U. S. DEPARTMENT OF COMMERCE
DANIEL C. ROPER, SECRETARY
COAST AND GEODETIC SURVEY
LEO OTIS COLBERT, *Director*

SERIAL NO. 607

UNITED STATES COAST PILOT

ALASKA

PART II

YAKUTAT BAY TO ARCTIC OCEAN

FOURTH EDITION

1938

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(1938)

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National Oceanic and Atmospheric Administration

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PREFACE

This volume is the fourth edition of the Coast Pilot 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 preceding (third) edition of this publication appeared in 1931.

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

Corrections and additions affecting all Coast Pilot volumes are included in Notice to Mariners, published weekly by the United States Department of Commerce. The aids to navigation mentioned in this pilot are those in existence, according to the latest available information, on September 30, 1938.

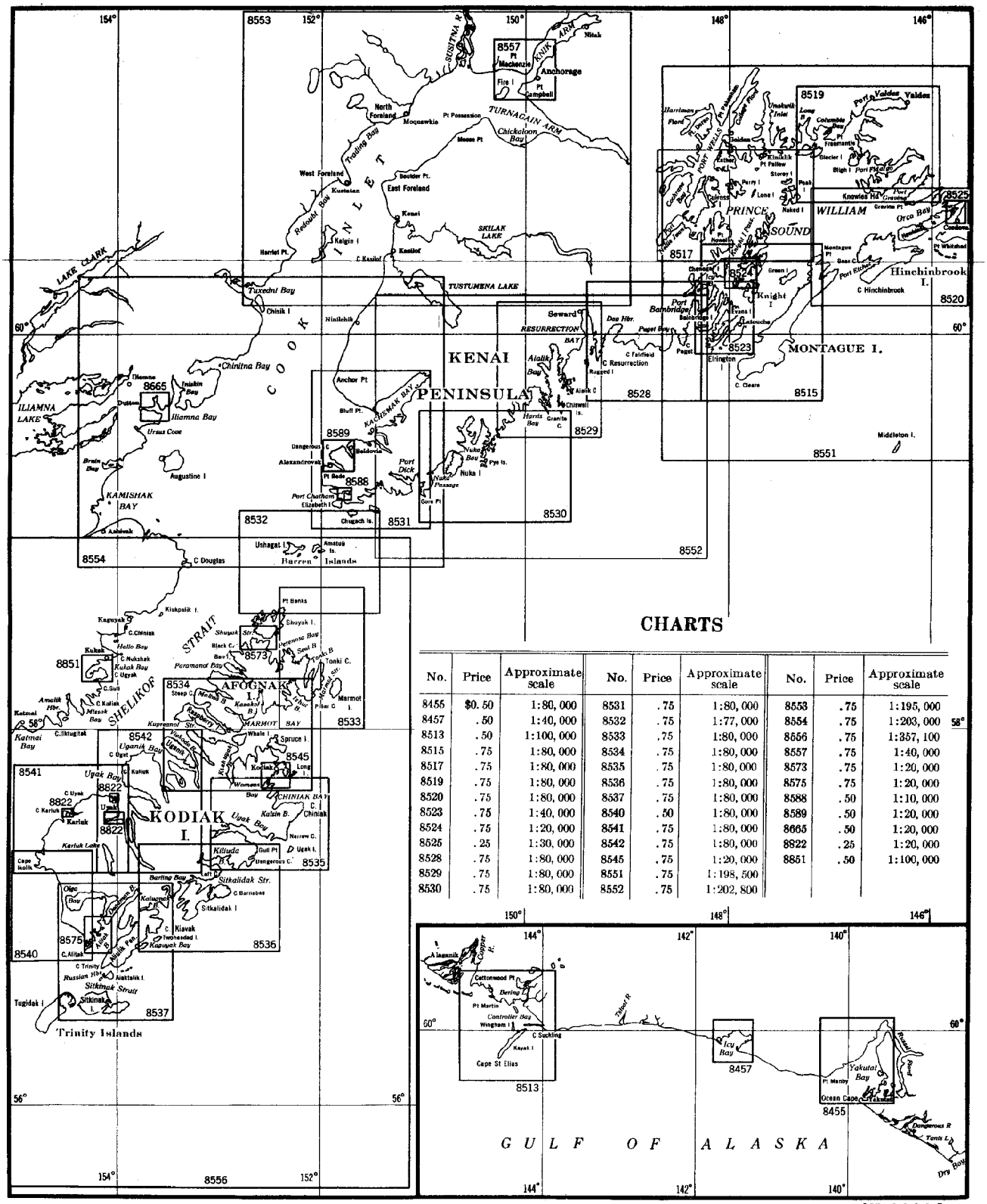
A supplement, giving the more important changes to the text, is issued about 1 year after a Coast Pilot volume is published, and again at approximately yearly intervals thereafter until a revised edition appears. Each supplement is complete in itself and cancels all previous issues. The date of the latest supplement to each Coast Pilot is given in the List of Coast Pilots published each month in Notice to Mariners.

In using this volume reference should be made to the latest supplement and to Notices to Mariners issued subsequent to the volume or supplement, and due regard should be given to the possibility of changes having occurred since the date of the latest of these publications. The supplement may be obtained, free of charge upon application to the United States Coast and Geodetic Survey, Washington, D. C., or to any of its field stations.

The present edition was prepared by Commander F. B. T. Siems, chief, coast pilot section. The United States Lighthouse Service, the United States Coast Guard, the Bureau of Fisheries, masters of vessels navigating in Alaskan waters and other authorities all cooperated in furnishing information.

L. O. Colbert, *Director.*

September 30, 1938.



CHARTS

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8515	.75	1:80,000	8534	.75	1:80,000	8557	.75	1:40,000
8517	.75	1:80,000	8535	.75	1:80,000	8573	.75	1:20,000
8519	.75	1:80,000	8536	.75	1:80,000	8575	.75	1:20,000
8520	.75	1:80,000	8537	.75	1:80,000	8588	.50	1:10,000
8523	.75	1:40,000	8540	.50	1:80,000	8589	.50	1:20,000
8524	.75	1:20,000	8541	.75	1:80,000	8665	.50	1:20,000
8525	.25	1:30,000	8542	.75	1:80,000	8822	.25	1:20,000
8528	.75	1:80,000	8545	.75	1:20,000	8851	.50	1:100,000
8529	.75	1:80,000	8551	.75	1:198,500			
8530	.75	1:80,000	8552	.75	1:202,800			

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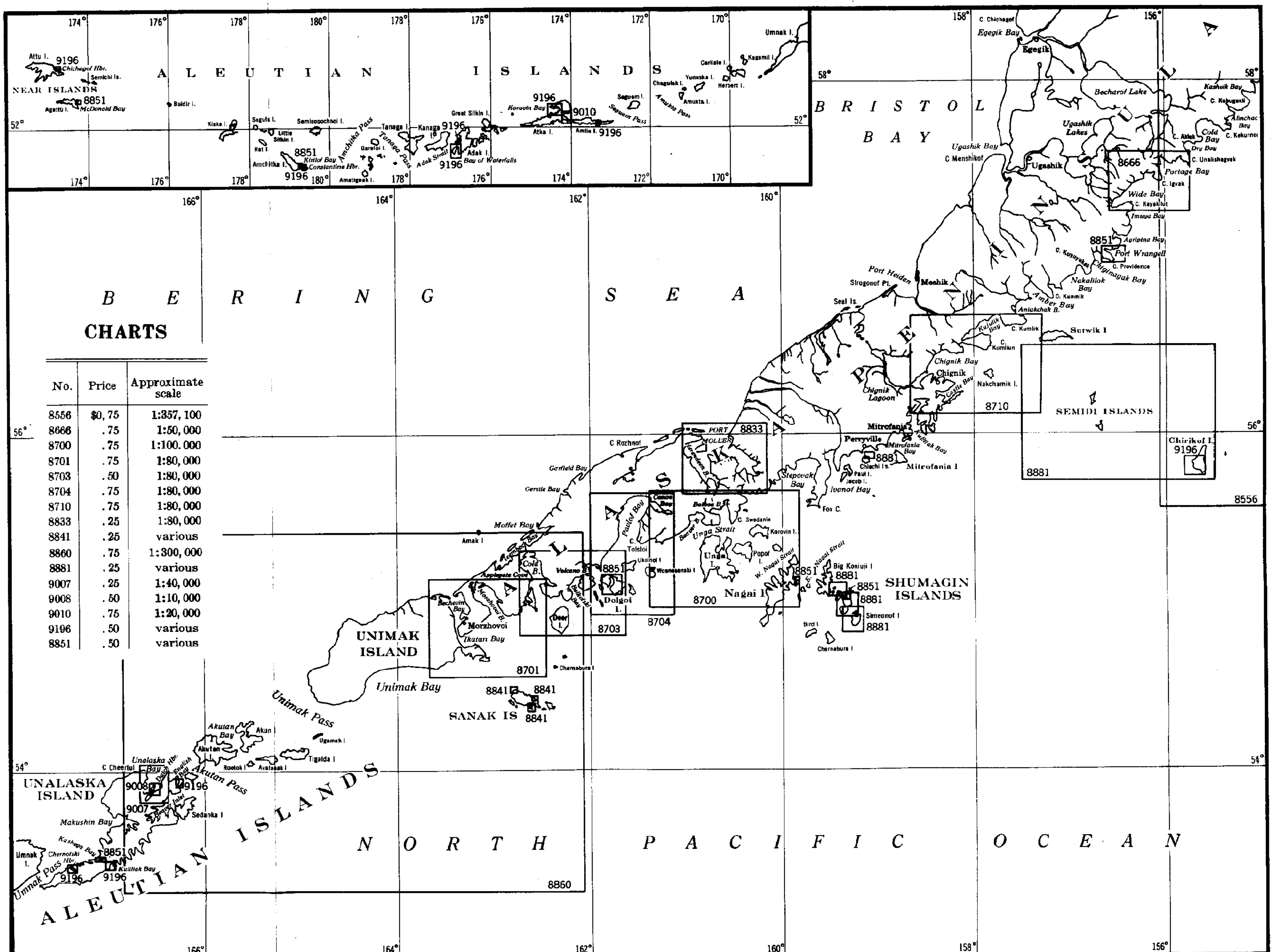
INDEX OF COAST AND HARBOR CHARTS

(1) Yakutat Bay to Kodiak Island



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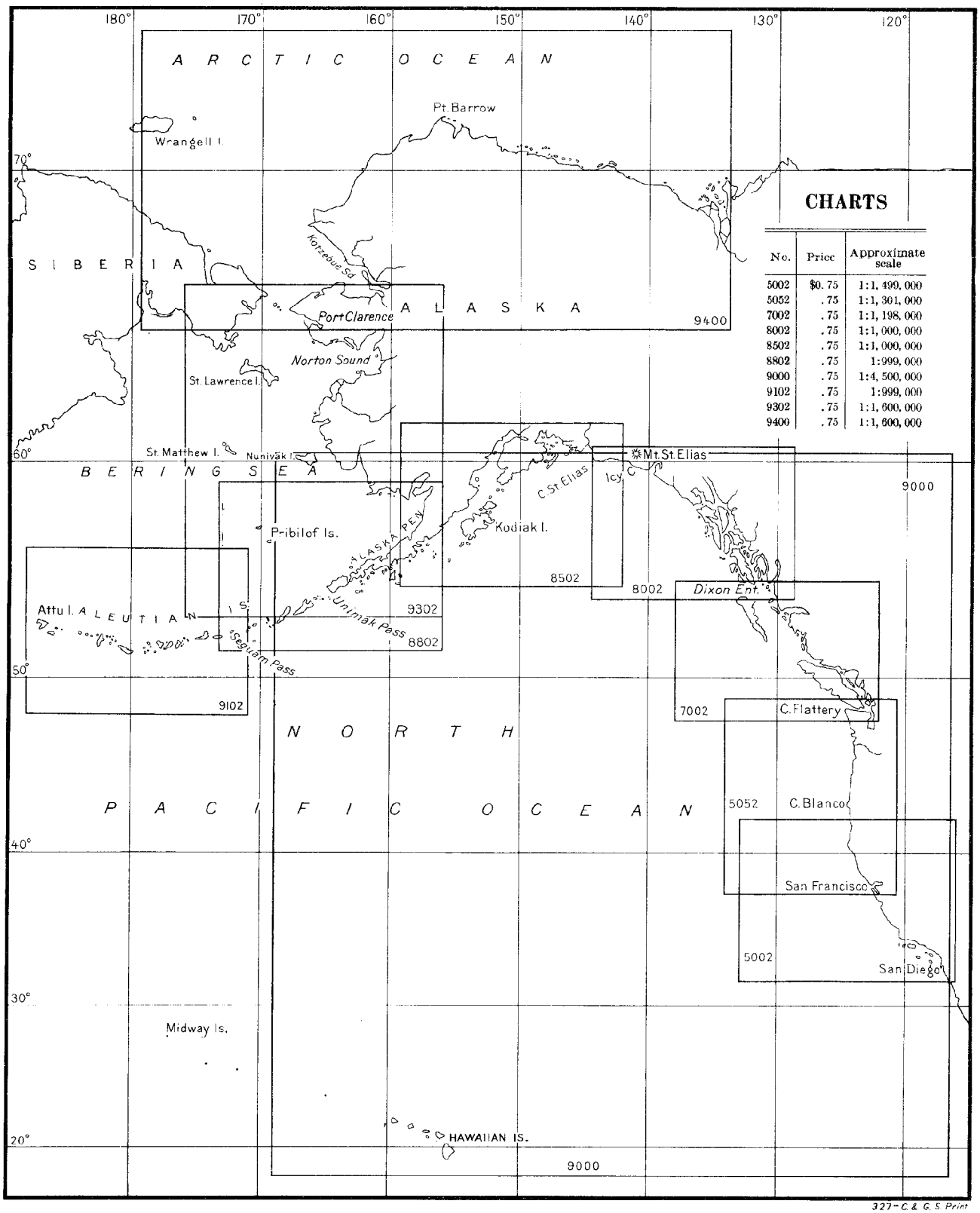
8833	.25	1:80,000
8841	.25	various
8860	.75	1:300,000
8881	.25	various
9007	.25	1:40,000
9008	.50	1:10,000
9010	.75	1:20,000
9196	.50	various
8851	.50	various

INDEX OF COAST AND HARBOR CHARTS

(2) Alaska Peninsula and Aleutian Islands



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8002	.75	1:1,000,000
8502	.75	1:1,000,000
8802	.75	1:999,000
9000	.75	1:4,500,000
9102	.75	1:999,000
9302	.75	1:1,600,000
9400	.75	1:1,600,000

