bold-to, and may be safely approached as close as 150 yards.

Rocky Point has a kelp-marked reef which extends toward Spithead about 350 yards; eastward of the point the shoal makes out about 200 yards with little kelp. The northeastern extremity of the reef is marked by a black can buoy in 7 fathoms (12.8 m.).

From Rocky Point south, the shore of Amaknak Island should not be approached closer than 300 yards.

Iliuliuk Reef is a ledge, portions of which are always exposed, extending 250 yards in an east and west direction. From the eastern dry rocks a ledge, with 12 to 15 feet (3.7 to 4.6 m.) over it and marked by kelp, extends 150 yards 177° true (S. by E. ¾ E. mag.).

Tuscarora Rock, marked on its southern side by a gas buoy, is charted as a 3-fathom (5.5 m.) spot of small extent. The 3-fathom (5.5 m.) curve on the edge of the shoal making out from the shore is only 35 yards southward of Tuscarora Rock. A rock with 15 feet over it lies on the southern edge of the channel opposite Tuscarora Rock. The black buoy is placed just outside this rock. About 80 yards northward of Tuscarora Rock is a ledge with 13 feet (4 m.) over it, with but 27 feet (8.2 m.) between it and the rock.

About 25 yards northeastward from Tuscarora Rock is a rocky and sandy shoal spot with 19 feet (5.8 m.) over it.

NORTH COAST OF UNALASKA BAY

There are no available surveys of the Aleutian Islands west of Unalaska Bay with the exception of a reconnaissance of a few harbors by a Coast and Geodetic Survey party in 1925. The charts are compilations from various sources and based principally on the early Russian surveys. They are necessarily imperfect, and must be used with caution, especially in the vicinity of land.

Cape Cheerful is described on page 240 and Wislow Island on page 243.

Irishmans Hat is a square tower rock about 50 feet (15.2 m.) high lying close to shore about 3 miles westward of Wislow Island.

Makushin Cape, 13 miles southwestward of Wislow Island, is a round hill 400 feet (122 m.) high, which appears like an island from a distance, and is a good mark. There are a number of prominent pinnacle rocks off the cape. Southward of it is **Cape Kovrizhka,** also called **Cape Gattan,** and **Volcano Bay.**

Makushin Bay has an Aleut village, and there are mineral prospects in the vicinity. The northern entrance point is marked by a rocky islet about 40 feet (12.2 m.) high, lying 1½ miles southwestward of the point; there are several rocks above water between it and the shore. **To enter the bay** pass about 1 mile westward of the rocky islet, and when it is abeam steer 151° true (SE. mag.) until some remarkable pinnacle rocks are in line with a low dip in the mountains at the head of the bay, bearing about 96° true (E. ⅞ N. mag.). Then steer for them through the middle of the entrance until Priest Rock and the village open out on the port hand; haul in for the village on bearing 286° true (W. mag.) and anchor in 13 fathoms (23.8 m.), mud bottom, with the church bearing 286° true (W. mag.) and Priest Rock bearing 230° true (SW. by S. mag.). Soundings in this harbor showed no dangers. Fresh water is obtainable near by.

Kashega Bay is charted 14 miles south-southwestward of Makushin Bay. The following information was furnished by the Coast Guard cutter *Manning:*

When clear of Cape Spray haul to pass 3 miles off Kashega Point. A high conical rock will be seen bearing a little on the port bow and apparently well over toward the western side of Kashega Bay. Keep this rock a little open on the port bow until Kashega Point is abeam, then haul to 139° true (SE. by E. mag.) with the conical rock open on the starboard bow, heading for a mid-channel position between the grassy island and the north entrance point of the inner harbor. When the village is first sighted on this course it is seen directly under a conical mountain peak. Continuing on this course, the village shuts in behind a low bluff and the harbor opens. With the harbor open, steer a mid-channel course for a short distance inside the grassy island, and anchor in 9 fathoms (16.5 m.), hard bottom.

Chernofski Harbor (chart 9196) is charted about 22 miles southwestward from Makushin Bay, and near the northeast entrance to Umnak Pass. It is reported to be a safe harbor, sheltered from all weather. Approaching it from northward, a vessel first makes **Nellie Juan Cape,** a high bold bluff, unlike any other land in the vicinity. There is a reef about 300 yards long extending off the cape; the reef ending in a rock about 15 feet (4.6 m.) high.

From Nellie Juan Cape continue for about 3½ miles to **East Point,** opening out Chernofski Church over the land to the right of a high wedge-shaped rock about 1 mile eastward of the entrance. The entrance is between East and West Points, through a narrow canal formed by low promontories. The seaward faces of the points are rugged and broken, and there are rocks extending seaward on the line of the ridges off both points; there is a deep wide cleft across the middle of the eastern promontory, which forms a landmark when bearing southward of southeast. The inner harbor is reported to be ¼ to ⅜ mile across. From the entrance the right tangent of Umnak Island bears 309° true (WNW. mag.).

To enter, round East Point not less than 500 yards distant, and steer 129° true (ESE. mag.) in mid-channel between the two points; round **Observatory Point,** the low shingle point at the southeastern extremity of the eastern promontory, giving it a good clearance and anchor in 10 to 12 fathoms (18.3 to 21.9 m.), mud bottom, in the middle of the harbor, halfway from Observatory Point to the church, with the church bearing 331° true (NW. mag.), and the point bearing about 196° true (S. mag.).

There is no wharf; a boat landing is made on the shingle beach in front of the village. Fresh water may be secured from a stream in the southern part of the bay. Soundings made in the harbor showed no dangers; but the head of the bay at the southeastern end is shallow, and can not be used. The harbor is surrounded by high land, with two valleys opening into the head of it. The position of Observatory Point is said to be latitude 53° 23′ 06″ N., longitude 167° 30′ 34″ W.

About 7 miles inland from the southwestern end of Unalaska Island there is a conical peak about 2,000 feet (610 m.) high, which forms an important landmark, as the other land in the vicinity is comparatively low.

SOUTH COAST OF UNALASKA ISLAND

The southeastern coast of Unalaska Island from Udagak Strait to Umnak Pass, a distance of about 60 miles, is indented by many bays. There are no directions for this coast available. **Kuliliak Bay** (chart 9196) is about 30 miles east-northeastward of Umnak Pass; it is said to be about 500 yards wide at the entrance, and 1½ miles long in a northeasterly direction, with depths of 4 to 9 fathoms (7.3 to 16.5 m.); there is no information about this bay except that contained in the published plan.

It is reported that the southern shore of Unalaska Island extends some miles farther south than charted.

UMNAK PASS

separates Unalaska Island from Umnak Island; vessels have used it, navigating slowly and cautiously, and using the lead constantly. It can not be recommended as a safe passage. The Coast Guard cutter *Manning* reports passing through in 1903, as follows: Give Samalga Island a good clearance; the southwest coast of Umnak Island has numerous outlying reefs, and care should be taken when approaching. Stand along the south side of Umnak Island for the Vsevidof Islands, and after rounding these islands, a course 61° true (NE. mag.) for Tulik Volcano will bring the Pillars on the port bow.

Later the *Manning* passed through Umnak Pass during bad weather and saw no breaks except those charted. Rounding Polivnoi Rock at a distance of 1 mile, she hauled straight up for Ship Rock, carrying 18 to 30 fathoms (33 to 55 m.) of water. When within ½ mile of Ship Rock she hauled to pass ½ mile off, and stood through.

The Pillars are two rocks, 170 and 125 feet (52 and 38 m.) high, with a small detached rock about 100 yards northward. From the Pillars haul for **Kettle Cape,** and then proceed slowly and cautiously through the middle of Umnak Pass. Care should be taken to avoid the 3-fathom (5.5 m.) shoal about 2½ miles southeast of

Kettle Cape. Avoid also the sunken rock which lies about halfway between the above shoal and Kettle Cape. The recommended track passes between these shoals, in a depth of 10 fathoms (18.3 m.).

After passing Kettle Cape avoid the kelp patch ½ mile off the western side of the pass, between the cape and **Ship Rock**, which is about 300 feet (91 m.) high, and lies near Umnak Island on the western side of the northeast entrance of the pass. From Ship Rock a course may be laid for Chernofski Harbor.

The chart shows two islets and a rock southwestward of the western end of Unalaska Island, on the line of the point. The rock is reported as sunken, and at a distance of 4¼ miles from the point; it is on the southeastern side of the recommended track.

BOGOSLOF ISLAND

lies in Bering Sea about 22 miles northward of Umnak Island. It is of recent volcanic formation and eruptions have completely changed the topographic features several times. In 1923, as reported by the Coast Guard, Bogoslof consisted of two islands. **Castle Island,** 360 feet (110 m.) high, consisted of two summits, sharp in outline, with a ridge running northward toward Fire Island and terminating in a long low spit known as Sealion Point. **Fire Island,** or Fire Peak, 270 feet (83 m.) high, was rounded in outline and smaller than Castle Island. A depth of 17 fathoms (31 m.), sandy bottom, was found 600 yards from shore eastward from the group. No evidence of rocky bottom was found, the bottom being sandy, with an even slope to the beach. The rocky portions of the two islands were the home of millions of birds, and **Sealion Point** the haul-out place of a large number of sea lions. The depth in the passage between the islands was not obtained, but from the discolored water and breaks, it was thought impassible for sea-going vessels.

The records state that eruptions have occurred in the following years: 1796, 1883, 1906, and 1910. There have probably been other eruptions of which there is no record. Bogoslof forms a useful landfall on a course westward from Cape Cheerful, and it is now charted in lat. 53° 59′ N., long. 168° 00′ W. No precise determination has been made. Observations were obtained by the Coast Guard cutter *Unalga* in 1926 which indicated that the island is located about 5 miles southward from the above position.

A **current** is often reported setting eastward in this vicinity, which is variously reported to set toward Cape Cheerful and toward Umnak Pass, with a strength of 0.1 to 0.4 knot. It is inferred that with a barometric depression near Unimak Pass it sets toward Cape Cheerful, but with a depression in the Pacific Ocean southward of Unalaska Island it sets toward Umnak Pass. Vessels coming from westward often make Cape Makushin ahead instead of to starboard.

UMNAK ISLAND

is, next to Unalaska, the largest island in the archipelago; it is about 70 miles by 16 miles in extreme length and breadth.

Mount Vsevidof, a volcano 7,236 feet (2,214 m.) high, is the summit of the island. It is a cone-shaped, snow-covered mountain

sloping to the sea from north around to southwest. It is situated southwestward of the center of the island, near the western shore, with no other mountains southwestward from it.

It is reported that the entire coast of Umnak Island should be approached with caution, and that in particular there is a rock surrounded by deep water off **Cape Tanak**, at the northernmost point. Vessels should pass a mile or more off **Cape Idak** and should keep outside the 100-fathom (183 m.) curve while rounding Cape Tanak.

Inanudak Bay lies on the northwest coast of the island. Anchorage has been reported in the northern part of the bay, in 13 fathoms (23.8 m.) inside the northern entrance point.

Nikolski Anchorage is about 14 miles southward of Mount Vsevidof.

A hurried topographic survey of Nikolski Anchorage was made in 1925, but the party was unable to do any sounding, other than in the small inside anchorage.

Ananiuliak Island, 5 miles northward of Nikolski, is about 300 feet (91 m.) high, kite shaped and about 1¾ miles long. The area between this island and the main shore is foul.

Adugak Island, about 12 miles west-southwestward of Nikolski, and about 5 miles offshore, is about 100 feet (30 m.) high.

High Hill, known also as the **Niggerhead,** 2 miles northward of Nikolski, shows flat-topped from seaward, and is 780 feet (238 m.) high. It makes a good leading mark for approaching the anchorage.

A **reef,** shoal enough to break, is reported to exist about 5 miles 292° true (W. ½ N. mag.) from the village. The entire area southwestward of this reef, and between Umnak and Adugal Islands, is reported to be foul. Vessels should not attempt to enter this area, nor should they pass anywhere inside a line between the north ends of Adugak and Ananiuliak Islands, except close to the latter. There are strong tide races and currents off the entrance to Nikolski.

Anchorage may be had in 12 fathoms (21.9 m.) off Kelp Point on the port hand going in. The anchorage, however, is not very good and with winds from the west-southwest to northwest is not tenable. A nearer anchorage for boating purposes can be had in 14 fathoms (25.6 m.) off the southern point of the entrance to the small inner harbor.

The shore from the village northward to the latitude of Ananiuliak Island is foul and should not be approached closely.

Small schooners and launches can enter the inner harbor through a narrow passage with 4 fathoms (7.3 m.). There is a **sunken rock** on which the sea usually breaks, 300 yards north-northwest from the south entrance point.

To enter, avoid this rock and pass midway between the entrance point and the islet opposite it. When in mid-entrance, head for the church and anchor as desired. There is about 16 feet (4.9 m.) in the middle of the basin.

Nikolski is one of the most frequented anchorages for small trading schooners west of Unalaska. There are two stores, a church, and a school in the village. There is a good shingle beach in front of the village, and there is seldom any surf.

The point about 4 miles west-southwestward from Nikolski village has many rocks off it above and below water, extending well out toward Adugak Island.

Samalga Island lies off the southeastern point of Umnak Island; the passage between it and **Cape Sagak** is reported dangerous. The island is low and sandy, and extends in a northeast and southwest direction. There is a fox farm on it. All navigators recommend giving it a good berth, on account of outlying reefs on all sides. There is a breaker reported westward of Cape Sagak and about on line between the western points of Samalga and Adugak Islands; another reef is charted off the southwest point of Samalga Island, on the axis of the island.

Driftwood Bay is on the southeast coast of Umnak Island opposite Nikolski village; vessels have anchored here, but no detailed information is available.

The southeast coast of Umnak Island should be navigated with great caution; reports state that it is foul and dangerous, but accurate information is not available.

ISLANDS OF FOUR MOUNTAINS

are a group of five volcanic islands lying southwestward of Umnak Island. Their names are **Chuginadak, Herbert, Carlisle, Kagamil, and Uliaga.** The group is about 20 by 30 miles in extent and is separated from Umnak Island by a passage about 17 miles wide.

The islands are all high and steep, and partly snow covered. The highest summit is **Mount Cleveland,** 8,150 feet (2,484 m.) high, on the western end of Chuginadak Island. The passages between the various islands all appear to be safe. There are no harbors, so that it is very difficult to find anchorages or landing places.

A reef which breaks heavily extends 1½ miles southeastward from **Concord Point,** the southeast point of Chuginadak Island. **Corwin Rock** is charted about 1½ miles northeastward of the northeastern point of the same island. There are strong tidal currents through the group; a current of 5 knots running about southwest is reported off Concord Point.

There is no other information about these islands except that given by the chart. This is the result of a reconnaissance in 1894, and the general features will no doubt be found reliable. These islands are uninhabited and are not often visited. There is an old report that a sounding of 13 fathoms (23.8 m.) has been made 50 miles southward of the Four Mountains; it is said that there was once an island there.

YUNASKA, AMUKTA, AND CHAGULAK ISLANDS

form a group westward of the Islands of Four Mountains; they are 2,800 to 4,300 feet (853 to 1,311 m.) high. Their positions are somewhat doubtful, and bearings among them do not agree. Reports have been received that Yunaska Island is charted 4 to 5 miles northward and westward of its true position. There is a high rock charted at the east point of Chagulak Island, a high rock between it and Amukta Island, and a high rock 1 mile southeastward of Amukta Island. There is no other information about these islands.

Amukta Pass is a broad clear passage, and is the first opening west of Unalga Pass which can be recommended to a stranger. It is often called the 172-degree pass. It is about 35 miles wide between Amukta and Seguam Islands; and no offshore dangers have been reported in it. The landfalls on both sides are good, but should be given a reasonably wide berth, as there are no soundings near their shores. Both Amukta and Seguam Islands may be seen across the full width of the pass in fair weather. Vessels have reported high breaking seas in Seguam Pass; it is probable that the current always runs northward through the pass, and in this case bad northerly weather would always cause this condition. Traders report that there is always a fair current from the Islands of Four Mountains to Cape Cheerful. In 1914 a 24-foot (7.3 m.) sea almost breaking was met eastward of Seguam Island, with northerly weather.

SEGUAM ISLAND,

2,098 feet (639 m.) high, shows two slight saddles in the profile from north and south. It slopes to the sea on the south and east sides, but has high cliffs on the northeast side. The middle peak is said to smoke at times. It is reported that rocks and discolored water extend for 1½ miles off the east and west points.

Seguam Pass lies between Seguam and Amlia Islands. It has been regarded with suspicion, and a sailing vessel has been lost on **Agligadak Reefs,** on the southwest side. The pass is about 12 miles wide, and it is reported that there are strong currents, rips, and overfalls. There are no reports of offshore dangers.

ANDREANOF ISLANDS

Amlia Island is about 40 miles long and very narrow; there is a chain of sharp peaks throughout its length, no one of which is especially distinctive. Its shores should be given a good berth, particularly near the eastern end. The eastern point is a good landmark in fair weather. It is visible at a considerable distance, running out with a straight profile at a moderate elevation, and dropping to the sea in a precipice. It must be given a berth of several miles on account of rocks which are shown on the chart eastward and southward of it.

Sviechnikof Harbor (chart 9196) is on the south shore of Amlia Island about 15 miles from the eastern point. The entrance is difficult to make out, and should be attempted only in clear weather. **Sagigik Islet,** about 9 miles eastward, and the pyramid peak to the right of the entrance, may be recognized. The harbor is said to extend about 2 miles in a north-northwest direction with a width of ½ mile, and is sheltered from the sea by a narrow islet off the eastern entrance point. It is said to be an excellent harbor with good holding ground and protected from all winds. **To enter** hold the port side of the entrance until past the long island and the rocks and reefs which will be seen on the starboard side, then stand up the middle of the bay and anchor in 12 fathoms (21.9 m.), mud bottom, with the waterfall open. Soundings have been taken in the bay which indicate that there are no dangers except the reef at the east entrance point.

Amlia Pass is a strait 1 to 1½ miles wide between Amlia and Atka Islands, and has been used by vessels. A current of 8 knots has been observed and there are strong tide rips across it which give it a very dangerous appearance. A sounding of 20 fathoms (37 m.) was obtained in these rips. There is an extensive ledge showing above water off the Atka Island shore. It is reported that only full-powered steam vessels should attempt to pass through, and that the Amlia Island shore should be held. One report says "favor the Amlia Island shore until up with the reef, and then steer about 169° true (SSE. mag.) in mid-channel."

Atka Island is the largest of the Andreanof Islands; it is about 20 by 50 miles in extent and contains the last settlement westward in the Aleutian Islands, except Attu. The northeastern portion contains the active volcano of **Korovin,** 4,852 feet (1,490 m.) high, with slopes of the mountain breaking off in a rocky escarpment at the northern extremity of the island. The southwest portion of the island from Nazan and Korovin bays is lower and runs off to the narrow low southwest extremity.

Nazan Bay (chart 9196) lies on the eastern coast, facing Amlia Island; the west point of Amlia is a conspicuous landmark for making the bay. A reconnaissance survey of Nazan Bay was made by a field party of the Coast and Geodetic Survey in 1925, from which the following information is derived.

Cape Kudugnak, 192 feet (58 m.) in height, is the northern point of the bay. From the cape the ground rises uniformly to the 2,340-foot (713 m.) mountain 2 miles to the northwestward. From off the cape **Uyak Island,** about 100 feet (30 m.) high, on the south side of the harbor entrance, may be seen. In foggy weather the harbor will often be found clear when there is fog at the cape. The northern part of the harbor is large, but unprotected from the eastward; it is about 1½ miles across with depths of 15 to 20 fathoms (27.4 to 37 m.).

The **inner harbor** lies in front of the village and is small and protected, with depths from 6 to 12 fathoms (11 to 21.9 m.)

Cone Islands are a group of three islands lying north of the inner harbor. The northeast island of the group has three remarkable pinnacles on it.

Bolshoi Islands are a group lying along the south shore of Nazan Bay. The largest island has an elevation of 220 feet (67 m.) and forms the southeastern shore of the inner harbor. A narrow passage which may be used by vessels up to 100 feet in length exists between Bolshoi Islands and the shore.

A **reef,** with a least-found depth of 5¾ fathoms (10.5 m.), lies about ¾ mile eastward from Uyak Island. This reef has not been fully examined and there may be less water on it. Mariners are advised to give it a good berth.

There is a patch of **sunken rocks** lying 200 yards northward from the north point of the largest Bolshoi Island.

Atka is a small settlement consisting of Aleuts and half-breeds. There are two stores and a school conducted by a white teacher. There are no mail facilities; the only communication with the out-

side being by trading schooners from Unalaska. There is a herd of reindeer on the island which is also farmed for foxes by the natives.

About 2 miles south of Atka village there is a large and conspicuous **waterfall.** Fresh water can be procured from a stream near the village.

There is a narrow passage between the Bolshoi Islands and the main shore. This passage is suitable for vessels up to about 100 feet in length. Four fathoms can be carried through the passage.

To enter Nazan Bay pass ¾ mile southward of Cape Kudugnak and steer 270° true (W. by S. mag.) with Uyak Island a little on the port bow. Hold this course until Uyak Island is abeam distant about 600 yards, then steer 257° true (SW. by W. ⅞ W. mag.), heading for the most northerly and highest of the Cone Islands. When about 500 yards distant from the island, haul to 215° true (SSW. ⅛ W. mag.) and anchor in 12 fathoms (21.9 m.) mud bottom, about midway between the point and the rocky ledge on the west side of the largest Bolshoi Island.

Vessels desiring more room can anchor northward of the Cone Islands, but there is less protection here.

Adak Island is large and mountainous; some of the peaks are always snow covered. Fox farming is now being conducted on the island.

Bay of Islands is a large bay with many islands on the northwest side of Adak Island. A Coast and Geodetic Survey party made a reconnaissance survey of this bay in 1925, and found a commodious landlocked harbor at the head of the bay. Such information as could be secured from reports of men with local knowledge would indicate a good harbor for vessels of all sizes; easy of access and with an abundant supply of fresh water at the falls on the south shore of the bay.

In 1926 a party from the Coast Guard cutter *Unalga* examined the bight on the south shore of the bay southward from the **Entrance Islands** (the group of islands on the south side of North Island Anchorage) and found it to be secure landlocked anchorage about ⅜ mile wide with soft, sticky bottom. The depths in midchannel ranged from 15 to 20 fathoms (27.4 to 36 m.) ¼ mile from the head, decreasing to from 4 to 6 fathoms (7.3 to 11 m.), sand and gravel bottom, about 200 yards from the head.

To enter Bay of Islands.—As stated above, the sailing lines have not been verified by soundings, and therefore great caution should be used in entering. It would be wise to send a small boat ahead of the ship until safe ranges can be established. The following are the best available directions: Follow the middle of Adak Straits until North Cape bears 301° true (W. by N. ¾ N. mag.), then steer 121° true (E. by S. ¾ S. mag.), keeping the high pinnacle rock at the foot of the bluff over the stern. When **Cliff Point,** 200 feet (61 m.) or more high bears 90° true (E. by N. mag.), steer 149° true (SE. ⅜ S. mag.) to pass midway between **Green Island** and the rocks ⅓ mile eastward from it. This course leaves Cascade Rock ⅜ mile on the port hand. **Cascade Rock** is low, and the sea is usually breaking over it. After passing Green Island, steer midchannel courses into the harbor.

From a point 400 yards westward of Cascade Rock the *Unalga*, drawing 14½ feet, proceeded to the bight mentioned above, steering approximately midchannel courses. Uneven bottom, with depths varying from 7 fathoms (12.8 m.) to no bottom at 20 fathoms (36 m.), was found. After passing Green Island several rocks awash were noted indicating the necessity for great caution until the region has been completely surveyed. In passing between Entrance Islands and **Long Island,** to the westward of Entrance Islands, the east side of the channel was favored slightly to avoid kelp off Long Island. Kelp patches along the western side of the anchorage bight were noted.

North Island Anchorage.—This anchorage has been used by the Coast Guard vessels, and has been erroneously shown on chart 9196 as Bay of Islands. It is reported by the Coast Guard as being a good anchorage.

To enter, proceed on a 121° true (E. by S. ¾ S. mag.) course with pinnacle rock over the stern and heading for the north side of South Island. When off the entrance, pass midway between North Rocks and South Island and head up to an anchorage near the south shore of North Island in 17 fathoms (31 m.). Mud bottom may be found, although it is generally of rock.

Entrance from this anchorage to the upper part of the Bay of Islands may be made through a channel 40 yards wide along the east shore of the largest of the Entrance Islands. There is a spot with less than 3 fathoms (5.5 m.) over it about 100 yards northward of the northern end of the narrow channel, and a similar spot just within the southern entrance. Both shoals are marked with kelp. The examination indicated that by avoiding these spots, 8 fathoms (14.6 m.) could be carried through.

Three-Arm Bay is located southwest from the Bay of Islands. It is reported by the local fox farmer that the north and south arms extend farther into the island than shown on the chart. The north arm nearly meets the south shore of Bay of Islands. It is reported that anchorage for small craft can be found in these arms.

Bay of Waterfalls (chart 9196) is at the southwestern point of Adak Island and opens on the Pacific Ocean. It is about 4 miles wide at the entrance, and extends about 8 miles in a northerly direction. The two entrance points are **Cape Yakak** and **Turret Point,** which form important landmarks for vessels passing southward of the islands. Cape Yakak is a long flat tableland well defined and easily distinguished, as it has no high peaks on it and is the only point of that nature on the western Aleutian Islands. In clear weather the peaks of Kanaga Island loom up in the distance above it. The Coast Guard reports that a good anchorage can be had within ½ mile of the head of the bay in 16 fathoms (29.3 m.).

Chapel Roads is on the eastern side of the Bay of Waterfalls and offers convenient anchorage in 20 fathoms (37 m.), rock and sand bottom. **Chapel Cove** is at the head of Chapel Roads; the entrance is narrow and almost in the middle of it there is a pinnacle rock with 2½ fathoms (4.6 m.) over it. Inside the cove there is a ledge of rock above water on the southwestern side, called **Pulpit Rocks.** There is swinging room for a 200-foot vessel with 45 fathoms of chain

if she anchors in the middle. There is 12 fathoms (21.9 m.) fairly soft bottom in this position.

Cataract Bight is on the eastern shore of the Bay of Waterfalls near its head and affords an anchorage in 24 fathoms (44 m.) about 200 yards off the beach where fresh water can easily be obtained. With southerly winds, a perceptible swell reaches here from the sea.

False Bay, 3 miles eastward of Turret Point, is distinguished from Bay of Waterfalls by two ragged islands on the eastern side which do not resemble Turret Point at all.

The local fox farmers state that there are several good harbors for small craft along the south side of Adak Island. One of these which is not indicated on the chart is on the east side of the pass between Adak and Kagalaski Islands.

Kuluk Bay, on the eastern side of Adak Island, is reported as a good harbor, with no sunken rocks, but slightly exposed to northeast weather. Some fox farmers have their winter residences here. Bays forming good harbors for small craft and not indicated on the chart are reported to exist on both the southwest and northeast sides of **Little Tanaga Island.**

It is reported that bearings between the islands in this vicinity do not agree with the chart, but there is not sufficient information on hand to correct the topography.

Adak Strait separates Adak and Kanaga Islands. In 1923 the Coast Guard cutter *Algonquin* passed through Adak Strait from the Bering Sea to the Pacific keeping in the middle of the strait, and encountered no current, passage being made 2 hours before low water. Tide rips and whirls were encountered 2 miles northward of Three-Arm Bay 1½ miles offshore. A long southwest swell was setting in the strait, but no uncharted obstructions were seen, and it was thought that the entire area in the middle of the strait was clear.

Kanaga Island is reported to have a high smoking volcano on its northern end; the southwestern end has an elevation of 1,392 feet (424 m.). Local navigators report a landlocked bay more extensive than the one shown on the chart, on the south coast just west of Cape Tusik. It has a narrow entrance.

Tanaga Island is westward of Kanaga Island, and has a volcano 6,975 feet (2,126 m.) high on its northwest point. **Tanaga Bay,** called also Glory of Russia Bay, lies midway of the west coast. It is said to afford anchorage in the northern part near the head, abreast of two streams, over a bottom of fine black sand. It is not recommended for large vessels, but small craft can find shelter.

A long **reef** is reported to extend eastward from **Cape Sudak,** the northeastern point of the island.

Rocks are reported off the east coast of Tanaga Island in the pass between it and Kanaga Island.

Tanaga Pass, westward of Tanaga Island, is reported clear by several vessels which have used it. Breakers are reported to extend 8 miles northward from Kavalga and Unalga Islands. The pass between Ulak and Kavalga Islands is reported to be 9 or 10 miles wide.

Gareloi Island is an active volcano which is reported to be a good landmark; it is 5,334 feet (1,626 m.) high and snow covered. There is a group of islands southward of it, for which no information is

available except the chart. **Amatignak Island,** 1,921 feet (585 m.) high, is the southernmost of the group, and is an important landmark for vessels passing southward of the islands.

RAT ISLANDS

Semisopochnoi Island, called also Island of the Seven Mountains, is shown on the chart as 3,112 feet (948 m.) high; it is important on account of **Petrel Bank,** which extends about 30 miles north-northeastward from it, and is about 18 miles across. The least known depth on this bank is 29 fathoms (53 m.). It is very useful in navigating this region in foggy weather, when Semisopochnoi Island is obscured.

Amchitka Island is long and low. The northwest end is shown on the chart as 1,008 feet (307 m.) high. The eastern extremity forms a peninsula, from the end of which a reef extends for 2 miles; a hillock marks the extremity of this point. The offshore navigator can not expect to see Amchitka at all as there are no commanding elevations.

A **reef** and outlying rocks are reported to extend 10 to 12 miles southwestward from the southwest end of Amchitka Island.

Constantine Harbor (chart 9196), near the easternmost point of Amchitka Island, on the northern side, is said to be the only harbor on the island. It is open to the northeastward, and is said to afford anchorage in 8 to 12 fathoms (14.6 to 21.9 m.), but from reports of the Coast Guard it is not to be recommended. The chart shows all the existing information.

Kirilof Bay is said to be only a small boat harbor inside the reef; vessels should not attempt to find a sheltered anchorage here.

Little Sitkin, Chugul (also called Iron Island), **Davidof,** and **Khwostof Islands** form a group of four; their positions have been disputed from time to time. The two largest are high volcanic cones with smooth slopes. Little Sitkin shows a long flat point at the northern side.

It is reported that there is a small island about midway between Little Sitkin and **Rat Island.** It is also reported that there is a reef all the way from Rat Island to the south end of Kiska Island, and that bottom can be seen all the way across; vessels have therefore regarded that passage with suspicion. There is no other information about Rat Island except the chart.

Kiska Island.—The general trend of the island is north-northeast and south-southwest, with a ridge of mountains as a backbone, having elevations of 4,050 feet (1,234 m.) at the northern end, and 1,200 to 1,500 feet (366 to 457 m.) in the southern part. The shores are hilly and rocky.

The northeast coast, from Northeast Cape to Kiska Harbor, is bold with numerous points and bays, with outlying rocks to a maximum distance of about 1½ miles.

McArthur Reef, a rocky patch about ½ by ⅓ mile in extent, and nearly awash at low water, lies about midway of, and on a line between, the peak on Chugul Island and the peak on the north end of Kiska.

Tanadak Island is flat-topped, resembling a mesa when seen from a distance.

Tanadak Pass, between Little Kiska and Tanadak Islands, should be used with caution.

South Pass, between Kiska and Little Kiska Islands, is foul and should not be used.

Kiska Harbor is closed to foreign shipping.

BULDIR ISLAND

is an important landmark. Its position has often been disputed, but is considered to be approximately correct as now charted. The island is said to be 1,145 feet (349 m.) high. Vessels have passed along the north shore, but the south shore has been regarded as dangerous. Vessels have found temporary anchorage near the western point in 10 to 15 fathoms (18.3 to 27.4 m.) about 1 mile offshore.

The north anchorage is about halfway between the two reefs shown on the chart, one off the north shore and the other off the northwest point. In approaching the anchorage avoid the reef on the north shore and stand in on a 163° true (SSE. mag.) course nearly parallel to the reefs off the northwest point. This reef consists of a low, round knuckle directly off the point and two fairly high islands. Foul ground exists close around the islands. The north reef at low water shows two rocks close inshore, and more foul ground is supposed to exist. It is stated that almost the only possible boat landing on the island is at this anchorage.

The southwest anchorage is in 10 fathoms (18.3 m.) with the sea-lion rookery bearing 41° true (NE. by N. mag.), distant 1 mile.

The passage between Kiska and Buldir Islands is about 50 miles wide; but can not be considered safe until it is more carefully explored. It is chiefly noted on account of a line of tide rips, breakers, and overfalls which are often seen extending well across between the two islands. The current amounts to a knot or more at times. The rips occur on banks of less than 100 fathoms (183 m.) surrounded by deeper water, and until the region is well explored a vessel must proceed through them with caution, and should take soundings at all times.

There may be a dangerous shoal near the 15-fathom (27.4 m.) sounding charted 10 miles from Buldir on a line toward the middle of Kiska; breakers have been reported here. There are indications that there may be a dangerous shoal halfway between Buldir and the south end of Kiska; and there have been reports to that effect. There is no information to verify the two reefs marked "P. D. sunken rocks" 10 miles southward and 6 miles southeastward of Buldir, and they may be anywhere in a wide region round about. One report places them about 14 miles southwestward of the island.