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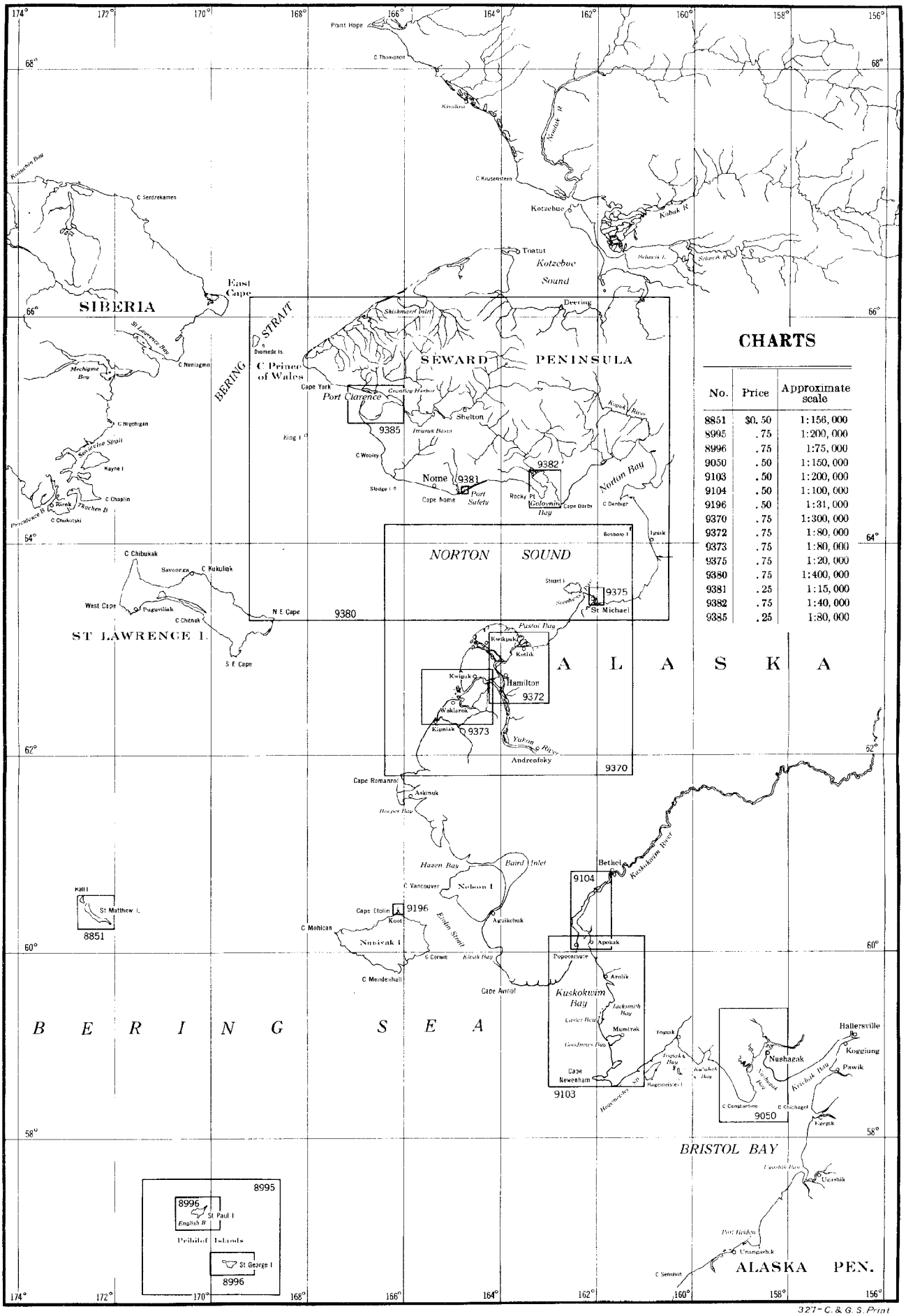
INDEX OF SAILING CHARTS

(4) North Pacific Ocean



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9104	.50	1:100,000
9196	.50	1:31,000
9370	.75	1:300,000
9372	.75	1:80,000
9373	.75	1:80,000
9375	.75	1:20,000
9380	.75	1:400,000
9381	.25	1:15,000
9382	.75	1:40,000
9385	.25	1:80,000

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INDEX OF COAST AND HARBOR CHARTS

(3) Bering Sea

UNITED STATES COAST PILOT

ALASKA—PART II—YAKUTAT BAY TO ARCTIC OCEAN

The courses and bearings given in degrees are *true* reading clockwise from 0° at north to 359°, and in a few cases are followed by the corresponding *magnetic* course in points, in parentheses. General directions, such as northeastward, west-southwestward, etc., are magnetic, unless otherwise stated.

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

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

Except where otherwise stated, all depths are at *mean lower low water*. This plane of reference (p. —) is abbreviated: m. l. l. w.

In accordance with the desire of the International Hydrographic Bureau, each depth is followed in parentheses by its equivalent in meters.

Heights are given in feet with metric equivalent in parentheses.

Use this Coast Pilot with reference to the latest supplement that may have been published and the Notices to Mariners issued after the date of the edition of this pilot or of the Supplement.

1. GENERAL INFORMATION

THE COAST.—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.

Between **Yakutat Bay** and **Cape St. Elias,** the coast is fairly regular, being formed by river and glacier deposit. The great **Malaspina Glacier** borders a section of this coast.

From **Cape St. Elias** to **Cook Inlet** the characteristic formation is generally 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 boulders,

some of them of great size, and the soundings indicate that these boulders 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 **Alaska Peninsula,** throughout the off-lying 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.

Coast landings.—There are many bold and precipitous sections of the open coast of Alaska that are inaccessible. A surf boat should be used in making landings on stretches of sand beach. On a rocky shore, the locality selected for landing should be free from nearby breakers and back of some rock or small point if available, but a small area partially enclosed and subject to violent to-and-fro movement of the sea should, of course, be avoided. The best landing place is one having a fairly steep-to face where covered and uncovered by the swell and at the same time offering adequate foothold. The swell here has less tendency to break or may not break at all.

The boat used for landings on a rocky shore should be moderately light so that it can be readily handled, and it should be of the square stern type. Approach is made stern-first under control of oars and having a line from the bow to an anchor some distance offshore if practicable. The line is manned so that the boat may be hauled away quickly at any time. The stern is brought within jumping or stepping distance of the selected spot immediately following the end of a break and a landing is made preceding the approach of the next break if there is time to do so. Several attempts may be necessary before a quiet spell of sufficient duration occurs.

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.

All ports in Alaska except those in Bering Sea and at the upper end of Cook Inlet, are ice free and open to navigation the year around.

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 it is known that extensive sounding or a wire drag survey have definitely determined that no dangers exist. There are, however, many rocks not marked by it. Boulder patches are generally not marked by kelp. 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.

Tide rips and **swirls** in regions of strong currents are usually encountered in the vicinity of shoals or islands and points of land, and they are therefore generally a positive indication of danger. The backwash of seas striking steep cliffs of a bold coast may often be felt at a considerable distance to seaward. Any change in the feel of the vessel proceeding in thick weather should be considered as an indication of danger near at hand.

Weather.—The weather in general is misty or rainy, with frequent blows. From April to October, mist and fog are prevalent. In the winter season and late spring northwest blows with clear weather are frequent. During the summer season the prevailing winds are mostly southeast to southwest with an occasional northeast storm. These summer storms are usually not very severe and are generally of short duration. As winter approaches the gales become more severe and prolonged.

A feature of Alaska weather is the ***williwaw,*** a violent gust of wind that sweeps down off the mountain slopes with great force. In stormy weather these williwaws will be experienced in coasting along the land, and in practically every harbor in western Alaska. Williwaws are dangerous to a vessel at anchor because of their very sudden occurrence and the radical changes in the directions of the successive gusts of wind. A vessel will yaw badly and is likely to break out her anchor. Sailing boats are liable to be capsized. A man cannot stand against a violent williwaw.

The weather is discussed in greater detail under the heading of the various localities. See also meteorological tables in the appendix.

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 5 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 1 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 4 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 5 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 4 hours later than at Goodnews Bay entrance, and at Bethel it is about 5½ 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.

Tide Tables.—For daily predictions of the tides in Alaska reference should be made to the Tide Tables, Pacific Ocean and Indian Ocean, published annually in advance by the Coast and Geodetic Survey; price 25 cents.

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 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.

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."

Capt. C. Cagle, of the American steamer *Alaska Standard*, as a result of many voyages across the Gulf of Alaska, reports his conclusions as to the currents in that locality. The voyages were made during the spring and summer months, and the observations of the currents during weather suitable for accurate determinations:

"It was found that the strong north and west sets from Cape Spencer to Cape St. Elias exist only inside the 100-fathom curve and a few miles outside of it. This current continues to Cape Cleare (Montague Island), and with less velocity beyond Cape Cleare, from which point on to the Barren Islands it is largely affected by the tides. This current from Cape Spencer to Cape St. Elias is accelerated by southeast winds and retarded by northwest to westerly winds, and from Cape St. Elias onward it is accelerated by northeast winds and more affected by the tides.

"The passages made outside of Middleton Island have all shown that there is a current setting to the south and east, with the exception of one passage against stiff southeast to east-southeast winds, when adverse currents were encountered. This northwest set was attributed to the force of the southeast winds.

"In crossing the banks off Kodiak Island neither a southwest set, nor any set worthy of mention, have been experienced, and it is thought that this is the condition except during or after strong northeast winds. Along the fifty-seventh parallel, between the meridians of 148° and 141° W., a southerly set of about 0.3 knot has always been experienced, but when making the shore of Baranof Island the current has been generally found to be setting northwest along the coast inside the 100-fathom (30 m) curve."

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 ***Kenai 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.

For remarks on **currents** along the ***Alaska Peninsula,*** in the ***Aleutian Islands*** and in the ***Bering Sea,*** see pages 237, 303, and 382.

Wind currents.—This subject is very complex. In general it may be said that along the Pacific coast of the United States at a distance of from 5 to 10 miles offshore, the wind brings about a

current having a velocity about 2 percent that of the wind. The direction of this wind-driven current, however, is not with the wind. With winds from the northeast, southeast, and northwest quadrants, the current sets about 20° to the right of the wind, while with winds from the southwest quadrant the current sets about 20° to the left of the wind. It is evident, however, that these are but average values, for strong currents are sometimes experienced when the local winds are light.

Current Tables, Pacific Coast, published annually in advance by the Coast and Geodetic Survey, contain information for numerous harbors and waterways of Alaska; price, 10 cents.

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.

Most of the harbors are subject to violent williwaws; and these severe gusts, which may come from any direction, should be borne in mind when selecting an anchorage.

The principal ports are Cordova and Valdez in Prince William Sound, Seward in Resurrection Bay, Kodiak on Kodiak Island, Unga and Unalaska to the westward, and Nome and St. Michael in the Bering Sea.

Repairs.—At most of the towns there are facilities for minor emergency repairs to machinery or small boats. All the salmon canneries maintain fairly well-equipped machine shops and usually minor repairs can be arranged for at any of the canneries.

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

At several canneries, notably Shepard Point (Prince William Sound), Alitak Bay (Kodiak Island), and King Cove there are slipways capable of hauling out vessels up to probably 75 tons. The use of these slipways can sometimes be arranged for during the summer season. There is a marine railway, capacity 200 tons, at Naknek, Bristol Bay.

Communication in Alaska is conducted mainly by radiotelegraph and radiotelephone. The *Signal Corps* of the United States Army (see p. 21) operates the ***Alaska Communication System,*** which consists of a network of radio stations in Alaska with the net control station located in Seattle, Washington. This system constitutes the backbone of radio communications in Alaska. Practically all of the canneries and mining activities operate radio stations and, in addition, there are several stations operated by the ***Territory of Alaska*** and other Government agencies, all of which have connections with the Alaska Communication System. Many of the shore stations of these various interests as well as certain stations of the Alaska Communication System listen on 500 kc (600 m), have ship to shore service, and are open to public correspondence. Most shore stations (ex-

cept the Alaska Communication System) have no fixed hours of service and some are closed between the normal periods of Alaskan fishing operations. For a list of Alaskan radio stations, hours, and nature of service concerned, consult the ***"List of Coast Stations and Ship Stations"*** published by the *International Telecommunication Union* (see p. 26). A list of commercial radio stations located in Alaska may be obtained from the Federal Communications Commission, Washington, D. C.

Pilotage is not compulsory for Alaska except as provided in the United States laws governing the Bureau of Marine Inspection and Navigation. Vessels making canneries, mines, and other settlements in unsurveyed areas can usually obtain the services of someone with local knowledge, although not a licensed pilot.

Practically all canneries in Alaska now have **radio telegraphic or radio telephonic stations,** and vessels desiring a pilot should arrange by radio to have one of the cannery men come out and pilot the ship in.

United States marshals are stationed at Juneau, Valdez, and Nome. Deputy marshals are stationed at Yakutat, Cordova, Latouche, Seward, Anchorage, Seldovia, Kenai, Kodiak, Unga, Naknek, Dillingham, Unalaska, St. Michael, Kotzebue, and Point Hope.

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 all kinds of fuel oil and lubricating oil are maintained at Seward and Dutch Harbor. Fuel oil, gasoline, and lubricating oils can also be obtained at Cordova.

There are regular oil stations at Sawmill Bay (Prince William Sound) and Kodiak where stocks of Diesel oil, gasoline, and lubricating oils are maintained for sale.

Most of the canneries now burn fuel oil; but, as a rule, they have a very small tank capacity and have no oil to spare.

Coal can be obtained at Cordova, Valdez, Seward, Kodiak, and Unalaska. In general, only small stocks are immediately available. Coal-burning vessels desiring coal in any quantity should make prior arrangements.

Transportation.—There is a steamship line operating from Seattle to Cordova and Seward via southeast Alaska. At Cordova and Seward the line connects with steamship lines serving points on lower Cook Inlet, Kodiak Island, and Alaska Peninsula (summer). There is railroad connection between Seward, Anchorage, and Fairbanks. There is a direct steamship line from Seattle to points on the Bering Sea including Dutch Harbor (Unalaska), Golovin (Cheenik), and Nome. Some of the canneries operate steamers to Alaska.

UNITED STATES PUBLIC HEALTH SERVICE.—American merchant seamen are entitled to medical relief obtainable through the United States Public Health Service at its established relief stations.

An American merchant seaman is one "engaged on board in the care, preservation, or navigation of any registered, enrolled, or licensed vessel of the United States, or in the service, on board, of those engaged in such care, preservation, or navigation."

Relief stations of the Public Health Service are located at the addresses given, in the following ports:

Seattle, Wash., **Marine Hospital**, Judkins Street and Fourteenth Avenue South. Out-patient office, Federal Building.
Ketchikan, Alaska, THIRD-CLASS RELIEF STATION, Koel Building.
Wrangell, Alaska, THIRD-CLASS RELIEF STATION.
Petersburg, Alaska, THIRD-CLASS RELIEF STATION.
Juneau, Alaska, THIRD-CLASS RELIEF STATION, First National Bank Building.
Sitka, Alaska, THIRD-CLASS RELIEF STATION.
Cordova, Alaska, THIRD-CLASS RELIEF STATION.
Seward, Alaska, THIRD-CLASS RELIEF STATION.
(Kodiak), Alaska, THIRD-CLASS RELIEF STATION (inactive, 1937).
Unalaska, Alaska, THIRD-CLASS RELIEF STATION, c/o United States Indian Service.
Nome, Alaska, FOURTH-CLASS RELIEF STATION, c/o U. S. Coast Guard Officer.

Hospitals are located in the following Alaskan towns; those marked with an asterisk (*) had United States Public Health contract space during 1937:

Anchorage (Federal).
*Cordova (individual ownership).
Fairbanks (church).
Fort Yukon (individual ownership).
Haines (Federal).
*Juneau (church).
Kanakanak (natives, Federal).
Kennecott (industrial).
*Ketchikan (church).
Kotzebue (natives, Federal).
Mountain Village (natives, Federal).
*Nome (church).
*Petersburg (city).
Point Barrow (church).
*Seward (church).
*Sitka (territorial).
Tanana (Federal).
*Unalaska (Physician in charge, Indian Hospital).
*Wrangell (church).
Yakutat.

Free medical advice is furnished to seamen by radio, see page 17.

UNITED STATES LIGHTHOUSE SERVICE.—The lights, radiobeacons (page 21) and buoys maintained in Alaska are under the jurisdiction of the Sixteenth Lighthouse District and reports regarding them should be sent to the Superintendent of Lighthouses, Ketchikan, Alaska. Reports of an urgent character should be sent by radio, see page 14.

Aids to navigation.—With the exception of four principal light stations, the navigational lights in the remote region covered by this volume are unwatched. Unwatched lights may become irregular or extinguished, although such apparatus has a high degree of reliability. Being in a remote and exposed locality, the unwatched lights are inspected less frequently and are therefore less dependable than are those in frequented waters.

The significance of the shapes, coloring, numbering, and light characteristics of buoys and beacons are given in the introductory pages of the Light List.

Light List, Pacific Coast.—Aids to navigation, including fog signals, buoys, and beacons are listed and described in the Light List, Pacific Coast, sold by the Superintendent of Documents, Washington, D. C., or by numerous agencies; price usually less than 50 cents.

The Light List also lists the radiobeacons operated by the United States Lighthouse Service and the radio direction finder stations operated by the United States Navy.

Mariners are referred to the Light List for detailed information regarding the characteristics, power, visibility, etc., of lights, as well as a description of light structures and day marks, buoys, fog signals, etc. Such information is not given in this Coast Pilot volume except for a few of the more important aids.

The above light list also contains (in the introduction) considerable information of general value to mariners. This includes a description of the character and power of lights, of light sectors, and distances at which lights can be seen; information regarding the use of radiobeacon signals, distance-finding stations, radio direction-finding stations and notes regarding sound-in-air fog signals, whistle and bell buoys.

The ***Notice to Mariners*** is a weekly publication giving all changes in aids to navigation as well as recent chart correction data. This publication will be mailed free to mariners who apply to the Superintendents of Lighthouses, or single copies may be obtained or consulted at the offices of the Superintendents of Lighthouses, or the Coast and Geodetic Survey Field Stations, or other agencies distributing marine information.