Tahoma Reef, on which the revenue cutter *Tahoma* was lost in 1914, is a reef of sunken rocks about 2 miles in extent, marked by heavy kelp fields, lying 189° true (S. ⅛W. mag.), distant 31 miles from the peak of Buldir Island. Breakers were seen in about 2 fathoms (3.7 m.), but there are no rocks above water. There are other breakers about 2 miles 108° true (E. by S. mag.) from the position located. Depths of 60 fathoms (110 m.) were found 6 miles distant southward and westward, with a regular slope from the reef to this distance.

Ingenstrem Rocks consist of a number of small black pinnacles about 20 feet (6.1 m.) high, with breakers near them. The water shoals to 50 fathoms (91 m.) within 3 miles of them, and there is moderately shallow water between them and the Semichi Islands. The latest information places their position 13 miles 121° true (SE. by E. ¾ E. mag.) from the southeastern end of the Semichi group.

The **Semichi Islands** are a group of three, of which the two eastern ones are low and the western one higher. There are reefs extending about 1½ miles southeastward and northeastward from the eastern point of the group. The passages between the islands are narrow and appear to be foul. A safe track was found 2 miles off the southern coast. Temporary anchorage may be found southward of the eastern island.

AGATTU ISLAND

has high mountains upon it, while the extreme western point is low. There are reports that the shape does not agree with the chart. It is reported that the northeast and southeast points are in range on a bearing 23° true (N. by E. ⅜ E. mag.), and that the eastern point of the Semichi Islands lies on the same range. A course from the Semichi Islands to the western point of Agattu indicates that this point is charted about 4 miles too far westward. The southern coast of Agattu is dangerous, with numerous outlying rocks and breakers. A vessel should keep at least 3 miles offshore.

McDonald Bay is an open anchorage on the east coast. Approaching it from northward bring Northeast Cape to bear 241° true (SW. by W. mag.) distant 3 miles, and then steer 213° true (SSW. ½ W. mag.) until it bears abeam. Then steer for Monolith Point at the north point of the cove on a course 255° true (WSW. ¼ W. mag.), and when Cone Peak bears 325° true (NW. ½ N. mag.) with a waterfall about in range, round to and anchor in 15 fathoms (27.4 m.), sand bottom, about ½ mile offshore.

ATTU ISLAND

is the westernmost of the Aleutian Islands, and the last of the islands belonging to the United States. It is about 20 by 35 miles in extent and is indented by many bays and long inlets; there are mountains 3,000 feet (914 m.) high upon it. There are many rocks and reefs off its shores, and a vessel should exercise extreme caution in the vicinity. It is reported that there is a rock about 15 feet (4.6 m.) high, connected with the land by a line of breakers, located 3 miles 125° true (SE. by E. ½ E. mag.) from **East Cape**, and that the cape should be given a berth of at least 4 miles.

The chart shows several deep bays on the south coast and many offshore dangers, but there is no other information about them. Sarana Bay on the northeast coast and Chichagof Harbor on the north coast are the only bays for which there is available information.

Chichagof Harbor (chart 9196) is small, but offers good shelter for a vessel of less than 14 feet (4.3 m.) draft. The chart is said to be correct in all essentials for navigation, but there may be considerable difficulty in finding the bay in bad weather. A vessel should

therefore proceed with caution, especially in bad northerly weather. Strong currents set northeastward and southwestward past East Cape, which are possibly influenced more by the weather than by the tide.

The small native village of **Attu** is located at the head of this harbor. There is a church, and a trading post maintained by a white man. Vessels of the Coast Guard visit Attu each year, but otherwise there is little communication with the outside world.

There are rocks for a distance of about 1 mile eastward of **Cape Khlebnikof,** which is the landfall in the approach from East Cape or from northeastward. **Cooper Island** is high and dome-shaped, and **Gibson Island** is lower and flat-topped. **Pisa Tower** is a leaning conical rock at the east entrance point, which is used as a front range mark. An outer anchorage is reported in 14 fathoms (25.6 m.) with Cooper Island dome bearing 309° true (NW. by W. mag.) and Pisa Tower bearing 185° true (S. mag.).

To enter the inner harbor steer for Pisa Tower on a bearing that will lead clear of Gibson Island. When within ⅜ mile of Pisa Tower steer 241° true (SW. by W. mag.) with Range Point a little on the port bow. Stand through the middle of the passage between Range Point and Inner Rocks, and round to 275° true (W. mag.), heading for the southernmost of five jagged heads on the shore just above the water line. Keep both leads going, and when the dome of Cooper Island shows in the open round slowly to a course about 224° true (SW. ¼ S. mag.), heading about halfway between the gulch and the village. Anchor in the middle of the harbor in 5 fathoms (9.1 m.), sticky bottom. A vessel must be maneuvered smartly, as the turns are sharp and there is little room.

Sarana Bay is a deep indentation on the northeast shore of Attu Island between Cape Khlebnikof and East Cape. The Revenue cutter *Tahoma* anchored in the cove at the head of the bay, and the available information is furnished on a sketch by that vessel. The sketch shows foul ground extending about 1 mile eastward from Cape Khlebnikof and off the western shore of the bay. The south shore apparently is bold from the head of the bay to **Square Point,** but is foul eastward of the point; there is a cascade eastward of Square Point.

The *Tahoma* entered on a 196° true (S. by W. mag.) course for Square Point open eastward of a notch in the mountain, until close to Square Point, and then followed the south shore on a 269° true (W. ½ S. mag.) course, midway between an islet and the south shore, and anchored in 9 fathoms (16.5 m.) soft bottom, close to the head of the bay. The anchorage is exposed from about north to east.

BERING SEA

The portions of Bering Sea here treated include the coast and islands of Alaska northward of the Aleutian Islands. Excepting a few localities, this territory has not been surveyed, and the charts of it are only compilations from various sources, with corrections made from later information received; the charts are necessarily imperfect and must not be followed implicity, especially when in the vicinity of the coast. Then, too, the currents are much influenced by the

winds, and are imperfectly known and difficult to predict, so that positions by dead reckoning are uncertain and safety depends upon constant vigilance.

Northward and eastward of the 100-fathom (183 m.) line the waters of Bering Sea shoal gradually to the coast. There are no dangers in the open sea, unless the Pribilof Islands, St. Lawrence Island, St. Matthew Island, King Island, and Diomede Islands be considered as such. These, being volcanic in character and rocky, are generally bold-to, and in approaching them in thick weather the lead can not be depended upon at all times to keep clear of them. The coast of the mainland from the head of Bristol Bay to St. Michael, including Nunivak Island, is characterized by extensive banks, formed by deposits from the rivers, which extend many miles from shore, in some cases out of sight of land. Some of these shoals are believed to be quite steep-to on their seaward faces, making it unsafe to shoal the water to less than 10 fathoms (18.3 m.) when in their vicinity.

In this region, where fog and thick weather are the rule during the season of navigation, safety, when near the coast, depends on the use of the lead, which, on account of the generally regular bottom, will indicate the approach to danger. In general, all the shores of Bering Sea and the Arctic Ocean are shallow, and when coasting it should be observed as a rule to keep the lead going constantly, and when north of St. Michael never to shoal the water to less than 5 fathoms (9.1 m.) unless feeling the way in to the land. Between St. Michael and the head of Bristol Bay the water should not be shoaled to less than 10 fathoms (18.3 m.) under the same conditions.

There are few aids to navigation. All of the rocky islands and rocky cliffs of the mainland are frequented by thousands of birds, whose numbers, constant cries, and flight may serve to indicate the approach to shore at these places in thick weather.

The coast of Alaska from the head of Bristol Bay to Point Barrow and eastward has driftwood, which is brought down from the interior by the rivers and carried by the northerly currents of the sea. Good water can always be found in the vicinity of high land. Salmon are plentiful during the open season in all the streams as far north as Kotzebue Sound, and cod are plentiful in the vicinity of the passes and in Bristol Bay.

Ice.—Except in bays and sheltered places, the ice of Bering Sea is detached fields, floes, and cakes, which are continually kept in motion, breaking up, piling, and telescoping by the action of variable winds and currents. At no time is the sea one solid sheet of ice, and in the winter, while it is forming, it is more scattered than in the spring, when the northerly movement has begun and it packs closer together. The general southern limit of ice is from Bristol Bay to the vicinity of St. George Island, and thence about west-northwest to the Siberian shore. The southern edge is ragged and very much scattered, and continued northerly winds sometimes drive fields of it far southward. As a rule, no heavy ice will be encountered south of the Pribilof Islands, and the ice in their vicinity is likely to be nothing more than detached fields.

During the winter of 1923–24 continued northerly winds drove the ice into Isanotski Strait, completely blocking the strait and clos-

ing it to navigation for a short period. During the following spring a steamer bound south from Nome was impeded by ice during the latter part of June.

The ice conditions in Bristol Bay have so far received little notice. Reports have been received that the bay is usually free from heavy ice between the middle of May and June 10. In 1899 the steamer *Jeanie*, of 1,000 tons and a draft of 18 feet, reached Clark Point, in Nushagak River, on April 4, and was discharged on April 15. At this time the ice in the river above Fort Alexander remained solid, but two weeks afterwards it broke up and came down the river in large pieces, which would have endangered any vessel at anchor. In approaching the Nushagak River some ice was encountered about 75 miles from Cape Constantine, but not sufficient to seriously interfere with navigation. On May 10, 1896, a vessel bound for Bristol Bay was brought up by the ice, which extended from Port Moller to St. George Island, and she was not able to reach the Nushagak River until 30 days later. It is within reason to believe that some years Bristol Bay is open to navigation all winter, though the rivers and sheltered bays are closed.

In December, 1918, a steamer succeeded in reaching the Pribilof Islands with cargo, which was discharged after much delay. A small cargo of seal skins and products was loaded for the return trip.

The information regarding ice conditions in Kuskokwim Bay and River is very meager. In general, however, this region may be expected to be clear of ice about June 1.

In 1925 the ice on the river broke on May 23 and went out at Eek Island on May 29. On June 5 large pieces of ice were encountered just below the mouth of the river. Local residents stated that this was the latest the river has been clear of ice for the last 15 years. See also page 285.

In the spring, beginning with April, there is a general northward movement of the ice, the shores clearing ahead of the center of the sea; but it sometimes hangs in the bays and around the islands later than in the open sea. Seasons vary, the movement and position of the ice depending greatly on the direction of the winds. Generally, however, by June 1 the whole body of ice is well up with St. Lawrence Island, and a passage opens to its west side. The eastern side of the sea is likely to be obstructed a little later than the western side, and ice is often met between St. Lawrence Island and Nunivak Island in the early part of June. The breaking out of the rivers toward the latter part of May clears the shores, but the ice is likely to hold in Norton Sound several weeks later.

In general, for a vessel not fitted to encounter ice, Norton Sound is not navigable before the middle of June, often not before June 20 to 25, and has been known to be as late as July 10. On entering the sound about this time, strips of ice are often encountered after the sound can be said to be navigable. From the deck these may appear extensive and solid, but from aloft clear water may be seen beyond and through them. At the opening of navigation the ice is likely to be heaviest and to remain longest on the north shore, and, in general, it is the last of June before that part of the sound is altogether clear.

In the fall young ice begins to form on the rivers, and in the bays

and sheltered place after October 1, and grows stronger and spreads according to the severity of the advancing season. Navigation is considered unsafe in Norton Sound after October 15.

Currents.—There has been no systematic study of the currents of Bering Sea, and the almost constant fogs prevent the navigator from adding much to our meager knowledge concerning them. It is said that in general the currents are greatly influenced by the tide and winds. The following observations apply to the open season, when the flow of the currents is not obstructed by ice:

Between Cape Cheerful and St. George Island the current is not believed to have any decided set or flow unless influenced by the wind. With a strong wind a current is likely to set with it, but ½ point allowance in a course will be sufficient to overcome any set that will be found in this vicinity due to this cause.

Between St. Matthew and Nunivak Islands the set of the current is northward; with prevailing northeast winds it sets northwest, and with northwest and southwest winds, northeast. This northerly current continues and increases between St. Lawrence Island and the mainland, being stronger toward the mainland north of the mouth of the Yukon River, where it amounts to about 1 knot, except in the early summer, when, increased by the freshets in the Yukon, it may amount to 2 knots or more. A strong northeasterly current setting on the Yukon flats has been observed, amounting at times to 2½ knots. The current sets north across Norton Sound to Sledge Island and then follows the coast to Bering Strait. It is strongly marked between Sledge Island and Bering Strait.

In Bering Strait the current sets north, and when not influenced by wind its velocity is about 2 knots an hour. Protracted northerly gales which prevail in the autumn change its direction to southward, but on the cessation of the wind it quickly set north again. Strong southerly gales increase its velocity to 3 knots. The current is stronger east of the Diomede Islands than west of them.

Captain Covell, of the Coast Guard cutter *Bear*, makes the following remarks concerning currents in this locality: "After a southeast gale in the Bering Sea, during which the water is banked up against Siberia, a very marked current sets in the opposite direction. The reverse is true for a southwest gale. The exact interval between the gale and the strong countercurrent is, so far, undetermined. Of the existence of this countercurrent under such conditions, there is no doubt, and it demands consideration."

A current sets strongly from Cape Newenham through Etolin Strait.

Tidal currents.—In the southern part of Bering Sea, inside the 100-fathom (183 m.) line, and through the various passes in the Aleutian Islands, the tidal current sets northward or northeastward during the rising tide, and southward or southwestward during the falling tide. In some of the passes it sometimes has a velocity of 9 knots; when clear of the passes its maximum velocity is about 2½ knots. At the Pribilof Islands, Nunivak, St. Matthew, and St. Lawrence Islands the tidal currents have considerable velocity. The flood current sets eastward and northward and the ebb westward and southward. In Bristol Bay the tidal currents have considerable

velocity. They have also considerable velocity at the Kuskokwim River and north to the mouth of the Yukon, especially in Etolin Strait and about Cape Vancouver.

Fog is most prevalent during spring, summer, and early fall, and it generally begins to clear about the middle of October. In summer fog is almost continuous, but few days are clear from morning to night, and the tops of the mountains can seldom be seen. At the surface of the water it is generally sufficiently clear to make out the shore at a distance of 3 or 4 miles, but at times it is so thick that nothing can be made out, and under such conditions strangers should not attempt to make the land. During the summer months the mist and fog are considered to be worse on the south side of the Aleutian Islands than on the north side in their immediate vicinity.

Weather.—The most striking feature about the weather in Bering Sea is its great uncertainty throughout the year. Good weather is rare and not lasting, and the winds can not be depended upon to remain long in one quarter. The late spring and summer are mild and very foggy, with frequent periods of light weather, comparatively few strong winds, and considerable rain. After September 1 gales become frequent and heavy, fogs gradually lessen, and toward the latter part of the month snow often accompanies the storms. During all the fall, gales are frequent, violent, and from almost any quarter.

During the fall and winter there are often periods of very low barometer (readings below 29.00 being common) accompanied by moderate to strong gales, with rain or snow. These gales, though sometimes very severe, are usually not so strong as would be expected by the fall of the barometer. After December and continuing into the spring there are often periods of moderate weather, and while severe gales occur, they are less frequent than in the fall. Strong winds or gales from any quarter always bring thick weather, rain, or snow. With easterly or southerly winds the rain is continuous, while with westerly or northerly winds the rain or snow occurs at intervals in squalls, and when the wind subsides the weather is likely to be clear.

Southeast gales, with falling barometer and rising temperature, are almost invariably preceded by an unusual clearness of the air; cirrus clouds are seen southwestward, which gradually thicken and overspread the sky. The wind usually shifts to southwestward when the barometer ceases to fall, but it sometimes backs from southeast to northeast, and generally goes to northwest before subsiding. Upon abating, the gale is followed by light westerly winds and comparatively clear weather.

BRISTOL BAY

Bristol Bay may be said to include all that part of Bering Sea lying east of a line drawn from Cape Sarichef, Unimak Island, to the Kuskokwim River. Unimak Island and the Alaska Peninsula bound it on the south and east, and separate it from the Pacific Ocean. The Naknek River is at the head of deep-water navigation, while the bay itself terminates in the Kvichak River, a few miles northward. The region about Nushagak River, Kulukak Bay, and the Kuskokwim forms its northwest boundary.

The shores are usually low and without distinctive features, but high mountain ranges and volcanic cones extend along the central parts of Unimak Island and the Alaska Peninsula. These rugged snow-covered mountains and lofty peaks would serve as unmistakable landmarks were they not obscured by the almost constant fogs which prevail in that region during the summer months. The shore and objects near the sea level are often seen beneath the fog when the higher lands are obscured, and, therefore, most of the available landmarks are found on or near the beach.

The winds and weather in Bristol Bay and the other parts of Bering Sea visited by the *Albatross* from the last of May to the 1st of September, 1890, may be summarized in a few words.

Southwest winds prevailed, but we had them frequently from southeast to northwest. It was boisterous weather nearly half the time, but seldom rough enough to interfere with our work. We had several summer gales of moderate force, but no severe storms. Fog and mist prevailed, and a clear day was the rare exception. The tidal currents were strongest in the vicinity of Unimak Pass and at the head of the bay; they were greatly affected, however, by the winds. The flood stream sets northward and slightly inshore along the coasts of Unimak Island and the peninsula, the ebb southward and offshore. The former was invariably the stronger, and probably found an outlet by sweeping past Cape Constantine in the direction of Cape Newenham.

Reports have been received which indicate an easterly set, variable in velocity, along the northern side of Alaska Peninsula and in Bristol Bay.

COAST FROM UNIMAK PASS TO PORT MOLLER

Cape Sarichef, Unimak Island, is described on page 225, it is low, with detached rocks close inshore, around which strong tidal currents sweep. The land falls away eastward in a gentle curve, forming an open bay, called **Dublin Bay,** about 4 miles in depth between the cape and Cave Point, which lies 16 miles from the former. This bay may be used as a temporary anchorage by vessels of any size. The holding ground is said to be good. **Cave Point** is a vertical, rocky cliff, about 150 feet (46 m.) in height, and takes its name from a cave on its face, inhabited by sea birds, which in summer hover about it in thousands, making it conspicuous in clear weather by their numbers, and in fog by their constant cries. The snow-clad peak of **Pogromni Volcano,** rising to an altitude of 6,500 feet (1,981 m.) above the sea, forms a striking background to the low, monotonous coast.

Passing **Cape Mordvinof,** a low, bluff point about 13 miles from Cave Point, the coast falls away slightly for 6 miles, when it turns abruptly eastward for 5 miles, and then takes a northerly direction forming **Urilia Bay.** This bay is open northward, but affords protection from all winds from southward of east or west. The approaches are clear, and the water shoals gradually to 6 fathoms (11 m.), black sand, about ¾ mile from shore.

From **Urilia Bay** to **Isanotski Strait** the coast trends in a northeasterly direction, is very low, and has several rocky patches extend-

ing ½ to 1 mile from shore, making navigation unsafe inside the 12-fathom (22 m.) line. The volcano of **Shishaldin** rises 9,387 feet (2,861 m.) about midway between the above points and 7 or 8 miles inland. Isanotski Strait is available only for small vessels.

Swanson Lagoon is a shallow lagoon on the north side of Unimak Island 7 miles westward from Chunak Point. It has a narrow entrance and during some years can be entered by light-draft launches, but at other times only pulling boats can enter. Inside is for the most part a mud flat at low water with crooked channels with from 1 to 3 feet (0.3 to 0.9 m.) of water flowing between tidal flats. The lakes draining into the lagoon are spawning places for salmon, and the lagoon is important only as a fishery. About ¾ mile eastward of the entrance is a cone-shaped hill 85 feet (25.9 m.) high.

Isanotski Strait (False Pass).—A beacon is established on a sand dune about 1⅞ miles westward from Chunak Point. This beacon is useful to small craft making the entrance of the strait from Bering Sea. For directions, Isanotski Strait, see page 216.

From the strait to Cape Glazenap, about 19 miles, the coast retains the same general direction. It is low with grassy bluffs in places 50 to 100 feet (15.2 to 30 m.) high.

Cape Glazenap, at the entrance to Izembek Bay, is oval in form and is about 100 feet (30 m.) high.

Izembek Bay covers a large area at high tide, but much of it is bare at low water. Reports have indicated a channel into the bay with 10 to 12 feet on the bar, but in 1924, launches were unable to find any consistent channels through the entrance. The bay is navigated with power dories by the local trappers and guides who often take bear-hunting parties into the bay. There is a trail from Izembek Bay to the headwaters of Cold Bay.

Amak Island is of volcanic origin, about 2½ miles in length, 1½ miles in width, and 1,682 feet in height. It lies 12 miles northwest from Cape Glazenap. The beaches are mostly huge bowlders and bluffs 30 to 150 feet (9 to 46 m.) high. The central peak is a dark-brown rock, bare, rugged, and precipitous. The southeast point is in latitude 55° 25′ N. and longitude 163° 08′ W. The island was determined by triangulation in 1924 and the charted position was found to be correct. There is foul ground off the northwest end of the island, several rocks awash or under water, and **Sealion Rock** between 2 and 3 miles distant. The latter is several hundred yards in extent and about 150 feet (46 m.) high, its slopes being occupied by an extensive rookery of sea lions.

A reef about ¼ mile long lies off the southeast end of Amak Island; about 250 yards of this reef shows bare. A reef, which breaks in a moderate swell, has been reported 3 miles about 63° true (NE. mag.) from the summit of the island.

It is reported that a fair lee and anchorage with hard bottom can be found on the southeast side of Amak Island, and one not so good on the southwest side, but the foul south point of the island must be given a wide berth.

The **Kudiakof Islands** extend about 19 miles between Cape Glazenap and **Moffet Point.** They are but little above high water, and some of them are connected by narrow spits at low water.

From Moffet Point the low coast extends 15 miles to **Gerstle Bay,** then northward and eastward about 55 miles to **Wolf Point,** on the western side of the entrance to Port Moller.

The **Kudobin Islands** occupy the last 23 miles of this distance. They are very low, and it is difficult to distinguish them from the mainland, the only distinctive feature being a knob about 25 feet (7.6 m.) high on the east end of **Kritskoi.** The land between Herendeen Bay and **Nelson Lagoon** is very low. The cannery in Nelson Lagoon has not been in operation for several years. Fish caught in the lagoon are taken to the cannery at Port Moller.

PORT MOLLER

The surveys of Port Moller (chart 8833) are incomplete. A party of the Coast and Geodetic Survey made a partial examination in 1910, the work being confined to the vicinity of Entrance Point. The following information is from the report and examination by that party supplemented by later information furnished by the Pacific American Fisheries, which company operates a cannery in the port.

Port Moller is surrounded by high mountains, and there is a high ridge across its head. The shore is steep and rocky except at the spits. **Kudobin Islands** are low and afford no definite features on which a bearing can be taken.

Walrus Island, the most easterly of the Kudobin Islands, lies on the west side of the entrance. The beacon formerly on Wolf Point has been discontinued.

Doe Point and **Point Divide** are bluffs and can be seen from some distance outside of Entrance Point. **Harbor Point** is a low, narrow, grassy sand and shingle spit, which can not be made out distinctly until nearly up with Entrance Point.

Port Moller and Herendeen Bay are indicated from seaward by a valley receding into the mountains. The land at the entrance is low and the chart indicates extensive shoals in the approach, so that access would be somewhat difficult in bad weather even if the charts were based on an accurate survey. The only channel of which we have any knowledge lies on the eastern side of the entrance, and **Entrance Point,** a low grassy spit, is the leading mark for entering. It is marked near the end by sand knolls, some noticeably eroded on the offshore side. There is deep water close to its southwest end, but a shoal extends some distance offshore from its outer side.

The cannery buildings and dock of the Pacific American Fisheries are located just inside Entrance Point.

Northwestward from Entrance Point is a large shoal with depths of 14 feet (4.3 m.) and less over it. There is a channel suitable for fishing boats between this shoal and the shore.

A shoal with little water over it and on which the sea generally breaks at low water lies about ¾ mile westward (true) from the end of Harbor Point and extends in a 354° true (NNW. ¼ W. mag.) direction for a distance of about 4 miles, where it forms the southeastern side of the channel which leads to Entrance Point. The

Pacific American Fisheries report that there has been considerable change in the flats off Port Moller during the past few years, but that the entering channel has remained about the same.

Anchorage.—A convenient anchorage can be had in the channel abreast the dolphin in 13 fathoms (23.8 m.). A more protected anchorage may be found in the channel between Entrance Point and Harbor Point.

The cannery company maintains a radio station (call letters KWR) during the canning season, from April to August of each year. There is a store from which a limited amount of provisions may be obtained. During the salmon season a company steamer from Bellingham, Washington, calls at Port Moller about twice monthly. There is a trail leading overland from Port Moller to Balboa Bay on the Pacific side of the peninsula.

Directions.—A stranger approaching Port Moller should notify the cannery by radio and a pilot will be sent out, for which there will be no charge. The following directions are given by Captains Jackson and Knight of the Pacific American Fisheries:

> From off the eastern end of Walrus Island steer about 120° true (E. by S. mag.) for the end of Entrance Point. When on the bearing, a white beacon on Entrance Point should be on range with another beacon on the high bluffs across the bay. This range passes close to the shoal to the northeastward, and for that reason the range should be held a little open to the southward. Each summer the cannery company drives a dolphin on the southwest extremity of the shoal with an arrow pointing toward the channel. The dolphin is usually driven in about 5 fathoms (9.1 m.) of water. When about ¾ mile off Entrance Point haul up and round the point at a distance of not more than ¼ mile and go to the dock. Special precaution should be taken when entering with a flood tide.

With a strong southeast wind, vessels are sometimes unable to get away from the dock at Port Moller. There are 18 feet (5.5 m.) of water at the dock, and fresh water is piped to it.

To make the anchorage northward of Harbor Point, pass ¼ mile southwestward of Entrance Point on a southeasterly course, and then bring the point astern on a 174° true (SSE. ¼ E. mag.), course until 1¼ to 1½ miles from it. Then steer 188° true (S. by E. mag.), heading to pass about ¼ mile westward of the end of Harbor Point.

Tides.—The mean range of tide at Port Moller is about 7½ feet. The high water interval is about 8 hours.

HERENDEEN BAY

There is no information regarding this region other than that which may be taken from chart 8833. In using the chart it should be borne in mind that, except for the area already described, the surveys upon which it is based were made in 1890, and that all information available points to extensive changes since that time, particularly in those areas exposed to the action of the sea.

Mine Harbor is small but free from dangers, except **Midway Reef,** which extends ⅜ mile from its eastern shore and shows at half tide. Anchor northwestward of Midway Reef in 12 to 15 fathoms (21.9 to 27.4 m.), and if intending to remain any time it is advisable to moor. A reef extends 600 yards westward from **Crow Point,** the

south point of Mine Harbor. **Crow Reef,** bare at low water, lies 7/8 mile westward of Crow Point and 1/2 mile southward of Bluff Point.

Hague Channel is 1 mile wide at its northern entrance, and is contracted to less than 1/2 mile between Point Divide and Doe Point. The tidal currents are very strong, and near high water they sweep across the narrow channel and over the flats, making it impossible to steer a compass course. They are more regular near low tide, which is the best time to make the passage, as the channel is indicated by the flats showing above water on either hand.

Johnston Channel, Herendeen Bay, has 7 to 15 fathoms (12.8 to 27.4 m.), but is very narrow with steep sides. It is difficult to find, but once in, the navigation is comparatively simple, as the tidal currents follow the general direction of deep water. The width of the channel at the northern entrance, 7/8 mile south of Point Divide, is 1/4 mile, with little variation until near the southern extremity, where it contracts to 250 yards.

A **rock** with 11 feet (3.3 m.) of water over it has been reported on the eastern side of Johnston Channel, abreast Eagle Rock. Having passed through the Channel, Crow Reef off the south point of Mine Harbor, is the only outlying danger known.

Anchorages may be found anywhere between Walrus Island and Entrance Point in case of fog, and a vessel may anchor in Hague Channel, but the tidal currents are strong. There are fairly good anchorages under the north side of Point Divide and Doe Point, where near the bank, a vessel will be out of the strength of the current. The *Albatross* anchored in mid-channel, 1 mile inside of the above points, at the time of spring tides, and the flood came in with a bore between 2 and 3 feet (0.6 and 0.9 m.) in height, the patent log registering a 9-knot current for some time, with a swell which occasionally splashed into the scuppers. There is a fair anchorage off the northern entrance to Johnston Channel, and an excellent one at its southern extremity, off **Marble Point,** just north of Shingle Point, or, in fact, almost anywhere in the upper bay. The last quarter of the flood tide is the best time to pass through this channel.

High land rises at the base of Harbor Point and extends northward and eastward near the middle of the peninsula. **Point Divide** is 50 feet (15.2 m.) in height, and mountain ranges rise a few miles back. The coal measures are found between Mine Harbor and the head of Port Moller. **Doe Point** is 40 feet (12.2 m.) in height, while the rest of Deer Island and the mainland south and west of it are generally lower. The southern shores of Herendeen Bay are mountainous, with intervening valleys, the whole face of the country being covered with rank grass and wild flowers during the summer months; but there is no timber, except occasional small poplars, alder bushes, and willows. Fresh winds, with fog and mist, blow across the low divides from the Pacific, obscuring the sun and greatly increasing the rainfall in Port Moller and vicinity.

There are no large fresh-water streams entering the bay.

Directions, Cape Sarichef to Port Moller.—From a position 3½ miles west (true) from Cape Sarichef Lighthouse, steer 40° true (NNE. mag.) for 29½ miles to a point with Cape Mordvinof

abeam, distant 3 miles. Then steer 51° true (NE. by N. mag.) for 53 miles to a point with Amak Island on the starboard beam, distant 7½ miles. From this point steer 60° true (NE. ⅛ N. mag.) to a position 9 miles offshore, with Black Hill near Cape Lieskof, abeam. Then steer 76° true (NE. by E. ¼ E. mag.) for about 35 miles, until the cannery buildings at Nelson Lagoon are abeam.

About 16 miles to the eastward of Black Hill and 2 miles inshore is a low prominent sand hill known locally as **Last Knoll,** as it is the last knoll on the coast to a vessel bound eastward. Local vessels use this hill extensively in checking their distance en route to Port Moller.

With the cannery buildings at Nelson Lagoon abeam, continue on the same course to a position off Walrus Island. After picking up the range for entering Port Moller, follow directions on page 266.

On the courses east from Amak Island, a strong inshore set is frequently noted, and should be guarded against.

PORT MOLLER TO KVICHAK RIVER

The coast is low for 19 miles between Entrance Point and **Cape Kutuzof,** which rises in a rounded bluff to an elevation of 150 feet (46 m.).

Cape Seniavin, 11 miles northward and eastward, is a rocky point 75 feet (22.9 m.) high. Passing it the low, monotonous beach continues to the Seal Islands, the only exception being a cluster of small hillocks near the beach, 12 miles from Cape Seniavin.

Seal Islands are several small islets, but little above high water, strung along near the coast for about 10 miles; thence to **Strogonof Point** the land continues very low.

Port Heiden has not been surveyed, and there is little information concerning it. The approach to the port will be recognized by the high bold headlands which arise from its northern shore, and there are some large buildings that show over Chistiakof Island. Shoals and sand banks are reported off the entrance.

Chistiakof Island, low and crescent shaped, forms the seaward side of the harbor, the channel lying between its northern extremity and a reef which makes westward about 3 miles from the land about 2 miles northward from the island. An extensive reef is also reported to extend about 1½ miles off the northwest side of Chistiakof Island. It is reported that there is a rise and fall of 18 feet (5.5 m.) on the largest spring tides, and about 12 to 14 feet (3.7 to 4.3 m.) on ordinary tides.

Until a proper survey of the Bristol Bay region has been made it must be regarded by mariners as a dangerous locality to navigate; it is only by the greatest vigilance and constant use of the lead that disaster can be avoided upon approaching the land. This is particularly true of the northeast arms and approaches which receive the waters of the great salmon streams on which all the Bering Sea canneries are located.

These rivers are the Igushik, Wood, and Nushagak, emptying into Nushagak Bay; the Kvichak, Alagnak, Naknek, and Ugaguk, which empty into Kvichak Bay; and the Ugashik, next southward of the Ugaguk. These rivers are large and discharge a great quantity of

water into wide indentations, locally still retaining the name of rivers, which open on the arms of the great bay. The banks of the rivers are frequently marshy, generally muddy, and the discolored water is charged with a large amount of sediment, which is deposited, forming the dangers to be encountered.

On account of the funnel-shaped configuration of the bays and river entrances, the tidal currents run with great force, having a velocity at times of at least 6 knots, and the tides have a rise and fall of 15 to 24 feet (4.6 to 7.3 m.); vast areas of shoals are uncovered at low water, leaving only pools and shallows, and generally narrow channels between. Navigation in the arms and approaches is only successfully accomplished at or near high water, even by those thoroughly acquainted with the channels.

From Port Heiden the same low coast extends to Cape Menshikof in nearly a direct line, the high land of Port Heiden gradually receding from the coast. A shoal inlet or river entrance lies about 10 miles southward of Cape Menshikof. It has sometimes been mistaken for the Ugashik River. **Cape Menshikof** is a high bluff, extending some distance along shore, with hilly country back of it.

False Ugashik is about 10 miles below the Ugashik River, and because of the similarity of the shore line of the two, False Ugashik has often been mistaken for the Ugashik. The charts show a broken coast line where this inlet should be.