Defects in Aids to Navigation.—Aids to navigation are protected by law, and mariners in their own interest should use every precaution to avoid collisions with them. Any such collisions as may occur as well as defects in the aids to navigation in Alaskan waters should be reported to the Superintendent of Lighthouses, Ketchikan, Alaska, by radio or other prompt means, see page 14.

Suggestions as to Aids to Navigation.—Mariners are also invited to send suggestions as to improvements or changes in aids to navigation directly to the Superintendent of Lighthouses, Ketchikan, Alaska, or to confer with him, or to address the Commissioner of Lighthouses, Washington, D. C.

Lighthouse tenders, when working on buoys in channels or other frequented waters, may display a red flag (international signal code flag B) and a black ball at the fore as a warning to other vessels to slow down in passing. Passing vessels will facilitate the work of the Lighthouse Service by a proper observance of the signals.

CUSTOMS.—Juneau is the headquarters port for the United States Customs Collection District of Alaska. The ports of entry are Juneau, Cordova, Craig, Eagle, Hyder, Ketchikan, Nome, Petersburg, Seward, Sitka, Skagway, Unalaska, and Wrangell. Marine documents may be issued at the ports named excepting Cordova, Craig, and Unalaska.

There are no warehouses under Government jurisdiction for bonded merchandise.

The **COAST AND GEODETIC SURVEY** is charged with (1) the survey of the coasts of the United States and its possessions, to insure the safe navigation of coastal and intracoastal waters; (2) the determination of geographical positions and elevations in the interior of the

country, to coordinate the coastal survey and provide a framework for mapping and other engineering work; (3) the study of tides and currents, to furnish datum planes to engineers and tide and current tables to mariners; (4) the compilation of aeronautical charts, to meet the needs of the pilots of aircraft; (5) observations of the earth's magnetism in all parts of the country, to furnish magnetic information essential to the mariner, aviator, land surveyor, radio engineer and others; and (6) seismological observations and investigations to supply data required in designing structures to reduce the earthquake hazard.

The results of these surveys and studies are analyzed in the Washington office and published as ***nautical*** and ***aeronautical charts;*** annual tables of ***predicted tides*** and ***currents; coast pilots;*** charts showing magnetic declination; annual lists of United States earthquakes; publications of geographic positions and elevations; Notice to Mariners (jointly with the Lighthouse Service); and other publications.

A **Coast and Geodetic Survey field station** is located at 601 Federal Office Building, First Avenue and Madison Street, Seattle, Wash. Files of charts, coast pilots, and other publications are maintained for the use of mariners, who are invited to avail themselves of the facilities afforded.

Charts, coast pilots, current tables, and tide tables are kept for sale. Mariners observing any changes affecting charts or coast pilots are requested to notify the inspector in charge of the field station.

Chart agencies.—Chart agencies where charts and publications of the Coast and Geodetic Survey are kept for sale are located in the following towns: Valdez, Cordova, Seward, Anchorage, and Kodiak.

Reporting of dangers, shoals, changes in channel depths, etc.—Mariners are especially requested to immediately inform the Coast and Geodetic Survey of all important facts relating to changes in the coast pilots and charts that may come to their attention. Reports of an urgent character should be sent by radio, see page 14.

The Coast and Geodetic Survey must depend in a great measure upon outside sources of information pending a complete revision of a **coast pilot volume.** Mariners and others will therefore realize the importance and great desirability of cooperation in this work and are urgently requested to forward to the Director, United States Coast and Geodetic Survey, Washington, D. C., directly or through a field station (p. 14), any information affecting the coast pilots or charts that may come to their notice, as well as any suggestions that they may have for increasing the value of these publications.

The ***wire drags*** used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Steamers passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires.

No attempt should be made to pass between the wire drag launches while the wire is being set out or taken in, unless it would endanger a vessel to do otherwise. In setting out or taking up the wire drag, the

tension on the bottom wire is released and the floats at each 100-foot section may cause the wire to be held near the surface. At the time the launches are usually headed either directly toward or away from each other and the operation of taking up or setting out may usually be clearly seen.

Special signals for surveying vessels.—The following signals have been prescribed for vessels of the United States engaged in hydrographic surveying:

By day a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, may carry in a vertical line, one over the other not less than 6 feet apart where they can best be seen, three shapes not less than 2 feet in diameter of which the highest and lowest shall be globular in shape and green in color and the middle one diamond in shape and white.

Vessels of the Coast and Geodetic Survey shall carry the above-described marks while actually engaged in hydrographic surveying and under way, including drag work. Launches and other boats shall carry the prescribed marks when necessary.

It must be distinctly understood that these special signals serve only to indicate the nature of the work upon which the vessel is engaged and in no way give the surveying vessel the right-of-way over the other vessels or obviate the necessity for a strict observance of the rules for preventing collisions of vessels.

By night a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, shall carry the regular lights prescribed by *The Rules of the Road*.

A vessel of the Coast and Geodetic Survey, when at anchor in a fairway on surveying operations, shall display from the mast during the daytime two black balls in a vertical line and 6 feet apart. At night two red lights shall be displayed in the same manner. In the case of a small vessel the distance between the balls and between the lights may be reduced to 3 feet if necessary.

Such vessels, when at anchor in a fairway on surveying operations, shall have at hand and show if necessary in order to attract attention a flare-up light in addition to the lights which are, by this regulation, required to be carried.

The **UNITED STATES COAST GUARD** is a military branch of the Government maintained for the purpose of enforcing the navigation and other maritime laws under the jurisdiction of the United States, rendering assistance to vessels in distress, saving life and property, destroying derelicts, and removing obstructions and menaces to navigation. These duties include the International Ice Patrol, the Bering Sea Patrol, flood-relief work, patrol of regattas and marine parades, and rendering medical relief to deep-sea fishermen and to the natives of Alaska.

The Coast Guard makes no charge for its services to vessels in distress, and will respond promptly to all proper requests for assistance so far as the distribution and condition of its facilities will permit. However, it is not the purpose of the Coast Guard to compete or interfere with commercial enterprise in ordinary towing and salvage operations, but to confine its assistance activities to cases of actual or potential distress.

Coast Guard assistance facilities.—Vessels of the Coast Guard are stationed at the following ports: Ketchikan, Cordova, Seward, Juneau. Additional vessels patrol the waters of the Bering Sea from April to September. During the patrol season, information on the movements of the vessels of the Bering Sea Patrol Force may

be obtained by communicating with the Commander, Bering Sea Patrol Force, at Unalaska through the communication facilities of the Army, Navy, or the Coast Guard.

Assistance or distress procedure.—Small craft or planes off the coast of Alaska may obtain the assistance of the Coast Guard by the following means:

Make the international or inland distress signal, if in sight of a vessel, lighthouse, or a Coast Guard station (only one Coast Guard station in Alaska at Nome). Passing vessels will inform the Coast Guard by radio.

Persons on shore may communicate with the commander, Seattle Division, United States Coast Guard, Seattle, Wash., to whom facilities are available for communicating with any or all Coast Guard assistance facilities in Alaska.

If equipped with radio, call NCU "Any Coast Guard Unit" by key or in case of extreme emergency call SOS by key (or Mayday by voice) transmitting on 500 kilocycles (600 meters). General radio procedure for vessels requesting assistance by radio is given on pages 15 to 18, inclusive.

Coast Guard administrative offices are located at Federal Building, Seattle, Wash., and at Customhouse, San Francisco, Calif. The telegraphic and radio addresses are "Coast Guard, Seattle" and "Coast Guard, San Francisco."

UNITED STATES BUREAU OF MARINE INSPECTION AND NAVIGATION.—The waters of Alaska are included in the bureau's Pacific Coast District (No. 7). The supervising inspector's office is at (514 Customhouse) San Francisco, Calif.; local inspection district headquarters are located at St. Michael, Alaska (Northern Commercial Co. Hotel. Open from May to September. During winter months in the Seattle office), and Juneau, Alaska (Federal Building), and at Seattle, Wash. (625 Federal Bldg.).

The **pilot rules** for "Certain Inland Waters of the Atlantic and Pacific Coasts and of the Coast of the Gulf of Mexico" (Form 804), apply to the inland waters of Alaska. Boundary lines separating the high seas from inland waters in Alaska have not been established (1937).

The licensed officer in command of any vessel shall report in writing and in person to the board of local inspectors nearest the port of first arrival any accident to said vessel involving loss of life, or damage to property to an approximate amount exceeding $500, and shall also report in like manner any casualty or loss of life from whatever cause of any person on board such vessel and any stranding or grounding, whether or not any damage has been sustained by the vessel.

The **HYDROGRAPHIC OFFICE** of the United States Navy exists for the improvement of the means for navigating safely the vessels of the United States Navy and of the mercantile marine by providing accurate and cheap nautical charts, sailing directions, navigators, and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

The Hydrographic Office publishes nautical charts, light lists and sailing directions (pilots) for the navigable waters of foreign countries including British Columbia; it also publishes numerous special charts, books, manuals, tables of interest to navigators and aviators, and Notice to Mariners (weekly) for correction of charts and publications.

The charts and coast pilots pertaining to the territorial waters of the United States and its possessions are published by the ***United States Coast and Geodetic Survey.***

Among the publications of the Hydrographic Office are monthly **pilot charts** for the various oceans (one for the North Pacific Ocean), a weekly hydrographic bulletin and a daily memorandum of information of interest to navigators. These publications can be secured by mariners who cooperate with the bureau by furnishing certain desired marine data.

The Hydrographic Office prepares navigational warnings for the Hydrographic radio broadcasts. The Hydrographic Office Publication No. 205, Radio Aids to Navigation (p. 26) contains comprehensive information regarding radio service of value to navigation throughout the world. An abstract of United States Naval Radio Stations broadcasting schedules is also published from time to time in the Hydrographic Bulletin, in a form convenient for posting in the ship radio room.

A branch Hydrographic Office is maintained at room 453, Federal Office Building, Seattle, Wash. In this office, bulletins are posted giving information of value to mariners who can also avail themselves of publications pertaining to navigation and facilities for correcting their charts from standards. No charge is made for this service.

Shipmasters are especially requested to inform the Hydrographic Office immediately by radio of all navigational information, which includes reports on ice, derelicts, wreckage, floating obstructions, and changes or defects in aids to navigation.

A report of any buoys adrift or any deficiencies noted in lighted aids to navigation affecting United States (including Alaska) waters should also be forwarded to the superintendent of the nearest lighthouse district (as given in Light Lists). Reports affecting United States Coast Pilots and charts should be made to the Director, Coast and Geodetic Survey, Washington, D. C. (p. 10).

RADIO (Marine Services).—The following pages on this subject are designed principally to acquaint the mariner with the various radio services available pertaining to weather, navigational warnings, direction finding, time signals, medical advice, etc.; also, the procedure for radio distress traffic; and to call attention to certain duties required of the shipmaster in connection with radio equipment and communication. Nothing herein relieves shipmasters and radio operators of their responsibility to comply with any laws, rules, or regulations which have been or may be made by authorities controlling radio communication.

Regulations.—No transmitting station may be established or operated without the authorization of the Government of the country concerned.

The radio communications in the United States and its possessions, except the Philippine Islands and the Panama Canal Zone, are controlled by the Federal Communications Commission, Washington, D. C. The Commission is charged with the enforcement of the general radio regulations in force as annexed to the International Telecommunication Convention; that part of the International Convention for Safety of Life at Sea, London, 1929, applying to radio; and the Communications Act of 1934 (United States federal statute) as amended. Violations of the Act may result in the application of heavy penalties and forfeitures. (In this connection shipmasters should see section 362 and title 5 of the Communications Act.)

The attention of masters is called to Rule 289 (*a*) and (*b*) of the Commission which states the conditions under which a vessel may use its radio transmitter when in territorial or inland waters of the United States or when alongside a wharf or at anchor in a harbor of the United States.

Service Document.—When a radio telegraphic installation is compulsory equipment on board a ship, the latter must be provided with the following service documents:

1. The radio license.
2. The operator(s)' certificate.
3. Register (radio service log) in which shall be mentioned, at the time they occur, service incidents of all kinds, as well as the communications exchanged with land stations or mobile stations and relating to reports of disaster. If the regulations on board permit, the position of the vehicle shall be indicated once a day in the said register.

*4. Alphabetical list of call signals.
*5. List of coast and ship stations.
*6. List of stations performing special services.
*7. The Convention and Regulations annexed thereto.
*8. The telegraph rates of the countries for which the station (ship) most frequently accepts radiotelegrams.

Reporting of dangers.—The master of every ship of the United States equipped with radio transmitting apparatus on meeting with a tropical or other severe storm, dangerous ice, derelicts, or any other direct danger to navigation, is required to cause to be transmitted a report of these dangers, to ships in the vicinity and to the appropriate Government agencies.

When practicable, these reports should be sent through Government facilities; however, any commercial radio station in the mobile service will forward the message without charge.

When in the North Pacific, special observations when encountering severe storms should be sent by radio to "Observer San Francisco," preferably in the International Meteorological Code, preceded by the ship's name, unsigned and checked collect. A copy of the code is contained in Radio Aids to Navigation (H. O. 205), and in "Distribution of Weather Information by Radio." (See p. 27.) The message may be sent in plain language, giving the ship's position, Greenwich time of observation, direction and force of wind, state weather and barometer reading.

Radio reports on ice, derelicts, wreckage, floating obstructions, and changes or defects in aids to navigation in the Pacific should be addressed "Hydro San Francisco." Reports of any buoys adrift or any deficiency noted in lighted aids to navigation affecting United

*See List of Radio Publications, p. 26.

States waters should also be sent directly to the nearest lighthouse district as given in the Light Lists. Reports of dangers discovered affecting charts and coast pilots of United States waters should be sent direct to the nearest field station of the United States Coast and Geodetic Survey, a list of which are given on page 459.

DISTRESS AND EMERGENCY TRAFFIC.—General rules of procedure regarding Distress and Emergency Radio Traffic as set forth by the International Radiotelegraph Conference in force should be followed; however, any means available to a vessel or aircraft in distress may be used to draw attention and obtain help.

All radio communications and signals relating to ships or aircraft in distress have absolute priority, and no transmission which may interfere with distress and emergency traffic is permitted.

Vessels in distress transmit the distress signals or calls and message on the calling (watching) wave of the service most likely to be of assistance. The international distress and calling wave of the maritime service is 500 kc (600 m). Over the sea aircraft are also equipped to receive and transmit on this frequency.

The attention of master and radio operator is invited to the distinction made between the purposes and uses of the **distress** and **urgent signals** and **calls** given below.

The International *Radiotelegraphic Distress Signal*, when sent on 500 kc (600 m) should, as a general rule, be preceded by the **Alarm Signal** and when circumstances permit, the transmission of the Distress Signal should be separated from the end of the Alarm Signal by a 2-minute silence.

The ***Alarm Signal*** consists of a series or 12 dashes sent in a 1-minute period, the duration of each dash being 4 seconds and of each interval between dashes, 1 second. The only purpose of this signal is to set into operation automatic alarm receivers and must only be used either to announce that a distress signal and message is to follow or to announce the transmission of an urgent cyclone warning; in the latter case it can only be used by coast stations duly authorized by their government and the transmission of the warning shall begin 2 minutes after the end of the alarm signal. This signal can be transmitted by hand or by an automatic instrument.

The International *Radiotelegraphic* ***Distress Signal*** (SOS) consists of the group . . . — — — . . . repeated 3 times, preceded or not by the *Alarm Signal.* The International *Radiotelephonic* ***Distress Call*** consists of the *spoken expression* MAYDAY repeated 3 times. This *signal* or *call* indicates that a ship, aircraft, or other mobile station is threatened by serious and imminent danger and requests immediate assistance.

The distress signals or calls should be followed as soon as possible by the distress message including the name of the ship, aircraft, or the vehicle in distress, information regarding the position of the latter, nature of the distress, and the nature of the help requested, and any other further information which might facilitate the assistance.

The distress signals or calls and messages should be repeated at intervals until an answer has been received and especially during the *Silent Periods.* The alarm signal may also be repeated if necessary.

Times of listening on Distress Wave.—Twice per hour, a 3-minute interval **(Silent Period)**, during which normal radio traffic in the bands of 460 to 550 kc (652 to 545 m) and the transmission of type B wave on any band must cease, has been provided by international agreement to insure the reception of Distress, Urgent or Safety calls or signals. All stations which normally listen on the waves of the authorized bands between 365 and 515 kc (822 and 583 m) must, during their working hours, make the necessary arrangements to insure the watch on the International Distress Waves, 500 kc (600 m), for 3 minutes, beginning at 15 and 45 minutes after the hour (Greenwich Time). During these Silent Periods only emergency broadcasts concerning the safety of life at sea (ships) and over the sea (aircrafts) are to be transmitted on 500 kc (600 m), preferably if possible in type A2 and B waves.

Many cases occur when the degree of danger is such as not to warrant the use of the Distress Signal or Distress Call. The International *Radiotelegraphic* ***Urgent Signal*** (XXX) consisting of the group — · · — — · · — — · · —, repeated 3 times, or the International *Radiotelephonic* ***Urgent Call*** consisting of the *spoken expression* (PAN), repeated 3 times, have been provided for these cases to indicate that the calling ship has a very urgent message to transmit concerning the safety of the ship; of a ship in sight; or of the safety of any person on board or in sight therefrom.

A vessel in distress off the coast of Alaska requiring assistance should make use of one of the *radiotelegraphic signals* (SOS or XXX) or one of the *radiotelephonic calls* (MAYDAY or PAN) mentioned above or the **radio call NCU—*"any Coast Guard unit"***—on the international distress and calling frequency. A vessel sighting a vessel in distress may send the international distress signal or distress call or make a report of the facts by making use of the international urgent signal or urgent call or the radio call NCU—"any Coast Guard unit"—or by calling direct any commercial or Government radio station which is capable of transmitting on 500 kc (600 m). Any or all of these radio stations will forward the information to the appropriate assisting agencies.

The floating units of the Coast Guard in Alaska are listed on page 11.

Information desired in requests for assistance.—If the following information is included in the original request for assistance, it will place the responsible Coast Guard officer in a position to determine immediately the types and number of vessels required to render adequate aid, thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatch of assistance.

1. Name, type, and nationality of vessel.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea, and wind.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

Recommended procedure for securing assistance *and* ***avoiding distress traffic interference.***—As a result of conferences on distress traffic communications, the United States Coast Guard has adopted a recommended course of action, based on International Radio Regulations and established practice, to be taken by radio-equipped vessels in

order to get assistance as quickly as possible. This recommended procedure is as follows:

When in distress.—Transmit your distress message on the international distress wave, giving all information which will leave no doubt as to your trouble and position. Approximately 10 minutes after the transmission of the original distress message, the ship in distress is requested to transmit slowly on the distress wave "MO" and its own call signal for 3 minutes. This will enable ships and radio direction-finder stations in the vicinity to take radio bearings and to plot accurately the position of the distressed ship, thereby permitting assistance to be dispatched without difficulty and delay.

When another is in distress:

1. Give absolute priority to distress call and messages relating thereto.
2. Cease all transmissions capable of interfering with the conduct of distress communications.
3. Maintain absolute silence if within range and not actually taking part in the conduct of distress communications.
4. Concentrate attention on the distress case and intercept all information possible.
5. If unquestionably in vicinity of distressed vessel, acknowledge receipt of the distress message, if received, giving your position to the vessel in distress, stating action being taken.
6. Be extremely careful not to interfere with stations more favorably situated to handle the case.
7. Do not try to silence other units, i. e., "QRT," unless you are in control.

The vessel in distress controls; permit him to handle the situation without being interfered with. The vessel in distress may delegate this control to some other station more favorably situated. *Do not interfere* with the station lawfully controlling the situation.

In Minor Cases of distress or other trouble.—Use the urgent signal XXX, or the general call for any Coast Guard Unit NCU.

Small craft in distress.—Under a provision of the International Regulations which permits the use of any means available to a vessel or aircraft in distress to draw attention and obtain help (See Distress and Emergency Traffic, p. 15), small commercial and private craft equipped with radio apparatus that cannot be operated on the International Distress Frequency of 500 kc (600 m) may usually obtain United States Coast Guard assistance by transmitting the distress signal or call and the message on the 2670 kc (112 m) frequency. Practically all Coast Guard units maintain a continuous watch on 2670 kc (112 m) and will answer emergency calls thereon, if heard.

Small craft and airplanes, not equipped with radio, may obtain the assistance of the Coast Guard off the coast of Alaska by following the procedure given on page 12.

FREE MEDICAL ADVICE by radio may be obtained direct from the United States Marine Hospital, Seattle, Wash. United States Government and the following commercial radio stations will forward messages for medical advice to the hospital without charge: Port Alexander (KPR), Uyak (KHA), Chignik (KHC), Naknek (KHT), Kvichak (KYM), and Nushagak (KZV).

Requests for medical advice of an urgent nature should be preceded by the urgent signal XXX in order to give them priority over all other radio traffic except distress communications.

The ***International Code of Signals, 1931 (vol. II—Radio)*** contains a medical section. The case-stating system in this medical section gives the nature of the information which should be included in the request for medical advice.

Vessels seeking medical advice from the United States Coast Guard may contact its units by calling NCU (general call for all Coast Guard units), on the international calling and distress frequency of 500 kc (600 m). The following is recommended by the Coast Guard and approved by the Public Health Service as a guide for preparing messages:

In order for a doctor to properly diagnose a request for medical aid all pertinent information is necessary. Before sending a radio message for medical advice the sender should carefully examine the patient and obtain all information possible and embody the data in one message. The following is presented as a guide for obtaining data:

(1) How long has the patient been sick? Was he taken sick suddenly, or did the sickness come on slowly?

(2) Has the patient a fever, and if so, how much?

(3) What is the patient's pulse rate per minute?

(4) How many breaths does the patient take per minute?

(5) What is the general appearance of the patient? Is the flesh in any part of the body swollen?

(6) Is the sickness thought to be due to poison or to poisoned food?

(7) Is the sickness thought to be due to a communicable disease, such as cholera, smallpox, etc.? To what diseases have the crew been exposed? Name and how long out of port of departure?

(8) Are other members of the crew suffering from the same sickness, or have other members been sick and recovered, or died?

(9) Mention all the symptoms or complaints of the patient.

The following is a list of common symptoms which may be used to aid in bringing out all the information:

1. Headache.
2. Chills.
3. Fever.
4. Pain, location and character.
5. Nausea.
6. Vomiting.
7. Diarrhea.
8. Constipation.
9. Appearance of tongue, coated or swollen.
10. Colic.
11. Urine, increased, decreased.
12. Consciousness.
13. Unconsciousness.
14. Labored breathing.
15. Convulsions.
16. Bleeding from any part of body, as mouth, bowel, or skin.
17. Rash, jaundice, or any discoloration of the skin.
18. Swelling of any part of the body.
19. Areas of tenderness.
20. Paralysis in any part.
21. Injury to any part of body.
22. The treatment that has been given.

The following are examples of good radio messages:

(*a*) "Man, aged 30, deck hand, sick for past 24 hours, with severe pains and cramps in lower right side of abdomen, which is hard and tender to touch. There is nausea and some vomiting. Temperature is 99½; pulse, 120 per minute; breathing, 25 per minute. Have given no medicine." (This information will inform the physician that the patient is probably suffering from an acute attack of appendicitis and he will therefore advise treatment accordingly.)

(*b*) "Man, aged 20, fireman. became sick three days ago with chill, and headache, followed in few hours by high fever, which does not go down. Fever is 104; pulse, 140, breathing, 50 per minute. Has severe pains in chest when he breathes. Face flushed. Lies on left side, coughs; sputum rusty or blood colored. Has hot water bottle to side." (This information conveys to the physician the idea that this patient is perhaps suffering from pneumonia and he will outline the treatment accordingly.)

(*c*) "Man, aged 45, cook, fell and broke both bones right leg, apparently near middle. Bones protrude through skin." (The physician receiving such a message will have no difficulty in understanding the nature of this fracture and will advise proper treatment.)

RADIO TIME SIGNALS.—Various systems of broadcasting official time signals are employed throughout the world. These systems and the stations performing this service are fully described in Radio Aids to Navigation (H. O. 205) and in the Berne publications.

(NPG) San Francisco (Mare Island) Calif., broadcasts first order time signals controlled and automatically transmitted by a clock synchronized with the Naval Observatory at Washington, D. C. These signals are normally correct to less than 0.1 second.

(NPM) Oahu (Honolulu) T. H., rebroadcasts automatically time signals from (Mare Island) San Francisco, Calif. These are signals normally correct to less than 0.2 second.

The United States system of broadcasting time signals, as indicated in the table below, consists of the transmission of dashes (—) and the omission of dashes (0) for the seconds of the 5 minutes preceding the final time signal which is on the hour. The final time signal is the beginning of a much longer dash (——) than the others, being of about 1.3 seconds duration. The number of dashes sounded in the group immediately preceding the 4 omissions at the end of the first 4 minutes of the signal indicates the number of minutes of the signal yet to be sent. There are 9 omissions before the final time signal. In all cases, the beginning of a second is on the beginning of a corresponding dash.

Minute interval during preceding hour	Seconds of minute intervals												
	1 to 28	*29*	*30 to 50*	*51*	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*
Min.													
55 to 56	Dash (—) every second 1 to 28, incl.	0	Dash (—) every second 30 to 50, incl.	0	—	—	—	—	0	0	0	0	—
56 to 57		0		—	0	—	—	—	0	0	0	0	—
57 to 58		0		—	—	0	—	—	0	0	0	0	—
58 to 59		0		—	—	—	0	—	0	0	0	0	—
59 to hour		0		0	0	0	0	0	0	0	0	0	——

In the event of an error occurring in the signal, another time signal will be transmitted 1 hour later.

RADIO TELEGRAPHIC BROADCASTS OF WEATHER.—Daily broadcasts, on schedule, of general and local weather information and broadcasts of storm and hurricane warnings whenever issued, are made by the United States Weather Bureau from certain Government and commercial radio stations for the benefit of marine, aviation, and commercial interests.

The marine broadcasts are divided into 3 classes. (*1*) The (major) Marine Bulletin, (*2*) the Local Weather Bulletins, (*3*) Storm and Hurricane Warnings.

1. The (major) marine bulletin issued every day at 6:18 a. m. and p. m. (Pacific Standard Time) via San Francisco, Calif., Naval Radio Station (NPG), is divided into 3 parts as follows: (1) Reports from ships in the North Pacific Ocean (keyed in the International Ship Code); (2) Synoptic reports of supplementary observation from land stations in North America (keyed in the International Code for Land Stations); (3) Forecasts and Storm Warnings for the Pacific Coast and a synopsis of the general pressure system over the North

Pacific influencing the weather (keyed in plain language). This bulletin is suitable for preparing weather maps at sea.

2. Local weather bulletins containing forecasts, storm warnings when issued, and a weather summary for specified areas of the Pacific coast and Alaska are broadcast on schedule every day by certain United States Naval or Coast Guard radio stations and (KSE), (KOK), (KPH), (KFS), (KEK), and (KPK). Local weather information on request may be obtained from (WXH) Ketchikan, Alaska.

3. Storm warnings, in addition to being a part of the above bulletins (*major and local*), are broadcast by certain United States Naval radio stations, at the end of the first ensuing silent period (*time of listening on distress wave*) after the message has been received at the broadcasting station and every 2 hours thereafter for a period of 10 hours unless superseded. These warnings are broadcast in plain language and on the frequencies assigned to the service (maritime or aeronautical) to which they are destined.

Complete details relative to this service are published in Radio Circular No. 1, issued by the Weather Bureau, which, together with a card descriptive of storm warnings, may be obtained upon application to any United States Weather Bureau office. Details are also given in Hydrographic Office Publication No. 205, Radio Aids to Navigation. These publications give the schedules with times and frequencies of all broadcasts, together with tables for decoding as needed.

Storm warnings broadcast by commercial radio stations are generally transmitted on the hour or the half-hour at hourly intervals.

Scheduled broadcasts of weather information affecting the Pacific coast of the United States, Canada, and Alaska are also made by Canadian radio stations. Most of these stations supply weather informtion on request only and without charge. (See Hydrographic Publication No. 205, Radio Aids to Navigation.)

RADIO NAVIGATIONAL WARNINGS affecting the regions described in this volume are compiled by the United States Hydrographic Office, Navy Department, and by the Lighthouse Service, Department of Commerce. These warnings contain important information regarding derelicts, defects and changes to aids to navigation, mine fields, etc. They are broadcast by certain United States Naval Radio stations and Ketchikan (WXH), Alaska.

These broadcasts are divided into 3 classes: (1) Major and Secondary Hydrographic Broadcasts, (2) Local Hydrographic Broadcasts, (3) Emergency Hydrographic Broadcasts.

1. The major and secondary hydrographic broadcasts (Pacific) are sent out every day at 7:00 a. m. and 7:00 p. m. (*Pacific Standard Time*) by Mare Island station (NPG), San Francisco, Calif. The information broadcast affects the Pacific coast of the United States together with important Hawaiian Islands Notices. The content of this broadcast is usually adequate for offshore navigation; however, it is recommended that before nearing the coast, ships copy the local broadcasts of the area they are entering.

2. Local hydrographic broadcasts affect only the area in which the broadcasting stations are located and occasionally adjacent areas.

These broadcasts are made *on schedule* from the stations listed below for the following areas:

San Diego, Calif. (NPL)	from Latitude 30°00′ N. to 35°00′ N.
San Francisco, Calif. (NPG)	from Latitude 35°00′ N. to 39°00′ N.
Eureka, Calif. (NPW)	from Latitude 39°00′ N. to 42°00′ N.
Astoria, Oreg. (NPE)	from Latitude 42°00′ N. to 47°00′ N.
Tatoosh, Wash. (NPD)	north of Latitude 47°00′ N. to and including Straits of Juan de Fuca.
Puget Sound (Keyport), Wash. (NPC).	Vancouver and Queen Charlotte Sound.
Ketchikan, Alaska (WXH)	Alaska.
Dutch Harbor, Unalaska (NPR)	Alaska.

Canadian radio stations supply hydrographic information on request. See Radio Aids to Navigation (H. O. 205).

3. ***Emergency hydrographic broadcasts*** of an urgent nature are broadcast by certain United States Naval Radio Stations in the area affected at the end of the first ensuing silent period (*time of listening on Distress waves*, see p. 15) and every 2 hours thereafter for a period of 10 hours unless superseded. If the warning is of sufficient importance they may be broadcast by San Francisco (Mare Island), Calif. (NPG) as a part of the regular major and secondary broadcasts in addition to the broadcast by the local stations.

A **naval radio station** is operated at Dutch Harbor (NPR). Practically all the canneries operate radio stations during the summer, and there a re several stations operated by other Government bureaus.

The **Signal Corps, United States Army** (see Communication, p. 6), operates radio stations at the following places:

WXE—Anchorage.	WXW—Kotzebue.
WXU—Cordova.	WXY—Nome.
WXB—Point Barrow.	WXF—Kodiak.
WXR—Seward.	WXK—Kanakanak.

Radio stations of the Navy and Coast Guard can be identified easily by their call letters which always begin with the letter N.

RADIOBEACONS, installed at light stations and in lightships, are radio transmitters from which characteristic radio signals are sent out in all directions. A radio direction finder (radio compass) is a special radio receiver with a rotating coil antenna by means of which bearings are taken on radiobeacons or on any other stations sending radio signals.

It should be understood that the use of radiobeacons is limited to vessels equipped with radio direction-finders (radio compasses); on the other hand, radio direction-finder stations (see p. 23) can furnish bearings to a vessel if equipped only with the regular radio transmitting and receiving set.

The Lighthouse Service operates a system of radiobeacons, established along the coast. This system has recently been coordinated with that of the Lighthouse Administration of Canada in order that the methods of operating the radiobeacon system of the United States and Canada might become more effective. In order to facilitate the widest utilization of this system of navigational aids, there are issued at intervals radiobeacon charts, upon which the radiobeacons are shown, with their characteristics and operating schedules. These charts may be obtained free from the offices of the District Lighthouse Superintendents.

All radiobeacons operate during fog or low visibility; also in clear weather during scheduled intervals. The clear weather schedules and other details are given in the Light Lists, Hydrographic Office Publication No. 205, and other radio publications (p. 26). Changes are announced in the Notices to Mariners.