Ugashik River is large and empties into the wide indentation between Capes Menshikof and Greig, the distance between the capes being about 15 miles. The capes can be approached from westward as close as about 2 miles. The coast between the capes including the river valley appears low. **Smoky Point,** a bluff on the north side at the entrance, is about 7 miles southward of Cape Greig. Here the river is about 4 miles wide at high water. The indentation between the capes and the mouth of the river are filled with shoals. There is a channel with about 10 feet (3.0 m.) at low water, which is buoyed during the season for the use of the cannery vessels, but a stranger could not follow it with safety. Off the cannery there are bowlders in the channel, and only launches approach it at low water. Fresh water may be obtained at the canneries. The river is fresh at low water about 5 miles above Ugashik.

There is communication by radio between Ugashik and most of the canneries at the head of Bristol Bay.

Cape Greig is a prominent brownish bluff, with a few yellow vertical stripes extending several miles along shore. It appears to be the seaward end of a low ridge with low land on each side. This and a peculiar notched mountain some distance inland are good marks.

Cape Grieg Light is an unwatched flashing white light 350 feet (107 m.) above the water. The light will be maintained from about May 1 to November 1 of each year. The low coast continues from the cape to the Ugaguk River and thence to the Naknek River with hardly a distinguishing feature except **Johnston Hill,** a solitary elevation 5 miles from the beach and about 9 miles southward from the mouth of the Naknek. It is reported that Johnston Hill about 250 feet (76 m.) high, is not easy to make out and is not so prominent as its position on the chart would indicate.

Egegik River empties into the outer limit of Kvichak Bay about 30 miles north of Cape Greig, and has **Cape Chichagof** for its northern entrance point. It is a large river, about 2 miles wide at the cannery, and is the outlet of **Lake Becharof.** It flows in a general westerly direction for about 50 miles. Tidewater is said to extend about 25 miles up the river; very little is known of the locality.

The lower part of the river is a wide bay, contracted at the mouth, and, like other rivers of this district, at low water a large part of the bed is exposed in shoals and banks with narrow channels winding through them. At the entrance shoal water extends 7 miles offshore, and the small cannery steamers enter only from half to full tide. The channel into this river is wider and deeper than in Naknek and Kvichak, and, if it were properly buoyed, vessels of moderate draft could enter at high water, but there is no swinging room inside. The cannery transporting vessel, a bark of 554 tons, was carried in at high water and moored head and stern alongside the low-water bank. A cannery is located at Egegik, and another on the north shore northwestward from Egegik.

Naknek River may be considered as the head of deep-water navigation in Bristol Bay. It enters Kvichak Bay on the eastern side, about 25 miles southward of **Kogiung.** The river has its source in the large lake of the same name as the river, on which two villages are located. The river is large and about 60 miles in length.

It is said that tide water extends about 25 miles from the mouth, where the river is about ½ mile in width, and that at the mouth the extreme rise and fall of spring tides is over 20 feet (6.1 m.).

Shoals and banks, many of which uncover at low water, fill the lower course of the river and extend 3 or 4 miles off the mouth, then trend around northward and join the body of the banks that fill the upper end of Kvichak Bay. At low water the channel between the banks and flats is very shallow; cannery steamers, drawing but 7 feet (2.1 m.) of water, await half tide before entering. Navigation is done on the rising tide or at high water. The high water interval is about 1 hour.

The mouth of the river is about 3 miles wide between the headlands, which are bluffs about 100 feet (30 m.) high; within the entrance the banks converge quite rapidly, and about 4 miles from the mouth the river is about ¾ mile wide.

Middle Bluff Light is flashing white, approximately 165 feet (50 m.) above water, and located about 8½ miles northward from Cape Chichagof. It is maintained from about May 1 to November 1 of each year.

KVICHAK BAY AND RIVER

The large arm at the head of Bristol Bay, extending northeast and bounded on the south by a line from the south entrance point of Egegik River to Etolin Point, has been designated as Kvichak Bay. The upper part of the bay is very shoal, and, as the current is strong, it can be safely navigated only by small vessels built to resist the shock of repeated grounding. It is said that the banks from the Etolin side project halfway across the bay, and, with those from the peninsula side, confine the channel to a comparatively narrow limit;

a seagoing vessel, however, under skillful guidance and with local knowledge, may reach a point a few miles below the mouth of the Naknek River, which is about 30 miles below the head of the bay; but some cannery men consider the risk too great to carry their transport vessels to this point and leave them there for the season.

Above the mouth of the Naknek River the shoals begin to extend across the channel, and, as a point higher up is reached, the whole bay at low water is filled with uncovered banks, having shallow, narrow channels winding through them.

At the head of the bay is the mouth of Kvichak River, which is the outlet to the great lakes, Iliamna and Clark, lying on the western side of the mountain system bordering Cook Inlet.

This region has become an important one in recent years on account of the rapid development of the canning industry. There are a large number of salmon canneries in operation at various points on the bay, and during the salmon season the locality presents a busy appearance.

Weather and ice.—The weather during the operating seasons from May to September, for the years 1912 to 1915, was very mild and no ice pack was encountered by the vessels en route to this district. However, ice is sometimes encountered in Bering Sea soon after passing through Unimak Pass. At times this is quite extensive, and if held by the winds will cause considerable delay to vessels in reaching anchorage in Kvichak Bay. In 1911 vessels were unable to proceed from the ship anchorage off Naknek River toward Kvichak River until June 1, as the ice had not broken up in the river until that date.

Currents.—The current in Kvichak Bay and River is very strong, and as a consequence the channel shifts more or less each year.

There is but slight variation from year to year in the approaches to the ship anchorage off the Naknek River, and after passing this anchorage the land is low and flat on both sides of the bay with no distinguishing marks that would be of any aid to navigation.

Tides.—The rise and fall of tide at the Alaska Packers Association's Kvichak cannery is normally about 24 feet (7.3 m.) and the June spring tides about 28 feet (8.5 m.). These figures are approximate only, there being no available data on tides at this point.

On account of the method of fishing by means of drift nets, buoys would be a constant menace to the gear; and no navigation aids are maintained by any of the companies operating at this point.

Pilots.—Practically all of the canneries in this region are equipped with radio communication, and strangers should arrange for a pilot in that manner. The captains of the local cannery tenders are all familiar with local waters, and no trouble is experienced in getting a competent pilot.

Navigators are reminded of the great range of tide in this bay. This must be borne in mind when selecting an anchorage.

Beyond Cape Suworof the bay is obstructed with shoals and the channel becomes very narrow and tortuous. At low water only about 3 feet (0.9 m.) can be carried through. At or near high water, vessels of more than 12 feet (3.7 m.) draft would find it difficult to use the channel. Vessels of 14 feet (4.3 m.) draft have ascended the Kvichak River as far as the mouth of the Alagnak River. In this

reach there are only three places where a vessel of 200 feet or less in length may anchor. The first is at Graveyard Point; the second is near the mouth of Jensen Creek; and the third is between the upper cannery of the Alaska Packers Association and the mouth of the Alagnak River.

Directions.—With Cape Greig, just north of Ugashik, bearing 112° true (E. mag.), distant 25 miles, the course to the anchorage is approximately 39° true (N. by E. ½ E. mag.). Follow this course carefully, using the lead when closing in with the land, until 4 miles beyond Johnston Hill, where anchorage should be obtained 5 miles offshore in 7 to 8 fathoms (12.8 to 14.6 m.) at low water.

The first vessels arriving in the spring should feel their way with the lead and locate their position when anchoring. Vessels arriving after about May 15 will have no difficulty in obtaining a suitable anchorage, as there are always a number of vessels in the bay by that time.

Kvichak River, from Kogiung to Iliamna Lake, is 50 miles long. In the upper half of its course it has a current of 3 to 6 knots, and is much broken by islands and bars into narrow, shallow channels. The lower half is tidal.

The river is navigable by cannery tenders for about 22 miles above Kogiung, and by launches and Columbia River boats (when favored by strong winds) for its entire length.

Iliamna Lake is about 70 miles long and generally from 7 to 17 miles wide. It is about 50 feet (15.2 m.) above tidewater. Reported soundings indicate a depth, at the east end, of many hundred feet.

The lake is usually frozen from late in December until late in May. The snow usually leaves the low ground in April, remaining until June in the pass between Iliamna Bay and Iliamna. Some snow may be expected in September, but the ground is not permanently covered at low altitudes until some months later.

Iliamna is the largest settlement. It is situated on Iliamna River, 3½ miles above its mouth, and 10 miles from Iliamna Bay. It has a United States commissioner, a Government school, and three stores.

A good horse trail leads from the head of Iliamna Bay to Iliamna, a distance of 10 miles, crossing a 900-foot (274 m.) summit 3 miles west of the bay. Another trail leads from the head of Cottonwood Bay to Iliamna, 17 miles, crossing three summits 1,700, 1,500, and 1,975 feet (518, 457 and 602 m.) high, at 3½, 5, and 13 miles from Cottonwood Bay, descending to 1,400 and 600 feet (427 and 183 m.) between the summits. These trails can generally be used by horses from June 1 to November 1. Dogs are used during the remainder of the year.

Iliamna can also be reached by a portage from the head of Kamishak Bay to the head of Kakhonak Bay. The portage is said to be an easy one over a low pass, but it is not much used except by natives, because of the difficulty of landing supplies on the uncharted coast of Kamishak Bay.

From Iliamna all parts of Iliamna Lake and Kvichak River can be reached in boats, there being several large sailboats and a gasoline launch at the village.

Newhalen River is about 20 miles long. The upper 10 miles can be navigated by canoes and poling boats. Rapids and reported

falls make even canoe navigation impossible for the lower 10 miles. These rapids may be avoided by a 5-mile portage.

Lake Clark is about 45 miles long and from 1 to 3½ miles wide. It is about 220 feet (67 m.) above tidewater, and is tributary to Iliamna Lake and Newhalen River.

NUSHAGAK BAY AND RIVER

are important on account of the extensive salmon fishing and a number of large canneries which are operated during the summer. The entrance of the bay is on the north side of Bristol Bay, between longitude 158° 18′ and 158° 40′ W. It is 15 miles wide at the entrance between Protection Point and Etolin Point, and extends about 12 miles in a northwesterly (mag.) direction to Ekuk, where it is 7 miles wide. Here it turns to a northerly (mag.) direction for 9 miles to Nushagak, where it is about 3 miles wide. The surveys extend from the entrance to the mouth of Wood River, the results of which are shown on chart 9050. The surveys on which this chart is based were made in 1909 and 1910, and it is probable that considerable changes in the bars and channels have occurred in the meantime. The chart, therefore, should be used with caution.

Nushagak Bay and River are obstructed by extensive shoals near the shores, and by long bars, partly bare at low water, which generally extend in the direction of the channels. In the absence of aids navigation is safe only in the daytime, when the marks, some of which are distant peaks, can be seen. The worst dangers in the approach are the extensive shoals southward and southeastward of Cape Constantine, the outer one being nearly out of sight of land.

The peninsula of **Cape Constantine** is low, rolling tundra country, with bluffs in places, the greatest elevation being shown on the chart. **Nichols Hills,** 125 feet (38 m.) high, are small sand knolls, the highest part of a ridge that follows the eastern side of the cape, and lie 5 miles northwestward of Protection Point. At the southwest end of the cape (lat. 58° 26′ N.) and on the southeast side of the cape (lat. 58° 25′ N.) are the entrances of two lagoons that can be entered by boats at high water when there is no surf.

Shoals with little water on them in places extend 6 miles southward from Cape Constantine, and the outer shoal (Ustiugof) lies 8 to 9 miles southeastward from the cape. These shoals are in the form of long ridges trending in the direction of the set of the tidal currents around the cape to and from Nushagak Bay. They are steep-to, especially on the offshore side, and the lead will not give sufficient warning to avoid them.

Ustiugof Shoal is a narrow ridge with a least depth of 13 feet (4 m.), and has a length of 8 miles in a 52° true (NNE. ¾ E. mag.) direction, with depths less than 4 fathoms (7.3 m.). Its southern end lies in lat. 58° 14.5′ N., long. 158° 46′ W. There are depths of 11 fathoms (20.1 m.) or more close to its southeast side. From a vessel near the shoal Cape Constantine can be seen in clear weather, but the greatest care is required when southward or southeastward of the cape and in sight of it. The shoaler ridges are generally indicated by rips or breakers at low water, but there is generally nothing to indicate Ustiugof Shoal.

Protection Point, the eastern end of Cape Constantine, is a low marshy spit which extends 1½ miles from the higher land. There is the entrance of a lagoon on the north side of the point 2 miles westward of its end, which is closed at low water, but at other times boats can enter, although the current is strong on the ebb. A narrow shoal awash in places at low water extends 4¼ miles southward from the point, its southern half lying about 1 mile from shore; there is a narrow channel for boats between the point and the north end of the shoal. A detached shoal with 15 feet (4.6 m.) on it lies 2 miles eastward from the point.

Protection Point is marked by a 30-foot (9.1 m.) beacon; upper part black, lower part white.

The low spit eastward of Nichols Hills forms a cove, dry at low water, that can be entered by boats at high water and affords shelter except with northerly winds.

Igushik River is a crooked, winding river on the west side of the bay, and vessels up to about 24 feet (7.3 m.) draft have been taken out. The channel into the river is not surveyed. The flat on the eastern side of the channel leading to the mouth of the river shows for nearly its full length at low water. The bar at the entrance of the channel has a depth of 12 to 14 feet (3.7 to 4.3 m.) on it, and lies about 7½ miles southeastward of the mouth of the river and 8¾ miles northward from Protection Point.

Igushik Ridge, on the west side of Igushik River, is prominent, having a greatest elevation of about 260 feet (162 m.) near its northern end, where it breaks sharply to the river. The peninsula eastward of the river is low, and on its eastern side is a slatted beacon, upper half black, lower half white. The range of the beacon and the summit at the north end of Igushik Ridge marks the turning point for the crossover southwestward of Ekuk.

Snake River is not used except by fishing boats. The channel leading to the mouth of the river has a depth of about 8 feet (2.4 m.), and is well defined at low water by the flats, which uncover, except at the entrance, the latter lying about 3 miles northeastward of the beacon described in the previous paragraph.

The land on the eastern side of the bay is low, rolling tundra, and the entrance point is rounding without a distinct point. **Etolin Point** is here applied to the middle and highest one (elevation 90 feet (27.4 m.)) of three prominent bluffs, 1 to 1½ miles apart. A rounded hill about 150 feet (46 m.) high lies 1½ miles northeastward of Etolin Point, and is one of the first summits to show when approaching. A higher ridge lies 1½ miles farther inland, but neither is prominent.

The 3-fathom (5.5 m.) curve lies 6½ miles, and the 5-fathom (9.1 m.) curve 8 miles, from the shore southeastward of Etolin Point. The shoaling is gradual, and the lead is a good guide in approaching the eastern shore when outside of a line joining Etolin and Protection Points. Above this line there are long shoals, most of which show in places at low water, in the eastern half of the bay.

Ekuk Bluff is 170 feet (52 m.) high and is prominent from Nushagak Bay. A spit extends 1¼ miles northward from the bluff. **Ekuk** is a native village on the spit at the foot of the bluff, and there

is a cannery on the north end of the spit. The lagoon inside the spit is bare at low water.

Clark Point is low and is marked by two canneries and a high water tank. A ridge, 150 feet (46 m.) high with a bluff at the water, lies 5/8 mile southward from the point and is the prominent feature from the bay.

Clark Slough, 1½ miles northeastward of Clark Point, is navigable for launches about 17 miles at high water. The bar at its entrance has a depth of about 3 feet (0.9 m.) at low water. There is a cannery on the northern side at its entrance.

The western shore from **Coffee Point** to **Snag Point** is generally a line of bluffs. **Dillingham** post office, a native village, and a cannery are on **Bradford Point** abreast **Williams Island,** the latter grassy and awash at highest tides. The Government courthouse is at Dillingham. There are two canneries and a high tank west of Snag Point.

Wood River has its entrance northward of Snag Point, and has a length of about 24 miles to **Aleknagik Lake.** Its width varies from about 600 yards in its lower part to about 50 yards where it joins the lake. A depth of 3 to 3½ feet (0.9 to 1 m.) at low water can be carried 15 miles up the river and not more than 2½ feet (0.7 m.) to the lake, though at high water 4 feet (1.2 m.) can be carried this distance. The lake is about 24 miles long. There is a cannery on the south shore, just inside Snag Point.

Nushagak post office is on **Nushagak Point,** 6½ miles northward from Clark Point. There are two canneries, a school, and Russian church. The point is a prominent ridge 250 feet (76 m.) high, eastward of which is a deep valley. On the eastern shore 2 miles northward of Nushagak is an unused cannery.

The mail steamer from Seward calls at Nushagak monthly from May to August, inclusive, each year. There are no docks. Vessels approach the town as closely as their draft permits, and use small boats or barges for handling cargo. The mud is very sticky, and it is difficult to get ashore at low water. A good boat landing can be made at high water.

Prominent features.—Northward of the bay is a chain of prominent mountains, some of which are described in the sailing directions. They are snow covered in early summer, but bare except in the ravines by the middle of July. In clear weather the peaks show from a long distance seaward, but much of the time they are obscured by clouds and haze. Many of the summits are shown on the chart.

Channels.—The channel along the western shore of the bay which was formerly in general use has now been abandoned and all vessels use the eastern channel which was developed by the survey of 1910. By this channel, good water is carried to a point about 2 miles southeast from the western end of Ekuk Bluff, where it crosses a narrow bar with a least depth of about 17 feet (5.2 m.). It then follows the general trend of the shore to the anchorage off Clark Point. This channel continues in a northerly direction and gradually shoals until there is about 8 feet (2.4 m.) off Nushagak.

The cross-over from Clark Point to the channel along the western side of the bay is shown on chart 9050. Above Coffee Point the

channel in general use is the one near the center of the river. The western channel, which follows the bank closely, has shoaled somewhat and is hard to enter from the southward.

Anchorages.—There is no anchorage in the outer bay sheltered from all winds. In southwest weather the western side of the bay should be selected, and in northeast weather the eastern side. With winds from east to south (mag.) there is no shelter, and a heavy sea makes into the bay. The strong current causes a vessel at anchor to lie stern or broadside to the sea when the wind opposes the current. The bars seem to afford little protection. In northerly weather any part of the bay is sheltered, but the wind does not appear to blow with force from that direction during the summer.

There is good anchorage, sheltered from southwest winds, for vessels of 12 feet (3.7 m.) or less draft 1 mile 21° true (N. mag.) from Protection Point in about 3½ fathoms (6.4 m.). Deeper draft vessels should anchor farther northeastward.

Above Ekuk Spit good anchorage will be found wherever the depth will permit. The cannery vessels are anchored or moored off their respective plants, except those at Nushagak, which are anchored in the channel between it and Clark Point. This part of the bay is very choppy in heavy weather, but the sea seldom, if ever, is heavy enough to endanger a vessel. The bottom is sand, but the anchor holds well if given sufficient scope, say 60 fathoms. The currents are strong, and care should be taken to avoid dragging. Vessels remaining long are anchored in line in the channel to interfere as little as possible with the nets.

Supplies.—There is a store at Nushagak where provisions, clothing, and trappers' supplies may be had. Most of the canneries operate stores during the season. Some coal is kept on hand for use by the canneries, but they usually have but little to spare. The nearest place at which coal can be obtained is Unalaska. Reindeer meat is generally obtainable but game is scarce.

Fresh water can be boated off from the cannery wharves. The cannery launches and tugs go to the wharves at high water. That part of the cannery wharves extending beyond high water is removed during the winter. The water is fresh at some of the river mouths on the last of the ebb, but it is too muddy for boilers or drinking. Northward of Dillingham there is a sparse growth of timber, which becomes heavy farther inland. Southward of Dillingham there are only occasional clumps of alder bushes.

Repairs.—The large tides and flats make it easy to beach a vessel of moderate draft (say 18 feet). A good place is at Clark Point just above the cannery. Small machine repairs can generally be done at the companies' shops.

Communication.—The mail steamer from Seward makes monthly calls from May to August of each year. During the winter, travel is by dog teams to points on the Alaska Peninsula or Shelikof Strait. There is little travel in summer except by boat on account of the soft tundra land and numerous lakes. There are some small native villages above Ekuk, and a few white men remain during the winter.

In former years the cannery supplies were brought in by sailing vessels which were moored during the summer, and loaded with the

pack for the return trip to Seattle, San Francisco, or Portland at the close of the season, usually in August. Of recent years the companies have been turning to the use of steamers and abandoning the use of sailing vessels. Some of the famous old American clipper ships have been used in this cannery trade.

Practically all of the canneries are now equipped with radio, and some are connected by telephone.

Weather.—The weather is variable, but it is considered better than farther westward. Spells of bad weather occur, and their duration increases in the late summer. In August and September, 1909, there was much stormy weather. Southwesterly winds predominated in the early summer, and easterly winds later.

Easterly winds bring thick weather and rain, and are accompanied by low or falling barometer. Southwesterly winds, if moderate, bring fair weather, but if strong, bring rain. Northwesterly winds bring fine, clear weather, but seldom blow steadily. In settled weather the wind may be light from any direction, accompanied by showers. After a gale there is usually no shifting of the wind or sudden breaking of the storm, but the wind decreases, and there is a gradual return to fair weather.

Fog sometimes sets in from sea, but there is little fog during the summer.

Ice.—Nushagak Bay is usually open to navigation the latter part of May, but the movement of the ice is variable, depending on the direction of the wind. Northeast winds drive it out of the bay. It is stated that the arrival of the cannery vessels has been as late as June 17. The cannery vessels leave Bristol Bay the later part of August, the pack having been completed. It is not known when ice begins to form, but it is probably late in the fall.

Tides are influenced to some extent by strong winds. The mean range of tide at Clark Point is about 15 feet.

Currents.—The currents have considerable strength, the ebb being the stronger, on account of the discharge from the rivers. The maximum ebb current observed is 3.8 miles, and flood, 2.9 miles. The ebb usually begins shortly before high water and continues to run after low water, roughly about 6½ hours ebb and 6 hours flood. The period of slack water is usually short. The currents generally set fair with the channels, but in navigating the bay the course is often across the current and allowance must be made for it. The velocity is influenced by freshets and continued winds, which also affect the times of slack water. A current of over 5 knots may be experienced at times.

Note.—The times given in the Tide Tables for Kodiak are expressed in one hundred and fiftieth meridian time; while the time used locally is one hundred and sixty-fifth meridian time; the following figures applied to the Kodiak one hundred and fiftieth meridian time gave the time of slack water or strength of current in one hundred and sixty-fifth meridian time direct.

Off Protection Point.—The mean velocity of the current at strength is about 2 knots on the flood and 3 knots on the ebb. Slack water before the flood occurs about at the time of low water at Kodiak, and slack water before the ebb about 30 minutes before the time of high water at Kodiak.

Off Etolin Point.—The mean velocity of the current at strength is about 2 knots on the flood and 2½ on the ebb. Slack water before the flood occurs about 30 minutes after the time of low water at Kodiak, and slack water before the ebb at about the time of high water at Kodiak.

Off Clark Point.—The mean velocity of the current at strength is about 2½ knots on the flood and about 3½ on the ebb. Slack water before the flood occurs about 1½ hours after the time of low water at Kodiak, and slack water before the ebb about ¾ hour after the time of high water at Kodiak.

Off Coffee Point.—The mean velocity of the current at strength is about 2½ knots on the flood and 3½ on the ebb. Slack water before the flood occurs about 30 minutes after the time of low water at Kodiak, and slack water before the ebb about ¾ hour after the time of high water at Kodiak.

Between Clark and Coffee Points.—The greatest strength of the flood or ebb occurs about 4 hours after the time of low water and high water at Kodiak respectively.

Off Dillingham.—The mean velocity of the current at strength is about 2½ knots on the flood and 3½ knots on the ebb. Slack water before the flood occurs about 2¼ hours after the time of low water at Kodiak, and slack water before the ebb about 1½ hours after the time of high water at Kodiak.

DIRECTIONS, NUSHAGAK BAY AND RIVER

The channels and bars are probably subject to constant change due to the action of currents, and to a smaller extent by the action of the sea. Changes of considerable extent are reported by those of long experience. A margin of safety should therefore be allowed for the soundings found by the survey. It is also well to remember that with a very low tide the water may fall as much as 2 feet (0.6 m.) below the plane of reference of the chart.

The navigation of the bay is not easy, and a stranger should proceed with great caution. Tide rips may be taken as good evidence of shoals. The shoals are long ridges trending in the direction of the set of the tidal currents, and a course should not be laid across the currents unless sure of the position, as the danger of stranding is greatly increased. A stranger, unless sure of his position, should navigate only on a rising tide.

Strangers are advised to communicate by radio to one of the canneries and arrange to have a pilot sent out.

It is recommended for vessels bound to Nushagak to make Cape Greig, which is high and easily recognized and marked by a flashing light, then shape the course for the entrance, favoring the Etolin Point side in preference to the Cape Constantine side. The currents that may be experienced when crossing from Cape Greig are not known, but there may be considerable set. Great care should therefore be exercised in approaching the entrance, and the lead should be used constantly. The land at the entrance when first seen in approaching is indefinite, and presents no feature that can be readily identified.

Protection Point at the western entrance of the bay is marked by a 30-foot (9.1 m.) beacon. If the weather is clear, this beacon should be of material aid in fixing the position at the entrance to the bay, and the beacon should therefore be made if possible. **Nichols Hill,** 125 feet (38 m.) high also forms a valuable landmark for entering the bay.

The following suggestions have been made by a shipmaster who was on a regular run to Nushagak with a vessel of about 7 knots speed:

From Amak Island steer to pass about 10 miles off Port Heiden, as there are some large houses there which are easily seen over Chistiakof Island. A good departure can be taken from here in daylight, as the shore along the coast has no other landmarks to be taken as a guide. From Port Heiden run up along the coast until Cape Greig is abeam, distant about 10 miles, then haul up for Nushagak Bay, course 343° true (NW. ⅝ N. mag.); if the tide is ebbing allow about ¾ point to the right, and the same to the left if the tide is flooding. This course should lead to a position about 5 miles off Etolin Point.

Great care must be taken to avoid the mud flats which extend off Etolin Point, and the shoals separating the eastern and western channels.

The western channel is no longer used for ascending the bay, and all traffic now uses the eastern channel. During the summer season a black and white buoy is maintained at the entrance to this channel in about 10 fathoms (18.3 m.), but it is reported as being hard to pick up and that there is danger of getting on the shoal off Etolin Point while looking for it.

To enter, pass between the shoals off Etolin Point and the long narrow shoal opposite, and bring the left-hand end of Ekuk Bluff to bear 340° true (NW. ⅜ N.) and in range with Peak E, a notched summit well up the river. Hold this range until over the 17-foot (5.2 m.) bar 1½ miles south-southeast of Ekuk Bluff, then follow the channel as shown on chart 9050 to anchorage off Clark Point. Another range in use for crossing the bar is to bring the wireless mast at Ekuk between the two huts on Ekuk Bluff. During the summer season this crossing is also marked by a spar buoy. The lead should be kept going constantly, using one on either side if possible.

Clark Point to the upper canneries.—From Clark Point the channel crosses the bay, where the least depth is about 12 feet (3.7 m.), and then follows the western shore above Coffee Point at a distance of about ¼ mile. Above Coffee Point the channel near the middle of the river is used. It should be navigated with great caution by a stranger, and on a rising tide.

From a position ½ to ¾ mile off Clark Point steer 319° true (NW. by W. ½ W. mag.), with the water tank in range with a small knoll (apparently a clump of alders) on the ridge astern. Hold the range for ¾ mile after Peak C is nearly in range with Coffee Point. Then steer 20° true (N. ⅛ W. mag.) with Bradford Point a little on the port bow, and follow the channel by the lead, passing close to Bradford Point.

Follow the western shore at Bradford Point at a distance of ¼ mile until about ½ mile above the courthouse, and then keep ⅜ mile from shore. Anchorage in 4 to 5 fathoms (7.3 to 9.1 m.) may be

had about ¼ mile from the shore at the canneries southwestward of Snag Point. The shoal eastward of the channel above Bradford Point is eastward of a line from the courthouse to the high tank at the cannery above, bearing 41° true (N. by E. ¾ E. mag.).

Peak C is a sharp peak at the western end of a low detached mountain ridge, and is the first mountain to the left of Peak B, which is the most conspicuous toward the head of the bay. In making the turn 2 miles southward of Coffee Point it should be noted that the prolongation southward of the shore of Coffee Point to the bight 1½ miles above intersects the range over the water tank on Clark Point at a point near the flat bare at low water that makes out from the western shore.

CAPE CONSTANTINE TO CAPE NEWENHAM

The area between Cape Constantine and Cape Newenham is unsurveyed, and there are indications that the present charts are considerably in error. Vessels laying a course from outside Ustiugof Shoal to pass about 2 miles off Cape Pierce, in thick but otherwise moderate weather, have reported making Hagemeister Island right ahead. This may be due either to a northerly set in this vicinity or to errors in the chart, or, more probably, to a combination of both. In the thick weather which constantly prevails in this locality safety is assured only by constant use of the lead.

Walrus Islands are three islands and three rocks, all above water, extending 16 miles east and west and about 6 miles north and south.

Round Island, the easternmost of the group, is nearly 2 miles long, ¾ mile wide, and about 800 feet (244 m.) high, its west end being in latitude 58° 35′ N., longitude 160° 01′ W.

Crooked Island is between 4 and 5 miles in length and 2 miles in greatest width. The eastern part is rather low, but toward the western extremity the elevation is nearly equal to that of Round Island. There is quite a large bay on the northeast side, but it was not examined.

High Island, the westernmost of the group, is 4 miles in length, about 1 mile in width, and 900 feet (274 m.) or more in height.

The Twins are two isolated rocks 4 miles southward of Crooked Island, the larger 300 (91 m.) and the smaller 100 feet (30 m.) in height.

Black Rock, about 150 feet (46 m.) high, lies 1 mile northward of the southeast end of Crooked Island.

No other outlying dangers were seen in passing between the islands and the mainland. From 6 to 10 fathoms (11 to 18.3 m.) were found abreast the group, the depth gradually decreasing to 3 fathoms (5.5 m.) off the north end of Hagemeister Island. The course was near the shore, however, and more water would doubtless have been found in mid-channel.

Hagemeister Island lies 9 miles west of High Island and is 14 miles in length and 8 in width. It is mountainous except for about 5 miles at the north end. Shoals surround the island and extend eastward 20 to 25 miles, including the area between Hagemeister and the Walrus Group.

Hagemeister Strait is about 16 miles in length and lies between the island of that name and the mainland. It is 3 to 4 miles wide,

but shingle spits contract it in two places to less than 2 miles. On a passage through the strait made by the Bureau of Fisheries steamer *Albatross* the least water found was 4½ fathoms (8.3 m.). Good anchorage was found under Tongue Point, the shingle spit making out from the mainland about midway of the channel. From the above anchorage the *Albatross* stood directly to sea, passing within a mile of the southwestern extremity of Hagemeister Island; thence 206° true (S. ½ W. mag.), shoaling the water to 3 fathoms (5.5 m.) 7 miles from the island. Greater depths might possibly be found by taking a more westerly course. It is reported that there is anchorage under the spits at both ends of Hagemeister Island. The tidal currents are very strong through the channel. The vessel was visited by a number of Eskimos while at anchor under Tongue Point.

Cape Peirce is of moderate height and symmetrical form. Depths of 10 fathoms (18.3 m.) are found 2 miles southward of the cape, and good anchorage in 10 fathoms (18.3 m.) of water is found inside Shaiak Islet (lying just eastward of the cape).

There are reports of good anchorage, sheltered from northerly weather, in the bight northwestward of Cape Peirce.

The same report states that a shoal area makes off westward (true) from the cape, having depths of from 2 to 3 fathoms (3.7 to 5.5 m.). The extent of this shoal and the least water to be found on it are unknown. To make the anchorage from eastward, give Cape Peirce a berth of about 3 miles, and steer 9° true (N. by W. mag.) for the junction of the northwest end of the sand beach with the rocky shores, and select anchorage at will off the sand beach. The approaches from westward are clear except for the shoal above mentioned.

KUSKOKWIM BAY AND RIVER,

from Cape Newenham to Bethel, are shown on charts 9103 and 9104. The surveys on which these charts are based were made in the period from 1911 to 1915. From an examination in 1924 it appears that the courses laid down on chart 9103 are good to the entrance to Eek Channel. As Eek Channel is ascended some changes in the mud flats and channels have occurred, and these observed new conditions are shown on the latest edition of chart 9103. The possibility of changes due to the action of the sea, current, or ice should always be borne in mind.

Cape Newenham is the landfall for this region, and can be approached close-to with deep water. It is the end of a peninsula formed by a series of rough saw-tooth mountains. These mountains terminate in a level plateau which forms the immediate cape. In southerly weather a heavy sea and tide rips occur off Cape Newenham.

Jagged Mountain is a well-defined peak, the highest of the Cape Newenham group. Viewed from northward its slopes appear jagged.

Security Cove, 9 miles northeastward of Cape Newenham, is a good anchorage except with northwest winds; the usual summer gales are southeasterly. The bottom is even and shoals gradually. The best anchorage is about ¾ mile northeastward of Castle Rock, on the range of Castle Rock and the first rocky promontory southwestward, in 3½ fathoms (8.2 m.) mud bottom. Fresh water can be procured from a stream which enters the cove.

There is also good anchorage in the middle of the small bight on the southwest side of Castle Rock, in 3½ fathoms (8.2 m.), good holding ground. This anchorage is less affected by the ground swell making along the coast from Cape Newenham than the anchorage in Security Cove.