The radiobeacons in or near the area covered by this volume are given in the following table:

Radiobeacon	Latitude north			Longitude west		
	°	′	″	°	′	″
Cape Spencer, Alaska	58	12	00	136	38	18
Cape St. Elias, Alaska	59	47	48	144	36	12
Cape Hinchinbrook	60	14	12	146	39	06
Scotch Cap, Unimak Island	54	24	00	164	44	40
St. Paul Island, Bering Sea	57	07	21	170	16	10

NOTE.—St. Paul Island is operated during fog and low visibility, only upon advance request made to (NPR) Dutch Harbor. From May 1 to November 1, the radiobeacon operates regularly during the second and fifth 10 minutes of every hour.

Originally radiobeacons were intended only for fog signals, but they have proven to be useful for clear-weather navigation as well, because of their considerable range. For this reason they are operated at certain periods in clear weather. This also facilitates the calibration of radio compasses on board ship, see below. The use of radiobeacons will greatly reduce the dangers incident to navigation in a fog, but this should not cause the mariner to neglect other precautions such as the use of the fathometer or lead.

The bearing of the radiobeacon 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 with the knowledge of the telegraph code. The radio direction-finding apparatus (radio compass) consists of a radio receiving set, similar in operation to those used for radiotelegraph or radiotelephone 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 made to vary, and by noting the position of the coil when the signal is heard or indicated instrumentally 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 the magnetic compass. Those using radio direction-finding apparatus aboard ship are cautioned to bear these errors in mind and to keep the radio direction-finder (radio compass) calibrated at all times. This may be done during clear weather by comparing the bearing obtained with the radio compass with the bearing as obtained by visual methods in general use. All radio bearings are subject to what is called "night effect," a variable error sometimes experienced near nightfall and sunrise. The uncertainty due to this cause may be lessened by taking repeated radio bearings.

The signals from the radiobeacons have definite characteristics for identifying the station. At some of the stations special radio and sound signals are synchronized for distance-finding purposes.

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

Vessels are requested to forward reports to the Commissioner of Lighthouses, Washington, D. C., or to the Superintendent of Lighthouses, Ketchikan, Alaska, as to the effectiveness of radiobeacons.

Radio bearings from other vessels.—Any vessel equipped with a radio direction finder can give a bearing to a vessel equipped with a radio transmitter and receiver. Such service will generally be furnished when requested, particularly by Government vessels. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio direction finder unless known and accounted for.

Any radio station, the position of the transmitter of which is *definitely known*, may serve as a radio beacon for vessels equipped with a radio direction finder. Canneries maintain radio stations and the Army has a net work of stations throughout Alaska. However, mariners are cautioned that stations established especially to give radio bearings for maritime service are more reliable and safer for use by the mariner, for numerous reasons. The geographic positions of commercial radio stations listed in various publications, generally, are only approximately given.

Many navigators are using the ship's radio direction-finder as a help in avoiding collision in fog, detecting with it the presence and observing the direction of approaching vessels.

RADIO DIRECTION-FINDER STATIONS, established and operated by the United State Navy, will furnish radio bearings to vessels equipped with radiotelegraphic transmitters. While the use of these bearings should not lead a mariner to neglect other precautions, such as use of the fathometer, the lead, etc., during thick weather, these bearings will greatly reduce the dangers incident to navigation in the fog.

Accuracy of bearings.—The accuracy with which bearings can be taken depends on various conditions and, while bearings taken by a station can generally be considered accurate to within 2°, the Government cannot accept any responsibility for the consequences of a bearing being inaccurate.

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 one-half before sunset and one-half hour after sunrise are occasionally unreliable. It is probable that the accuracy of a bearing is also affected if the ship's transmitting instrument is not adjusted to the correct wave length. Bearings signaled as "approximate" or "second class" should be regarded with suspicion as being subject to considerable error. The maximum distance for which bearings from these stations are accurate is 150 miles.

Direction-finder stations used as radiobeacons.—A naval direction-finder station when used as a radiobeacon transmits upon request, its call sign for 45 seconds on 375 kilocycles (800 m). When

so used, the position of the radio direction-finder station *transmitter* is used in plotting the bearing.

There is no naval radio direction-finder station open to the public within the approximate limits of this volume.

For further details regarding radio direction-finder stations see Hydrographic Office Publication No. 205.

CONVERSION OF RADIO BEARINGS TO MERCATOR 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 these 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 a Mercator chart, so it is necessary to apply a correction to a radio 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 25 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 radiobeacons or radio direction-finder station *receiver* or *transmitter* 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 radiobeacon and radio direction-finder stations found in Hydrographic Office Publication No. 205.

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

When bearings are taken from the ship, the sign of the correction (bearings read clockwise from the north) will be as follows: In north latitude, the minus sign is used when the ship is east of the radiobeacon and the plus sign used when the ship is west of the radiobeacon. In south latitude, the plus sign is used when the ship is east of the radiobeacon, and the minus sign is used when the ship is west of the radiobeacon.

To facilitate plotting, 180° should be added to the corrected bearing, and the result plotted from the radiobeacon.

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

When the bearing is from a radio direction-finder station shore, the sign of the correction will be reversed to that given when the bearing is taken from the ship, and the position of the radio direction-finder station *receiver* is used in plotting the bearing.

Example.—A ship in latitude 39°50′ N., longitude 67°35′ W., by dead reckoning, obtains a radio bearing of 299° true on the radiobeacon located in latitude 40°37′ N., and longitude 69°37′ W.

Radiobeacon station ..... Latitude, 40°37′ N.
Dead reckoning position of ship 39 50

Middle latitude, 40 14

Radio station ..... Longitude, 69°37′ W.
Dead reckoning position of ship 67 35

Longitude difference, 2 02

Entering the table with difference of longitude equals 2°, which is the nearest tabulated value, and opposite 40° middle latitude, the correction of 39′ is read.

The ship being east of the radiobeacon, the correction is minus. The Mercator bearing will then be 299° − 0°39′ = 298°21′. To facilitate plotting, add 180° and plot from the position of the radiobeacon, the bearing (298°21′ + 180°) or 478°21′ or 118°21′ (Mercator bearing reckoned clockwise from north true).

Table of corrections, in minutes

[DIFFERENCE OF LONGITUDE IN DEGREES]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
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	186	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 PUBLICATIONS.—The ***international general radio regulations*** are published in the Report to the Secretary of State by the Chairman of the American Delegation to the *International Radiotelegraph Conference, Madrid 1932* (also known as the International Telecommunication Convention). This publication is number 7 of the service documents described previously and is for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C.

Extracts from the International Convention for the ***Safety of Life at Sea,*** London 1929 (*affecting radio*) may be obtained from the Federal Communications Commission, Washington, D. C.

The ***Communications Act*** of 1934 with amendments and index thereto, and revised to May 20, 1937, is for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 10 cents.

Ship Radio Telegraph Safety Rules must be carried in the radio room under the present regulations of the Federal Communications Commission. This publication may be obtained from the Commission or from the Superintendent of Documents, Washington, D. C.

The International Bureau of the Telecommunication Union (Berne, Switzerland) publications give a complete description of radio communications throughout the world, including name of stations, call letters, geographic location, frequencies, types of emission, power, hours, nature of services, rates, and name of owners or operating agencies. Editions are issued in different languages, including English, which enable nations to adopt the Berne publications for their own local use. A list of the more important publications follows:

1. ***List of Frequencies,*** 8th Edition (February 1938), published once a year with monthly supplement. Price 21 Swiss gold francs.
2. ***List of Coast Stations and Ship Stations,*** 10th Edition (March 1938), published every 6 months, no supplement. Price 4.00 Swiss gold francs.
3. ***List of Aircraft and Aeronautical Stations,*** 9th Edition (November 1937), published every 6 months, no supplement. Price 2.90 Swiss gold francs.
4. ***List of Broadcasting Stations,*** 7th Edition (June 1937), published whenever necessary. Supplement every 6 months. Price 4.25 Swiss gold francs.
5. ***List of Stations Performing Special Services,*** 6th Edition (July 1936), published whenever necessary. Supplement every 3 months. Price 5.50 Swiss gold francs.
6. ***List of Call Letters of Fixed Land and Mobile Stations,*** 7th Edition (August 1937) published once a year. Supplemented monthly. Price 7.00 Swiss gold francs.
7. ***List of Fixed Stations,*** 4th Edition (March 1937), published once a year. Supplemented monthly. Price 7.70 Swiss gold francs.

NOTE.—The above prices include postage and are subject to fluctuations. Remittances should be made by international money order to the International Bureau of Telecommunication Union, Berne, Switzerland.

Information in the various *Berne publications*, concerning radio stations under the jurisdiction of the United States Federal Communications Commission, is currently corrected by a *radio service bulletin* published twice a month by the Commission. Changes in the rules and regulations of the Commission are also contained in the bulletin. The substance of the previous bulletins is not repeated in each new issue. The ***Radio Service Bulletin*** may be obtained from the Federal Radio Communications Commission, Washington, D. C.

Radio Aids to Navigation, United States Hydrographic Office Publication (*H. O. 205*), (1938 edition in two volumes) contains com-

prehensive information regarding radio service of value to navigation throughout the world. It may be obtained from the *Hydrographic Office*, Washington, D. C., price $1.80. This publication is divided into chapters according to the nature of the service rendered by the radio stations. In each chapter the stations are arranged, in general, in geographical order so that the mariner may readily determine the stations available in his vicinity. In addition this publication includes: Instructions, regulations, and general information regarding radio time signals, radio direction-finder stations, radio beacon stations, radio weather bulletins, storm and navigational warnings, medical advice by radio, distress signals, codes, etc. Additions and changes to this publication are issued weekly in the *Hydrographic Office Notice to Mariners* and extracts affecting it will be mailed to those not in receipt of the Notice to Mariners on request to the Hydrographic Office, Washington, D. C.

The ***Hydrographic Bulletin,*** issued weekly by the Hydrographic Office, contains at frequent intervals a very convenient table arranged in chronological order showing the broadcasting schedule of the United States Naval radio stations transmitting time signals, weather information, storm and navigational warnings. This bulletin may be obtained from the Hydrographic Office, Navy Department, Washington, D. C., without charge.

International Code of Signals (*American Edition*) *Vol. II.—Radio*, contains the international code whereby exchange of information in abbreviated form may be made between peoples speaking or not speaking the same language. This publication is for sale by the Hydrographic Office, Navy Department, Washington, D. C.

Radiobeacon charts issued by the United States Lighthouse Service show the radiobeacon stations with their characteristics and operating schedules. These charts may be obtained without charge from the offices of the District Lighthouse Superintendents.

The ***Light Lists*** issued by the United States Lighthouse Service contain information relating to radiobeacons and distance finding. A general description is given in the introduction, and the characteristics and operating schedules appear in the list.

Distribution of Weather Information by Radio (*Radio Circular No. 1*) is issued by the United States Weather Bureau.

2. SAILING DIRECTIONS

For the convenience of the navigator, the courses and distances for the more frequently traveled routes in western Alaska are shown below in tabular form. The courses given are those usually followed by vessels navigating the locality, but the tables should be used judiciously and should be considered as supplementing the latest charts.

The continual **current** setting northward and westward along the coast of Alaska should be given *special attention* in following the courses along the coast. Remarks on these currents will be found under the headings: General Information, Alaska Peninsula, Aleutian Islands, and Bering Sea.

Sailing directions for bays, harbors, channels, etc., not shown in the following tables, will be found under the headings of the various features.

Distance table.—The table of distances shown on page 37 is a reprint from *Distances Between United States Ports* published by the Coast and Geodetic Survey, price 10 cents.

Courses and distances

TABLE 1.—*Cape Spencer to Cape Hinchinbrook*

CHARTS (8002–8502)

	Course (true)	Distance in nautical miles	Distance from Cape Spencer in nautical miles
	°		
(Continued from course No. 192a, Alaska Coast Pilot, pt. I)			
1. To **Cape Spencer Lighthouse** bearing 0° true, distant 2 miles	227	10	0
2. To 1 mile off **Cape St. Elias** lighted whistle buoy	291	266	266
3. To **Cape Hinchinbrook Lighthouse**, bearing 28° true, distant 1½ miles	296	67	333
For route to Seward see table 4.			

TABLE 2.—*Cape Hinchinbrook to Cordova*

CHARTS (8520–8525)

	Course (true)	Distance in nautical miles	Distance from Cape Spencer in nautical miles
	°		
4a. To **Porpoise Rocks** abeam, distant 2¾ miles	328	5¾	339
5a. To abeam point 3 miles northward of Bear Cape. Keep 1 mile or more offshore	0	5¾	344
6a. To **Johnstone Point Light** abeam, distant 1¾ miles	26	7	351
7a. To **Middle Ground Shoal** lighted bell buoy abeam, distant ½ mile	69	9	360
8a. To **Hanks Island Rock** lighted bell buoy abeam, distant ½ mile	78	12	372
9a. To **buoy 3** abeam, distant 400 yards	82	5	377
10a. To a position ½ mile 17° true from **North Island.** Rock awash northeast from North Island is usually marked by a stake	58	3¼	381
11a. To a position 400 yards 95° true from **lighted buoy 2.** Follow buoys to Cordova	120	1⅛	382
12a. To **buoy 4**	203	1⅝	384
13a. To a position off **Ocean Dock**, Cordova. Except at slack water strong currents will be experienced in Orca Inlet	212	3	387

TABLE 3.—*Cordova to Latouche*

(CHARTS 8525–8551–8515)

	Course (true)	Distance in nautical miles	Distance from Cordova in nautical miles
	°		
14a. From off Ocean Dock to **buoy 4**	32	3	3
15a. To a position 400 yards 95° true from **lighted buoy 2**	23	1⅝	5
16a. To a position ½ mile 37° true from **North Island**	300	1⅛	6
17a. To a position 400 yards off **buoy 3**	238	3¼	9
18a. To a position 1½ miles 345° true from **Seal Island Light.** Pass north of buoy 2	259	49	58
19a. To **Point Helen Light** abeam, distant 1 mile	207	20½	79
20a. To **Point Grace** on port beam, distant ¾ mile	229	5¼	84
21a. To a point off the **wharf** at Latouche. For continuation to Seward see table following course No. 8	215	2	86

TABLE 4.—*Cape Hinchinbrook to Seward via Latouche*

(CHARTS, 8551, 8523, 8528, AND 8529)

	Course (true)	Distance in nautical miles	Distance from Cape Spencer in nautical miles
	°		
4. From a position 1½ miles 26° true from Cape Hinchinbrook Lighthouse to a point with the north tangent of **Montague Point** abeam	321	16½	349
5. To a position 1½ miles 345° true from **Seal Island Light.** Pass northward of buoy 2	277	12¼	362
6. To **Point Helen Light** abeam, distant 1 mile	207	20½	382
7. To **Point G ace** on port beam, distant ¾ mile	229	5¼	387
8. To northeast tangent of **Beetles Island** abeam, distant ½ mile	231	4¼	392
9. To a **position** midway between day beacon on left and light on right	263	1	393
10. To **day beacon** on starboard quarter	220	5	398
11. To tangent of **point** on port beam. Pass 500 yards off Lone Tree Point Light	282	3	401
12. To **Cape Puget** abeam, distant 1 mile	240	7¼	408
13. To **Cape Junken** abeam, distant 1 mile	254	6¼	414
14. To **Resurrection Bay lighted whistle buoy** ¼ mile on *starboard hand*	261	20¼	434
15. To a position 1 mile 345° true from **Hive Island Light.** Pass midway between Hive and Renard Islands	319	4½	439
16. To **Caines Head Light** on port quarter. Pass ½ mile offshore	4	5	444
17. To the railroad **wharf,** Seward	344	6¾	451

TABLE 5.—*Cape Spencer to Seward direct*

	°		
1. From a position with Cape Spencer Lighthouse bearing 0° true, distant 2 miles to 10 miles south (true) from **Middleton Island**	282	310	310
2. To a position ¼ mile southward of **Resurrection Bay lighted whistle buoy.** For continuation to Seward see table 4, course 15	291	97	407
3. To Seward	--------	16	423

TABLE 6.—*Seward to Kodiak*

	Course (true)	Distance in nautical miles	Distance from Seward in nautical miles
	°		
1. From the railroad wharf to **Caines Head Light** abeam	164	7	7
2. To southwest point of **Rugged Island** abeam, distant 1 mile	196	8	15
3. To **Pilot Rock Light** abeam, distant 1 mile. In case of thick weather course should be laid outside Seal Rocks	179	6¾	22
4. To **Chiswell Island** abeam, distant 1 mile	198	9½	31
5. To **Seal Rocks Light** on port beam, distant 1 mile	225	5¼	36
6. To **Sealion Rocks** on port beam, distant 3 miles. See remarks on currents in the vicinity of Tonki Cape, page 159	225	97½	134
7. To a point halfway through **Marmot Strait**	189	9½	143
8. To **Hutchinson Reef** buoy 250 yards on starboard beam	205	26	169
For directions from Hutchison Reef buoy to **Kodiak**, see page 188, positions 7 to 1.			

TABLE 7.—*Seward to Unalaska via Shelikof Strait*

	°		
1. From railroad wharf to **Caines Head Lighthouse** abeam	164	7	7
2. To southwest point of **Rugged Island** abeam, distant 1 mile	196	8	15
3. To **Pilot Rock Light** abeam, distant 1 mile	179	6¾	22
4. To **Chiswell Island** abeam, distant 1 mile	198	9½	31
5. To **Seal Rocks Light** on port beam, distant 1 mile	225	5¼	36
6. To **Outer Island** abeam, distant 5 miles	232	25	61
7. To **Gore Point** abeam, distant 5 miles	242	19½	81
8. To **East Chugach Island Light** abeam, distant 3 miles	256	17½	98
9. To northwest point **Ushagat Island** abeam, distant 4 miles	267	28	126
10. To **Cape Karluk** abeam, distant 5 miles	221	111	237
11. To **Foggy Cape** bearing 337° true, distant 10 miles	224	103	340

TABLE 7.—*Seward to Unalaska via Shelikof Strait*—Continued

	Course (true)	Distance in nautical miles	Distance from Seward in nautical miles
	°		
12. To the southeast point of **Mitrofania Island** abeam, distant 5 miles	237	69	409
13. To mid-channel position, **Gorman Strait**	244	56	465
14. To **Unga Spit Light** bearing 150° true, distant 1¾ miles. Pass 1¼ miles off light	281	21¾	487
15. To **Jude Island** on port beam, distant 3½ miles	243	15	502
16. To west tangent of **Cape Tolstoi** abeam, distant 3¾ miles	270	12¾	515
17. To **Bluff Point** abeam, distant 1 mile. Pass 1 mile off Ukolnoi Island beacon and 800 yards northwest of striped buoy marking 1¾-fathom rock. There is local magnetic attraction at Arch Point	239	15¾	531
18. To **Moss Cape** day beacon abeam	189	3½	534
19. To **Goloi Sandspit Light** bearing 85° true, distant ½ mile. Head for NW. point of Inner Iliasik Island	208	1	535
20. To **Inner Iliasik Light** bearing 266° true. Moss Cape day beacon should be astern	168	4¼	539
21. To **Inner Iliasik Light** abeam, keep in mid-channel	222	0¾	540
22. To **Morgan Point Light** on starboard beam, distant 2¼ miles	263	14	554
23. To **Fox Island Light** ¾ mile on port beam. There is local magnetic attraction at Vodapoini Point	242	4½	559
24. To **Umga Island** on port beam, distant ⅞ mile	228	14	574
25. To **Cape Pankof** Light 1¾ miles on starboard beam	226	14½	588
26. To **Seal Cape** abeam, distant 3 miles	252	58	646
27. To **Akun Head** abeam, distant 2 miles. Pass 3 miles off Scotch Cap Lighthouse. Strong currents may be experienced in crossing Unimak Pass	269	34½	680
28. To **North Head** bearing 128° true, distant 3 miles	252	14	694
29. To **Priest Rock Light** abeam, distant 1¼ miles	224	19¾	714
30. To south entrance, **Constantine Bay** abeam, distant 1 mile	212	4	718
31. To abeam **islet** off southern entrance to **Sumner Bay**, distant ⅞ mile	195	3½	722
32. To **Tuscarora Reef** lighted buoy. See pages 344 and 345 for directions for Unalaska and Dutch Harbor	220	2½	724

TABLE 8.—*Unalaska to Seward*

	Course (true)	Distance in nautical miles	Distance from Unalaska in nautical miles
	°		
1. From Tuscarora Rock gas buoy to **Ulakta Head** on port beam	40	2¾	3
2. To south entrance, **Constantine Bay** abeam	10	2¾	5
3. To **Priest Rock Light** abeam, distant 1¼ miles	32	4¼	10
4. To **North Head** abeam, distant 3 miles	45	20½	30
5. To **Akun Head** abeam	73	13	43
6. To **Seal Cape** abeam, distant 3 miles. Strong currents may be expected crossing Unimak Pass	89	34½	78
7. To **Cape Pankof Light** 1½ miles on port beam	73	58	136
8. To **Umga Island** on starboard beam, distant ⅞ mile	46	15	151
9. To **Fox Island Light** ¾ mile on starboard beam	48	13¾	16
10. To **Stag Point** abeam, distant 1¼ miles	61	5	169
11. To east tangent of **Inner Iliasik** abeam. Keep mid-channel through strait	84	13½	183
12. To **Inner Iliasik Light** bearing 266° true	44	0⅞	184
13. To **Goloi Island Sandspit Light** on starboard beam, distant ½ mile. Head for Moss Cape day beacon	348	4¼	188
14. To **Moss Cape** day beacon on port beam, distant ½ mile	28	0¾	189
15. To **Bluff Point** bearing 150° true. Head for Arch Point Light	8	3¾	192
16. To west tangent of **Cape Tolstoi** bearing 0° true. Pass 800 yards off striped buoy marking 1¾ fathom spot and pass 1 mile off Ukolnoi Island day beacon	59	15¾	208
17. To **Jude Island** on starboard beam, distant 3 miles	90	14	222
18. To **Unga Spit Light** abeam, distant 1¾ miles	59	13¾	236
19. To a mid-channel position in **Gorman Strait**	101	22	258
20. To southeast point **Mitrofania Island** abeam, distant 5 miles	64	55½	313
21. To **Foggy Cape** abeam, distant 10 miles	57	72	385
22. To **Cape Karluk** on starboard beam, distant 5 miles	44	102	487
23. To northwest point of **Ushagat Island** bearing 176° true, distant 4 miles	41	111	598
24. To **East Chugach Island Light** on port beam, distant 3 miles	87	27½	626
25. To **Gore Point** on port beam, distant 5 miles	77	16½	642

TABLE 8.—*Unalaska to Seward.*—Continued

	Course (true)	Distance in nautical miles	Distance from Unalaska in nautical miles
	°		
26. To **Outer Island** abeam, distant 5 miles	63	21	663
27. To **Seal Rocks Light** on starboard beam, distant 1 mile. In thick weather lay course outside of Seal Rocks	52	25	688
28. To **Chiswell Island** on port beam, distant 1 mile	45	4½	693
29. To **Pilot Rock** 1 mile on port beam	19	9½	702
30. To southwest joint of **Rugged Island** abeam, distant 1 mile	358	6¾	709
31. To **Caines Head Light** on port beam, distant ¾ mile	18	8	717
32. To railroad wharf, **Seward**	344	7¼	724

TABLE 9.—*Kodiak to Seward*

	Course (true)	Distance in nautical miles	Distance from **Kodiak** in nautical miles
	°		
For directions from **Kodiak** to **Hutchinson Reef buoy**, see page 187, positions 1 to 7.			
1. From **Hutchison Reef buoy** distant 250 yards bearing northwest, to a position halfway through **Marmot Strait**	25	26¼	31
2. To **Sealion Rocks** on starboard beam, distant 2½ miles. Keep in mid-channel through Marmot Strait	9	7¾	39
3. To **Seal Rocks Light** on starboard beam, distant 1 mile. In thick weather lay course outside Seal Rocks	45	99	138
4. To **Chiswell Island** on port beam, distant 1 mile	45	4¾	142
5. To **Pilot Rock** on port beam, distant 1 mile	19	9½	152
6. To southwest point of **Rugged Island** on starboard beam, distant 1 mile	358	6¾	159
7. To **Caines Head Light** on port beam, distant ¾ mile	18	8	167
8. To railroad wharf, **Seward**	344	7¼	174

TABLE 10.—*Seward to Cordova via Latouche*

	Course (true)	Distance in nautical miles	Distance from **Seward** in nautical miles
	°		
1. From railroad wharf, Seward, to **Caines Head Light** abeam, distant ⅝ mile	164	7	7
2. To south entrance point of **Sunny Cove** abeam, distant ½ mile	186	4¾	12
3. To **Ressurrection Bay** lighted whistle buoy on port beam, distant 400 yards	139	4¼	16
4. To **Cape Junken** abeam, distant 1 mile	82	20	36
5. To **Cape Puget** abeam, distant 1 mile	74	6	42
6. To **Lone Tree Point Light** on starboard beam, distant ½ mile	60	8	50
7. To day beacon on southeast point of **Evans Island** bearing 0° true	105	2¾	53
8. To Elrington Island day beacon on starboard beam. Keep in mid-channel	41	5	58
9. To east tangent of **Bettles Island** abeam	84	1	59
10. To **Point Grace** on starboard beam, distant ¾ mile	52	4½	63
11. To **Point Helen Light** on port beam, distant 1 mile	50	4¾	68
12. To **Seal Island Light** bearing 163° true. Pass ⅞ mile off and 1 mile beyond light	27	20¾	89
13. To **Channel Island Rock** buoy C3, 400 yards on port beam	79	49	138
14. To a position ½ mile 17° true from **North Island**. Rock awash NE. from North Island is usually marked by a stake	58	3¼	141
15. To a position 400 yards 85° true from lighted **buoy 2**. Follow buoys to **Cordova**	120	1⅛	142
16. To **buoy 4**	203	1⅝	143
17. To a position off the Ocean Dock at **Cordova**. Except at slack water, strong currents will be experienced in Orca Inlet	212	3	146

TABLE 11.—*Seward to Cape Hinchinbrook via Latouche*

	Course (true)	Distance in nautical miles	Distance from Seward in nautical miles
(For directions to Seal Island Lighthouse see table No. 10)			
1. From a position 1½ miles 345° true from Seal Island Light to **Middle Point** on starboard beam, distant 5 miles	° 97	13½	102
2. To a position with **Cape Hinchinbrook Lighthouse** bearing 28° true, distant 1½ miles	144	15¾	118

TABLE 12.—*Cape Hinchinbrook to Cape Spencer*

1. From a position 1½ miles 208° true from Cape Hinchinbrook to **Cape St. Elias** lighted whistle buoy abeam, distant 1 mile	° 116	67	185
2. To **Cape Spencer Lighthouse** bearing 0° true, distant 2 miles	111	266	451

TABLE 13.—*Seward to Cape Spencer direct*

1. From railroad wharf, Seward to **Caines Head Light** abeam	° 164	7	7
2. To south entrance point of **Sunny Cove** abeam, distant ½ mile	186	4¾	12
3. To **Resurrection Bay** lighted whistle buoy on port beam, distant 400 yards	139	4¼	16
4. To a point 10 miles south (true) from **Middleton Island**	111	97	113
5. To a point with **Cape Spencer Lighthouse** bearing 0° true, distant 2 miles	102	310	423

Distances between ports in Alaska and from Alaskan ports to Seattle, Portland, and San Francisco

From— \ To—	Ketchikan	Hyder	Wrangell	Petersburg	Juneau	Skagway	Sitka	Cape Spencer	Yakutat	Cordova	Valdez	Latouche	Seward	Seldovia	Anchorage	Kodiak	Uyak	Chignik	Unga	False Pass	Unalaska	Unimak Pass, 5 miles 294° true from Cape Sarichef Light	St. Paul Island	Nome	Point Barrow	Seattle (inside)	Juan de Fuca entrance	Columbia River entrance	San Francisco Bay entrance
Ketchikan	-----	143	86	115	224	306	[1] 225	314	453	701	713	704	737	825	953	816	882	1,040	1,116	1,245	1,360	1,308	1,542	1,935	2,444	649	587	707	1,191
Hyder	143	-----	229	258	367	449	[1] 368	457	596	844	856	847	880	968	1,096	959	1,025	1,183	1,259	1,388	1,503	1,451	1,685	2,078	2,587	682	672	792	1,276
Wrangell	86	229	-----	40	147	229	[1] 170	238	377	625	637	628	661	749	877	740	806	964	1,040	1,169	1,284	1,232	1,466	1,859	2,368	738	667	787	1,268
Petersburg	115	258	40	-----	110	190	[2] 158	197	336	584	596	587	620	708	836	699	765	923	999	1,128	1,243	1,191	1,425	1,818	2,327	764	668	788	1,269
Juneau	224	367	147	110	-----	100	[2] 159	107	246	494	506	497	530	618	746	609	675	833	909	1,038	1,153	1,101	1,335	1,728	2,237	873	749	869	1,350
Skagway	306	449	229	190	100	-----	[2] 186	132	271	519	531	522	555	643	771	634	700	858	934	1,063	1,178	1,126	1,360	1,753	2,262	955	810	930	1,411
Sitka	[1] 225	[1] 368	[1] 170	[2] 158	[2] 159	[2] 186	-----	-----	226	460	473	459	494	579	707	558	624	775	854	969	1,087	1,032	1,266	1,659	2,168	[1] 874	682	802	1,285
Cape Spencer	314	457	238	197	107	132	-----	-----	139	387	399	[3] 390	423	511	639	502	568	726	802	931	1,046	994	1,228	1,621	2,130	963	748	868	1,349
Yakutat	453	596	377	336	246	271	226	139	-----	272	284	[3] 275	314	404	530	412	484	648	722	852	967	915	1,149	1,542	2,051	1,102	873	993	1,474
Cordova	701	844	625	584	494	519	460	387	272	-----	76	86	148	258	386	283	333	494	590	699	814	780	1,014	1,407	1,916	1,350	1,092	1,212	1,689
Valdez	713	856	637	596	506	531	473	399	284	76	-----	83	144	254	383	282	334	493	588	697	812	779	1,013	1,406	1,915	1,362	1,105	1,225	1,702
Latouche	704	847	628	587	497	522	459	[3] 390	[3] 275	86	83	-----	61	172	300	200	250	410	505	615	730	695	929	1,322	1,831	1,353	1,091	1,211	1,688
Seward	737	880	661	620	530	555	494	423	314	148	144	61	-----	146	275	174	225	383	480	588	703	669	903	1,296	1,805	1,386	1,108	1,224	1,684
Seldovia	825	968	749	708	618	643	579	511	404	258	254	172	146	-----	137	112	137	296	392	501	616	578	812	1,205	1,714	1,474	1,173	1,288	1,735
Anchorage	953	1,096	877	836	746	771	707	639	530	386	383	300	275	137	-----	241	259	423	513	626	741	706	940	1,333	1,842	1,602	1,301	1,416	1,863
Kodiak	816	959	740	699	609	634	558	502	412	283	282	200	174	112	241	-----	78	237	335	447	562	510	744	1,137	1,646	1,465	1,133	1,244	1,679
Uyak	882	1,025	806	765	675	700	624	568	484	333	334	250	225	137	259	78	-----	178	269	377	492	440	674	1,067	1,576	1,531	1,199	1,310	1,745
Chignik	1,040	1,183	964	923	833	858	775	726	648	494	493	410	383	296	423	237	178	-----	121	228	343	291	525	918	1,427	1,689	1,307	1,371	1,808
Unga	1,116	1,259	1,040	999	909	934	854	802	722	590	588	505	480	392	513	335	269	121	-----	106	221	169	403	796	1,305	1,765	1,383	1,452	1,860
False Pass	1,245	1,388	1,169	1,128	1,038	1,063	969	931	852	699	697	615	588	501	626	447	377	228	105	-----	157	103	337	730	1,239	1,894	1,469	1,563	1,940
Unalaska	1,360	1,503	1,284	1,243	1,153	1,178	1,087	1,046	967	814	812	730	703	616	741	562	492	343	221	157	-----	69	237	661	1,170	2,009	1,583	1,673	2,034
Unimak Pass	1,308	1,451	1,232	1,191	1,101	1,126	1,032	994	915	780	779	695	669	578	705	510	440	291	169	103	69	-----	234	627	1,136	1,957	1,539	1,630	1,994
St. Paul Island	1,542	1,685	1,466	1,425	1,335	1,360	1,266	1,228	1,149	1,014	1,013	929	903	812	940	744	674	525	403	337	237	234	-----	70	985	2,101	1,773	1,864	2,228
Nome	1,935	2,078	1,859	1,818	1,728	1,753	1,659	1,621	1,542	1,407	1,406	1,322	1,296	1,205	1,333	1,137	1,067	918	796	730	661	627	470	-----	572	2,581	2,166	2,257	2,621
Point Barrow	2,444	2,587	2,368	2,327	2,237	2,262	2,168	2,130	2,051	1,916	1,915	1,831	1,805	1,714	1,842	1,646	1,576	1,427	1,305	1,239	1,170	1,136	985	572	-----	3,093	2,675	2,766	3,130

[1] Via Sumner Strait and Cape Ommaney. [2] Via Peril Strait. [3] Via Cape Hinchinbrook.