Castle Rock, the southwest point of Security Cove, is a small, prominent headland, 299 feet (91 m.) high, joined to the land by a low neck.

At the northeast point of Security Cove there is a conspicuous pinnacle rock, 169 feet (51 m.) high and covered with light tundra.

Chagvan Mountain is a smoothly shaped mountain terminating in two rounded knobs about 1,540 feet (469 m.) high, which lies between Security Cove and Chagvan Bay.

Chagvan Bay has a narrow shoal entrance. Inside it is very shoal and cut up by bars that are bare at low water.

Red Mountain is a conspicuous reddish-colored mountain just south of Goodnews Bay. From northward it appears as a long ridge with the highest part at its northern end.

Goodnews Bay is shoal except for the deep channel which leads through the entrance and for a distance of about 1 mile inside. This channel affords good anchorage, the best place for vessels being in the middle of the entrance; small craft can select a berth from the chart that affords the best shelter. The sea from outside is broken by the shoals off the entrance and does not reach the anchorage. With southerly or easterly winds tide rips, dangerous for boats, occur in the channel. The spits at the entrance are of shingle and steep-to. Fresh water may be had from a small stream near Baluka Hill.

Shoals extend 2½ miles off the entrance of Goodnews Bay. In 1914 the channel with best water led across the shoals from southward, and had two bars, with a least depth of about 10 feet (3 m.), 2½ miles southward of the entrance. The following directions led through the channel: Bring the inner shore of the north spit just open from the west shore of the south spit, and stand in on this range, course 17° true (N. ¼ W. mag.), until across the bars. Then follow the south spit at a distance of ¼ mile, and cross the entrance to a position 300 yards eastward of the north spit. A 56° true (NE. ¾ N. mag.) course with the south side of the north spit astern will then lead in the channel through the bay for a distance of over 1 mile.

In entering Goodnews Bay the mariner should bear in mind that the tide tables are for Apokak, at the mouth of the Kuskokwim River. High tide at Goodnews Bay occurs 3¾ hours earlier than at Apokak.

Baluka Hill is a prominent conical hill 886 feet (270 m.) high, with a steep, rocky face that rises abruptly from the north side of the bay. Although lower than the mountains behind it, Baluka Hill usually stands out prominently from all parts of Kuskokwim Bay.

Directions.—After rounding the north spit at a distance of 300 yards, steer 312° true (WNW. mag.) for the high bluffs on the west side of the bay. Hold this course for about 2 miles, or until the eastern side of Baluka Hill is in range with the flat-topped mountai just back of Mumtrak village. Then head up for Baluka Hill and hold the range until up to the anchorage under the mountain.

About 6 feet (1.8 m.) of water will be found here at low tide. In 1913 the survey ship *Yukon* lay at anchor here during a northerly gale. There is no protection in southerly or easterly weather. A fine stream enters the bay here, and there is a good shingle beach.

It should be noted that this route has not been surveyed, and that there may be, in places, less than 6 feet (1.8 m.) at low tide. It should therefore be used with caution, with the lead going constantly, and only on a rising tide. There is a cabin on the bluffs at the foot of Baluka Hill.

Carter Spit is a low sand spit about 4½ miles long and from 50 to 300 yards wide. A white painted beacon, 35 feet high, stands on the spit 1 mile south of the elbow. Carter Spit incloses Carter Bay, which is a wide area of shoals and mud flats. Around the end of the sand spit there is a narrow channel scoured out, affording an anchorage for launches and small craft. There is no protection from northward. A small stream, known as **Indian Creek,** flows into the east side of Carter Bay near two abandoned cabins, formerly called **Carter.** Fresh water can be obtained by boats from Indian Creek at high water.

Explorer Mountain is the highest peak northward of Goodnews Bay. From southward it appears as a long ridge, and is recognized by three deep gulleys on its side. From westward it appears as a pyramid peak, the highest of the group.

Tooth Mountain is a flat-topped mountain in the front range, and has a sharp, rocky pinnacle on the northern edge of its summit. It is easily recognized from the vicinity of Carter Spit.

Figure IV Mountain is a sharp peak in the front range eastward of Jacksmith Bay. The deep ravines on the side of this mountain form a perfect IV, which is conspicuous from westward when the ravines are filled with snow. In the latter part of the summer the snow disappears from the ravines.

Cone Mountain is a large conical mountain in the first range.

Yukon Hill is low, but is the north end of the front range paralleling the coast, and is visible from the entrance of Eek Channel. From westward it is not distinguishable, as it has the receding range as a background.

Thumb Mountain is a fairly sharp summit in the range which recedes from Jacksmith Bay. From off Kwinak it resembles a huge thumb placed on a high flat mountain plateau. As Eek Island is approached the mountain appears as a ridge and is not so distinctive.

In clear weather when the peaks are visible, they can be identified by means of the sketch on chart 9103. Navigators accustomed to using the sextant and three-arm protractor should have no difficulty in piloting their ship to the entrance of Eek Channel.

Jacksmith Bay is the large indentation 14 miles northward of Carter. It is entirely bare at low tide.

Kwinak (Quinhagak post office) is almost inaccessible by water because of the great mud flats bordering its shores. Launches can enter the creek here only at the highest tides, and even small craft can hardly get within sight of the village and remain afloat at low water. Supplies are landed with great difficulty, owing to the extensive flats and their exposure. There is a Moravian mission, a

store, and a Government school, and a limited amount of supplies may be procured. The church steeple is sometimes visible from Eek Channel. The Kanektok River here runs fine clear mountain water at all stages of the tide.

Warehouse Bluff is a long dark-colored bluff about 12 miles northwestward of Kwinak. This is an important landmark, as it is the first land on the east bank to be sighted when ascending Eek Channel. No objects on the west shore are visible until approaching the head of Eek Channel. A square tower beacon 25 feet (7.6 m.) high has been erected on the highest part of the bluffs.

Warehouse Creek is a deep creek about 2 miles above Warehouse Bluff. It is approached through a long tortuous channel through the mud flats that can be followed by small craft when the flats are bare. Small craft may find shelter here. The greatest range of tide in the bay occurs in the vicinity of Warehouse Creek. Inside the creek there is just swinging room for a 75-foot vessel riding to 15 fathoms (27.4 m.) of chain.

In the early days trading schooners ascended the bay only to Warehouse Creek. Natives and traders from various bay and river points assembled here to wait the coming of the schooner. At one time there were some small warehouses built here, but no traces of them now remain.

Kuskokwak Creek flows into the east side of the river about 4 miles southward of Beacon Point. It is approached through a short channel across the flats and affords a good shelter for launches and other small craft. There is a depth of 4 fathoms (7.3 m.) just inside the mouth of this creek. There is a tripod beacon at the southern entrance to the creek.

Beacon Point is low and flat, and in common with the shores of the river, is barely above storm high water. There is a 30-foot (9.1 m.) tower built on the point.

Popokamute is a large native summer village on the west bank of the river opposite Beacon Point. The natives gather here to catch and dry their winter supply of salmon. The point has washed away considerably since the time of the survey.

Eek Island is a grass-covered mud flat cut up by deep sloughs, and is covered by the higher tides. Eek Island affords a feeding ground for many thousands of ducks and geese.

West Point is the local name given the fishing camp on the west bank of the river just above Eek Island. The native pilot "Capt. John" lives near here, and "Moses" is often found at the fishing camp. The mud bank making out from West Point has extended itself considerable since the time of the survey. From West Point, the West Channel is not used any more. The navigable channel extends in a northerly direction to the east bank of the river.

Eek River is a large tributary flowing into the Kuskokwim on its eastern side just above Eek Island. It is navigable by launches for 15 or 20 miles. The river rises in the mountains about 60 miles distant, but its waters are muddy and full of silt.

There are a number of small native villages on the river between West Point and Bethel.

Bethel, 65 miles up the river, is considered the head of ocean navigation. From here there are four river boats operating to

points on the upper river. There is a dock with a 90-foot face with a float for breasting off vessels about 20 feet where there is about 18 feet (5.5 m.) at low water. The dock is connected with a large warehouse on the bank.

The range of tide here is about 3 feet (0.9 m.), but the stage of the river influences the depth.

There is a Moravian mission, a school and two or three stores at Bethel which is the distributing point for the Kuskokwim district. There is an Army radio station, call letters WUX. Provisions and gasoline can be obtained. A limited amount of coal is kept on hand, but the price is very high. There are reindeer herds in the vicinity, and deer meat can be arranged for.

Communication.—There are two vessels making regular trips from Seattle to Bethel during the summer season of navigation. These vessels carry freight and passengers. Radio communication may be established through the radio station mentioned above.

Mail facilities.—The mail for the lower Kuskokwim comes monthly by the way of the Yukon and Holy Cross Mission. It is transported over the portage to the Kuskokwim and carried down that river in small boats as far as Kwinak. Vessels from Seattle also carry mail when practicable.

Pilots.—The pilot in most general use now is a young native from the Moravian Mission at Bethel. His services should be arranged for by radio in sufficient time to enable him to meet the vessel at the river mouth. He uses a launch and proceeds ahead of the vessel. There are also two old native pilots, "Moses" and "Captain John," who can usually be obtained at one of the camps near West Point. There is no established fee for piloting vessels up the river. As a rule the pilots have little knowledge of the waters southward of Popokamute.

Currents.—The currents of Kuskokwim Bay and River are strong. A strong tidal current sweeps past Cape Newenham, setting approximately north and south true, and another follows the shore along the north side of the cape. In general the currents set in directions parallel to the axis of the channels between the shoals. In the deep channels off Jacksmith Bay the flood current has a velocity usually of about 2 to 2½ knots at strength, and the ebb from 2½ to 3 knots. In the vicinity of Eek Island the strongest ebb current observed was 3½ knots. Here the current turns from one to one and one-half hours after high and low waters. The flood current is felt only about as far as Bethel.

By arriving at the entrance to Eek Channel on the last of the ebb current, a favorable current can be carried nearly to Bethel, providing there are no delays.

Ice.—The river is usually open for navigation by June 1, although ice conditions are uncertain and vary much from year to year. In the fall ice makes on the upper river in October, and heavy ice forms off Goodnews Bay in November. Goodnews Bay freezes over entirely in the winter.

In 1924 the river ice broke up on May 23, and went out at Eek Island on May 29. Large pieces of ice were encountered on June 5 just below Eek Island. This is reported as being the latest break-up in 15 years.

Weather.—All reports agree that the best weather usually occurs in March and April of the early spring. During the summer southeast to southwest gales are frequent, lasting from two to five days. These storms gradually blow themselves out and are generally followed by a few days of good weather. In the early fall northerly winds are frequent and are usually accompanied by a clear sky. After the middle of September strong gales become frequent and prolonged.

Fresh water can be obtained from small streams in Security Cove, in Goodnews Bay near Baluka Hill, and from Indian Creek in Carter Bay. In the vicinity of Eek Island the river water is fresh at all stages of the tide. It is very muddy, but settles readily.

The water freshens as the bay is ascended. Men of experience can sometimes estimate their position on the bay by tasting the water.

Tides.—The tide tables published by the U. S. Coast and Geodetic Survey give the predicted tides for Apokak, near the river entrance. Predictions for other river and bay ports may be found by applying the tidal differences as given in Table 2 of the volume.

CURRENTS, KUSKOKWIM BAY AND RIVER

Goodnews Bay.—The currents are strongest at the entrance, the maximum observed being an ebb current of 2.5 knots. During large tides the ebb tide overran the flood by as much as 2½ hours. The strength of the current follows the channel toward Baluka Hill, causing a strong eddy to sweep around the northeast shore of the south spit. Here the current nearly always runs ebb and sweeps with great force during the run out. Tide rips were observed in and off the entrance, but they are dangerous for small boats only.

Note.—The time differences given in the following list are such that, when applied to the times of high and low waters as given in the Tide Tables for Astoria, Oreg., the current will be given in one hundred and sixty-fifth meridian time.

Kuskokwim Bay and River.—The currents are swift and follow in general the direction of the channel. The strength of current and the time of slack water varies and may at times differ from the values given in the following list due to freshets and prevailing winds. Occasionally a current of 5 knots is experienced.

In the Channel, off the entrance to Goodnews Bay.—The mean velocity of the current is about 2½ knots at strength of ebb and flood, setting in a southwest and northeast true direction, slack water before the flood occurring about 1 hour after the time of high water at Astoria, Oreg., and slack water before the ebb about 1 hour after the time of low water at Astoria, Oreg.

In the Channel west of Carter Bay.—The mean velocity of the current is about 2½ knots at strength of ebb and flood, slack water before the flood occurring about 2 hours after the time of high water at Astoria, Oreg., and slack water before the ebb, about 2 hours after the time of low water at Astoria, Oreg.

In the Channel, southwest of Warehouse Bluff.—The mean velocity of the current at strength of ebb and flood is about 3 knots, slack water before the flood occurring about 2¼ hours after the time of high water at Astoria, Oreg., and slack water before the ebb about 2¾ hours after the time of low water at Astoria, Oreg.

In the Channel off Apokak.—The mean velocity of the current at strength of ebb and flood is about 3 knots, slack water before the flood occurring about 3 hours before the time of low water at Astoria, Oreg., and slack before the ebb about 1 hour before the time of high water at Astoria, Oreg. The strength of the flood current occurs about 1 hour after the time of low water at Astoria, Oreg., and the strength of the ebb current about 2 hours after the time of high water at Astoria, Oreg.

DIRECTIONS, KUSKOKWIM BAY AND RIVER

About 15 feet (4.6 m.) is the deepest draft that should attempt to reach Bethel, although a vessel drawing 16½ feet (5 m.) and traveling only at or near low water has ascended the river to that point.

The navigation of Kuskokwim River and its approaches is difficult. In the bay the shoals are generally hard and steep-to. In a southerly storm a heavy sea makes up the bay nearly to Eek Island, and vessels caught on a shoal are in danger of being pounded to pieces.

The lead is the navigator's best aid, and it should be kept going constantly on both sides of the vessel. No definite rules can be given for following the channels by the surface indications of the water. At certain times the channels will be smooth with rips on the shoals; but again for no apparent reason the indications may be reversed, with rips in the channel and a slick on the shoals. The edge of a channel is often marked by a long line of foam, although cases have been known where the line of foam extended across the channel. It is always well to approach such a line with caution.

Mariners are strongly cautioned against attempting to follow the channels in the bay at high water. Owing to the inequality of the tides, a vessel grounding at high water may not float again for several days. By waiting for low water the mud flats become natural aids instead of dangers.

In 1924 a number of spar buoys were placed to mark the channel from off Carter Spit to Eek Island. There has been no arrangements for maintaining or replacing these buoys, therefore the navigator can not depend upon them. Vessels contemplating a trip to the Kuskokwim should communicate with the Superintendent of Lighthouses, Ketchikan, Alaska, for the latest information concerning these buoys.

Passing about 2 miles westward of Cape Newenham, make good a 28° true (N. ¾ E. mag.) course for about 6 miles until the cape bears 190° true (S. ⅞ E. mag.); then make good a 10° true (N. ⅞ W. mag.) course with Cape Newenham directly astern for about 18 miles until Baluka Hill bears 65° true (NE. mag.) and Red Mountain 121° true (E. by S. mag.). From this position make good a 341° true (NW. ½ N. mag.) course for about 13 miles to a position 4 miles 256° true (SW. by W. mag.) of the elbow of Carter Spit, and 4½ miles 270° true (WSW. ¼ W. mag.) from the beacon on the spit.

In thick or hazy weather a route nearer the coast may be taken as follows: Pass ½ mile off Cape Newenham and Seal Rock, and then make good a 70° true (NE. ½ E. mag.) course for about 6½ miles

until Castle Rock, the southwest headland of Security Cove, bears 177° true (SSE. mag.). Strong tidal currents occur along the north shore of Cape Newenham. From this position make good a 357° true (NNW. mag.) course with Castle Rock astern for 14 miles until the summit of Red Mountain is abeam; then make good a 341° true (NW. ½ N. mag.) course for 19½ miles to a position 4 miles 256° true (SW. by W. mag.) of the elbow of Carter Spit.

From a position 4 miles 256° true (SW. by W. mag.) of the elbow of Carter Spit make good a 302° true (W. by N. mag.) course for 5½ miles with Baluka Hill in range with Pyramid Mountain astern. This range should be held until the water begins to deepen after crossing the 8-fathom ridge shown on the chart. Then head up the channel on a 6° true (N. by W. ¼ W. mag.) course.

Vessels should arrange to make this point at the last of the ebb tide, and go up the channel with the flood tide. After heading on the 6° true (N. by W. ¼ W. mag.) course, the long shoal on the east side of the channel should be made out, either heaping or breaking. It is only with a very smooth sea that this shoal is not in evidence at low water. After continuing on this course for about 10 miles the long shoal on the west side of the channel should be made out, either heaping or breaking. This shoal should be followed at a distance of about 1 mile until its northern extremity is reached. Here it becomes a flat, bare at about half tide. It is of a yellowish color and has deep water close-to. This flat is the leading mark for entering Eek Channel, and therefore it should always be made at low water.

From here, the track veers slightly westward and follows the flats on the west side of the channel on a course of about 0° true (N. by W. ¾ W. mag.) for some 13 miles. Arriving at this point a black mud flat, bare at half tide, should be made out a little on the starboard bow. Pass ½ mile westward of this mud flat and follow the channel by chart and lead. The beacon on Warehouse Bluff should now be visible. On reaching the head of Eek Channel, eastward of Popokamute, vessels of 15 feet (4.6 m.) draft must wait for nearly high water before making the cross over to the West Channel.

East side of Eek Island.—The channel along the north side of Eek Island, once used by power schooners, has shoaled until it is now bare at low water and is only used by small fishing boats. Small vessels now go as far as Apokak where there has been a salting station. The beacon on Beacon Point is in position and will be an aid in reaching the point. From Beacon Point the channel follows the east bank of the river closely to Apokak, which is located on a small slough nearly bare at low water.

To pass on the west side of Eek Island.—The crossover from the head of Eek Channel to the West Channel is difficult. The only landmarks visible are the beacon at Beacon Point and the tripod near Kuskokwak Creek. If the buoys are in place, the crossover is much easier. Conditions here are changeable, and the pilot and his launch should be employed. The chart indicates the approximate track to be followed. In 1924 it was necessary for vessels of 15 feet (4.6 m.) draft to wait until almost high water for making the crossover.

Once in the West Channel, pass close off Popokamute, and follow the west bank of the river for 4 miles. The course then bears out into

the river towards Eek Island. From here the channel crosses to the east bank of the river and continues to Bethel, crossing back and forth many times. There are no leading marks, and at some of the crossings it is necessary to wait for high water. A pilot is necessary.

Vessels coming down the river stand out to sea from abreast of Carter Spit. In entering, this track is not used, as the possibility of running up a blind channel is too great.

PRIBILOF ISLANDS

This group, shown on chart 8995, consists of St. Paul, St. George, Otter, and Walrus Islands. The two latter are small and uninhabited. St. Paul and St. George are important as containing the largest and most numerous seal rookeries of the world. These two islands are each in charge of a United States Government agent. Excepting vessels of the United States Government, all vessels are forbidden landing on these islands. United States naval radio stations are maintained on both St. Paul and St. George Islands. There are no harbors about the islands, and the anchorages are only available with the wind off the land. Because of the uncertain and shifting nature of the wind in this locality, vessels should always anchor with a view of getting underway quickly if necessary.

Fogs are especially thick and prevalent in this vicinity in the summer, and navigation is attended with difficulty and danger.

These islands are at about the southern limit of the ice in Bering Sea. Detached fields of ice will generally be found in their vicinity from February to May.

ST. GEORGE ISLAND

consists mainly of high volcanic hills and ridges, and its entire coast is a precipitous cliff except for a few miles on the north side and short intervals at Garden Cove and Zapadni Bay. The east and west extremities of the island, Tolstoi and Dalnoi Points, are bold promontories.

High Bluff, on the north side of the island, 1,012 feet (308 m.) high, is a prominent landmark, and is visible from St. Paul Island, a distance of nearly 40 miles, on a clear day. There are no harbors, but vessels anchor at North Anchorage, Garden Cove, and Zapadni Bay, according to the direction of the wind; the anchorages are poor except with the wind directly off the land. At a distance generally not greater than 2 miles from the island the depth of the water is but little less than the surrounding sea, and in thick weather it is not safe to depend upon soundings for picking up the land unless sure of the position. Vessels should not approach the island in less than 12 fathoms (21.9 m.) of water. There are no outlying dangers except the small reefs at Zapadni Bay and at North Anchorage. It is reported that vessels have found breakers, in very heavy weather, about 9 miles east of Tolstoi Point.

The anchorage in **Zapadni Bay,** on the southwest side of the island, in 10 fathoms (18.3 m.) of water, affords shelter with winds from east-northeast to north-northwest. The landing is on the open sand beach, and can usually be made with northerly winds. A reef extends about ¼ mile offshore southward of the anchorage.

With northerly winds, a landing may sometimes be made at **Garden Cove,** on the sand beach. The anchorage affords good shelter from northwesterly winds, but with the exception of a small area the bottom is rocky.

North Anchorage.—The following information has been supplied by the United States Navy: On approaching North Anchorage from seaward the first prominent object to be sighted will be a water tank erected on a hill southeastward of the village. Vessels approaching the anchorage should keep the street which extends through the village bearing 164° true (SSE. 5/8 E. mag.). Good anchorage will be found 740 yards from the crane on the landing dock. There is swinging room sufficient for a 400-foot vessel riding to 45 fathoms chain.

The landing is a cutting in the rocks, and can be used only in favorable weather and during a period of 3 hours from high water.

At East Landing, just northeast of the village, is a similar boat landing, but better protected from a westerly swell. A ledge of rocks awash lies a short distance off this landing. If desired, a boat will come out to vessels at anchor when landing is practicable.

A radio station, call letters WWD and operated by the Bureau of Fisheries is located on St. George Island.

Local attraction.—Magnetic observations at 25 points on St. George Island gave results varying from 5° 14′ E. to 20° 03′ E. for variation.

Tidal currents.—The current sets eastward during the rising tide and westward during the falling tide, with a maximum velocity of about 2½ knots. With opposing wind and current, tide rips occur off Tolstoi and Dalnoi Points. These rips are not heavy enough to be of any moment, except that to strangers they may appear to be breakers. The water off both points is deep, and they can be passed close-to with safety.

OTTER ISLAND

has an abrupt bluff at its southwest end, 288 feet (88 m.) high, slopes gradually to the north and rises again in a crater, 150 feet (46 m.) high, at its extreme east end. Foul ground, marked by kelp, extends about ¾ mile from the island on its south, southwest, and north sides. The north side, from Crater Point to Northwest Reef, is clear of dangers. Probably the best anchorage near the island is in 9½ fathoms (17.4 m.), black sand and broken shells, with great caution in thick weather, and at all times keep out of (S. by E. mag.), distant ½ mile. This island must be approached with the northeast extremity of Crater Point bearing 185° true kelp. Between Otter Island and Reef Point, St. Paul Island, the tidal currents are strong, and with heavy winds dangerous tide rips occur, especially on the ebb.

WALRUS ISLAND

is low, about 39 feet (12 m.) above the water, level on top, and composed of irregular masses of volcanic rock. It is about ⅜ mile long and ⅛ mile wide. Anchorage can be had on either side of it, ¼ to ½ mile offshore, in 10 to 15 fathoms (18.3 to 27.4 m.) Landing

can be made with smooth water, the best place for this purpose being in a small cove at the southwest corner. The island is a bad place to make in a fog.

Parts of Otter and Walrus Islands are covered with sea birds in the breeding season, and at the proper time, a plentiful supply of eggs may be obtained.

ST. PAUL ISLAND

The west and southwest parts of St. Paul Island are high and mountainous, with precipitous cliffs at the coast. The rest of the island is a comparatively low, rolling plateau, with a number of extinct volcanic peaks scattered over its surface. **Bogoslof,** 590 feet (180 m.) high, a conical crater near the center of the island, and **Polovina,** a double-peaked hill, 470 feet (143 m.) high, near its east end, are conspicuous, and are the best landmarks in clear weather when coming from southward. From this hill the island stretches away, in a low, narrow neck to **Hutchinson Hill,** 100 feet (30 m.) high, on Northeast Point. West of Lukanin Bay the coast of the south side of the island is rocky, with bluffs at the points. The shore of the rest of the island is generally a sand beach, with rocks in the vicinity of the seal rookeries.

Dangers.—Kelp-marked reefs extend about ⅜ mile southeastward from the two low points lying ⅝ mile and 1⅛ miles southward of **Northeast Point.** A dangerous ledge, marked by kelp, lies 1 mile 355° true (N. by W. ⅞ W. mag.) from Hutchinson Hill. It is about ¼ mile in diameter, and its least depth is found on two rocks with 3 fathoms over them. With a moderate swell the sea breaks over these rocks and for a short distance off Northeast Point. Depths of 8 to 10 fathoms (14.6 to 18.3 m.) can be carried between the ledge and Hutchinson Hill by keeping the shore aboard distant ⅜ to ½ mile.

The north coast from west of Hutchinson Hill to Southwest Point is free of dangers, no reefs or rocks until within ½ mile of the land, except off North Hill; but the bottom is uneven and rocky and the anchorage not generally good.

A rocky patch, with 7 fathoms (12.8 m.) water on it and 9 to 13 fathoms (16.5 to 23.8 m.) around, lies with Hutchinson Hill bearing 80° true (NE. by E. ¾ E. mag.), distant 3⅛ miles. There may be less water on the shoal, as the locality was not fully examined.

Off **North Hill** a shoal extends about ¼ mile northward, the depths gradually increasing to 4 and 6½ fathoms (7.3 and 11.1. m.) at 1 mile from the coast.

A spot with 5 fathoms (9.1 m.) over it is reported 8 miles 272° true (WSW. ¾ W. mag.) from the west end of St. Paul Island. Kelp has been noticed in this vicinity.

Breakers extend ½ mile or more off **Southwest Point.**

A dangerous ledge, usually marked by breakers, extends ½ mile southwestward and southward from **Reef Point,** the south point of the island.

A reef extends about ¼ mile off **Tonki Point,** the northeastern point of Lukanin Bay.

Anchorage.—The usual anchorage at this island is off the west side of Reef Point, and there is also an anchorage on the east side, off Black Bluffs. From the anchorage on the west side the village is

hidden, but there is a flagstaff on the top of the hill overlooking the bay; from the Black Bluffs anchorage the village is in full view, and there is another flagstaff, the lower of the two, on this side. If a vessel is seen approaching, the United States ensign is hoisted on the flagstaff on the side on which she ought to anchor, and the ensign is kept flying if landing is safe, but hauled down if it is not safe.

Vessels should not attempt to ride out a gale at anchor near the islands, unless to leeward and well sheltered. The surf is apt to make quickly and is dangerous on the weather side of the island.

The following information is furnished by the United States Navy: In approaching the anchorage off Village Cove the most prominent objects are the three main naval towers, the radiocompass station on Village Hill, and a tall steel stack at the site of the by-products plant. The radio towers are 300 feet (91 m.) high and are visible 10 miles.

Vessels approaching the anchorage should steer for the steel by-products stack on course 82° true (ENE. mag.) and anchor in 8 fathoms (14.6 m.) with the stack distant 1,750 yards and the radiocompass station bearing 124° true (ESE. ¼ E. mag.), distant 1,300 yards.

Landing.—In Village Cove, the landing place on the west side of Reef Point, the landing is just northward of the bluff point where the flag is hoisted; a bar extends across the entrance, on which the sea breaks unexpectedly and is often dangerous. Boats going in, after passing north of the point, must keep close in to the small point just outside the wharf. At low water boats can not land at the wharf.

The landing on the east side is a small cutting in the rocks close to a salt house; with westerly winds and high water, landing here is easy.

A landing can sometimes be made at the head of the cove on the south side of Lukanin Bay when impracticable at Black Bluffs or Village Cove.

Village.—The village is a number of small, wooden houses, painted white, with dark roofs, a church, also several large buildings for the Government agent. There are about 250 inhabitants.

A **Naval radio station,** call letters NPQ, is located on St. Paul Island. This station is open to commercial traffic and handles most of the through business of the section.

A **radiocompass station,** call letters NPQ, is maintained on the island (see p. 9).

During the sealing season the Pribilof Islands are guarded and patrolled by vessels of the United States Coast Guard, under provisions of the international treaty governing sealing. The islands are under the jurisdiction of the Bureau of Fisheries of the Department of Commerce. In 1925, 22,000 seals were killed by the Government, and a census showed that the seal herd was increasing satisfactorily.

Tides.—The mean rise and fall at St. Paul Island is about 2 feet (0.6 m.). Around St. Paul Island the flood tidal currents sets eastward and the ebb westward, following the trend of the shore. The greatest velocity occurs at Northeast Point and between Reef Point and Otter Island and is 1 to 2 knots, but with continued strong winds from one direction it may be increased to 3 knots. There are

heavy rips around Northeast and Southwest Points, also between Reef Point and Otter Island, where they are worst on the ebb. The tides and tidal currents are greatly influenced by the winds.

NUNIVAK ISLAND

(chart 9302) is rarely approached by vessels. For a distance of 10 miles about the island, especially on its east and north sides, the bottom is reported very uneven, consisting of ridges with deeper water between. The island should therefore be approached with caution. From westward it presents gentle slopes, terminating seaward in reddish cliffs 150 to 462 feet (46 to 141 m.) high. The highest point of the western part of the island is 830 feet (253 m.), which is found 10 miles eastward from Cape Mohican. Near the center there are some mountains of moderate height that rise with a gentle slope. Except some hills, the eastern end of the island is low. In clear weather the island can generally be made out at a distance of 30 miles from any direction.

In 1899 the U. S. S. *Corwin* cruised completely around Nunivak Island, following the shore and outlying islands at a distance of about 2 miles, and found general depths of 7 to 10 fathoms (12.8 to 18.3 m.). The coast is generally abrupt and rocky, with numerous bights in which anchorage was found with 3½ to 7 fathoms (6.4 to 12.8 m.) of water.

Cape Mohican, the western point of the island, is in latitude 60° 12′ 45″ N., longitude 167° 27′ W., as determined by the Coast and Geodetic Survey in 1902, and is a narrow promontory about 2 miles long. The point of the cape is a cliff 266 feet (81 m.) high, from which it falls eastward to a height of 150 feet (46 m.) in a distance of 2 miles, and then rises by a gentle slope to the higher land of the island.

A dangerous ledge extends off Cape Mohican, probably 1 mile, though the distance is uncertain. Between 1 and 14½ miles westward of the cape the soundings show a somewhat irregular bottom with depths of 13 to over 23 fathoms (23.8 to 42 m.). A shoal with 4½ fathoms over it is reported about 14 miles 271° true (WSW. ½ W. mag.) from Cape Mohican. It is reported that a reef exists 1½ miles north of Cape Mohican, and extends eastward about 3 miles; this reef was observed to be breaking along its entire length with a smooth sea. A shoal with 3 fathoms (5.5 m.) and less is reported 5 miles 349° true (NNW. ½ W. mag.) from Cape Mohican.

A shoal with 9 feet (2.7 m.) over it is shown on the charts about 12 miles 46° true (NNE. ½ E. mag.) from Cape Mohican. A line of soundings with 12 to 13 fathoms (21.9 to 23.8 m.) was run by the *Manning* about 2 miles inside (southward) of this position, and another by the *Patterson*, with 14 to 16 fathoms (25.6 to 29.3 m.) 1¾ miles westward of it.

From Cape Mohican the southwest coast extends with a slight curve in a southeasterly direction for 9½ miles to what may be called the southwest cape of the island. This stretch of coast is impassable cliffs 150 to 462 feet (46 to 141 m.) high, and there is no boat landing. The 6-fathom (11 m.) curve is about 1¼ miles offshore, and there are no known outlying dangers. An observation of

the tidal current gave a maximum velocity of 1.2 miles on both flood and ebb; the flood sets northwestward and ebb southeastward alongshore.

The southwest cape of the island is cliffs 100 to 150 feet (30 to 46 m.) high, the summit of which is gentle slopes of tundra. The coast here changes direction gradually eastward for 2 miles to a small cove, which is the first boat landing southeastward of Cape Mohican. The best landing place is on the sandy beach in front of a small native village. Fresh water can be obtained from the stream just east of the village, which, at low water, is fresh to its outlet. A temporary anchorage may be made about ¾ mile off the entrance to the cove, in 7 to 8 fathoms (12.8 to 14.6 m.).

From the southwest cape of the island the coast has a general 122° true (ESE. ¾ E. mag.) direction for about 21½ miles, and then changes direction to about 108° true (E. mag.) to Cape Mendenhall, the southern point of the island. In the first 22 miles from the southwest cape, the few soundings taken show deep water fairly close to the shore, and following the coast at a distance of 2 miles is apparently safe. But at a distance of 5 miles or more offshore there is an extensive bank on which soundings of 4¾ to 6 fathoms (8.7 to 11 m.) have been made. The bank is included approximately between latitude 59° 46′ and 59° 53′ N., and longitude 166° 50′ and 167° 20′ W.

Cape Mendenhall, the southern point, is about 200 feet (61 m.) high, with a steep bluff on its east side, which extends halfway to the bottom of the bight between this cape and Cape Corwin. Breakers are said to exist 6 or 7 miles from Cape Mendenhall. In 1900 the *Manning* rounded the cape at a distance of about 5½ miles in depths of 13 to 14 fathoms (23.8 to 25.6 m.).