NOTES.—Distances from ports in southeast Alaska (except Sitka) to ports in western Alaska are via inside route to Cape Spencer.
Distances from ports east of the Alaska Peninsula to Unalaska are via Akutan Pass; to other ports north of the peninsula they are via Unimak Pass.
Distances to Seattle (inside) are via inside route to Cape Spencer.
Distances to Latouche from points eastward are via Cape Hinchinbrook.

3. YAKUTAT BAY TO CAPE ST. ELIAS

YAKUTAT BAY (chart 8455) is important as affording good anchorage in Yakutat Roads and Monti Bay, the best between Cape Spencer and Prince William Sound. (In this volume, only that part of Yakutat Bay and entrance leading to the anchorages is described. For information regarding other parts of the bay see United States Coast Pilot Alaska, pt. I.)

The **entrance** to Yakutat Bay is 16 miles wide between Ocean Cape and Point Manby. A submarine ridge with depths of 8½ to 16 fathoms (15.5 to 29.3 m) extends from the shoal water at Point Manby to the vicinity of Ocean Cape, forming a **bar** practically across the entire entrance. During very heavy weather, breakers or a pronounced increase in the height of seas have been observed all along this bar. The best water over the bar is about 2½ to 3½ miles westward of Ocean Cape. In places the bar is quite narrow and the water deepens rapidly on either side.

OCEAN CAPE, the eastern point at the entrance to Yakutat Bay, is low, well wooded, and marked by a light. Three bare, light-colored bluffs, from 50 to 70 feet (15.2 to 21.3 m) high, the western one forming the point of the cape, are an unmistakable landmark for it. On the southwest side of the cape a few rocks uncover at low tide, 250 yards from the beach.

An area of shoal, irregular depths, lies within the 10-fathom (18.2 m) curve westward from Ocean Cape and **Point Carrew.** A 5-fathom (9.1 m) lump near the 10-fathom (18.2 m) curve lies 1¼ miles 300° true from Ocean Cape. A northerly extension of this shoal area has depths of 6¾ to 8½ fathoms (12.3 to 15.5 m), and the northern limit of this extension is 2 miles 350° true from Point Carrew. The long and usually heavy ocean swell and the formation of the bottom cause this shoal area to be covered with enlarged seas and surf rollers. Breakers extend well offshore even in fair weather.

Monti Bay (chart 8455) is the first inlet on the eastern side of Yakutat Bay after entering at Ocean Cape. The bay extends 3¼ miles easterly from the entrance to the head. About 1 mile eastward of the head the bay opens at the north to join Yakutat Roads which is the anchorage used by vessels.

The northern shore of Monti Bay, near the entrance, is marked by a light. This shore, the southern side of **Khantaak Island,** is foul. The island is low and wooded, except **Point Turner,** which is a tongue of sand covered with grass and bushes and is a good mark.

A boulder ledge extends about ⅜ mile off **(Point Munoz)** the westernmost point of Khantaak Island, and broken bottom extends ¾ mile off the shore between Point Munoz and the light. A reef extends nearly ¼ mile into Monti Bay from the Point Turner spit, and drops off quickly from the 3-fathom (5.5 m) curve to 30 fathoms

(55 m). The outer end of the reef is marked by a buoy. In ordinary weather the breakers along this shore are a sufficient guide.

Southeast Shoal lies ⅜ mile east of Point Turner and is marked by a buoy on its southeasterly side. The entrance to Yakutat Roads lies between Southeast Shoal and Yakutat Village on the mainland. The shoal uncovers about 2 hours after high water, and except at highest tides a few of the larger stones at the southwest portion show above water. At low water the bare shoal is about 200 yards in extent. At a distance of ¼ mile north-northwestward of the center of Southeast Shoal are two rocks awash at lowest tides.

Yakutat is a post office and native village on the north side of the eastern end of Monti Bay and on the east side of Yakutat Roads. There are a Government school, a well-kept hospital, dwellings, and two general stores. At ⅜ mile eastward of the school is a cannery and wharf, 267 feet long, with a least depth (at its southern end) of 17 feet (5.2 m) at its outer face. Fresh water can be obtained on the wharf. The company runs a general store in one of the wharf buildings. The cannery operates a **radio station** (call letters KKA) during the season. There is also a floating cannery in operation here during the season. Some of the mail steamers call at Yakutat. A United States deputy marshal is stationed at Yakutat.

Yakutat Roads lies between Yakutat and the shoals extending from the southeast end of Khantaak Island. It has a clear width of ⅜ mile, a length of nearly 1 mile, depths of 5 to 25 fathoms (9.1 to 46 m), muddy bottom, and anchorage can be made in almost any part of it. The best anchorage for large vessels is in 22 to 23 fathoms (40 to 42 m) with the point at the north end of the village bearing 141° true, distant 700 yards, and Point Turner 250° true. Smaller vessels can anchor closer in off the middle of the shoal cove north of the village in as little as 10 fathoms (18.3 m), but care must be taken not to anchor in a less depth. Anchorage may also be made at the head of Monti Bay below the cannery in 20 to 25 fathoms (37 to 46 m), muddy bottom.

Yakutat Roads at its north end connects through **Johnstone Passage** with a number of bays and arms, which separate the numerous islands and rocks east of Khantaak Island. The channels are not navigable at low water except for small craft, though the inclosed bodies of water have depths from 20 to over 100 fathoms (37 to 183 m).

Port Mulgrave is suitable only for small craft with local knowledge. It is ¾ mile long and 200 yards wide, and its north side is formed by Village and Middle Shoals. Its entrance is close to the north side of Point Turner, between it and Middle Shoal, and is 60 feet wide and 16 feet (4.9 m) deep. **Middle Shoal** shows at one-quarter ebb; parts of **Village Shoal** show at high water.

Rurik Harbor is a narrow shallow indentation in Khantaak Island north of Village Shoal with depths of 9 to 15 fathoms (16.5 to 27.4 m) in its entrance. Small vessels can anchor here, but should not go above the south point at the entrance. Its entrance is from Yakutat Roads north of Southeast Shoal. **Prince Shoal,** partly bare at low water, extends ⅜ mile east-southeastward from the north point at the entrance.

Point Manby, the western point at the entrance to Yakutat Bay, is low and wooded. There is usually a heavy surf on the beach, rendering it dangerous for boats to land. The great **Malaspina Glacier** descends to within about 4 miles of Point Manby.

Between Point Manby and Cape Suckling, the **COAST** is fairly regular, being formed by river and glacier deposit. Remarks on coastal **currents** in the Gulf of Alaska are given under General Information, page 4.

Sitkagi Bluffs (chart 8002) 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. Westward of the bluffs the glacier recedes from the coast about 4 miles up the Yahtse and Yana Rivers, and then reaches the water again at the head of Icy Bay.

Tides.—The mean range of tide at Port Mulgrave is about 7½ feet (2.3 m) and the range between mean lower low water and mean higher high water is 9½ feet (2.9 m). High and low waters occur about one-half hour later than at Sitka.

ICY BAY (chart 8457) has been formed by the recession of Guyot Glacier, a part of 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 bar extends across the entrance of Icy Bay roughly in the shape of a crescent, the outer limits being about 6 miles off the entrance. 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 the breakers 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 and 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 in entering. 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 velocity of about ½ knot.

Communication.—There are no settlements on Icy Bay. The nearest point where supplies may be had is Yakutat. 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.—There is a prominent mountain ridge ending in a tongue-shaped point at Guyot Glacier on the glacier's western side. Bring the eastern end of the tongue-shaped point, which is about 800 feet (244 m) high, to bear **29½° true** (N. mag.) and steer in on this bearing until the south tangent of Point Riou is abeam. (NOTE.—The glacier may have receded since these directions were determined in 1923, so that the end of the tongue-like point in sight may now be farther to the eastward.)

Then if bound to an anchorage off the western shore, steer **307° true** for 3 miles until the pyramid-shaped mound or hill, 40 feet (12.2 m) high, and 150 yards north of a cabin bears 284° true. 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, then steer **104° true** 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** 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.

There is no information available as to the present condition of these cabins.

Yakataga Reef (chart 8002) 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.

It is the highest of a large number of snow-clad peaks in its immediate vicinity.

From Mount St. Elias a high ridge of snow-covered mountains extends westward to the Copper River country. From offshore, **Malaspina** and **Bering Glaciers** appear as an ice field from Yakutat Bay to the Bering River. In clear weather this section of the coast affords scenery of great grandeur.

CAPE SUCKLING (chart 8513) 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 from the western bluff mentioned in the preceding paragraph and 3¾ miles 260° true from Cape Suckling.

Okalee Spit, forming the south side of Controller Bay, is low, with 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 (22.9 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 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 shoals 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 (between Kayak and Wingham Islands) 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.

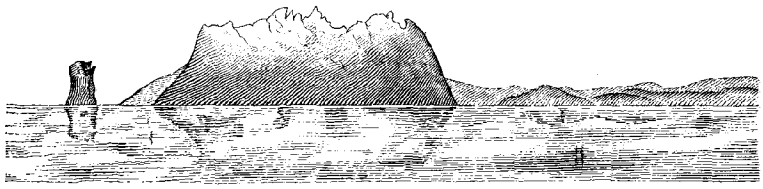
Kayak Island is 17½ miles long, has peaks 1,110 to 1,390 feet (338 to 424 m) high in the central portion, and slopes gradually to its northern part, which is low and wooded. **CAPE ST. ELIAS**, the south end of Kayak Island, is an important and unmistakable landmark. It is a precipitous, sharp, rocky 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 second, eclipse 4.2 seconds, flash 0.8 second, eclipse 14.2 seconds), is 85 feet (25.9 m) above the water and visible 15 miles. It is a white square tower at the corner of a rectangular building.

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

The **radiobeacon** sounds groups of 3 dashes for 60 seconds and is silent for 120 seconds. It is operated at all times during thick or foggy weather and in clear weather from 10 to 20 and from 40 to 50 minutes of each hour.

Cape St. Elias lighted whistle buoy, showing a flashing white light is located 2.9 miles 200° true from Pinnacle Rock off the cape.



Cape St. Elias, looking Northwest, mag.; 10 miles away

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. In approaching, care should be exercised in crossing the shoal extending from the cape to the Pinnacle Rock. The depths here are reported to be shoaling.

The eastern coast of Kayak Island is strewn with boulders and landing is impracticable. Rocky shoals with 11 feet (3.4 m) over them lie 1¾ miles 172° true 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, 145 miles.**
Cape Spencer, **111° true, 263 miles.**
Klokachef Point, Salisbury Sound, **117½° true, 307 miles.**
Cape Edgecumbe, **121° true,** 321 miles.
Cape Ommaney, **124° true,** 383 miles.
Summit of Forrester Island, **130° true, 467 miles.**
Cape Hinchinbrook, **297° true, 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 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.

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.

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.

Anchorage.—Good protection from all except westerly winds can be found on the west side of Kayak Island. The smoothest water will usually be found between Sea Ranger Reef and Kayak Entrance. This anchorage is much frequented by fishing vessels during the halibut season.

An indifferent anchorage can be had on the east side of Kayak Island in 15 to 20 fathoms (27.4 to 36 m) about 1½ miles offshore midway between Cape St. Elias and Lemesurier Point. The holding ground here is poor and a vessel should be ready to move on short notice.

4. CAPE ST. ELIAS TO CAPE HINCHINBROOK AND MONTAGUE ISLAND (OUTER COAST)

Between Cape St. Elias and Cape Hinchinbrook there are numerous high, snow-covered mountains that are visible on a clear day, but identification is difficult and they are not of much use in fixing positions.

It has been found convenient to approach **Hinchinbrook Entrance** (p. 56) on a radio bearing using the radiobeacon station at Cape Hinchinbrook, and taking cross bearings on the radiobeacon at Cape St. Elias as an aid in clearing Wessels Reef and Seal Rocks. It is reported that the currents along this ***approach*** set southwesterly invariably, and occasionally with a velocity of 2½ knots; accordingly extreme caution is required in approaching Hinchinbrook Entrance in thick weather.

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 westward from the side of the low wooded spit on Kayak Island, and a reef, partly bare at low water, extending 350 yards off 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 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** course until the southeast tangent of Wingham Island bears 6° true. Then steer **18° true** 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 Isnand, 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, 3/8 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) 3/8 to 1/2 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 1 1/2 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 3 1/4 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 sometimes 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 from the east around through south to southwest. During the early spring and fall, northwest winds blow with great force over the flats. There is a great deal of cloudy misty weather during the summer. Fog is infrequent and usually clears 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 southeastward of Kanak Island, observations show an average velocity of about 2 knots at strength of current. To obtain the approximate times of the slacks and strengths add 20 minutes to the predicted times of current in Wrangell Narrows given in the Pacific Coast Current Tables. Small tide rips occur when the wind is against the current. Around the north end of Wingham Island the tidal current strengths have velocities of about 1½ knots. The times may be obtained by adding 30 minutes to the predictions for Wrangell Narrows.

KATALLA BAY (chart 8513), 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 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, gasoline, and distillate. The depth in the river is ample for boats that can cross the bar.

The oil company maintains 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 eastern end of the town bearing between 17° true and 355° true. 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** 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** 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 (charts 8502 and 8513) emerges through the mountains between **Miles and Childs Glaciers,** above which there 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 **Martin Point** to Point Bentinck (eastern end of Hinchinbrook Island) the coast is fringed with a chain of low sand **islets** lying 4 to 5 miles from shore. The shoals extending seaward from the sand islets in the section off the Copper River Delta have not been developed by surveys; however, danger may be avoided by giving these islets a berth of more than 3 miles and by avoiding depths less than 10 fathoms (18.3 m). The **shoals** extending about 4 miles seaward from Egg Island and Point Bentinck were surveyed in 1916, see chart 8520.

The area back of the chain of islets between Points Martin and Bentinck is largely composed of **tidal flats** of mud and sand intersected by sloughs. The sloughs connect with the Copper River passes, Glacier River, Eyak River, and with channels in Orca Inlet (p. 62) and Hawkins Island Cut-Off; and they drain into channel outlets to the sea. The principal channel outlet passes just eastward of Egg Islands, marked by a **light,** and is connected with **Alaganik Pass** (main outlet to the **Copper River)** by a comparatively deep slough across the tidal flats.

Half-way along the slough from Egg Islands to Alaganik Pass is a sand flat which bares soon after high tide. The slough skirts close to the northwestern end of this flat and leads off to the northward toward **Glacier River** for about ½ mile, thence leads in a straight line to the pass. The current flow in the slough is strong.

Navigation in this region is limited to small craft and local knowledge is necessary. Anchorage may be found in the wider parts of the sloughs northward of the Egg Islands; there is no protection from the prevailing winds but seas are broken down by the surrounding flats.

The **Egg Islands** (chart 8520) are low and partly grass-covered. On one of the islands is a group of trees of which a dead tree was the highest in 1916.

Alaganik Pass (chart 8502), the westernmost and main outlet of the 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 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.

Mountain Slough is 1½ miles westward from the mouth of Eyak River. There are two clam canneries on this slough.

Point Whitshed (chart 8520) is at the southern extremity of the **Heney Range,** the steep eastern side of which flanks the alluvial coastal region of the Copper River. The **waterfall,** 1 mile from the point on the coastal side of the ridge, is a prominent landmark, seen for several miles over the mud flats, and it shows well when the peaks and higher land are cloud-covered. The higher peaks on Heney Range, as well as those on Hinchinbrook Island, are generally sharp and bare-topped. The end of the peninsula westward from Heney Range is covered with rolling hills. **Government Rock,** at Point Whitshed, is 30 feet (9. 1 m) high and rounded in outline.

The irregular **slough,** marked by stakes, trending east and west near Point Whitshed and Twin Rocks has a ruling depth of about 1 foot (0.3 m) at low water. When the **Twin Rocks** are just covered, the depth in the slough is increased to about 6 feet (1.8 m). Twin Rocks may be avoided by bringing the summit of Mummy Island, a rounded wooded knoll, in range with the 1845-foot (562 m) mountain peak on Hawkins Island.