Cape Corwin, the eastern point, is low, with a rocky shore north of it; the cape is definitely marked by the twin peaks of a mountain, which can be seen 25 miles in clear weather. The *Manning* passed about 2 miles eastward of the cape in depths of 10 to 11 fathoms (18.3 to 20.1 m.).

The three following **anchorages** are from an oral description by Capt. J. L. Fisher, who anchored with a stern-wheel steamboat in each of them in July, 1898:

The first is in the bight between Cape Mendenhall and Cape Corwin, close inshore, in 3 fathoms (5.5 m.), with sand and gravel bottom. Fresh water can be obtained at this anchorage.

The second is in the cove on the north side of Cape Corwin; it is very rocky and a poor anchorage. Fresh water can be obtained here; it is discolored and of poor quality.

The third is on the north side of, and about 12 miles eastward of, the north end of the island. It is in a cove open eastward, but deep enough to afford shelter from northerly and southerly winds. Capt. Fisher considers this the best anchorage on the east side of the island. Fresh water can be obtained at this place. In 1900 the *Manning* cruised in this locality and reports that the anchorage on the north side of Cape Manning has not the appearance of a good harbor at low water, and that the rise and fall of tides is 12 feet (3.7 m.).

From Cape Etolin the shore trends in a general 120° true (E. by S. mag.) direction about 20 miles to a point called **Cape Manning,** and from the latter cape to Cape Corwin the direction is 176° true (SSE. mag.) and the distance about 20 miles. An island called **Triangle Island** lies about 6 miles westward from Cape Manning, and about 2 miles from the shore of Nunivak Island, with reported foul ground between. The *Manning* passed about 1 mile northward of the island in depths of 7 to 9 fathoms (12.8 to 16.5 m.).

Cape Etolin, the northern point, is a narrow strip of land about ¾ mile long. There is a ridge of low hills about midway of this outer strip. A small island lies about 2 miles off the end of the cape, with ledges between it and the point of the cape. A dangerous rocky spit makes westward for probably more than 1½ miles from Cape Etolin.

Cape Etolin Anchorage (chart 9196) in the bight on the east side of the cape, has fair holding ground, but is open to the northeast. Near the southerly side and about ⅓ mile from the head of the bight an anchorage in 18 feet (5.5 m.) can be found; farther out it is deeper but more exposed to the effects of the strong tidal currents and rips of **Etolin Strait.** The holding ground is gravel and only moderately good. There is a small native winter village at the northwest corner of the bay.

In 1900 the *Manning* made a reconnaissance of Nunivak Island and found a shoal with 3 fathoms (5.5 m.) over it about 10 miles 355° true (NNW. mag.) from Cape Etolin, with deep water between. Keeping Cape Vancouver bearing northward of 86° true (ENE. mag.), Cape Etolin can be rounded when coming from westward in 10 fathoms (18.3 m.) of water. With Cape Vancouver bearing 86° true (ENE. mag.) or eastward of this bearing, considerable shoal water and irregular depths are found.

Nash Harbor, on the north side of the island, nearly halfway between Cape Etolin and Cape Mohican, is a good harbor except with winds from northwest through north to northeast. On the western point at the entrance are a number of Indian graves, and at the head of the harbor is a frame house, which can readily be distinguished at a distance of 3 miles.

Tides.—The mean rise and fall at Nunivak Island is 3 feet (0.9 m.). There is nearly two hours difference in the time of tide on the north and south sides of the island.

It is stated that the tidal currents in Etolin Strait are so strong that the middle portion does not freeze over in winter.

ST. MATTHEW AND ADJOINING ISLANDS

(chart 8851) are rocky, uninhabited islands, whose shores are little known and are poorly charted. During the season of navigation fogs are very prevalent in their vicinity and vessels should keep away from them. From what is known of them, anchorage may be made with an offshore wind on nearly all sides, though the shore should be approached with great caution.

Cape Upright, the eastern point of St. Matthew Island, is high and vertical, and the land in its immediate vicinity is mountainous; off the cape is a detached rock about 25 feet (7.6 m.) high. West-

ward of the high land of the cape there is a low neck, apparently of sand, and the cape might easily be mistaken for a detached island.

Glory of Russia Cape, the north point of St. Matthew Island, is also high and mountainous, and the land between it and Cape Upright is a succession of hills and low valleys that extend across the island from north to south.

There are numerous detached rocks along all the shore of this island, which should not be approached too closely.

There is an abundance of fresh water on the island in streams and fresh-water lakes.

There is a good **anchorage** on the north side of the island in a bight 6½ miles westward of Cape Upright, with **Sugarloaf Mountain** bearing 218° true (SSW. mag.), and westward of some outlying rocks which show well out of water and should not be approached closely. This anchorage is protected from southerly winds between southeast and southwest. Landing is difficult with any swell at all, as the beach is of stones and rather steep. With northerly winds anchorage can be had on the south side of the island.

Hall Island is high and rugged on its northeast, north, and west sides, and slopes to the southeast point, where it is low. There is a large detached rock off Cape Hall, and a number of detached rocks on the south side of the island. There is anchorage in 10 fathoms (18.3 m.) on the east side of the island in the bight where ruins are indicated on chart 8851.

Pinnacle Island is a remarkable narrow rock, about 1 mile long, 200 yards wide, and 900 feet (274 m.) high, which rises so abruptly from the water that there is scarcely a place for a boat to land. There are numerous small rocks near the island, and it should be avoided. Lieut. S. P. Edmonds, R. C. S., reports that from observation and bearings on Cape Upright and Sugarloaf Peak, Pinnacle Island is about 2 miles westward of the position shown on the chart.

There are reports of uneven bottom, with depths of 6 to 9 fathoms (11 to 16.5 m.) or less, on what appears to be a ridge connecting Pinnacle Island with St. Matthew Island. Vessels are advised to avoid this passage.

Sarichef Strait is the passage between St. Matthew and Hall Islands. The tidal currents and rips are strong, and the rocks on either side give it a bad appearance. It is said to be clear in mid-channel.

Tides.—The mean rise and fall at St. Matthew Island is about 2½ feet (0.7 m.). The flood currents sets eastward, and the ebb westward, at the rate of about 1 to 2½ knots.

CAPE VANCOUVER TO APOON PASS

Cape Vancouver is a bold promontory, possibly 1,000 feet (305 m.) high. The shoal from the mouth of the Kuskokwim River is thought to extend along the coast to Cape Vancouver, so that on the south side of the cape the water is shoal. Immediately off the end of the cape there is deep water, which extends about 5 miles along the north side to the bight on which the native village of

Tanunak is situated. This bight is a series of mud flats, mostly bare at low water. The *Bear* anchored in 4½ fathoms (8.2 m.) about 1 mile off the south point of the bight. From observation on that vessel, shoals extend off the mouth of that bight northwestward, and **Hazen Bay** is supposed to be shallow.

Father Barnum states that there are shoals parallel with the coast, behind which small boats go when coasting between Scammon Bay and Nelson Island. He is uncertain as to their exact limits and location, but they are believed to extend from the north entrance to Hazen Bay to, or nearly to, Cape Romanzof, with passages through in places.

Cape Romanzof is a bold and prominent headland with cliffs rising abruptly from the water over 1,200 feet (366 m.) along its western face; at the sharp extermity of the cape there are remarkable perpendicular shafts of rock on the side of the cliff. The cape is the western termination of the **Askinuk Mountains,** the highest of which (2,363 feet (720 m.)) is about 5 miles from the cape and can be seen a considerable distance at sea. A tidal current of about 1.6 knots was observed off the point.

Northeastward of the cape, 4½ miles, is the southern end of the **Sand Islands.** These two islands extend in a general north and south direction about 13 miles, including the interval between them, and at a distance from the coast diminishing from 7 to 5 miles. The north island is mostly covered at high tide.

The coast trends in an easterly direction from Cape Romanzof 15 miles to the mouth of Kun River, and throughout most of this distance is bordered by abrupt cliffs and hills gradually diminishing in elevation.

Scammon Bay lies between this shore and the south Sand Island. In general it is very shoal, with numerous bars bare at low tide. There are two small coves along its south side, respectively 1 and 9 miles from Cape Romanzof, but both are quite shoal. There is a limited area with a depth of 5 fathoms (9.1 m.) just south and east of the southern end of Sand Island, and there is a channel of the same depth leading into this and passing about 2¼ miles north of Cape Romanzof. A narrow channel with a minimum depth of about 2 fathoms (3.7 m.) continues through Scammon Bay and into the **Kun River.** There are depths of from 2 to 4 fathoms (3.7 to 7.3 m.) off Cape Romanzof but the water shoals quickly northeastward, so there is little protection except for very light-draft boats. There is a large shoal area with breakers about halfway between the cape and Sand Island, and another shoal with less than 2 fathoms (3.7 m.) lies 2½ miles 338° true (NW. ⅜ N. mag.) from the cape. Along the high land forming the south shore of Scammon Bay the water is 1 fathom (1.8 m.) or less in depth throughout its length, excepting just inside Cape Romanzof. The mean rise and fall of tides at the entrance to Scammon Bay is about 5 feet.

North from the mouth of the Kun River the coast is low and marshy to the Yukon River mouths. It is reported to be extremely shoal between the northern Sand Island and this shore.

The **bay south of Cape Romanzof** has not been explored, but a number of bars, bare at low tide, were seen extending across its entrance between the cape and the north end of an island; near the

latter there appeared to be a channel. The coast between Cape Romanzof and Nelson Island is low, and it is reported that the adjacent waters are shoal.

The **Yukon Delta** extends from the Black River to Apoon Pass, a distance of about 90 miles. The land along the coast is only a foot or two above high water, is covered with low marsh grass, and is entirely lost to view when but a few miles offshore. The only landmarks visible in clear weather are the sharp peaks of **Kusilvak Mountain** and the **Askinuk Mountains** back of Cape Romanzof, all very distant and often obscured by clouds or mist. The extreme flatness of the land and the remarkable mirage effect, often seen over the shoals when bare, make the whole region deceptive at times.

The river discharges by many mouths through the delta. The bars at the entrance have little depth, and the channels through the flats are narrow, crooked, and bordered by shoals bare at low water. They are also subject to constant change. **Apoon Pass** (see p. 311) is the entrance used by the river steamers.

When well inside the confined bank the country on each side is covered with an almost continuous growth of willow and alder bushes. The water has a brownish-white appearance, something like glacial water, without its fine, sharp grit. It has no unpleasant taste, and is always fresh in the inner channels.

The main channels are everywhere free from snags, though trees are sometimes seen temporarily lodged on the bars, and quantities of driftwood are piled along the shores in places. Undoubtedly the ice freezes in and carries off the snags when it goes out each season. The channels and banks show indications of changing rapidly both from erosion and deposits. Very probably much of this is effected each year during the breaking up of the ice, its consequent jams, and the great floods following.

Inhabitants.—No white men live in the delta south of the Apoon except the Catholic missionaries at a summer fishing station. The native summer settlements near the mouths are shown on Chart 9370. The natives are friendly and honest, and will attempt to pilot boats, with more or less success.

Currents.—None were observed to exceed 3 miles per hour. In the delta channels currents were observed varying from 0.5 to 1.6 miles. The velocities were greater in the bar channels and up the river.

Weather.—The prevailing winds in summer are northeasterly, easterly, and southeasterly; the strong blows are believed to come from the same directions. Fogs were unusual, but there was a good deal of thick mist and rain.

Yukon Flats.—The 6-fathom (11 m.) curve is about 10 miles westward of Cape Romanzof. From about 15 miles off Cape Romanzof the 6-fathom (11 m.) curve on the western edge of the flats has a general 24° true (N. ⅜ E. mag.) direction for about 108 miles to latitude 63° 32′ N., longitude 164° 58′ W. At this point it turns to a general 87° true (NE. by E. ⅞ E. mag.) direction for 61 miles to the west point of Stuart Island. On the western edge of the flats the 3-fathom (5.5 m.) curve is 1½ to about 5 miles inside the 6-fathom (11 m.) curve, while on the northern edge the distance between the curves ranges from 5 to 10 miles. For a distance of 40

miles northward of Cape Romanzof detached shoals with 3¾ to 6 fathoms (3.8 to 11 m.) over them lie as much as 10 miles westward of the flats as described above, and deep-draft vessels should give the cape a berth of 30 miles to avoid these shoals. When in the vicinity of the flats vessels should not shoal the water to less than 8 fathoms (14.6 m.).

ST. LAWRENCE ISLAND

The eastern end of this island is usually made by vessels bound into Norton Sound, and in clear weather can be seen from a distance of 30 to 35 miles. From Southeast Cape a ridge of mountains extends in a northerly direction across the island, and another ridge extends in a northerly direction from East Cape to Northeast Cape. Between these two ridges a deep bight makes in from southward and at its head very low land extends northward across the island. The shore of the eastern end of the island is generally a low sand beach with outlying rocks; the mountain ridges begin ½ to 2 miles back from the beach.

Northeast Cape is low tundra land, with numerous fresh-water lakes, 2 miles wide to the foot of a mountain which rises abruptly and has a peak 1,435 feet (437 m.) high which can be seen on a clear day a distance of 35 miles or more. At ¼ and ⅝ mile from the end of the cape are two hummocks 94 and 280 feet (28.7 and 85 m.) high, respectively; the lower hummock is in latitude 63° 17′ 45″ N., longitude 168° 41′ 40″ W., as determined by the Coast and Geodetic Survey in 1902.

Although the bottom is irregular off the point of the cape, no break was noticed while passing it in rough weather. The north shore of St. Lawrence Island, for a distance of 10 miles westward of Northeast Cape, is a low sand beach and grassy tundra with numerous fresh-water lakes. Anchorage with shelter from southerly or southeasterly winds can be had along this shore about 2 miles from the beach in 8 to 9 fathoms (14.6 to 16.5 m) of water; the holding ground is not good, the bottom being gravel. At a point on the north shore 6 miles westward of Northeast Cape, breakers extend 1 miles offshore.

From Northeast Cape the east coast of St. Lawrence Island has a general 192° true (S. ½ E. mag.) direction for 4 miles to a point where a spur, 450 feet (137 m.) high, from the higher hills reaches to within ½ mile of the beach. In this stretch the 6-fathom (11 m.) curve is ¾ to 1 mile offshore. A current observation made 2 miles southward of Northeast Cape and 1 mile offshore gave a maximum velocity of 1.4 miles on both flood and ebb; the flood sets northward and ebb southward alongshore.

The east coast of the island then trends 209° true (S. by W. mag.) for 4 miles, and then curves westward and northward in a distance of 5 miles until it has a 310° true (WNW. mag.) direction, forming **East Cape.** The coast of this entire section is a low, narrow strip with a large lagoon back of it. East Cape is so rounding that there is no particular point to which the name applies. The mountains are about 2 miles back of it and are about 900 feet (274 m.) high.

Punuk Islands, lying 4 to 5 miles 164° true (SE. by S. mag.) from East Cape, is a group of three small islands 1½ miles long; the

northeastern end of the group lies about 13¼ miles 192° true (S. ½ E. mag.) from Northeast Cape. The northernmost and largest island has two marked rocky hummocks, the higher having an elevation of 100 to 150 feet (30 to 46 m.); on the southwestern end of the island are the remains of a native village. The southernmost island is an irregular mass of rocks, the highest point about 75 feet (22.9 m.) above water. Between these islands is a low, sandy islet, which is separated from the other two by narrow channels completely obstructed by ledges over which the sea breaks. The shores of all the islands are foul, and a ledge extends southward from the southernmost island; the *Patterson* passed 2 miles southward of the islands in a least depth of 8 fathoms (14.6 m.). Vessels should approach these islands with caution.

A heavy break was observed in the channel between Punuk Islands and East Cape, and vessels should not attempt to pass through. From eastward the islands can be approached as close as 2 miles.

A current observation made 2¾ miles 220° true (SSW. mag.) from Punuk Islands showed the flood currents setting about 24° true (N. ½ E. mag.) with a maximum velocity of 1.1 miles.

Southeast Cape is about 5 miles across on its southern face; the eastern point of the cape slopes gradually to the water for a distance of ¼ mile from the highland, and a reef extends about ½ mile southeast from the point. The western point is lower and slopes more gradually to the water for a distance of 3 miles from the highland, and a reef makes off from the point in a southerly direction for a distance of 2 to 3 miles. The bight between these points is very foul and should be avoided.

Cape Kialegak, about 5 miles northward of Southeast Cape, is a long sand spit strewn with rocks, extending in a northeasterly direction from the highland of the coast, and forms what is in appearance a good anchorage in southerly winds. There are breakers about ¾ mile 355° true (NNW. mag.) from the end of the cape, and there may be others inside; a reef extends southward from the south side of the sand spit for a distance of about 1 mile. The remains of a native village on the sand spit serve to identify the locality.

The deep bight westward of East Cape is little known; vessels have anchored well up toward the head of this bight. Vessels entering should give the points a good berth and exercise caution.

Cape Chibukak, probably 600 feet (183 m.) high, is a steep, black bluff, flat on top. There is a wide sand beach west of the bluff, on which is a native village called **Gambell,** containing about 200 inhabitants and 40 houses.

The water is deep close to Cape Chibukak, and anchorage may be made on either side of the point of the sand beach off the native village, ½ mile from shore, in about 7 fathoms (12.8 m), hard bottom.

In May and June, fresh water may be obtained in the center of the bight on the northeast end of Cape Chibukak.

The western end of the island, south of Cape Chibukak, is rolling land. From West Cape around to the bay east of Southwest Cape the land is mountainous, and abrupt close to the coast, being highest at **Southwest Cape.** There are one or two families living at Southwest Cape.

Between the highland east of Southwest Cape and Cape Chitnak the land is low. A reef makes off 1 mile in a 220° true (SSW. mag.) direction from **Cape Chitnak** and is bare at low water. The submerged part of this reef extends about 4 miles in a general 175° true (SSE. mag.) direction from the bare part. This reef is dangerous, as the water shoals abruptly when approaching the cape. The rest of the island is generally high and rolling. There are some sunken rocks in the bight westward of Southeast Cape, and also some detached rocks showing off the north shore near **Cape Kukuliak** and **North Cape.** It is probable that with care an anchorage may be found almost anywhere around the island, but the shores must be approached with caution.

Savoonga is a village situated at the extreme end of North Cape. There are about 50 inhabitants and a dozen houses including a United States Bureau of Education schoolhouse. The Bureau of Education operates a radio set (½ kw. spark transmitter, Navy type). It is also the headquarters of the Reindeer Commercial Co. which runs about 7,000 deer on the island.

A **bar** extends ¾ mile to the northward from North Cape, and vessels should anchor to the eastward of this bar.

Tides.—The mean rise and fall at St. Lawrence Island is probably about 1 foot (0.3 m.) at the east end, increasing to perhaps 2 feet (0.6 m.) at the west end. The time of high water probably changes rapidly from point to point, but no tidal observations have yet been made.

Currents.—About ¾ mile off Savoonga the flood sets northwesterly and the ebb easterly. The flood averages about 1 knot in strength and the ebb 1½ knots. Slack water occurs about 1½ hours before the times of tide at Kodiak.

NORTON SOUND

Norton Sound is one of the important arms of Bering Sea. Some supplies for the Yukon River by way of St. Michael pass through it. The north shore is also important because of the mining operations now conducted there. The south side of the entrance to the sound is occupied by the extensive Yukon Flats, and should be avoided by deep-draft vessels. The rest of the sound generally has soundings of 8 to 12 fathoms (14.6 to 21.9 m.), the greater depths being near the north side. Off Cape Nome and Cape Darby there are spots with depths of 15 to 19 fathoms (27.4 to 35 m.). The bottom of the sound is very even, the depths decreasing to the shore with marked regularity, and the lead will indicate the approach to dangers, and should be kept going constantly. There is driftwood on all the shores of the sound.

Fog.—The remarks on fog, page 262, apply also to the region west of Cape Nome, but not to Norton Sound east of it. On entering the sound with thick weather in Bering Sea, the fog will almost always thin out and gradually clear as the vessel proceeds up the sound. At St. Michael fogs are rare.

Mirage.—In the vicinity of St. Michael and Stuart Islands and the coast southward mirage often distorts the appearance of the land, small objects being sometimes greatly magnified.

Due to this abnormal refraction, positions obtained by astronomic sights (especially on the flats) can not be depended on and may be several miles in error although the sight seemed a good one.

Stuart Island lies northwest of St. Michael Island, from which it is separated by **Stephens Pass,** about ⅔ mile wide in its narrowest part. **Cape Stephens,** on the southeast side of Stephens Pass, is marked by a flashing white light, shown from August 1 to November 1 each year. **Stuart Mountain,** 483 feet (147 m.) high, east of the center, is the highest point. The rest of the island is low and rolling, with some small, scattered peaks. The shore of the island is very irregular. From North Point to Observation Point and around through Stephens Pass is a line of conspicuous bluffs about 170 feet (52 m.) high; the rest of the coast is much lower. From Observation Point to the west point of the island the north shore is free from outlying dangers; 5 fathoms (9.1 m.) can be carried 1 mile from the beach. Off the west point, some detached rocks extend about 300 yards. On the east face of the island well toward the southeast point a shoal makes out about 3 miles.

St. Michael Island is separated from the mainland by a narrow, crooked, tidal slough, called **St. Michael Canal.** The island is generally low, and has two conspicuous elevations; **St. Michael Hill,** near the center, 472 feet (144 m.) high; and **Stephens Hill,** a sharp, conical hill, overlooking Stephens Pass. **Orizoba Reef** extends 1½ miles off **Rock Point,** the point 51° true (NNE. ⅝ E. mag.) from St. Michael Hill. Orizoba Reef bell buoy has not been on its station since 1922.

Whale Island, lying close off the east end of St. Michael Island, is about ½ mile long east and west, 118 feet (36 m.) high, and on approaching the harbor its east end is seen as a vertical bluff. It is marked on its eastern end by a flashing white light. The passage between this and St. Michael Island is blocked by rocks, bare at low water. Eastward and northward of the island the water deepens rapidly.

Dangers.—A bowlder with 20 feet (6.1 m.) of water over it lies 2⅕ miles 61° true (NE. ½ N. mag.) from Whale Island Light, and another bowlder with 19 feet (5.8 m.) of water over it lies 1,000 yards 64° true (NE. ¼ E. mag.) from the same point.

Beulah Island, about ¼ mile northwest from Whale Island, is about 50 feet (15.2 m.) high, small and rounded. It has bold water off its northeast side. Between this and Whale Island the water is shoal.

St. Michael, on the east point of St. Michael Island, is the point of transfer from deep-water vessels to the Yukon River steamboats. The traffic through St. Michael has decreased greatly in recent years, due to the fact that the greater part of the freight for the Yukon Valley now goes in via the White Pass Railway from Skagway, or via the Government railway from Seward. There is a United States commissioner here. There is no quarantine officer; no pilots are available.

A wharf is available for vessels of 6 feet or less draft; larger vessels must discharge their cargoes by lighters. Three lighters are available; the largest is covered and has a capacity of 400 tons. There is one tug, a 45-horsepower Diesel launch.

No coal is obtainable; in 1926 about 1,500 barrels of fuel oil were on hand, but this stock probably will not be replenished. A limited amount of provisions, including fresh reindeer meat, can be obtained. There is a small cold-storage plant. The water is not suitable for drinking or boiler purposes. A 50-ton lighter of spring water can be obtained upon two days' notice if the weather permits its lighterage from the southern part of the bay; the current price for this water at ship's side is 2 cents per gallon. Vessels can obtain water at Golofnin Bay.

There is no hospital or physician at St. Michael. A nurse of the Bureau of Education is employed at the public school.

Vessels of the Alaska Steamship Co. generally call here twice a month from about June 15 to October 15 and during the same season a small steamer operates weekly to Nome and the villages of Norton Sound. From about June 10 to September 1 river steamers connect with Nenana semimonthly.

Repair facilities are limited to woodwork and caulking.

The Army post has been abandoned.

There is an Army radio station, call letters WXT. This station has only one operator and does not answer calls from vessels.

The tallest of three radio pole masts, 265 feet (80 m.) high, 238° true 1,100 yards from Whale Island light, is a conspicuous object from the vicinity of Whale Island.

Anchorage.—There is no harbor for seagoing vessels; the anchorage is an open roadstead exposed to winds from northwest through north to east. The larger vessels anchor in the offing between St. Michael Bay and Egg Island, and in heavy northerly gales shift their anchorage to get a lee under Egg Island or go to sea. Anchorage is found about ½ mile southeastward of Whale Island in 3½ to 4 fathoms (6.4 to 7.3 m.), bottom dark-blue mud and good holding ground. Care should be taken to avoid the sunken bowlders described on page 302.

Light-draft vessels and river steamers can find shelter from northerly and westerly winds by anchoring close in under the east side of the island, in 3 to 8 feet (0.9 to 2.4 m.). The shores of St. Michael Bay are strewn with loose rocks, which are often frozen in the ice in winter and dropped as it goes out in the spring. Light-draft vessels, when anchoring in shoal water, should be careful not to anchor over any of these loose, scattered rocks.

Egg Island.—This island has been used as a quarantine station. The water off the western shore is deep, 6 fathoms (11 m.) being found close inshore. The island is so small that it does not afford much protection in heavy weather, but it is the only lee to be had in northerly gales.

Tides.—See Coast and Geodetic Survey tide tables, in which the tides are predicted for every day of the current year.

Currents.—About ¾ mile offshore in St. Michael Roadstead the tidal current averages about 1 knot at times of strength. Like the tide itself, the tidal current is chiefly diurnal and sets southeasterly on the flood and northerly on the ebb.

Ice.—The records of the Alaska Commercial Co. from 1880 to 1899, both inclusive, show that ice begins to move out of St. Michael

Bay between May 31 and June 25, the former being the earliest date recorded and the latter the latest. The earliest date recorded for ice forming in St. Michael Bay is October 6 and the latest November 10; during the past 10 years, however, the dates when ice formed ranged from October 18 to November 10. (See also p. 259.)

ST. MICHAEL BAY TO CAPE DARBY

The coast is generally low and rock strewn, and the depths when approaching it shoal gradually from 6 fathoms (11 m.) toward the beach; a depth of 3 fathoms (5.5 m.) can be taken as close as ¾ mile except in a few places. There are no outlying dangers, but a reef makes off about ½ mile from the shore 2 miles southward of **Black Point,** the point about 26 miles northeastward from St. Michael. **Tolstoi Point** and its vicinity are high and rocky, and from there to Unalakleet River the shore is low. A shoal extends about 1½ miles off the mouth of the **Unalakleet River;** there is no channel through this shoal into the river except for light-draft craft. The entrance is marked by a lighted range which is maintained from August 1 to November 1 of each year.

Good **anchorage,** in southerly winds, is found in the bight eastward of **Kiktaguk,** about 15 miles eastward of St. Michael. There are a number of native villages on this coast, and a depot for supplies at **Unalakleet.**

Besboro Island is 1,012 feet (308 m.) high and very prominent; on a clear day it can be seen from St. Michael; it affords a poor lee, as the wind draws all around the island. A shoal with depths of 4 to 4¾ fathoms (7.3 to 8.6 m.) makes off 2 miles in a northeasterly direction from the north end of the island; the western side of the island is bold-to, and the eastern side of the island can be approached as close as ½ mile, with a depth of over 5 fathoms (9.1 m.).

Cape Denbigh is a moderately high, rounded hill, joined to the mainland by a low, narrow neck. The head of the bight, eastward of the cape, is shoal, but in approaching the water shoals gradually. A good anchorage in northeastly winds can be had eastward of the cape in depths suitable to the draft of the vessel. The south end of the cape is bold-to, and its western side, 2½ miles northward of the point, can be approached close-to in 4 fathoms (7.3 m.) of water. The water shoals rapidly inside a depth of four fathoms (7.3 m.) when approaching the shore.

Norton Bay is generally shoal. About midway between **Point Dexter** and **Bald Head** there is a depth of about 6 fathoms (11 m.), and from this depth the water shoals gradually, as the shores are approached in any direction inside of Bald Head. In some places the 6-foot (1.8 m.) curve is 5 miles or more from the beach. The north shore of the bay for a distance of 15 miles westward of Bald Head is comparatively low, and the water is shoal for some distance from the shore. From a point 15 miles west of Bald Head to Cape Darby the land is high and wooded along the coast; a few native villages are located on this stretch. For a distance of 20 miles northeastward from Cape Darby a depth of 4 fathoms (7.3 m.) can be taken ⅓ mile from the shore, and in some places much closer.

The water shoals gradually on aproaching the coast, but the south and east sides of Cape Darby have deep water close-to. During strong northerly winds the water is lowered considerably in Norton Bay.

During the season the entrance to the **Koyuk River** is marked by about 27 black buoys (gasoline drums and tins), the outer buoy being 9 miles off the mouth of the river.

Cape Darby is a high, rounded mountain, which terminates at the water in steep, rocky bluffs. **Rocky Point** is a high, bold promontory with irregular rocky cliffs.

GOLOFNIN BAY

(chart 9382), the entrance to which lies between Cape Darby and Rocky Point, with a width of 10 miles, extends in a general northerly direction for 12 miles to the entrance to Golofnin Sound. The east shore is high and bold, with occasional sand and gravel beaches. **Carolyn Island,** low and rocky, lies ¼ mile off the east shore, about 8 miles north of Cape Darby. The west shore for about 3 miles north of Rocky Point is high and bold, but beyond this is a low sand beach, with a prominent point about 5 miles north of Rocky Point. At the head of the bay on the west side the entrance to Golofnin Sound lies between a sand spit projecting from the eastern shore and a low sand island extending northward from the west shore and connected with it at low water.

Deep water can be carried close under Cape Darby and Rocky Point. Eastward of Rocky Point is an extensive middle ground on which the least depth found was 3¾ fathoms (6.8 m.); on its east edge it rises abruptly from 6 and 7 fathoms (11 and 12.8 m.). With the exception of this middle ground the bay is free from dangers south of the low point on the west shore, the deepest water being on the east side, and ranging from 11 fathoms (20.1 m.) close under Cape Darby to 4 fathoms (7.3 m.) ½ mile northwest of Carolyn Island. In the south part of the bay the high land may be approached closely, but off the low land the 3-fathom (5.5 m.) curve is in places nearly 1 mile offshore.

In the north part of the bay an extensive shoal, with 4 to 8 feet (1.2 to 2.4 m.), makes out in a northeast direction from the west shore to within ¾ mile of the east shore, its extremity lying about 2 miles 93° true (ENE. ⅜ E. mag.) from the north point of the low sand island on the south side of the entrance to Golofnin Sound. The channel leading to the entrance to Golofnin Sound lies on the eastern side of the bay, passing around the east end of the shoal and following the eastern shore at a distance of ⅜ to ¾ mile, with an average width of 800 yards. The least depth in the channel is 13 feet (4.0 m.) at low water, but 15 feet (4.6 m.) has been taken in at high water. The rise and fall of the tide (diurnal) is about 2 feet (0.6 m.), but this is influenced by the prevailing winds, which have a tendency to bank up the water in heavy southerly weather, and to lower it with northerly and northeasterly winds.

Lights.—During the summer season, from about August 1 to November 1, lights are shown as follows: A fixed white light on a small white house on the northeasterly shore of the bay, 3¼ miles

southeastward from Golofnin. A light is also displayed from an upstairs window of the store located in the southwestern part of the village. It is visible from all points of approach from Golofnin Bay, but is obscured from Golofnin Sound.

Anchorage.—A little westward of the southern sand spit, in the entrance to Golofnin Sound, anchorage may be had in 6 to 7 fathoms (11 to 12.8 m.), with protection from all winds. For vessels whose draft prevents the use of this anchorage, the best is off the point on the west side of the bay in about 4 fathoms (7.3 m.). This is unsafe in southerly weather, but is the most convenient for communicating with the head of the bay. By shifting anchorage from one side to the other in Golofnin Bay good shelter is found from easterly or southwest or westerly winds.

Golofnin (Golovin post office), on the north spit at the entrance to Golofnin Sound, is a distributing point for the mining district of the Fish River country.

Golofnin Sound is very shallow and is navigable for small steamers of 3½ feet (1.1 m.) draft to the mouth of the **Fish River,** which empties into the head of the sound. The channel through the sound is narrow and tortuous.

ROCKY POINT TO CAPE NOME

For about 22 miles, from Rocky Point to Topkok Head, the land is high and bold, in many places rising abruptly. Beyond this to Cape Nome the coast is low, with high land farther back. Immediately behind this low land is a large shoal lagoon with two small entrances, the west one called Port Safety. Between Rocky Point and Cape Nome the water is deep, the bottom regular, and by giving the shore a berth of 1 mile a depth of 6 fathoms (11 m.) or more will be found.

Topkok Head is 22 miles westward of Rocky Point, and is the first high land close to the coast eastward of Cape Nome. Its seaward face rises abruptly from the water 586 feet (179 m.) and is a well-known and conspicuous landmark.

A yellow bluff, 572 feet (174 m.) high, on the east side of **Bluff,** about 6 miles eastward of Topkok Head, is conspicuous, but not as much so as Topkok Head.

Solomon is a post office at the mouth of **Solomon River,** 11 miles westward of Topkok Head and 17 miles eastward of Cape Nome. A railroad has been built up Solomon River. From a survey made in 1902 there was a depth of 3 feet (0.9 m.) on the bar at the entrance and inside Solomon River, but local knowledge is necessary to keep in the best water.

Port Safety (chart 9381) is a small anchorage for vessels of less than 7 feet (2.1 m.) draft; it is about 8 miles eastward of Cape Nome. The channel is narrow and has a depth of 7 feet (2.1 m.). Small vessels can anchor in the narrow sloughs which lead between the flats inside the entrance.

From about August 1 to November 1 of each year a lighted range is maintained to mark the entrance channel to the harbor. The front range is fixed red and the rear range is fixed white.

DIRECTIONS, UNIMAK PASS OR CAPE KALEKTA TO NORTON SOUND OR PORT CLARENCE

For vessels of any draft.—If no observations can be obtained on account of thick weather, the lead must be depended upon and used constantly, as the currents are liable to set a vessel off her course.

To avoid Nunivak Island, and also to sight the island in clear weather so as to check the vessel's position, the course should be laid to pass about 18 miles westward of the island in latitude 60° 14′ N. and longitude 168° 04′ W.

I. **From a position 5 miles 254° true (SW. by W. mag.) from Cape Sarichef Lighthouse,** on the eastern side at the northern end of Unimak Pass, a 344° true (NNW. 7/8 W. mag.) course made good for 353 miles should lead to the above latitude and longitude, and Cape Mohican should bear about 95° true (ENE. 7/8 E. mag.) and be distant 18 miles.

II. **Or, from a position 3 miles westward from Cape Kalekta** a 352° true (NNW. 1/8 W. mag.) course made good for 376 miles should lead to the above position with Cape Mohican bearing 95° true (ENE. 7/8 E. mag.), distant 18 miles.

On the above courses little can be said of the currents except that with a strong wind from any direction a current is likely to set with it. A slight northerly set will sometimes be experienced. Thick weather is the rule in Bering Sea during the season of navigation, and care should be observed when in the vicinity of Nunivak Island (see also the description of Nunivak Island, p. 293).

III. **From Cape Mohican** bearing 95° true (ENE. 7/8 E. mag.), distant 18 miles, a 4° true (N. by W. 1/4 W. mag.) course made good for 166½ miles will lead to a position in latitude 63° N. and longitude 167° 40′ W., the highest peak, 1,462 feet (446 m.) high, 3 miles back of Northeast Cape, St. Lawrence Island, should then bear 296° true (W. 3/4 N. mag.), distant 35 miles, and will be visible in clear weather at this distance. From this position:

IV. **If bound to St. Michael.**—Make good a 53° true (NE. by N. mag.) course for 76½ miles to a position in latitude 63° 46′ N. and longitude 165° 24′ W. On this course the depth should be 12 fathoms (21.9 m.) or more until the vessel has arrived at the above position. From the above latitude and longitude a 93° true (ENE. ½ E. mag.) course made good for 81 miles will lead to a position 3 miles northward of Stuart Island with Stuart Mountain bearing 201° true (S. mag.). From this position make good a 126° true (ESE. 3/4 E. mag.) course for 14½ miles, giving the shore of St. Michael Island a berth of 3 miles. Whale Island Light should then bear on the starboard beam distant 3½ miles, and deep draft vessels can anchor in this position in about 5¾ fathoms (10.5 m.). (See also "Anchorage," p. 303.

On the 93° true (ENE. ½ E. mag.) course the lead should be frequently used, and if the water is shoaled to less than 8 fathoms (14.6 m.) while westward of Stuart Island it is pretty safe to assume that the vessel is southward of her course. Thick weather is not as prevalent in Norton Sound as in Bering Sea, and it is but seldom that Stuart Island and the mountains southeastward of St. Michael can not be seen and used as landmarks.

Vessels should keep well clear of Orizaba Reef until the bell buoy is again on its station.

V. **If bound to Golofnin Bay.**—Follow the directions in section IV, and when the vessel is in latitude 63° 46′ N. and longitude 165° 24′ W. make good a 59° true (NE. ½ N. mag.) course for 71 miles, which should lead to a position about 2 miles southeastward of Rocky Point (the high point on the western side of the entrance to the bay).

VI. **If bound to Nome.**—From a position in latitude 63° N. and longitude 167° 40′ W. make good a 33° true (N. by E. ¼ E. mag.) course for 100 miles, which should lead to a position about 8 miles from the beach abreast the town. Anchor according to draft, as indicated in the description of Nome on page 312.

VII. **If bound to Port Clarence.**—From a position in latitude 63° N. and longitude 167° 40′ W. a 0° true (N. by W. ⅝ W. mag.) course made good for 138 miles will lead to a position about 8 miles from Cape York. Then follow the directions under heading "Port Clarence."

On the 0° true (N. by W. ⅝ W. mag.) course, King Island should be left about 8 miles on the port hand when the vessel has been standing 119 miles on this course. A northerly or northwesterly set of the current may be found after the vessel has stood about 90 miles on the course. In clear weather the mountains back of Cape York should be sighted after King Island has been passed and the cape should be made on the starboard bow. The depths until abreast King Island range from 15 to 20 fathoms (27.4 to 37 m.); but northward of King Island the soundings are irregular and care should be taken not to be set eastward toward the shoals which lie off the coast between Cape Douglas and Point Spencer. (See p. 313.)

DIRECTIONS, ISANOTSKI STRAIT TO ST. MICHAEL

The following remarks are intended to apply only to **small craft and river steamboats** that are unable to make the direct passage.

After passing out of Isanotski Strait, clear of the outlying breakers, the course is shaped for the east side of Amak Island. Shelter can be found on the south, southeast, and east sides of the island. Some of the Moran fleet found shelter in 1898 on the east side in about 6 fathoms (11 m.). Capt. J. L. Fisher states that he crossed pretty close inshore over the indicated shoal off the southeast end, with a least depth of 7 fathoms (12.8 m.). He also states that the outlying rocks and reefs off the north end of the island appeared very nasty and dangerous.

Leaving Amak Island, the next course is laid for Cape Newenham. Shelter can be obtained on either side, according to the wind.

From Cape Newenham the course is laid for Nunivak Island. If heavy northerly or northeasterly winds are encountered before the island is reached, shelter is sought in the depth of the bight on the south side. Weather conditions being good, it is only necessary to touch at this island if needing water. The anchorage on the north side, about 12 miles eastward of Cape Etolin, is considered the best. (See Nunivak Island, p. 293.)

From the northern end of Nunivak Island the customary course is to cross over diagonally to a little north of Hazen Bay, and then coast along just outside the shoals, in 3 to 5 fathoms (5.5 to 9.1 m.) of water, until Cape Romanzof is reached. If the weather is unpropitious or water is required, an anchorage in Scammon Bay is made close inshore on the south side, in a bight where a stream empties.

After leaving Scammon Bay, by giving the spit on the north side of the entrance a good berth, the remaining distance to St. Michael is made by skirting along on the outer portion of the Yukon Flats, in 2 to 5 fathoms (3.7 to 5.1 m.), where the courses are exclusively guided by the use of the lead. On this crooked stretch, after the mountains of Cape Romanzof and the Kusilvak Mountains disappear, no land will be visible until the high peaks on the mainland south from Stuart Island are sighted; a little later the summits of Stuart and St. Michael Islands become visible. After Stuart and St. Michael Islands become defined, the course is shaped to go through the pass between them, and then skirt around the north side of St. Michael Island to St. Michael.

In the summer, from all that can be learned, northerly and easterly winds prevail a large portion of the time between Cape Newenham and Cape Romanzof.

The **tidal currents** in Etolin Strait are strong and at times cause heavy tide rips.

COAST FROM ST. MICHAEL TO APOON PASS

St. Michael being the end of deep-water navigation, all the Yukon traffic (which at present is very small) beyond this point has to be conducted with vessels drawing 5 feet (1.5 m.) or less. The larger river steamboats leaving St. Michael Bay go around the north side of St. Michael Island and through Stephens Pass, between St. Michael and Stuart Islands. They give the reef off **Rock Point,** on the north side of St. Michael Island, a wide berth, and after passing between the islands a straight course is made slightly westward of Point Romanof. When the summit of Point Romanof is abeam, distant about 1½ miles, the direction is changed and a course is made for the range lights for entering the Apoon Pass. The most dangerous portion of the passage is the 14 miles around the north end of St. Michael Island, which is exposed to the deep-water swell from the north. This can be avoided by small craft by going through St. Michael Canal.

St. Michael Canal separates St. Michael Island from the mainland, and is a narrow, crooked, tidal slough, which forks and comes together again. The distance through by way of the north fork is 18 miles and by the south one 20 miles. The southern and longer one is the wider, and for that reason is the one generally used. There is a sufficient depth in the canal for ordinary river steamboats. The northern entrance has a dredged cut 6¼ miles long and 100 feet wide, with a depth of 6 feet (1.8 m.) at low water, extending from deep water in St. Michael Bay. The channel, during the summer months, is marked by buoys. There has been no recent examination of this channel.

The southern entrance has about 3 feet (0.9 m.) on its bar at mean low tide. Thus far, on account of its narrowness and sharp curves, it has only been used by the smaller class of steamboats. A light is maintained on **Canal Point** during the summer months.

Most of the river steamers and barges that once made up the extensive Yukon River fleet now lie in the "bone yard" in St. Michael Canal.

From Stephens Pass to Apoon Pass is 42 miles along an open coast, but owing to the protection from heavy seas offered by the flats that extend seaward, it is safe in summer months for the flat-bottomed river steamboats that have to traverse it.

With the exception of the promontory of Point Romanof, the immediate coast is low and flat all the way from St. Michael Island to and including the Apoon entrance. The promontory of **Point Romanof,** 340 feet (104 m.) high, stands well out about 12 miles westward from the high hills of the coast range. After clearing Stephens Pass it appears in clear weather like an island in the sea. A light is shown on the point from about August 1 to November 1 of each year.

Coming north from the Apoon entrance after passing Point Romanof, Crater, St. Michael, and Stuart Mountains appear above the horizon, and afford excellent marks.

In moderate weather the ocean swell is not felt between Stephens Pass and the Apoon entrance; but in heavy weather and westerly weather, which is more likely to occur during the latter part of the season, there is a choppy sea which is heavier off Point Romanof than elsewhere. In general, after rounding the north side of St. Michael Island, this passage is safe for river steamers in the summer season. During the latter part of the season, however, high winds become more frequent, and the boats are obliged to watch their opportunities.

Anchorages.—River steamboats anchor on the flats or in the channel, wherever exigency demands.

Good shelter can be had in all but southwesterly weather in the cove on the south side of Cape Stephens, in 6 to 9 feet (1.8 to 2.7 m.) of water. Stebbins, a large Eskimo settlement, is located on this cove.

In the southern end of **St. Michael Canal,** in the southern branch, just above the junction, there is a good and safe anchorage in all kinds of weather. There is only about 3 feet (0.9 m.) at mean low tide on the outside bar, and it has to be crossed at high tide.

About 10 miles southward of Canal Point is the **Pikmiktalik River.** In the mouth of the right-hand stream there is an anchorage for medium-sized steamers. The bar to this stream has only about 2½ feet (0.8 m.) on it at mean low tide. A shoal extends out from the south point at the entrance.

The mouth of the **Pastolik River,** about 2 miles from the outer end of the Apoon Pass, affords anchorage for steamboats under medium size. The Apoon flats extend in front of the entrance, and it can only be entered at high tide.

The eastern entrance point of the Pastolik River is marked by a fixed white light, which is maintained from about August 1 to November 1 of each year.

APOON PASS

This is the most northern outlet of the Yukon River, and is about 55 miles, via Stephens Pass, from St. Michael. It is used exclusively by the steamboats trading up the Yukon and its tributaries.

Apoon Pass is the extreme northeastern limit of the Yukon Delta. In common with the rest of this region, the country is low and flat, it being 1 to 2 feet (0.3 to 0.6 m.) above high-water mark. Down to within about 2 miles of its mouth, the banks are generally covered with low willow and alder bushes 8 to 10 feet (2.4 to 3 m.) high. Near the mouth the land becomes more marshy, and a considerable area westward appears to be entirely an open marsh. The open country eastward is flat, and is made up of marsh, ponds, and tundra. The only high ground in the general vicinity is **Hogback,** a rounded ridge about 300 feet (91 m.) high lying 5 miles east from the entrance. Some distance back from the coast, 12 to 18 miles, is seen the range of hills or mountains trending southwestward, which extend in that direction to where the Yukon makes its great bend to get around the end of this ridge. On these low, flat shores there are often remarkable mirage effects, tending greatly to magnify insignificant objects.

Bar.—Off the mouth of Apoon Pass, and for some distance northwestward, the bottom is nearly flat, having a depth of about 2 feet (0.6 m.) of water at low tide, and with little choice as to a channel. All but very light-draft vessels must time their departure from St. Michael so as to cross these flats at high tide, or must wait for the tide.

Pastol Bay front and rear range lights show the best lead across the flats. Pastolik River Light, Apoon Bar Light, and Apoon Mouth Light are guides to the channel inside the flats. This channel is further marked by about 17 buoys, so that no detailed directions are necessary for following it. Lights and buoys are maintained only during the navigation season, from about August 1 to November 1 each year.

The distance between the Apoon mouth and the head of the delta is traversed by going up the Apoon Pass about 31 miles to where it branches off from the Kwikpak Pass, and then up the Kwikpak about 30 miles to the head of the delta, where it and the Kwikluak Pass separate the Yukon into two principal mouths. The channels and banks are subject to rapid change both from erosion and deposit.

Inhabitants.—The natives are mostly migratory, living at different places at different seasons. Their principal settlement, after leaving St. Michael Island, is on the Pastolik River. **Kotlik,** about 6 miles from the Apoon mouth, on the **Kotlik River,** has a store, Greek church, and a few dwellings. **New Fort Hamilton** is on the **Kwikpak,** 36 miles above Kotlik.

Pilots.—Native pilots can be hired at St. Michael and various places on the river. Except with local knowledge, a pilot is necessary in following the Apoon.

Tides.—The tide in Apoon Pass is more or less diurnal. The diurnal range is about 4 feet (1.2 m.). The tides at this entrance, as is the case with the shores of eastern Norton Sound, are greatly affected by the winds, northerly and easterly ones making low

waters and southerly and southwesterly ones making high waters. The wind effect may be sufficient to entirely obliterate the natural tide conditions. The effect of the tides reach above the head of the delta. At the head of the Kwikpak Pass the rise and fall is about 6 inches.

Current.—The ordinary outflow of the Apoon is much less rapid than other mouths of the Yukon; but there is a tidal inflow and outflow, the velocity of which depends upon the amount of the rise and fall of the tide at any particular time.

Ice.—In the fall thin ice begins to make in the river the latter part of September, and navigation in October is attended with danger of being frozen in. It is more than probable that the movement and clogging of the ice in the breaking up of the river in spring has much to do with the location and peculiarities of the channels and with clearing it perfectly from snags.

Supplies.—Immediately within the Apoon mouth the water is fresh, and that on the flats outside, close in, is nearly so, the degree of freshness depending upon the stage of the tide.

Cordwood is cut and sold by the natives along the river from the mouth up. That in the delta, and more particularly near the mouth, is of inferior quality, being cut from wet driftwood.

COAST FROM CAPE NOME TO BERING STRAIT

Cape Nome is a bluff, about 300 feet (91 m.) high, apparently 1 mile broad, and rounded down to the water on either side, where there is low land at the shore, with higher land farther back. The water off this cape is quite deep. The diurnal rise and fall of tides at Cape Nome is about 2 feet (0.6 m.).

From Cape Nome to Cape Rodney the coast, except abreast of Sledge Island, is a comparatively straight stretch of low sand beach with no projecting points and the higher land some distance back. Abreast of Sledge Island for a distance of several miles the hills slope down to the beach, giving this part of the coast the appearance of a point. The stretch of beach is broken by a number of small rivers, where mining is in progress. The entrances to **Nome, Snake, Penny,** and **Sinuk Rivers** have shifting bars, but there is generally water enough in the channels over these bars to permit steamers of 4 feet (1.2 m.) draft to enter. When approaching the coast between Cape Nome and Sledge Island, the water shoals regularly and gradually until a depth of 5 fathoms (9.1 m.) is reached; inside this depth the bottom is irregular, especially near the mouths of the rivers.

A small shoal, with about 18 feet (5.5 m.) over it, lies about 9 miles westward of Cape Nome and 2¼ offshore. Shoals extend a comparatively short distance off the mouth of Nome River.

Nome is on the beach at the mouth of the Snake River, about 11 miles westward of Cape Nome. The general anchorage for deep-draft vessels is in 7 fathoms (12.8 m.) about 1 mile from the beach abreast the town. Vessels of less draft anchor in 5 fathoms (9.1 m.) a little closer to the beach, but it is not advisable to anchor in less. In strong southerly winds no landing can be made on the beach,

and the anchorage is unsafe. Southerly winds raise the water, and northerly winds lower it. At Nome there is a relief station of the United States Public Health Service for the treatment of seamen and an Army radio station, call letters WXY. There is also a life-saving station of the Coast Guard at Nome.

The mouth of the Snake River has been improved by the construction of two parallel jetties 400 feet long, and the dredging of a channel to a basin 200 feet wide and 250 feet long in the city of Nome. In June, 1926, there were depths of 5 feet (1.5 m.) on the bar, 4.1 feet (1.2 m.) in the channel and 6.9 feet (2 m.) in the basin. Redredging was in progress. The outer end of the east jetty is marked by an occulting red light and the outer end of the west jetty is marked by an occulting white light. The channel through the entrance is marked by **range lights,** the front range being fixed red and the rear range being fixed white. Small coasting vessels enter the basin and discharge directly to the wharves. Freight from the deep-draft vessels is lightered ashore, either on the beach or in the basin. The barges used have a draft of about 4 feet (1.2 m.).

Communication.—There is radio and telegraphic communication. During the season of navigation vessels from Seattle make regular trips to Nome carrying passengers, freight, and mail. During the winter season mail goes in overland via the Yukon Valley.

Considerable hydraulic gold mining is carried on in the country back of Nome, but the placer mining for which the Nome beach was famous has largely been abandoned.

Sledge Island, about 31 miles west of Cape Nome and 4½ miles offshore, is a rocky, flat-topped island rising 604 feet (184 m.) above the water and comparatively rounded in outline. There is a native village on a small, rocky slope on the east side; excepting this and a short sand spit making off from the northern end of the island, the shores are steep. The island may be safely approached from any direction and anchorage may be had on all sides of it; the bottom is rocky in spots. A depth of 6½ fathoms (11.4 m.) has been found about 3¾ miles offshore and about 7½ miles eastward from Sledge Island. During heavy weather tide rips, or breakers, have been observed about ¾ mile eastward from the northern point of the island; a depth of 5 fathoms (9.1 m.) is reported near this locality.

A depth of 3 fathoms (5.5 m.), hard clay and bowlders, is reported 7 miles westward of Sledge Island and 4 miles from the beach just eastward of Cape Rodney. The 2¼ and 3 fathom (4.1 and 5.5 m.) shoals off the mouth of Sinuk River are said to exist about as charted.

With heavy southerly winds, vessels at anchor in the Nome roadstead usually seek shelter behind Sledge Island. A flashing white light is located on the north end of the island.

From Cape Rodney to Cape Douglas the shore is a low sand beach, and the high land is farther inland from the beach than eastward of Cape Rodney. This coast is seldom approached close-to; the water is comparatively shallow and dangerous shoals and ledges

are found between Cape Douglas and Point Spencer. Vessels are cautioned to exercise care when approaching the shore while southward of Cape Douglas and to give the shore between Cape Douglas and Point Spencer a berth of over 5 miles.

Currents.—A tidal current is perceptible from Cape Nome to Cape Rodney, but the strongest current sets northwestward; lying at anchor, vessels usually tail northwestward. In the vicinity of Sledge Island and between the island and the mainland the currents have considerable velocity; with strong southeast winds an average velocity of 2 knots and a maximum velocity of 3½ knots have been observed setting northwestward. Vessels when in this vicinity should give special attention to the currents. Above Cape Rodney there is no preceptible current southward or eastward; the general set is northward and westward.

About 2 miles offshore in Nome roadstead the tidal current averages about 1 knot at times of strength. Like the tide itself, the tidal current is chiefly diurnal and sets easterly on the flood and northwesterly on the ebb.

King Island is rugged and rocky, about 2 miles square, and 700 feet (213 m.) high. It has nearly perpendicular cliffs, deep water, and generally rocky bottom on all sides. There is a native village on the south side, the houses being built in the sides of the cliffs some distance above the water. Off the village, but close inshore, vessels may anchor in about 15 fathoms (27.4 m.), muddy bottom, with good protection from northwest winds. In clear weather the island is an excellent landfall for vessels coming from southward and bound to Port Clarence.

Cape York is a high, rocky, nearly vertical cliff, with numerous ravines and a range of high, rugged mountains immediately back of it. The cliff is about 10 to 12 miles in extent. There is no distinct promontory and no exact point along the cliff that can be defined as the cape. The water shoals slightly off the western end of the cliff, but nothing less than 6 fathoms (11 m.) will be found at a distance of 2½ miles from shore. A shoal with 2 fathoms (3.7 m.) is reported about 1½ miles southeastward of the cape.

A **rock** is reported about ¾ mile from the shore southeastward of York village.

Between Cape York and the high land of Cape Prince of Wales there is a bight, with comparatively low, rolling land back of it extending across the peninsula to the northern shore. The beach is low and the water shoals gradually when approaching the shore. The eastern part of the bight is slightly shoaler than the western part; about 6 fathoms (11 m.) will be found 1 mile offshore; in the western part of the bight 8 fathoms (14.6 m.) will be found at the same distance from the beach. When standing westward alongshore, and when abreast of Cape Mountain, the water deepens suddenly to 20 fathoms (37 m.).

PORT CLEARANCE

(chart 9385) is a good harbor, close to the strait, free from ocean swell, and is clear of ice beginning about June 25 to 30. The bay is formed by a sand spit which extends from the mainland about 10 miles in a northerly direction to **Point Spencer.** The point is

bold, with depths of 7 fathoms (12.8 m.) as close as ¼ mile, and marked by a flashing white light.

The channel between Point Spencer and Point Jackson, on the north shore, is about 4 miles wide, clear of danger, and carries 7 to 9 fathoms (12.8 to 16.5 m.). One and one-half miles south of Point Spencer a shoal makes into the bay from the sand spit, with depths of 2½ fathoms (4.6 m.) 1 mile off. The northern half of the bay has a general depth of 7 fathoms (12.8 m.) as close as 1 mile from the shore; the southern half of the bay shoals gradually from this depth toward the shore, and the extreme southern part is very shoal. The north shore is clear of danger and can be approached as close as ¼ mile, the soundings decreasing regularly to the beach.

Grantley Harbor is connected with Port Clarence by a narrow channel which is marked by buoys during the season of navigation. A fixed white light is maintained on the north side of the entrance.

Teller is a small town with a post office, located on the southern spit of the entrance to Grantley Harbor. There is a Moravian mission near by, a school, and a road house, also a good store and an oil station. The mining operations here are now insignificant.

Imaruk Basin is a shoal basin eastward of Grantley Harbor and connected with it by a narrow, difficult channel.

Port Clarence and Grantley Harbor were once the rendezvous for the large whaling fleet that annually visited Bering Sea and the Arctic Ocean. These vessels have now been withdrawn and the locality is now visited only by trading schooners and an occasional freighter. The Coast Guard cutter *Bear* usually calls on her annual cruise to the Arctic.

Fresh water can be obtained in several places in Port Clarence, the best being from a stream on the east side near **Bering**, about 5 miles southward from Teller.

Anchorages.—There is anchorage in 5 fathoms (9.1 m.) just inside Point Spencer; also in 5 fathoms (9.1 m.) 1½ miles off Teller, the village bearing 116° true (E. ⅝ S. mag.), exposed to southwest winds only.

Fog.—In this vicinity fog is quite prevalent and very dense in summer.

Tides.—The mean rise and fall in Port Clarence is about 1 foot (0.3 m.). Southwesterly winds increase and northeasterly winds decrease the height of tide.

Current.—Outside of Point Spencer the current sets northwestward with a velocity of 1 to 2 knots per hour.

DIRECTIONS, PORT CLARENCE

In approaching Port Clarence in thick or misty weather the long, low spit of sand and shingle which forms the west side of the bay is not seen until close-to. The best course from southward is to steer directly for Cape York, bearing in mind the set of the current northwestward, and after making Cape York follow along the coast eastward until the entrance to Port Clarence is made out, then steer for the anchorage just inside Point Spencer. Or, follow the north shore at a distance of about 2 miles until abreast the settlement at Teller.

Point Spencer is marked by a light, and there is also a light on the north spit of the entrance to Grantley Harbor. The channel through the entrance to Grantley Harbor is marked by buoys maintained from about August 1 to November 1 of each year.

Dangers.—A ledge with a reported least depth of 1¾ fathoms (3.2 m.) lies nearly 5 miles offshore and about halfway between Cape Douglas and Point Spencer, and vessels should keep well outside of it. Extending about west-northwest from this ledge toward Cape York is a ridge with hard bottom and depths ranging from 4 fathoms (7.3 m.) near its southeastern end to 5 fathoms (9.1 m.) in about the latitude of Point Spencer. Spots with depths of 6 fathoms (11 m.) over them will be found 15 miles offshore westward of Cape Douglas. It is recommended that vessels approaching Port Clarence give the lowland between Cape Douglas and Point Spencer a berth of not less than 5 miles before hauling in for the entrance.

ARCTIC OCEAN

The remarks on the navigation of Bering Sea (p. 259) apply generally to the Arctic Ocean as far as Point Barrow, except that the current and depths in the Arctic are more uniform, and with the exception of the shoals at Cape Prince of Wales, Hotham Inlet, Blossom Shoals, and Point Franklin there are no outlying dangers, and the lead is an excellent guide in approaching the land. Another exception is that in the Arctic the question of ice must always be considered. The following remarks on the navigation, weather, and currents of the Arctic Ocean, by Capt. M. A. Healy, R. C. S., contained in the report of the cruise of the revenue steamer *Corwin* in the Arctic Ocean, 1884, though relating to an extreme season, may be of interest to those navigating these waters:

In my previous experience in the Arctic I have never seen a season like the past. From the time of first reaching the ice up to leaving the Arctic, dense fog has been almost constant. Currents that have hitherto been considered permanent in direction, if not in force, have become erratic, and others have entirely failed. The ice fell back before the sun's advance slowly and compactly. For three weeks after we reached the Diomede Islands it refused entrance into Kotzebue Sound, and three weeks later still it was hanging with discouraging tenacity around Point Hope. It was unsafe to anchor with any but a short scope; moving steam had to be kept; and constant vigilance exercised to prevent being dragged ashore by fields of ice moving in the rapid and changing currents. For weeks at a time it was impossible to take observations, dead reckoning was almost worthless, owing to the continual changes in force and direction of the currents, and the safety of the ship depended entirely on the constant use of the lead. Fortunately for those who are obliged to sail this frozen ocean the depth of water is not so great but what bottom can always be obtained, and the proximity of land is indicated by regular shoaling, with but few exceptions. Yet with this aid and the best charts that we have, several years' experience is necessary to enable the navigator to judge with any degree of precision the position of the ship. Anyone at all familiar with coasting knows how difficult it is to recognize land in a fog, where marks are well defined—high bluffs often appearing like low beaches and small rocks looming to gigantic size, while the general contour of the small portion of the shore visible may be taken for almost any land that one expects to make. How much more difficult must it be where the formation of the shore for miles differs but little, as is the case in the Arctic.

Among the best landmarks that we have in these northern waters are the bird rookeries at King Island, the Diomedes, Cape Seppings, Cape Thompson, and Cape Lisburne. The distance between these rookeries enables one to form

a very accurate idea of the one he is approaching, while the cries of birds congregated at them answer the purpose of a fog signal. With one or two exceptions these are the only aids to navigation.

In the shallow waters of this ocean the effect of the wind on the currents is very marked.

Inside the Arctic Circle snow has fallen all the past season, and it may almost be said that there has been no summer. As late as August 27 ice was within a few miles of Cape Sabine, and at the Seahorse Islands it was heavy and dangerous. The pack at this time was still southward of Point Barrow, and vessels could not go eastward of that place this season. During the latter part of our stay the weather was exceptionally severe.

The experience of many years in the Arctic has demonstrated the fact that no rules whatever can be given as to the time of the breaking up of the ice. The severity of the winter, the time at which spring weather opens, and the beginning of southerly winds that break up the ice all have their influence in governing this time. Vessels have been able to enter St. Michael as early as May 21; this year we found ice to the southward of St. Matthew Island on June 2, and some days later still in the season vessels have been stopped by it between the Seal Islands and Nunivak. The southern limit of the ice is almost entirely dependent on the severity of the winter. Heavy southerly winds and swell will break up the ice; and if followed by northerly winds it will open out and the waters become navigable. When once broken up, if the weather is mild, it will not cement again if nipping, and consequently will open more readily to light winds. Northeast winds tend to drive the ice off the American shore and westerly winds off the Siberian side. With these few exceptions, little can be said of ice conditions.

In clear weather the ice blink indicates the presence of ice, and it may be seen a great distance; but in thick, foggy weather approach to the pack must be made with great caution. Its proximity is usually indicated by the slack, and when this once begins to be seen about the vessel it may be judged that a large body is not far distant. As the pack is neared, one sees only ice as far as the eye can reach. It rises from 10 to 25 feet above the water. It is a well-known fact that the depth of water and the surrounding features of this ocean render the formation of large icebergs an impossibility.

When a pack is reached, it usually becomes necessary to track along its edge to find a lead. Whoever is piloting the ship takes his place at the masthead and with glass in hand seeks for a favorable opening. Oftentimes days are spent working up and down along the ice without clear water presenting itself, and when it does extreme caution must be used in entering the lead. It is here that the judgment and experience of the ice pilot becomes a necessity. The weather, currents, appearance of the ice, probable winds, and a dozen other things that would never enter the mind of a novice are to be taken into consideration before the vessel's head is turned into the pack. Once it is determined to enter the lead, vigilance must be doubled and every faculty kept on the alert. The vessel is conned from the masthead, and, while directing how the helm must be put to keep clear of immediate danger, the pilot must be looking ahead for the clearest water and watching ice, sea, and sky for change of currents and winds. If any signs of the closing-in of the lead are presented, the vessel must be gotten out as soon as possible, for, if shut in and she escapes being crushed, she will go to the northward in the drifting pack from 1 to 2 knots per hour, and it will become necessary to abandon her. If the lead followed up is between the ground ice and the pack and the wind comes on shore, a safe place can sometimes be found behind the ground ice. A vessel may be made fast to this ice with grapnels, or anchored to leeward of it, and lay with comparative safety. If anchored in a current, however, with drifting ice about her, the scope of chain must be short and everything kept in readiness for getting under way at a moment's notice. If anchored in shoal water, it is desirable to get in the ice as far as possible to avoid the swell; but if the water is deep, the ice should be avoided. Generally the presence of the ice tends to kill the swell, and it will be found much smoother inside the ice than out.

The bowhead whale keeps as far to the northward as he can find spouting holes, and to take him the whalers are obliged to keep as close to the pack as possible. Usually they track along the Asiatic side in Bering Sea and Strait, and, as they reach the Arctic, cross over and work up the American shore to the northward and eastward. In Bering Sea there is very little danger in entering the ice, as it is almost sure to open and offer a chance to escape

before reaching the Arctic. With a knowledge of this fact, whalers sometimes enter the ice to the southward of the strait and endeavor to work through it if they have reason to believe, from the sudden disappearance of the whale, that there is clear water to the northward. In the Arctic, however, the pack is carefully avoided, and it is only when conditions are most favorable that attempts are made to follow up the leads. Point Barrow is approached with the greatest caution, as it is one of the most dangerous places in the Arctic. As has already been mentioned, by far the major portion of the vessels lost in the Arctic are wrecked in its vicinity.

Ice.—Bering Strait is free of ice by the first week in July and sometimes earlier, but clear water does not extend very far northward, and it is seldom possible for vessels not fitted to encounter ice to reach Point Hope before July 10–15. Kotzebue Sound is usually open by July 15, at times a few days earlier, but it has been known to remain closed until the last of July. The running ice from Kotzebue Sound is encountered at Point Hope some time after the pack has moved northward. By July 15 the main pack has moved north of Cape Lisburne.

Thus far the movement of the ice does not appear to depend to such a great extent on the winds, it is reasonably certain each year, and dates can be depended upon within a small limit of time; but north of Cape Lisburne the movement is generally slow, uncertain, varying greatly in point of time in different years, and seems to depend almost wholly on the winds for its further movement. Prevailing northeasterly winds move it away from the shore rapidly and early, while southwesterly or westerly winds hold it against the shore and make a late season.

From Icy Cape north no specific time can be set for the opening of navigation. Its variations are from July 12 to the latter part of August, though an average date for the whaling vessels to reach Point Barrow is about August 1. Between these points and the early part of the season the ice is always dangerously near the shore, and southwesterly or westerly winds will bring it in. Later, the southern point of the pack is just off Seahorse Islands and generally remains there the rest of the season. From the Seahorse Islands to Point Barrow the pack is seldom far offshore, and from the latter point can almost always be seen. During the open season it is always liable to come in on these two points with a westerly wind.

Beyond Icy Cape there is always danger to vessels, and strangers should be cautious and careful in going there. In the lead of open water between the pack and the shore the current is swift and nearly always carries drift ice, and vessels rarely reach Point Barrow at any time without encountering some ice. The ice can not be forced, and vessels should not venture into small leads between the pack and shore ice. With a southwesterly or westerly wind, which brings the ice in, vessels seek protection east of Point Barrow when it is open, in Peard Bay close in as possible, and under the lee of heavy ground ice, which acts as a breakwater against the smaller cakes. In anchoring where there is drifting ice, vessels should use a short scope and be ready to get under way immediately. A comparatively small cake will sometimes cause the loss of an anchor and chain. In the vicinity of Point Barrow sailing vessels should not go offshore in water too deep to anchor, as in light winds or calms the current is likely to take them into the pack. Navigation east of Point Barrow is such that it should only be attempted by those having experience.

As a rule, the pack does not come down on Point Barrow before the latter part of September, but in 1897 it came down the first of September, and, in general, except for whaling vessels, whose officers are men of long experience in judging the ice, weather, etc., September 1 is as late a date as vessels should remain in that vicinity. About this time, or a little later, young ice begins to make in the lagoons, along the shore, and around the old ice, though it is not likely to form in the open sea until the last of the month. The young ice makes stronger and spreads over the open sea with the advancing season. It is dangerous to vessels, and will very quickly cut through one not sheathed to withstand it. Ordinary vessels should be out of Kotzebue Sound by September 15 to 20, and out of the Arctic by October 1. The whaling vessels make it a rule to be ready to leave there about October 10, and though there may be times when they stay later, these are exceptions.

At times there is a body of ice, which holds on the Siberian shore through the summer, that moves down past East Cape into the western side of Bering Strait, sometimes as early as the latter part of August, and makes that side of the strait difficult of navigation late in the season.

Weather.—In summer the weather is usually light, with much fog and rain. The winds are variable, though mostly easterly and southerly. There are seldom gales in summer, but occasionally, sometimes with intervals of years, there come southwesterly gales, short-lived but very severe and disastrous, as there is little protection from winds in that quarter. In the vicinity of the ice the weather is nearly always light and foggy. Later in the season it grows more boisterous, gales are frequent and more generally from northward, and as the weather grows colder there is considerable snow.

Currents.—From Bering Strait to Point Barrow there is a general current setting northward alongshore (stronger inshore), which, when not affected by winds or stopped by the ice, has a velocity of not less than 1 knot at any part of it. The current from the strait turns northeastward and is joined north of Cape Krusenstern by that from Kotzebue Sound. From Eschscholtz Bay a northerly current sets alongshore on the eastern side of Kotzebue Sound, having a velocity of ½ to 1 knot at Cape Blossom. It continues past Cape Krusenstern, where it is increased by the flow from Hotham Inlet to a velocity of 1 to 2 knots, and northward of the cape joins the current from Bering Strait, where, in the latter part of July and August, its velocity is 1½ to 2 knots. It continues with the same velocity around Point Hope, then with a reduced velocity to Cape Lisburne and across to a short distance south of Point Lay. After rounding Point Hope, and thence to Icy Cape, the current does not appear so strong, and, as a rule, is about 1 knot.

In the bight between Cape Lisburne and Cape Beaufort there is a tidal current, and unless driven in by a westerly wind the outside general current is not felt.

Northward of Point Lay, if the ice has not opened up from the shore, the current is stopped; but if the ice is open to Point Barrow, the current continues along the shore and, because of the contracted space between the shore and the ice, increases in velocity to from 2 to 3 knots and sometimes more at Point Barrow.

This general current is more or less affected by the wind and may be decreased or even stopped at times by northerly winds, but when the wind abates it starts again. When the wind is with the current its velocity is increased. Well offshore the currents are variable and not so strong and depend to a great extent on the winds. There is, however, a general set northward.

A report from the Coast Guard states that in the vicinity of Point Barrow (that is, from Sea Horse Island to Point Barrow) a northeast wind will act against a northerly current and produce a resultant current which will carry the ice offshore.

Cape Prince of Wales is a peak 2,300 feet (701 m.) high, comparatively regular in outline; on the south and southwest sides the slope of the mountains comes down to the sea. The face of the cape is a low sand beach, which extends northward 3 to 4 miles from the base of the mountain, and then trends northeastward toward Shishmaref Inlet. On this sand beach, close to the mountain, is the native village of **Wales** (post office), the largest on the northern coast.

On approaching the cape from southwestward, nothing less than 20 fathoms (37 m.) can be had at a distance of ¾ mile from the highland at its southwestern extremity. From this point the 20-fathom (37 m.) line runs nearly northwest, gradually increasing its distance from shore until 5 miles northward, where it is 3 miles offshore. The 3-fathom (5.5 m.) line, commencing very close to the southwest point, increases almost at once its distance from the shore to 1 mile, continuing at that distance until the cape makes northeastward, where it joins presumably Cape Prince of Wales Shoal.

Cape Prince of Wales Light, fixed white, is located on the sand spit about 2 miles northward from Wales post office. It is shown from about August 1 to November 1 of each year.

Cape Prince of Wales Shoal seems to be a ridge of sand which extends about 8° true (N. by W. mag.) from the western extremity of the cape to a distance of about 35 miles. In 1925 the Coast Guard cutter *Bear* found that the shoal extended to about latitude 66° 10′. The depth of water on the shoal is not definitely known, but numerous cases are reported of whaling vessels having struck on it at distances supposed to be 10 or 15 miles from the cape. The western face of the shoal is very steep, the depth decreasing rapidly from 20 fathoms (37 m.). It is recommended that vessels give this shoal a wide berth, and not haul eastward when coming from southward until at a distance of 35 to 40 miles from the cape. Vessels bound southward through the strait should be careful not to fall too far eastward and be caught between the shoal and the northern shore, especially sailing vessels with northerly or northeasterly winds.

Vessels making an **anchorage** off the native village of Wales at Cape Prince of Wales should approach it only from southwestward. The soundings decrease rapidly from 13 fathoms (23.8 m.); and anchorage should not be made in less than 7 fathoms (12.8 m.). During the open season the current sweeps by the cape northward with a velocity of 2 to 3 miles, and care should be taken in making an anchorage here not to be swept by this current upon the shoal.

Fairway Rock is a high, square-headed, steep-sided rock. The bottom is steep-to on all sides, and there are no outlying dangers.

Big and Little Diomede Islands rise abruptly from the sea with nearly perpendicular sides; they are steep-to, and there are no beaches. The tops of the islands are a sort of broken table-land. The larger is 1,759 feet (536 m.) high, and the smaller somewhat lower. In the vicinity the water is deep with generally rocky bottom, and the anchorage is poor. There are some rocks above water close to shore on the west side of the larger one. The native village on the larger island is on the southwest side, off which vessels can anchor in 14 fathoms (25.6 m.) sandy bottom. The channel between the islands is about 2 miles wide. It is not generally used, but whaling vessels have passed through, carrying 20 fathoms (37 m.) of water, favoring the side of the channel next the larger island. There is a native village on a rocky slope on the smaller island facing this channel, off which a reef of rocks and sand is said to extend a short distance into the channel.

The boundary line between the United States and Russia passes between these islands.

East Cape is a bold, rugged headland, about 2,500 feet (762 m.) high, steep on all sides, and with deep water quite close-to. It has low, marshy land back of it, and when seen at a distance appears as an island. There are no dangers off the land, and except at the anchorages the water is deep with rocky bottom. There is good anchorage in 8 fathoms (14.6 m.), with good shelter from offshore winds, on both the north and south sides of the cape, where the low land back of it begins. There is also an anchorage (in 10 fathoms (18.3 m.), muddy bottom) off the native village on the face of the cape.

From Cape Prince of Wales to Shishmaref Inlet the coast is a low sand beach, with lagoons and marshes back of it. On a clear day the mountains in the interior can be seen, the **Ears** and **Potato Mountain** (Cone Hill) being distinguishable.

Shishmaref Inlet, a large inlet extending into the land, has been explored by prospectors. Across its mouth is a low sand island, with shallow openings at each end. Shoal water extends off the mouth of the inlet several miles. During the season of navigation about four buoys are maintained to mark the entrance channel.

From Shishmaref Inlet to Cape Espenberg the coast is higher than that westward of the inlet, and is a line of low bluffs and small sand dunes, terminating at Cape Espenberg in a very low spit, which is made out with difficulty. A number of small native settlements are scattered along this coast from Cape Prince of Wales to Cape Espenberg.

Cape Espenberg is marked by a flashing white light which is maintained from about August 1 to November 1 of each year.

KOTZEBUE SOUND

is about 30 miles wide at its entrance between Cape Espenberg and Cape Krusenstern, 22 miles from Cape Espenberg to the shoal water off the mouth of Hotham Inlet, and extends about 30 miles south of Cape Espenberg. Except for the shoal off the mouth of Hotham Inlet, the soundings throughout the sound are very uniform, varying from 7 to 9 fathoms (12.8 to 16.5 m.). From Cape Espenberg the

west shore of the sound is shallow some distance from the land, and vessels should approach it with care. The land on this side of the sound is generally low. There is a small but conspicuous hill about halfway between the cape and the southern shore. On the south side of the sound the land is higher, more rocky, and of a bolder character than the west shore. Under water, also, it is bold, and has soundings of 4 and 5 fathoms (7.3 to 9.1 m.) quite close to the promontories.

Chamisso Island, at the entrance to Eschscholtz Bay, is a small, rounded island with a grassy hill 231 feet (70 m.) high. Its shores are rocky, except its northeast end, which is a low sand spit. Along its north and east sides shoals extend ¼ to ½ mile offshore.

Puffin Islet, west of Chamisso Island, is rocky, with two conspicuous rocks southward of it. Between the island and rocks and Chamisso Island the water is shoal and rocky. The water on the north and west sides of Puffin Islet is bold.

Chamisso Anchorage, between Chamisso Island and Choris Peninsula, is the only place on the Arctic coast of Alaska that can be called a harbor. By shifting anchorage ½ mile good shelter can be found from all winds. Off Choris Peninsula shoals extend toward Chamisso Island fully 1 mile. The deepest water is close to Puffin Islet. In approaching the anchorage give **Point Garnet,** the southwest extremity of Choris Peninsula, a berth of 1 mile, and stand down well toward Puffin Islet before hauling in. Anchor with Puffin Islet bearing 203° true (S. mag.) at a distance not greater than ¾ mile, in 8 fathoms (14.6 m.), muddy bottom.

Early in the season **fresh water** can be obtained on Chamisso Island and on the east side of Choris Peninsula.

Tides.—The mean rise and fall at Chamisso Island is 4 feet.

Kiwalik River empties on the southern shore about 8 miles southward of Chamisso Island. It is reported that with local knowledge a depth of 12 feet (3.7 m.) at high water can be taken into the river to an anchorage behind the spit at the mouth. During the season of navigation, four fourth-class red spar buoys are maintained to mark the channel to Kiwalik.

Kiwalik is a small town on the spit at the mouth of Kiwalik River. There is a pilot here by the name of Ben Tipperman, who is familiar with local waters. There is a small store at Kiwalik.

Candle is a town about 10 miles up the Kiwalik River. Freight is lightered up the river from Kiwalik. There is a private radio station here with call letters KGF.

Deering is a town and post office on the south side of Kotzebue Sound at the mouth of the **Inmachuk River,** about 22 miles westward from Kiwalik. There is a store and school here, and reindeer meat can be procured. There is telephone communication with Candle. A firm at Deering has a lighterage outfit and will discharge vessels at various points in the sound.

Eschscholtz Bay, east of Chamisso Island and Choris Peninsula, is generally shoal. The soundings decrease gradually from Chamisso Anchorage to 2½ fathoms (4.6 m.) at 2 miles off the point which lies 4 miles west of Elephant Point. East of this point the shoaling continues, and this part of the bay is only navigable for small boats. The shore at the head of the bay is difficult of access on account of long, muddy flats, which at low water are bare in some places ¼

mile from the beach. It is probable that the whole bay is gradually filling up, and vessels going east of Chamisso Anchorage should proceed with caution. **Buckland River,** a large but shallow river, empties into the head of the bay. There are few natives in its vicinity.

Choris Peninsula, forming the western side of Eschscholtz Bay, has two hills, about 300 feet (91 m.) high, separated by a low, sandy neck. Northward of Choris Peninsula the land is low for some distance, and then rises into low bluffs which continue to Hotham Inlet. These bluffs are composed of ice and frozen mud, which is gradually melting and sliding down, making deep furrows all along their face.

Cape Blossom is a distinctly marked point in this line of bluffs, which are highest at the cape and slope to either side.

The bottom of this side of the sound is very even southward of Cape Blossom at a distance of about 5 miles from the land; but northward of the cape a shoal, with very little water on it, extends 8 to 10 miles off the land from the mouth of Hotham Inlet, and south to within 2 miles of the latitude of Cape Blossom. This shoal is very dangerous, as the soundings give short warnings of its proximity; the distance from the shore can not be judged under ordinary conditions, and there are no good landmarks.

Kotzebue is a town and post office at the entrance to Hotham Inlet. Vessels of less than 6 feet (1.8 m.) can reach the town if they know the channel, which is shifting and hard to follow. During the season of navigation buoys are planted, but they are hard to pick up and can not be relied upon. A pilot can be obtained at Kotzebue where there is an Army radio station, call letters WXW.

Vessels of deep draft approach the town as closely as possible and lighter freight ashore in skin boats. A mail launch from Nome calls here during the summer months. During the winter, mail comes in overland by dog teams once a week.

Kotzebue is the central distributing point for the gold-mining industry along the **Kobuk River.** There is a small wharf at the town, and small launches can obtain good shelter near the town.

There are many herds of reindeer in this locality, and meat in any quantity can be obtained. The industry has suffered from lack of transportation to the United States.

Provisions and such supplies as gasoline and oils can be obtained at several points on the sound.

The general **anchorage** in this vicinity is off Cape Blossom, as it is the nearest point from which communication can be had with Hotham Inlet. In approaching the cape, it should not be brought to bear southward of 90° true (ENE. mag.) until in the vicinity of the anchorage. Anchor in 5 fathoms (9.1 m.) with the cape bearing between 90° true (ENE. mag.) and 102° true (E. by N. mag.) distant 3 miles. This anchorage is protected from northerly and easterly winds.

The coast from Cape Blossom to the mouth of Hotham Inlet is the place of rendezvous for the natives of the surrounding country for the purpose of fishing and trading. The coast natives from Cape Prince of Wales, including the Diomedes and King Island, to Point Hope, assemble here about the last of July to meet those who come down the large rivers from the interior.

Current.—The average velocity of the current at strength of flood and ebb in the anchorage about 6 miles west of Cape Blossom is about ¾ knot. The flood sets southeasterly and the ebb northwesterly, the strengths of the flood and ebb occurring about the times of high and low water, respectively, at Kodiak.

HOTHAM INLET

is about 35 miles in length and 4 to 8 miles in width. Its general trend is southeast; its water is little influenced by tides, but a prolonged southeast wind causes a low stage. The entrance is obstructed by vast mud flats and sand bars, some of which are bare at low water. In the inlet proper the channel in 1884 had a depth of 3 to 7 fathoms (5.5 to 12.8 m.) for a distance of 20 miles. There are three large rivers emptying into the inlet. No landing can be made at many places in the inlet on account of extensive mud flats. There is no recent information available concerning the inlet.

The **Noatak River**, joining it at the north, has numerous rapids, and is not navigable for any distance for boats larger than native canoes. The natives portage from the headwaters of this river to the Chipp River, and thus to the Arctic Ocean east of Point Barrow.

The **Kobuk River** empties at the east side of the inlet by many mouths, off which shoals with 2 to 4 feet (0.6 to 1.2 m.) extend far out into the inlet. In crossing the bar, which is indicated by drift lodged on the shoals, it is difficult to find a channel, the one generally used being known as the "Middle Mouth." The delta from the inlet is about 45 miles long and very difficult to navigate, but when fairly between the banks of the river there is comparatively deep water. In 1898 a large number of prospectors were attracted to the region of Hotham Inlet. Two stern-wheel steamers were used in transporting their supplies up the Kobuk River, and it is said that these steamers ascended the river 200 miles. The current in the river was found very strong, running at some points with a velocity of 5 or 6 miles an hour. The current is dangerous for small boats; eight men lost their lives in 1898 while boating their provisions up the river. The natives portage from the headwaters of the Kowak River to the Koyukuk River, a branch of the Yukon.

There is at present considerable gold-mining activity along the Kobuk River. All supplies come in via Kotzebue.

Selawik Lake is the prolongation of the head of Hotham Inlet eastward; it is about 50 miles long and 20 miles wide, and a depth of 2 fathoms (3.7 m.) can be taken around the lake by giving the shores a good berth. It has a large river, Selawik River, emptying into it at its head, the entrance of which is obstructed by a mud flat extending ¾ mile from the shore, through which a depth of 12 feet (3.7 m.) could be carried, in 1884, into the westernmost outlet of the river into the lake.

KOTZEBUE SOUND TO POINT BARROW

From Hotham Inlet to Cape Krusenstern the coast is a low beach. The shoal water from the mouth of the inlet extends nearly halfway to the cape; the edge of the shoal is steep, and should be

approached carefully. From where the shoal joins the land to Cape Krusenstern there is good water close in, with regular soundings.

Cape Krusenstern.—Back of Cape Krusenstern there is a high, prominent range of mountains, which can be seen at a long distance. On nearer approach the mountains are seen to fall away to the cape in a series of steps, and in shaping a course into the sound these cliffs, or steps, must not be mistaken for the cape, which is a low point extending about 3 miles westward of them. A shoal extends about 2 miles westward and northward off the point of the cape.

From Cape Krusenstern to Cape Seppings the coast is a low, shingly beach, back of which is a series of lagoons which discharge their waters through small, shallow openings. The high land of Cape Krusenstern extends along this coast some distance inland, terminating in the Mulgrave Hills, about 30 miles northwestward. After passing Mulgrave Hills the land is an extensive plain until in the vicinity of **Cape Seppings.** Here the mountains approach close to the coast and slope down to the water. Cape Seppings and Cape Thompson are not distinct, and it is difficult to determine the points to which the names should be applied.

Kivalina is a native village about 10 miles southeastward from Cape Seppings. There are several reindeer herds in the vicinity, and meat can be obtained.

In the vicinity of **Cape Thompson,** for a distance of 6 miles, the mountains break off directly to the water in a series of abrupt cliffs about 500 feet (152 m.) high. The coast is generally straight, and there are no distinct promontories. What was probably named Cape Thompson is a rugged mountain face, about in the middle of this line of cliffs, having at its southern end a distinct series of strata in the form of an irregular semicircle. In the ravine south of this point there is a small stream, from which good water can easily be obtained. Directly off the watering place anchorage may be had in 5 fathoms (9.1 m.), sandy bottom. At other points along the cliffs the bottom is generally rocky.

From Cape Thompson the mountains continue northward to Cape Lisburne, while the coast curves northwestward and westward to Point Hope.

Point Hope is the western extremity of a low tongue of land which projects almost 16 miles from the general line of the coast mountain range. It has a steep shingle beach, and its surface is broken by a number of lagoons. The largest of these, **Marryat Inlet,** has its entrance on the north side, close to where the coast trends northward, and a draft of 10 feet (3 m.) can be carried through the entrance. For a number of years some small schooners have been using this inlet as a place to winter. Those not familiar should sound out the channel before entering. In the first of the season, when the ice breaks in the inlet, there is a strong current running out and the moving ice is more or less dangerous.

The outer end of Point Hope is marked by a fixed white light which is maintained from August 1 to November 1 of each year.

Tigara is the name of the native village situated on the west end of the spit. There is a Protestant Episcopal Mission and a United States commissioner at Point Hope. There is no communication

other than by boat during the summer and dog team during the winter.

In the bight just west of the high land of Cape Thompson the water is somewhat shoaler than farther west, though the soundings are regular. Seven miles east of Point Hope there is a 3-fathom (5.5 m.) shoal nearly 1 mile offshore. As the point is approached the water deepens, and toward its end 8 fathoms (14.6 m.) can be carried to within ¼ mile of the beach. The tip of the point is very bold, there being 13 fathoms (23.8 m.) a few ship's lengths from shore; but on rounding the point to the north side the soundings decrease rapidly to 5 fathoms (9.1 m.) ½ mile from shore, and, in general, the water in the bight on the north side of the point is shoaler than on the south side. At the mouth of Marryat Inlet shoals extend off some distance.

There is a narrow shoal, with a depth of 4 fathoms (7.3 m.) at its southern end, which lies about 2¼ miles 314° true (WNW. mag.) from Point Hope. This shoal extends in a general 314° true (WNW. mag.) direction for a distance of 3 miles from the 4-fathom (7.3 m.) spot, and has depths of 5 to 7 fathoms (9.1 to 12.8 m.) over it.

It is reported that there is a 10-fathom (18.3 m.) channel inside the broken shoals off Point Hope and quite close to the point. This channel was used by a Coast Guard cutter in 1921, but it has not been examined.

From the mouth of Marryat Inlet to Cape Lisburne the mountains lie along the coast and terminate at the shore in rugged, rocky cliffs. There are a few ravines through the cliffs, having running streams, with beaches at the shore, where fresh water can be obtained.

Cape Lisburne is a bare, brown mountain, 850 feet (259 m.) high, forming a rugged headland that is distinctly marked by the number of pinnacles and scattered rocks near its summit. Its faces at the shore are very steep. At the cape the coast changes its direction abruptly eastward. There are no outlying rocks, but there is a ridge extending 5 miles northeastward from the cape, on which 5 fathoms (9.1 m.) can be found at a distance of 2 to 3 miles from the land. Off this cape the wind rushes down from the mountains in gusts of great violence and varying directions, and with offshore winds vessels should keep well off the land in passing.

From **Cape Lisburne to Cape Sabine** the land is lower and loses the rugged character of that southward of the former cape. The hills are rounded and rolling, regular in outline, and slope to the sea. Toward Cape Sabine the land becomes a series of ridges and valleys running inland; both terminate at the coast in bluffs.

Cape Sabine is the end of one of these ridges, and projects but slightly from the general line of coast.

Coal.—Veins of coal are found from Cape Thompson to Cape Beaufort. In the face of the bluffs at Cape Sabine some veins, varying in thickness from 1 to 4 feet, have been worked by whaling vessels. The veins show plainly along the top of the bluffs directly at the shore. The use of the coal is limited, owing to its poor quality and the difficulties in obtaining it, and it is not recommended to depend upon it except in case of necessity.

From Cape Sabine to **Cape Beaufort** the land continues of a rolling character until nearing the latter cape, which is a dark moun-

tain coming down directly to the coast. There is no break in the coast at the cape, and it probably received its name as such because seen at a distance. This is the most northern extension of high land on the coast of Alaska. The mountains at this point trend inland and the coast continues low.

The bight from Cape Lisburne to Cape Beaufort is comparatively shallow, but the bottom is regular, and anchorage may be had anywhere alongshore from 1 to 2 miles from land. Directly off Cape Beaufort the water is shoaler than elsewhere between it and Cape Lisburne. There are numerous valleys along this part of the coast, nearly all of which have streams of good water. North of Cape Beaufort it is almost impossible to obtain fresh water on the coast.

About 10 miles north of Cape Beaufort is the southern end of a large lagoon, which stretches along the coast without a break to within a few miles of Wainwright Inlet. Separating this lagoon from the ocean is a narrow strip of sand beach, elevated but a few feet above the water, with several small, shallow openings through it south of Icy Cape, and two considerable openings north of that cape. The land on the inside of the lagoon is generally low, but in coasting along some small bluffs with low, rolling land back of them can be seen in places. South of Icy Cape the lagoon has three large rivers emptying into it, and its whole extent is filled with flats and bars that make it scarcely navigable even for native canoes. North of Icy Cape the water in the lagoon is deeper. Through an opening about 10 to 12 miles from the cape 8 feet (2.4 m.) of water can be safely carried, with 2 to 3 fathoms (3.7 to 5.5 m.) inside. The channel is close to the sand spit on the south side of the entrance.

Another opening, 10 to 12 miles farther north, is somewhat shallower.

Point Lay is a slight bend in the narrow sand spit forming the outside coast. There is a native village here and it is reported that good coal can be found about 3 miles up the river.

Icy Cape is low and flat. The meridian of Icy Cape forms the western boundary of the Naval Petroleum Reserve No. 4.

From Cape Beaufort to Icy Cape the bottom is regular, and the shore can be approached closer than in that part of the bight west of the former cape. When coasting, it should be remembered that off the openings into the lagoon the water is shoaler than on either side.

Blossom Shoals extend 6 to 8 miles off Icy Cape, and are a number of ridges parallel with the coast. These shoals are greater in extent than shown on any chart, and, from the grounding of vessels and observation, appear to be spreading. In approaching the shoals the bottom is lumpy and the soundings irregular. Of late years, on account of frequent grounding in unexpected places about the edge of the shoals, all the whaling vessels give them a wide berth: and it is recommended that vessels rounding Icy Cape should keep outside of 12 fathoms (21.9 m.).

Wainwright Inlet, about 40 miles from Icy Cape, is a moderate-sized lagoon, and has a river emptying at its head. Its entrance, between **Point Marsh** and **Point Collie,** is a narrow, difficult channel, through which 8 to 10 feet (2.4 to 3 m.) can be carried. Inside the water is deeper. Off the mouth of the inlet the water is shoal fully 1 mile from land.

Wainwright is a small village and post office on the inlet. There is a school and two trading stores where gasoline, oil, and general supplies can be obtained; reindeer meat is available. There is a native church. There is a coal outcrop about 10 miles up the inlet, and this coal has been used somewhat for supplying the schools in the vicinity. A boat 52 feet in length is the largest known to have entered the inlet. The channel is very crooked. There is no communication other than trading schooners in the summer and dog teams in the winter.

The **coast from Point Collie to Point Belcher** is a continuous line of mud cliffs until within a few miles of the latter point.

At **Point Belcher** the coast again becomes a shingle beach, with lagoons inside, and back of it low, rolling hills, which are higher than any other land that can be seen north of Cape Beaufort. North of the point the coast continues in a very low sand beach to Seahorse Islands.

Seahorse Islands and **Point Franklin** are the highest points of a continuous sand bank which extends from a point 8 miles north of Point Belcher to Point Franklin, thence turning abruptly east to the mainland at Peard Bay incloses a large lagoon. The first two islands from Point Belcher are higher than the rest of the bank, and their position seems to be permanent. The openings between the islands are as a rule very shallow and continually changing. Former openings are now closed, and openings now occur in the positions of former banks. Point Franklin is a very small sand island, with several hummocks on it. It is so small and far removed from the other islands that it is not easily made out. The greatest changes in the bank occur in that part of it between Point Franklin and Peard Bay, of which what is above water is merely a narrow strip of sand.

In the vicinity of Seahorse Islands the water is shoal, especially off the openings and Point Franklin. Off Point Franklin a shoal makes out several miles northward and northeastward, and vessels rounding the point should give it a berth of 4 to 5 miles.

Peard Bay, eastward of Point Franklin, is a deep bight which is often used by whalers in heavy southerly and southwest winds, and for protection from ice when it sets toward the shore. The bottom of the bay is regular, and the soundings decrease gradually to the shore. The water is deeper along the mainland than on the south side along the sand spit making out to Point Franklin.

The **coast from Peard Bay to Cape Smyth** is a line of mud cliffs 25 to 70 feet (7.6 to 21.3 m.) high, being highest at what is called **Skull Cliff.** From this point they become gradually lower to Cape Smyth, where they end. The coast curves regularly northward, and there are no projecting points. The cliffs are broken by numerous small rivers. There are beaches at the mouths of the rivers, but little or none along the face of the cliffs.

Cape Smyth is not a projecting point, and can not be distinguished as a cape. There is a native village named **Utkiavi** at this place.

From **Cape Smyth to Elson Lagoon** the coast is low with a grassy plain back of it; but from the south shore of Elson Lagoon to Point Barrow the coast is a narrow sand spit.

Barrow is the post office and settlement about 10 miles southwestward from Point Barrow. There is an important trading post here and a store well stocked with provisions. There is a mission and a well-equipped hospital maintained in connection with it. The Bureau of Education maintains a school at Barrow.

There is no communication except by boat in the summer and dog team in the winter. Two trips overland for mail are made during the winter. A few trading schooners and supply vessels call at Barrow during the season of navigation, and a vessel of the Coast Guard makes an annual cruise to the Arctic, calling at Barrow.

Landing at Barrow is difficult and often hazardous. Lighters are kept on hand for discharging freight.

Anchorage.—Offshore soundings of 15 fathoms (27.4 m.) are found 2 miles from the land. The water then shoals evenly to 7 fathoms (12.8 m.) at about 1 mile from shore.

The depths then lessen rapidly to 2½ to 3 fathoms (4.6 to 5.5 m.) about ¾ mile offshore, where there is a slight ridge shoved up by the ice, and which in the early part of the season is always marked by heavy ground ice. Inside and close to this ridge the water deepens again to 3 to 4 fathoms (5.5 to 7.3 m.), and vessels seek this inside passage for protection from the ice when necessary. The ridge ends in a 2½-fathom (4.6 m.) shoal about 1½ miles offshore, where the high land ends and the sand spit begins at the head of **Elson Lagoon.** From this point to Point Barrow, depths of 3½ to 4 fathoms (6.4 to 7.3 m.) can be carried very close up to the sand spit, and there is apparently no ridge in the bottom as in that southward.

At **Point Barrow,** latitude 71° 23′ 31″ N., longitude 156° 21′ 30″ W., the most northern point of Alaska, the sand spit forming the coast turns abruptly eastward. There is a native village on the end of the point. Directly off the point the water is fairly bold, and 3 fathoms (5.5 m.) can be carried to within ¼ mile of the shore. Farther offshore the deepest water of this part of the Arctic Ocean is found. On rounding the point eastward the water becomes shoal, and the coast can seldom be approached anywhere closer than 2 miles. About 2 miles east of Point Barrow is **Moore Channel,** the entrance to **Elson Bay,** where H. M. S. *Plover* wintered in 1852–53–54. A shoal with a least depth of 2 fathoms (3.7 m.) makes off from the point on the east side of the channel and extends westward, from ½ to ¾ mile off the sand spit, and ends nearly opposite the native village on Point Barrow. Inside the shoal there is a channel leading to Moore Channel, with nothing less than 3 fathoms (5.5 m.), and deeper water in Moore Channel. This channel is often used as an anchorage for protection from the ice, as heavy ice grounds on the outer shoal. Changes may be expected in the channel at the entrance.

Tides.—The mean rise and fall at Point Barrow is about ½ foot.

COAST EASTWARD OF POINT BARROW

A shoal, with a depth of 3½ fathoms (6.4 m.), is reported to lie about 6 miles northeastward from Point Barrow.

Ice.—The ice pack seldom moves more than a few miles offshore between Icy Cape and Point Barrow, and is likely to close in at

any time. A northeast wind, although it blows directly along the shore, keeps the ice clear and allows the current to set up past Point Barrow. The heavy ice, when close inshore, stops the surface current entirely and lowers the temperature to about 36° F. or less, so that a vessel working up the shore may readily tell if the ice is on the point by watching the set of the current and the temperature of the water. If the ice is clear of the shore, the current will be setting northward from 1 knot to 3 knots, with a temperature of about 40° F.

A vessel going northward of Icy Cape should sight the ice pack frequently, keeping close watch of its movements, and in the event of its starting inshore should get below Blossom Shoals as soon as possible, as several vessels have been caught in the ice in the vicinity of Point Barrow, and some probably crushed.

Eastward of Point Barrow it is reported that ice is always found along the coast, the heavier ice being in close proximity to the various projecting points and islands. With westerly or northwesterly winds the ice pack is likely to come down upon the shores at any or all of these points, while a northeasterly wind may be expected to clear the ice from the coast and open a lane.

The following report on the cruise of the Coast Guard cutter *Bear* in 1921, by Captain Cochran, may be of interest as showing conditions in a fairly open season:

The *Bear* left Cape Smyth August 8, 1921, rounded Point Barrow, and proceeded to Demarcation Point, arriving there on August 15, 1921.

Coast and Geodetic Survey chart 9400 was used and found to be fairly accurate. The greatest discrepancy noted was in the longitude of the islands marked "Jones Islands." This group of islands is termed "Thetis Islands" on B. A. chart 2435. Leffingwell has named the westernmost island of this group, in longitude 150 degrees, "Thetis Island." Professional Paper No. 109, issued by the United States Geological Survey, based on surveys made by Leffingwell, was valuble in identifying the numerous islands and reefs.

Ice was first encountered a little east of Cape Halkett. From there to Demarcation there was considerable ice. The heavy ice appears to reach in to about 7 and 8 fathoms. If the ice forces the vessel inshore into shoal water, it is advisable to stop and anchor and wait a more favorable opportunity rather than to run offshore unless a clear lead can be seen which will bring the vessel back into water from 5 to 7 fathoms deep. Several times the *Bear* attempted to go offshore in depths from 8 to 10 fathoms, and each time encountered very heavy ice and had eventually to work back through this ice into shoaler water.

The discharge from rivers carries the ice offshore. This was noted especially off the Colville River, off Canning River, and off Camden Bay.

From the Thetis or Jones Islands to Flaxman Islands the ice was close to the reefs and islands, and at Cross Island the vessel passed through 3 fathoms of water about ¼ mile north of the island.

From Barter Island past Martin Point, Griffin Point, Humphrey Point, and Beaufort Lagoon to the end of Icy Reef the ice was fairly close to the island and reefs. Along the reef off Beaufort Lagoon the vessel again passed through 3 fathoms of water. About halfway along Icy Reef the ice was packed in to the shore. A clear lead was found outside of this ice and a course laid for Demarcation Point. While the vessel was at anchor off Demarcation Point a very heavy swell was experienced during a northeast gale, indicating that the ice was a long distance off in this vicinity. It is said that freedom from ice in this locality is usual at this season. This may be due to the discharge from the Mackenzie River carrying the ice offshore.

Along the entire route the water shoals very gradually and soundings give ample warning of shoaling.

The current sets from east-northeast to west-northwest, average strength ½ to 1 knot. The strength of the current may have been augmented by fresh east-northeast breezes covering a long period.

The water close in to the north shore of Cape Halkett is very shallow. A landing was attempted with the whaleboat, but could not be made, due to shoal water extending a considerable distance offshore. Information was obtained later that a landing can best be effected to the southward of the island forming the pitch of the cape. A landing was made at Griffin Point where there is an abandoned native village, the beach off the village being steep enough to permit easy landing of the boat. A landing was made at a native village near the west end of Beaufort Lagoon at Point Humphrey. The water is shoal off this place but with care a landing can be made with a light-draft boat. A boat trip was made from Point Humphrey to a point about 8 miles to the eastward through Beaufort Lagoon. There are numerous shoals in this lagoon, but 4 or 5 feet of water was carried practically the entire distance made by the boat. A landing was made at Cape Simpson, which is mentioned as the position of an oil seepage near two prominent mounds in Leffingwell's account of his explorations on the Arctic coast. This oil seepage was found to be about 3 miles to the southward of the beach at the pitch of the cape, and the earth in the neighborhood of this exudation of petroleum has the appearance of asphaltum. Numerous claims have been staked in the vicinity of this oil seepage. A landing was effected without any trouble at Demarcation Point, as there are no off-lying shoals to render such a landing difficult.

Gordon's trading station, consisting of several buildings, is located close to the shore about ¼ mile east of the beginning of the higher land at the east end of Demarcation Bay. The summer of 1921 was a particularly open season on the Alaskan coast.

Tangent Point is low, flat, and indented by a number of shallow lagoons.

Cape Simpson, at the eastern entrance to Smith Bay, is low with two 50-foot (15.2 m.) hills near it. There are two oil seepages near the cape. A boat landing can be made at Cape Simpson.

Cape Halkett lies about 55 miles eastward of Tangent Point. The water close in to the north shore of Cape Halkett is shoal, making a landing difficult or impossible. It is reported that a landing can be made to the southward of the island at the cape.

Pacific Shoal, about 1 mile in extent and having about 15 feet (4.6 m.) of water, is reported about 7 miles eastward of Cape Halkett.

Colville River enters the ocean 40 miles eastward of Cape Halkett. The delta at the mouth of the river is called **Beechey Point.**

Jones Islands, also called **Thetis Islands,** extend from the delta of Colville River eastward a distance of 25 miles to Return Reef. The group consists of a considerable number of small islands, the largest reported to be about 3 miles in length. Leffingwell has named the westernmost island of this group Thetis Island.

Return Reef was the most westerly point reached by Franklin in his exploration of the coast in 1826.

Midway Islands, about 15 miles eastward of Return Reef, form the western extremity of a chain of islets and shoals known as **Lion Reef,** which extends eastward, roughly parallel to the coast, a distance of 50 miles to **Flaxman Island.** The islands lie, in general, from 4 to 7 miles offshore. Separating the islands from the mainland, is a channel, with depths from 1 to 2 fathoms (1.8 to 3.7 m.) as reported by Leffingwell who spent several years on Flaxman Island.

Vessels enter past **Pole Island,** about midway of the group, steering for a small inshore group of islands shown on the chart until in mid-channel. They then follow the mainland, coming out in the

vicinity of Return Reef. The entrance channel is said to be marked by a pole on the island.

A shoal area is reported to exist about 25 miles northward of Flaxman Island, but no definite information concerning it is available.

Simpson Cove lies 20 miles east-southeastward of Flaxman Island. The cove, although restricted, is said to afford good anchorage, available for winter quarters, southward of **Collinson Point.** A sand spit affords protection from northerly winds and from ice.

During the summer the Eskimos come down from the interior for trading purposes, and at that season their camps may be expected at Collinson Point and Barter Island. During the winter the region is uninhabited.

Barter Island lies about 45 miles east-northeastward of Flaxman Island. From Barter Island eastward to **Herschel Island** the coast, although still low, has deeper water than that to the westward. East of Barter Island the 10-fathom (18.3 m.) curve is a good depth to follow, while west of the island the depth usually carried is about 7 fathoms (12.8 m.).

Demarcation Point is the northern extremity of the boundary between Alaska and Canada.

Gordon's trading post, consisting of several buildings, is located close to the shore about ¼ mile eastward of the beginning of the higher land at the east point of Demarcation Bay. In 1921 the magnetic variation at Demarcation Point was observed to be 40° 45′ E.

Herschel Island, about 45 miles eastward from the boundary line, is an important trading post, and a station of the Northwest Mounted Police of Canada. Many vessels have wintered here. Supplies go in both by vessel from the westward and from the Mackenzie River. Every fall, about the 1st of December, mail is taken out from Herschel Island by the mounted police. Letters are brought in during July, when the freight arrives from Fort McPherson. The round trip to Fort Yukon requires about two months.

APPENDIX

COAST PILOTS AND FIELD STATIONS OF THE COAST AND GEODETIC SURVEY

COAST PILOTS

	Price
U. S. Coast Pilot, Atlantic Coast, Section A, from St. Croix River to Cape Cod	$0.75
U. S. Coast Pilot, Atlantic Coast, Section B, from Cape Cod to Sandy Hook, including Long Island Sound	.75
U. S. Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays	.75
U. S. Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West	.75
U. S. Coast Pilot, Gulf Coast, from Key West to the Rio Grande	.75
U. S. Coast Pilot, West Indies, Porto Rico, and Virgin Islands	.75
Inside Route Pilot, coast of New Jersey	.30
Inside Route Pilot, New York to Key West	.30
Inside Route Pilot, Key West to the Rio Grande	.50
U. S. Coast Pilot, Pacific Coast, California, Oregon, and Washington	.75
U. S. Coast Pilot, Alaska, Part I, from Dixon Entrance to Yakutat Bay	.75
U. S. Coast Pilot, Alaska, Part II, Yukatat Bay to Arctic Ocean	.75
U. S. Coast Pilot, Hawaiian Islands	.50
U. S. Coast Pilot, Philippine Islands, Part I, Luzon, Mindoro, and Visayas	.75
U. S. Coast Pilot, Philippine Islands, Part II, Palawan, Mindanao, and Sulu Archipelago	.75

FIELD STATIONS

Boston, Mass., Appraisers Building, 408 Atlantic Avenue.
New York, N. Y., 311–312 Maritime Exchange Building, 78 Broad Street.
New Orleans, La., room 314 Customhouse.
San Francisco, Calif., room 305–306 Customhouse
Seattle, Wash., room 202, Burke Building.
Manila, P. I., Intendencia Building.

At these stations complete files of the United States Coast and Geodetic Survey charts, Coast Pilots, Tide Tables, Current Tables, and other publications relating to navigation may be consulted and information affecting navigation obtained without charge. Light Lists, Buoy Lists, and Notices to Mariners are kept for sale or for free distribution to mariners. The field stations are also sales agencies for the Coast and Geodetic Survey publications. A chart catalogue, giving lists of charts, coast pilots, tide tables, and agencies of the Coast and Geodetic Survey, can be obtained from any of the field stations or will be sent, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C. Frequent changes occur in the agencies, and the list of agencies is published in the first notice each month of the Notices to Mariners.

NAVIGATIONAL AIDS AND THE USE OF CHARTS

The **U. S. Coast and Geodetic Survey** is charged with the survey of the coasts, harbors, and tidal estuaries of the United States and its insular possessions and issue the following publications relating to these waters as guides to navigation: Charts, Coast Pilots, Tide Tables, Current Tables, a catalogue of these publications, and Notices to Mariners, the last-named published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey.

Charts bear three dates, which should be understood by persons using them: (1) The date (month and year) of the edition, *printed* on the late charts below the border in a central position; (2) the date of the latest correction to the

chart plates, *printed* in the lower left-hand corner below the border; (3) the *date of issue, stamped* below the border and just to the left of the subtitle. Charts show all necessary corrections as to lights, beacons, buoys, and dangers, which have been received to the *date of issue*, being hand corrected since the latest date printed in the lower left-hand corner. All small but important corrections occurring subsequent to the *date of issue* of the chart are published in Notice to Mariners and should be applied by hand to the chart immediately after the receipt of the notices. The date of the edition of the chart remains unchanged until an extensive correction is made on the plate from which the chart is printed. The date is then changed and the issue is known as a new edition. When a correction, not of sufficient importance to require a new edition, is made to a chart plate, the year, month, and day are noted in the lower left-hand corner. All the notes on a chart should be read carefully, as in some cases they relate to the aids to navigation or to dangers that can not be clearly charted. The charts are various in character, according to the objects which they are designed to subserve. The most important distinctions are the following:

1. Sailing charts, mostly on a scale of approximately 1:1,200,000, which exhibit the approaches to a large extent of coast, give the offshore soundings, and enable the navigator to identify his position as he approaches from the open sea.
2. General charts of the coast, on scales of 1:400,000 and 1:200,000, intended especially for coastwise navigation.
3. Coast charts, on a scale of 1:80,000, by means of which the navigator is enabled to avail himself of the channels for entering the larger bays and harbors.
4. Harbor charts, on larger scales, intended to meet the needs of local navigation.

Note.—General charts of the Philippine Islands are on scales 1:1,600,000, 1:800,000, and 1:400,000; coast charts are on scales 1:100,000 and 1:200,000.

Coast Pilots, relating to surveyed waters of the United States, Porto Rico, Virgin Islands, Alaska, Hawaiian Islands, and the Philippine Islands, contain full nautical descriptions of the coast, harbors, dangers, and directions for coasting and entering harbors. At intervals of about one year supplements are issued, containing the more important corrections since the publication of the volume. The supplements are printed on one side of the paper only, so that they may be cut and pasted in the appropriate places in the volume. Supplements and other corrections for any volume can be furnished, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C., or any of its field stations, provided the volume itself has not been superseded by a subsequent edition.

Tide Tables.—The Coast and Geodetic Survey Tide Tables are issued annually in advance of the year for which they are made and contain the predicted times and heights of the tide for each day in the year at the principal ports of the world, including the United States and its possessions. A table of tidal differences is given by means of which the tides at about 3,500 intermediate ports may be obtained. Separate reprints from the general Tide Tables are issued for the Atlantic and Pacific coasts of the United States and its dependencies.

Current Tables, which have heretofore been issued as a part of the Tide Tables, are now published separately as Current Tables, Atlantic Coast of the United States, and Current Tables, Pacific Coast of the United States.

Agencies for the sale of the Charts, Coast Pilots, Tide Tables, and Current Tables of the Coast and Geodetic Survey are established in many parts of the United States and in some foreign ports. They can also be purchased in the office of the Coast and Geodetic Survey, Washington, D. C., or any of the field stations. If ordered by mail, prepayment is obligatory. Remittances should be made by postal money order or express order, payable to the "Coast and Geodetic Survey." Postage stamps, checks, and drafts can not be accepted. The sending of money in an unregistered letter is unsafe. Only catalogue numbers of charts need be mentioned. The catalogue of charts and other publications of the survey can be obtained free of charge on application at any of the sale agencies or to the Coast and Geodetic Survey, Washington, D. C.

Other publications.—Lists of Lights, Buoys, and other Day Marks of the United States, its insular possessions, and the Great Lakes, are published by the Bureau of Lighthouses and may be purchased from its sale agencies or

from the Superintendent of Documents, Washington, D. C. Notice to Mariners, relating to the same waters, is published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey; this publication can be obtained free of charge on application to the Division of Publications, Department of Commerce, Washington, D. C.

REMARKS ON THE USE OF CHARTS

Accuracy of charts.—The value of a chart depends upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become. In these respects the source from which the information has been compiled is a good guide. This applies particularly to the charts of the Alaska Peninsula, Aleutian Islands, Arctic Ocean and part of Bering Sea, and the Philippine Islands. The early Russian and Spanish surveys were not made with great accuracy, and until they are replaced by later surveys these charts must be used with caution.

With respect to these regions the fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed it may be taken for granted that the survey was not in great detail. A wide berth should therefore be given to every rocky shore or patch, and this rule should invariably be followed, viz, that instead of considering a coast to be clear, unless it is shown to be foul, the contrary should be assumed.

With respect to a well-surveyed coast only a fractional part of the soundings obtained are shown on the chart, a sufficient number being selected to clearly indicate the contour of the bottom. When the bottom is uneven the soundings will be found grouped closely together, and when the slopes are gradual fewer soundings are given. Each sounding represents an actual measure of depth and location at the time the survey was made. Shores and shoals where sand and mud prevail, and especially bar harbors and the entrances of bays and rivers exposed to strong tidal currents and a heavy sea, are subject to continual change of a greater or less extent, and important ones may have taken place since the date of the last survey. In localities which are noted for frequent and radical changes, such as the entrance to a number of estuaries on the Atlantic, Gulf, and Pacific coasts, notes are printed on the charts calling attention to the fact.

It should also be remembered that in coral regions and where rocks abound it is always possible that a survey with lead and line, however detailed, may have failed to find every small obstruction. For these reasons when navigating such waters the customary sailing lines and channels should be followed, and those areas avoided where the irregular and sudden changes in depth indicate conditions which are associated with pinnacle rocks or coral heads.

Dredged channels.—These are generally shown on the chart by two broken lines to represent the side limits of the improvement. Before completion of the project the depth given is that shown by the latest survey received from the engineer in charge. After completion the depth given is that determined on a certain date which is stated in the channel legend. The actual depth of a completed channel may be greater than the charted depth shortly after dredging and less when shoaling occurs as a result of storms or other causes. These changes are of too frequent occurrence and uncertain duration to chart. Therefore, when a vessel's draft approximates the charted depth of a dredged channel, the latest information should be obtained before entering. The possibility of shoaling along the edges of the channel should always be considered.

Danger curves.—The depth curves will be found useful in giving greater prominence to outlying dangers. It is a good plan to trace out with a colored pencil the curve next greater than the draft of the vessel using the chart and regard this as a "danger curve," which is not to be crossed without precaution. Isolated soundings shoaler than surrounding depths should be avoided, as there is always the possibility that the shoalest spot may not have been found.

Caution in using small-scale charts.—It is obvious that dangers to navigation can not be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore in approaching the land or dangerous banks regard should be had to the scale of the chart and the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. For the same reason bearings to near

objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

Distortion of printed charts.—The paper on which charts are printed directly from copper plates has to be dampened. On drying, distortion takes place from the inequalities in the paper, which varies with the paper and the amount of the original dampening; but usually it is not sufficient to affect ordinary navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted upon the chart, especially if the lines to objects be long. The longer the chart the greater the amount of this distortion. The majority of Coast and Geodetic Survey charts are now printed by lithography on dry paper and have little, if any, distortion. A lithographed chart may be distinguished from a plate-printed chart by the feel of the surface, the former being smooth while the latter is rough. Lithographed charts also are usually tinted in colors while the others are in black and white.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact position, especially when in exposed positions. It is safer, when possible, to navigate by bearings or angles to fixed objects on shore and by the use of soundings.

Gas buoys and other unwatched lights can not be implicitly relied on; the light may be altogether extinguished or, if intermittent, the apparatus may get out of order.

Lights.—The distance given in the Light Lists, coast pilots, and on the charts for the visibility of lights are computed for a height of 15 feet (4.6 m.) for the observer's eye. The table of distances of visibility due to height, published in the Light List, affords a means of ascertaining the effect of a greater or less height of the eye. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

As the range of visibility increases with the elevation of the observer, it is often possible to obtain a bearing before the light is sighted from the bridge by sighting the light from aloft, noting a star in range with it and then obtaining a bearing of the star with compass or pelorus. The actual power of a light should be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen. The power of a light can be estimated by its candlepower as given in the Light Lists and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the wind, large areas of silence have been found in different directions and at different distances from the origin of the sound signal, even in clear weather. Therefore too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal may require some time before it is in readiness to act. A fog often creeps imperceptibly toward the land and is not observed by those at a lighthouse until it is upon them, whereas a vessel may have been in it for many hours while approaching the land. In such a case no signal may be sounded. When sound travels against the wind it may be thrown upward; in such a case a man aloft might hear it when it is inaudible on deck. The conditions for hearing a signal will vary at the same station within short intervals of time. Mariners must not, therefore, judge their distance from a fog signal by the force of the sound and must not assume that a signal is not sounding because they do not hear it. Taken together, these facts should induce the utmost caution when nearing the land or danger in fog. The lead is generally the only safe guide and should be faithfully used.

In regions where the shores are high and rocky the echo of the whistle frequently gives warning of too close an approach to shore. In narrow passages it is often possible to keep in mid-channel by directing course so that the echoes from both shores are heard at approximately the same time.

Submarine bells installed on many lightships and buoys have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus can determine the approximate bearing of the signal. These signals can be heard also on vessels not equipped with receiving apparatus by observers below the water line, but a bearing of the signal can not then be readily determined.

Tides.—A knowledge of the tide, or vertical rise and fall of the water, is of great and direct importance whenever the depth at low water approximates to or is less than the draft of the vessel, and wherever docks are constructed so as to be entered and left near the time of high water. But under all conditions such knowledge may be of indirect use, as it often enables the mariner to estimate in advance whether at a given time and place the current will be running flood or ebb. In using the tables slack water should not be confounded with high or low tide, nor a flood or ebb current with a rising or falling tide. In some localities the tide may be at a high or low water stand while the current is at its maximum velocity.

The **Tide Tables** published by the Coast and Geodetic Survey give the predicted times and heights of high and low waters for most of the principal ports of the world and tidal differences and constants for obtaining the tides at all important ports.

Plane of reference for soundings on charts.—For the Atlantic coast of the United States and Porto Rico the plane of reference for soundings is the mean of all low waters; for the Pacific coast of the United States and Alaska, with the one exception noted below, and for the Hawaiian and Philippine Islands, it is the mean of the lower low waters. For Wrangel Narrows, Alaska, the plane of reference is 3 feet below mean lower low water. For the Atlantic coast of the Canal Zone, Panama, the plane of reference for soundings is mean low water, and for the Pacific coast of the same it is low-water springs. For foreign charts many different planes of reference are in use, but that most frequently adopted is low-water springs.

It should be remembered that whatever plane of reference is used for a chart there may be times when the tide falls below it. When the plane is mean low water or mean lower low water, there will generally be as many low waters or lower low waters below those planes as above them; also the wind may at times cause the water to fall below the plane of reference.

Tidal currents.—In navigating coasts where the tidal range is considerable special caution is necessary. It should be remembered that there are indrafts into all bays and bights, although the general set of the current is parallel to the shore, and that the effect of a cross current is greater on a vessel running slowly than when at full speed. The turn of the tidal current offshore is seldom coincident with the time of high and low water on the shore.

At the entrance to most harbors without important tributaries or branches the current turns at or soon after the time of high and low water within. The diurnal inequality in the velocity of current will be proportionately but half as great as in the height of the tides. Hence, although the heights of the tide may be such as to cause the surface of the water to vary but little in level for 10 or 12 hours, the ebb and flow will be much more regular in occurrence. A swift current often occurs in narrow openings between two bodies of water, because the water at a given instant may be at different levels. Along most shores not seriously affected by bays, tidal rivers, etc., the current usually turns soon after high and low waters.

The swiftest current in straight portions of tidal rivers is usually in the mid-channel, but in curved portions the strongest current is toward the outer edge of the curve. Counter currents and eddies may occur near the shore of straits, especially in bights and near points.

Tide rips and swirls occur in places where strong currents occur, caused by a change in the direction of the current, and especially over shoals or in places where the bottom is uneven. Such places should be avoided if exposed also to a heavy sea, especially with the wind opposing the current. When these conditions are at their worst, the water is broken into heavy, choppy seas from all directions, which board the vessel, and also make it difficult to keep control, owing to the baring of the propeller and rudder.

The current tables published by the Coast and Geodetic Survey give the predicted times of slack water and other current data for a number of places on the Pacific and Atlantic coasts of North America.

Current arrows on charts show only the usual or mean direction of a tidal stream or current. It must not be assumed that the direction of the current will not vary from that indicated by the arrow. In the same manner the velocity of the current constantly varies with circumstances, and the rate given on the chart is a mean value, corresponding to an average range of tide. At some stations but few observations have been made.

Fixing position.—The most accurate method available to the navigator for fixing a position relative to the shore is by plotting with a protractor sextant angles between well-defined objects on the chart. This method, based on the "three-point problem" of geometry, should be in general use.

In many narrow waters also where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore. For its successful employment it is necessary, first, that the objects be well chosen, and second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice.

Near objects should be used either for bearing or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn. On the other hand, distant objects should be used for direction because less affected by a small error or change of position. The 3-arm protractor consists of a graduated circle with one fixed and two movable radial arms. The zero of the graduation is at the fixed arm, and by turning the movable arms each one can be set at any desired angle with reference to the fixed arm.

To plot a position the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges in case of a metal instrument or the radial lines in the case of a transparent or celluloid instrument pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole. The tracing-paper protractor, consisting of a graduated circle printed on tracing paper, can be used as a substitute for the brass or celluloid instrument. The paper protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through the three objects, it will be indeterminate, as it will plot all around the circle. An approach to this condition, which is called a "revolver," must be avoided. In case of doubt select from the chart three objects nearly in a straight line or with the middle object nearest the observer. Near objects are better than distant ones, and, in general, up to 90°, the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer, the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation. A single angle and a range give, in general, an excellent fix, easily obtained and plotted.

The compass.—It is not intended that the use of the compass to fix the position should be given up. There are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. Where accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal or of additions to a chart, as fresh soundings or new buildings. In such cases angles should be taken to several objects, the more the better: but five objects is a good number, as the four angles thus obtained prevent any errors. When only two objects are visible, a sextant angle can be used to advantage with the compass bearings and a better fix obtained than by two bearings alone.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called bow and beam bearing, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam when the position is obtained. By taking the bearing at two points and four points on the bow a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam. Such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in case of being suddenly shut in by fog. A graphic solution of the problem for any two bearings of the same object is frequently used. The two bearings are drawn on the chart, and the course is then drawn by means of the parallel rulers, so that the distance as measured from the chart between the lines is equal to the distance made good by the vessel between the times of taking the bearings.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, charts compiled from early Russian and Spanish sources, referred to in a preceding paragraph, should not be used.

Soundings.—In thick weather, when near or approaching the land or danger, soundings should be taken continuously and at regular intervals and, with the character of the bottom, systematically recorded. By marking the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship and then moving the paper over the chart parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined.

Sumner's method.—Among astronomic methods of fixing a ship's position the great utility of Sumner's method or one of its many modifications should be well understood, and this method should be in constant use. The Sumner line—that is, the line drawn through the two positions obtained by working the chronometer observation for longitude with two assumed latitudes, or by drawing through the position obtained with one latitude a line at right angles to the bearing of the body as obtained from the azimuth tables—gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. If directed toward the coast, it marks the bearing of a definite point; if parallel with the coast, the distance of the latter is shown. Thus the direction of the line may often be usefully taken as a course. A sounding at the same time with the observation may often give an approximate position on the line. A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The Sumner lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day, and in combination with the sun gives an excellent fix.

Position line by means of tables.—The Sumner line of position furnished ready to lay down on the chart may be derived from the tables of "Simultaneous Hour Angle and Azimuth of Celestial Bodies," published by the Hydrographic Office as Publication No. 203. By means of these tables all calculations are avoided.

Position line by Marc St. Hilaire or calculated altitude method.—By this method the altitude of the celestial body is calculated for the assumed position, and the difference between the observed and calculated altitudes is laid off toward or away from the assumed position, according to sign, along the azimuth of the observed body. The line of position is then drawn through the new point in a direction normal to the azimuth of the celestial body. This method has certain advantages, the principal one being that the solution is strong even when the body is near the meridian. Full description of this method will be found in any epitome of navigation.

Radiocompass bearings and positions are especially valuable at night and during fog or thick weather when other observations are not obtainable. For practical navigating purposes radio vibrations may be regarded as traveling in a straight line from the sending station to the receiving station. Instruments for determining the bearing of this line are now available. The necessary observations may be divided into two general classes: First, where the bearing of the ship's radio call is determined by one, two, or more radio stations on shore and the resulting bearing or position is reported to the vessel (see p. 3, Radio Service); secondly, where the bearing of one or more known radio stations is determined on the vessel itself and plotted as a line of position or as cross bearings. Experiments show that these bearings can be determined with a probable error of less than 2°, and the accuracy of the resulting position is largely dependent on the skill and care of the observer. It must be remembered, however, that these lines are parts of great circles, and if plotted as straight lines on a Mercator chart a considerable error may result when the ship and shore station are a long distance apart. The bearings may be corrected for this distortion as explained on page 3.

Radio bearings may be combined with position lines obtained from astronomic observations and used in ways very similar to the well-known Summer line when avoiding dangerous shoals or when making the coast.

Change of variation of the compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are replotted for every new edition if the error is appreciable. Means for determining the amount of this error are provided by printing the date of constructing the compass and the annual change in variation near its edge.

The change in the magnetic variation in passing along some parts of the coast of the United States is so rapid as to materially affect the course of a vessel unless given constant attention. This is particularly the case in New England and parts of Alaska, where the lines of equal magnetic variation are close together and show rapid changes in magnetic variation from place to place, as indicated by the large differences in variation given on neighboring compass roses.

Local magnetic disturbance.—The term "local magnetic disturbance" or "local attraction" has reference only to the effects on the compass of magnetic masses external to the ship. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places. Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflection of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centers near together. The law which has hitherto been found to hold good as regards local magnetic disturbance is that north of the magnetic equator the north end of the compass needle is attracted toward any center of disturbance; south of the magnetic equator it is repelled. It is very desirable that whenever an area of local magnetic disturbance is noted the position should be fixed and the facts reported as far as they can be ascertained.

USE OF OIL FOR MODIFYING THE EFFECT OF BREAKING WAVES

Many experiences of late years have shown that the utility of oil for this purpose is undoubted and the application simple. The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil skillfully applied may prevent much damage both to ships (especially of the smaller classes) and to boats by modifying the action of breaking seas. The principal facts as to the use of oil are as follows:

1. On free waves—that is, waves in deep water—the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances, but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosne is of little use; crude petroleum is serviceable when nothing else is obtainable: but all animal and vegetable oils, and generally waste oil from the engines, have great effect.

4. A small quantity of oil sufficies, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, either when running or lying-to or in wearing.

6. No experiences are related of its use when hoisting a boat at sea or in a seaway, but it is highly probable that much time would be saved and injury to the boat avoided by its use on such occasions.

7. In cold water the oil, being thickened by the lower temperature and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to facilitate leakage of the oil. The oil is also frequently distributed from canvas bags or oakum inserted in the closet bowls. The positions of these bags should vary with the circumstances. Running before the wind, they should be hung on either bow; for example, from the cathead and allowed to tow in the water. With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter. Lying-to, the weather bow, and another position farther aft seem the best places from which to hang the bags, using sufficient line to permit them to draw to windward while the ship drifts.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect can not be so much trusted. On a bar with the ebb tide running it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck it is recommended to pour oil overboard to windward of her before going alongside. The effect in this must greatly depend upon the set of the current and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat and the bag readily hauled on board for refilling if necessary.

Meteorological tables compiled from data of the United States Weather Bureau

VALDEZ

Month	Air temperature in degrees F.			Precipitation, monthly mean	Snowfall, monthly mean	Prevailing wind, direction
	Mean	Extreme				
		Lowest	*Highest*	*Inches*	*Inches*	
January	17.5	−20	50	3.66	70.9	NE.
February	21.6	−24	48	5.07	56.9	NE.
March	24.7	−11	52	3.14	23.6	NE.
April	33.9	4	63	3.21	26.8	NE.
May	43.3	18	78	2.49	1.0	SW.
June	51.1	30	78	1.99	0	SW.
July	53.6	37	84	2.98	0	SW.
August	51.2	29	84	5.52	0	SW.
September	45.9	23	82	8.13	0	SW.
October	37.3	11	62	6.10	3.9	NE.
November	25.3	−4	53	3.55	28.4	NE.
December	19.5	−18	46	6.39	62.4	NE.
For year	35.4	−24	84	52.23	273.9	NE.

SEWARD

January	20.5	−20	48	3.40	21.0	N.
February	27.3	−14	55	4.74	20.3	N.
March	30.9	−7	52	2.96	9.2	N.
April	37.1	10	72	3.83	7.0	S.
May	44.8	22	77	2.67	T.	S.
June	50.7	32	84	2.30	0	S
July	55.6	40	88	2.50	0	S.
August	53.9	33	85	6.55	0	S.
September	48.6	27	84	10.10	0	S.
October	39.6	11	65	9.79	.5	N.
November	30.1	5	58	6.18	5.5	N.
December	24.5	−12	53	7.85	16.6	N.
For year	38.6	−20	88	62.87	80.1	N.

ANCHORAGE

January	6.8	−33	47	1.18	19.2	N.
February	16.9	−31	55	.91	12.0	N.
March	20.3	−19	45	.34	5.8	N.
April	32.8	−15	58	.32	3.1	N.
May	43.0	20	71	.59	.9	SW.
June	52.2	29	79	.58	0	W.
July	56.0	36	79	1.93	0	W.
August	54.4	31	80	3.06	0	W.
September	47.4	21	73	2.28	T.	N.
October	34.6	−5	62	2.44	6.1	N.
November	17.4	−18	62	.85	14.4	N.
December	7.8	−36	47	1.20	15.9	NE.
For year	32.5	−36	80	15.68	77.4	N.

KODIAK

January	28.7	−9	53	4.82	10.7	NW.
February	31.1	−3	58	4.57	10.0	NW.
March	33.6	2	65	3.92	9.6	NW.
April	36.1	5	61	3.86	7.5	SE.
May	43.2	20	74	5.32	.5	NE.
June	50.2	30	82	4.68	T.	NE.
July	54.5	35	82	3.38	0	SE.
August	54.3	34	85	5.42	0	W.
September	49.5	26	77	5.59	.1	SE.
October	41.6	7	66	7.28	.8	NW.
November	34.6	−3	54	5.76	3.5	NW.
December	30.3	−12	61	6.43	6.7	NW.
For year	40.6	−12	85	61.03	49.4	NW.

Meteorological tables compiled from data of the United States Weather Bureau—Continued

DUTCH HARBOR

Month	Air temperature in degrees F.			Precipitation, monthly mean	Snowfall, monthly mean	Prevailing wind, direction
	Mean	Extreme				
		Lowest	*Highest*	*Inches*	*Inches*	
January	31.6	5	52	5.51	(1)	NW.
February	31.9	6	51	7.09	(1)	SE.
March	33.6	5	57	5.06	(1)	SW.
April	35.1	15	59	3.38	(1)	N.
May	40.8	22	62	5.10	(1)	SE.
June	46.0	30	73	2.84	(1)	NE.
July	51.3	36	80	2.39	(1)	SE.
August	51.4	28	78	3.30	(1)	SW.
September	47.2	28	78	5.95	(1)	SW.
October	41.4	24	65	9.05	(1)	SW.
November	35.4	14	58	6.95	(1)	SW.
December	32.0	12	53	7.07	(1)	SW.
For year	39.8	5	80	63.69	(1)	SW.

[1] No data.

ATTU

January	31.1	12	45	5.49	(1)	(1)
February	28.9	12	40	2.87	(1)	(1)
March	32.2	17	44	6.03	(1)	(1)
April	34.3	18	53	3.30	(1)	(1)
May	39.4	27	58	5.45	(1)	(1)
June	42.6	32	55	7.02	(1)	(1)
July	----------	----------	66	5.67	(1)	(1)
August	50.8	35	70	4.84	(1)	(1)
September	47.4	31	67	6.17	(1)	(1)
October	41.2	26	58	9.10	(1)	(1)
November	35.3	20	51	9.09	(1)	(1)
December	31.5	12	43	6.14	(1)	(1)
For year	----------	12	70	71.17	(1)	(1)

[1] No data.

NOME

January	0.8	−47	36	0.88	9.9	(1)
February	5.7	−38	41	.95	10.6	(1)
March	8.4	−38	39	.95	9.8	(1)
April	16.9	−30	48	.55	3.4	(1)
May	34.7	−6	62	.91	.9	(1)
June	45.0	26	78	1.17	T	(1)
July	50.5	30	79	2.66	0	(1)
August	49.8	23	74	2.85	0	(1)
September	41.2	19	66	2.28	0.6 0.6	(1) (1)
October	28.7	1	49	1.45	3.8	(1)
November	14.7	−24	39	.93	9.9	(1)
December	5.2	−36	37	1.11	11.6	(1)
For year	25.1	−47	79	16.69	60.5	(1)

[1] No data.

POINT BARROW

January	−19.9	−52	33	0.13	5.2	E.
February	−13.0	−55	35	.43	5.9	E.
March	−13.1	−50	33	.20	4.0	E.
April	−1.7	−36	34	.26	10.4	E.
May	21.7	−14	44	.26	2.5	E.
June	35.3	12	64	.30	T	E.
July	40.9	26	75	.94	T	E.
August	38.5	26	64	.91	T	E.
September	32.1	12	57	.52	4.8	E.
October	16.3	−25	42	.68	11.0	NE.
November	.3	−36	35	.28	5.0	NE.
December	−15.4	−53	29	.43	6	NE.
For year	10.1	−55	75	5.34	55.4	E.

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