There is an unused radio tower near **Gravel Point,** the mainland point about 1 mile eastward from Mummy Island. Two clam canneries are located at Gravel Point.

Mummy Island is wooded. Clam diggers have established themselves in small houses hidden among the trees. There is a clam cannery on the island. A **light** is established on one of the eastern islets off Mummy Island, where there is an approach through a slough. The **islet,** ¼ mile southwest of Mummy Island, has two steep ends, 75 feet (22.8 m) high, with a low flat strip between them. **Little Mummy Island** is rounded in outline and profile.

About 1 mile southward of Mummy Island is **Pinnacle Rock,** 75 feet (22.9 m) high, bordering on the slough extending from Point Bentinck to Mummy Island.

POINT BENTINCK is a low sandy point, grass-covered and with sand dunes and brush ½ mile back. The brush covers a ridge extending southwest from **Strawberry Hill** at the south shore of Boswell Bay. The 798-foot knoll northward of Boswell Bay is prominent.

At low tide, sand flats are bare for 2 miles off Point Bentinck. Part of this area is above ordinary high tide, offering a footing for sparse grass and a lodging place for driftwood. Shoal water continues off the point in a southeasterly direction, and at a distance of about 4 miles from the point the shoal drops off into deeper water.

The approach to the **channel** at Point Bentinck should be made from the eastward, following the low water line of breakers extending westward from Egg Islands. To round the shoals extending from

Point Bentinck, in entering, is not advisable. After crossing the bar the uhannel becomes deep and narrow abreast of Point Bentinck. Low water is the best time to negotiate the entrance as the flats are bare and of some aid. A stranger, however, should not attempt this entrance.

There is a ¾-fathom (1.0 m) **rock** in mid-channel about 1 mile northward of Point Bentnick. As it stands squarely in a swift current it is often indicated by ripples on the surface. With local knowledge it is best to avoid by picking up a safe range on the northeast point of Hinchenbrook Island.

Boswell Bay, indenting the eastern end of Hinchinbrook Island, affords anchorage for small craft just inside the entrance. **Boswell Rock,** massive, lies 100 yards off the northern entrance point. Immediately adjacent to the point itself is an **under-cut rock.** A very small rock lies 100 yards outside of Boswell Rock. To enter bring the 67-foot (20.4 m) rock (brown in color and near the southern shore of the bay) just clear of the southernmost rock (pinnacle) inside the entrance, and run in on the course (210° true) of this range until abreast of Boswell Rock. Then haul southward a little and anchor when the northeast point of Hinchinbrook Island is just shut in on the *under-cut rock*, selecting a position to swing clear of the shoal water bordering the sandy shore on the southeast side. The best protection given is from northwest winds.

Hinchinbrook Island (southeast coast).—A mountain ridge parallels the southeast (outer) coast. The tree line is about 1,000 feet (305 m) above sea level, and the summits of the islands are bare. The peaks are not prominent and from offshore they are difficult to identify.

The **promontory** between **Point Steele** and **Hook Point** is 2 miles broad and is faced with 200-foot (61 m) bluffs. The land recedes from the bluffs and there is swampy land back of them. Low land and sand beaches lie adjacent to the promontory on either side. A boat can land in good weather on the northwest side of Hook Point and ½ mile northward of Point Steele. Reefs make out ⅜ mile from the promontory.

Northeastward of **Cape Hinchinbrook** (p. 57) 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 west side of the promontory.

Hinchinbrook Entrance is described on page 56.

MONTAGUE ISLAND, east coast (chart 8551).—The island is high and mountainous and wooded to an elevation of about 1,000 feet (305 m). There are no distinctive peaks, although **Montague Peak,** the most northerly one of the range, may be distinguished from the southward. A striking characteristic of the eastern part of the northern half of the island is the regularity of the succession of spurs reaching from the mountain range to the coast, where the spurs terminate in dirt bluffs with comparatively steep slopes. **Purple Bluff** is the southernmost bluff of this series and 20 miles from Zaikof

Point. This bluff has a purple hue especially in the afternoon. Southward of Purple Bluff, a conspicuous valley trends far inshore and is drained by a river.

A **constant current** southwestward is reported along the east coast of Montague Island (see remarks on Currents under General Information, p. 14).

There are no settlements on Montague Island, but a number of fish traps are operated on the western shore of the island. Many brown bears live on this island and they are said to be ferocious.

From **Zaikof Point** (p. 52) to Purple Bluff the outer coast of Montague Island is unbroken and free from outlying dangers excepting Seal Rocks. About 3½ miles southward of Purple Bluff a spit extends ½ mile offshore terminating in a group of rocks awash at m. l. l. w.

Box Point (chart 8515), about 5 miles southward of Purple Bluff, is about 130 feet (40 m) high and is comparatively level, with steep bluffs, giving a rectangular appearance. Two box-shaped islets about 30 feet high lie off the point, and foul ground extends 1½ miles eastward from the point. Convenient temporary anchorage in fair weather can be found northward of Box Point.

A **bay** indents the coast of Montague Island between Box Point and Wooded Islands. It is about 4½ miles wide and, being open to the eastward, offers little protection from the prevailing easterly gales. A comparatively large river enters the bay with depths of about 1 foot at m. l. l. w. on the bar at the entrance, with deeper water inside. The bay has not been surveyed.

Wooded Islands are a group of islands lying from 14 to 18 miles northeastward from Cape Cleare, the southwestern extremity of Montague Island. They extend from 1 to 3 miles offshore. The largest island is about 1 mile long. It is wooded, flat-topped, and about 130 feet (40 m) in height. **Tanker Island,** lying ⅜ mile eastward from the largest islands, is low and flat. When viewed from the southwestward it has the appearance of a tank steamer heading inshore, a small clump of trees showing as the smokestack and deck house. The northeasternmost island of the group is small with a tree-covered summit. From the southwestward its profile has the appearance of a whale on the surface of the water, heading inshore. A reef was observed extending a short distance northeastward from this island.

Reefs and foul ground extend around the Wooded Islands, and they should be given a berth of 2 miles. There appears to be no passage between the largest island and the mainland. At low water a reef can be seen which probably extends completely across the passage.

The survey of the coast from Wooded Islands to Cape Cleare disclosed no outlying dangers, but there are areas of broken bottom near the shore and vessels are advised to give the coast a berth of 3 miles.

Jeanie Cove is a bight lying 10 miles northeastward from Cape Cleare. It is exposed to the southward and affords no protected anchorage. There are numerous reefs and rocky patches in this vicinity and it is one to be avoided if possible.

A rock which bares 2 feet (0.6 m) at mean lower low water lies ¾ mile off the western entrance point, and a reef bare at low water

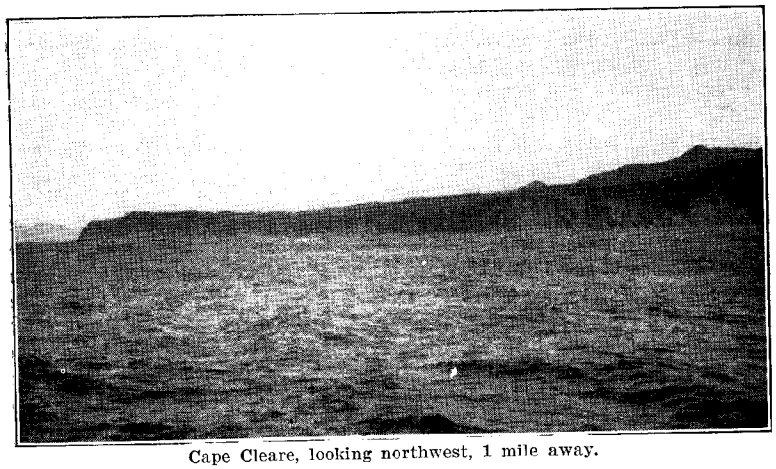
exists ¾ mile off Jeanie Point, the eastern entrance point. There is a distance of 1¾ miles between the two dangers.

Jeanie Point, the eastern entrance point to Jeanie Cove, is bold with rock cliffs. Back of the cliffs the land is timbered and rolling. There is a prominent detached rock lying a short distance southward of Jeanie Point.

To enter Jeanie Cove, pass midway between the entrance points and anchor in not less than 10 fathoms (18.3 m), sand and gravel bottom.

The first prominent point to the northeastward from Cape Cleare is bold with eroded bluffs and there is a prominent pinnacle rock about 100 yards off the point. Deep water extends close up to the point. The point is separated from the higher peaks back of it by a neck of land somewhat lower than the outside point.

There is an exposed anchorage in the bight about 2 miles southwestward from the above point in 10 to 20 fathoms (18.3 to 37 m), sand and gravel bottom.



Cape Cleare, looking northwest, 1 mile away.

CAPE CLEARE (chart 8515) is the southwestern extremity of Montague Island. It is gently rounding and consists of eroded bluffs with rocky beaches. Back of the cliffs the cape is timbered and undulating with the ground gradually rising to the mountain masses near by. The headland 7 miles northeastward of Cape Cleare and the 1,900-foot peak near the headland are separated from the main ridge by a deep valley. When viewed from a position southwestward of the cape, the peak has the appearance of a detached conical island. There is a detached rock with a double head 25 feet (7.6 m) high lying about 75 yards off the southwest pitch of the cape.

In 1928 a breaker was seen about ⅜ mile off the south tangent of Cape Cleare. The least depth found was 6 fathoms (11.0 m), but there may be less.

Except for a fringe of rocks near the beach and the above breaker, there are no known outlying dangers. There is considerable uneven bottom, however, and dangers may exist. For this reason the cape should be given a berth of at least 1 mile.

Strong tidal **currents** sweep around the cape and tide rips are frequently encountered.

The west coast of Montague Island is described on page 90; the north coast, on page 89.

MIDDLETON ISLAND (chart 8551), about 60 miles southwestward of Cape St. Elias, is 4½ miles long in a north and south direction and is 1 mile wide at its widest part near the southern end. It is entirely covered with grass and its comparatively low and general level surface makes it difficult to pick up when making a landfall.

When viewed from a few miles offshore the island appears as a flat. The highest ground to the south, elevation 126 feet (38 m) is composed of two parallel rows of **hummocks** or **mounds**, which are the island's most distinctive feature when at a distance of not greater than 5 miles. The surface slopes gradually to the north end which terminates in a sand spit.

Second in prominence in approaching Middleton Island is a solid group of **trees** on top near the center. They appear as a dark mass on the skyline and are visible from all directions except the south. Viewing the island from the westward, two similar groups of trees near the southern end sometimes have the appearance of two detached rocks or islets when the island is partly below the horizon. A pinnacle rock at the extreme southern end is conspicuous from the eastward and westward.

The entire eastern and southern sides terminate in bold, nearly vertical hard-clay **cliffs** upon which numbers of sea fowl make their nests. The steepest and highest section of cliff is found on the west side and extends for 1 mile from the southern extremity of the island. There is also a short section of cliff midway on the western shore.

Driftwood in large quantities was found buried in the gravel layer underlying the humus, formed by decayed grasses. It is much in evidence along the cliff's walls at an elevation of 25 to 40 feet (7.6 to 12.2 m) above high water, particularly on the east side of the island.

A small sand islet about ¾ mile northwestward of the northern end is about 4 feet (1.2 m) high. Seas breaking on this islet give the appearance of a breaker. This islet as well as the northern spit changes shape after each storm. The channel between this islet and the main island has a depth of 2½ fathoms (4.6 m) in the middle, but strong rips occur and it is dangerous to navigate.

Middleton Island has been used as a fox ranch and people have lived on the island for many years. It is now uninhabited and the few buildings are in a bad state of repair.

The entire island is fringed with reefs and rocks and heavy kelp to a distance of ⅜ mile. Breakers occur at greater distances. Foul ground extends 2 miles southward of the island, terminating in a number of breakers, which break at all times except in smooth weather. Seaward of these breakers, the bottom falls off rapidly into deep water.

Broken bottom extends 3 miles to the eastward, terminating in a number of breakers which first begin to appear when a moderate swell is running. This side of the island should be given a wide berth.

The waters westward of Middleton Island are clear of offlying dangers, giving an easy approach to the anchorage from this direction.

The best **anchorage** is about 1¼ miles west of the middle of the island in 10 to 12 fathoms (18.2 to 21.9 m) sand bottom. The anchorage is protected from the eastward from magnetic north to magnetic south, and furnishes fair protection from the prevailing easterly gales. The *Surveyor* rode out several severe blows here. The tidal currents at the anchorage have an estimated velocity of 2 knots, setting northward along the shore on the flood and southward on the ebb.

The best **landing place** on Middleton Island is in the bight on the western side, and is marked by the detached short section of cliff. At low water the shore 100 yards south of this spot is calm, due to the protection of a small hooked gravel spit which bares at low water.

At the northern and southern ends of the Island the **current** is irregular and sets eastward and westward. Tide rips are visible several miles to the south of the island and to the northward in the vicinity of Fountain Rock.

Fountain Rock, lying 4 miles 357° true from the northern end of Middleton Island, breaks only in heavy weather. The least depth found on it is 4½ fathoms (8.2 m) although shoaler water may exist. It should be given a good berth.

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 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.

5. PRINCE WILLIAM SOUND

HINCHINBROOK ENTRANCE (chart 8520), between Montague and Hinchinbrook Islands, is used by vessels entering Prince William Sound from eastward and southeastward, while **Elrington Passage** (p. 94) is used by vessels approaching from southwestward. Hinchinbrook Entrance is about 6 miles wide, and clear with the exception of Seal Rocks.

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.

The **tidal currents** in the entrance set directly in or out of the sound. In Hinchinbrook Entrance, Montague Strait, and Latouche Passage slack water occurs about the time of high water or low water within Prince William Sound; 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.*** See remarks on currents under General Information, p. 4.

Current observations in ***Elrington Passage*** indicate an average velocity at strength of current of 1½ knots. To obtain the times of slacks and strengths add 2 hours and 10 minutes to the predicted times of current in Sergius Narrows given in the Pacific Coast Current Tables.

With a strong southerly gale and ebb tide, very heavy overfalls and tide rips occur in **Hinchinbrook Entrance,** which are very dangerous to small craft. Tremendous seas, steep and breaking, are sometimes encountered just outside the entrance. During heavy weather, there are tide rips and confused seas in the vicinity of Wessels Reef. Many halibut schooners have foundered in the area between Cape St. Elias and Montague Island.

Tides.—In ***Prince William Sound*** high and low water occur about the same time as at Cordova. The mean range of the tide at Cordova is 10 feet (3.0 m) and the range between mean lower low water and mean higher high water is about 12½ feet (3.8 m). Daily tide predictions for Cordova are given in the tide tables published annually by the Coast and Geodetic Survey.

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.

CAPE HINCHINBROOK is on the eastern side of Hinchinbrook Entrance, the principal entrance to Prince William Sound from the eastward.

There are a few rocky islets close to the southeast side of the Cape, 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 Lighthouse, flashing white every 15 seconds, is located on the southwest point of Cape Hinchinbrook, 235 feet (72 m) above sea level, and is visible 22 miles. The light is shown from a white square tower in the corner of a building. The fog signal is a diaphone (two-tone, air) blast 5 seconds, silent 40 seconds.

Records over a period of 18 years show an average of 773 hours of fog per year at the lighthouse. The figures range from 353 hours in 1926 to 1,521 hours in 1920.

Cape Hinchinbrook Radiobeacon is in operation. For position see page 22.

Zaikof Point is the entrance point on the western side of Hinchinbrook Entrance and the northeastern end of Montague Island. **Schooner Rock,** a pinnacle 75 feet (22.9 m) high, lies about ¼ mile off Zaikof Point.

At the northern end of **Montague Island** are three prominent points forming Zaikof and Rocky Bays, and low depressions run through from the heads of these bays to the western side of Montague Island (p. 90).

Zaikof Bay (chart 8520) 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. It is between the short reef at the western point and the middle of the cove, where two rocks bare at half tide lie close to the shore. This anchorage is exposed to winds from north to east, and a swell makes in during southeast gales.

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.

Middle Point is the point separating Zaikof and Rocky Bays. An old wreck of a steel steamer is grounded on Middle Point.

Rock 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. 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** (p. 90).

PORT ETCHES (chart 8520) is an inlet in the southwest end of **Hinchinbrook Island.** It has 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, 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; 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 Point Horn and steer **93° true.** 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 3/8 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.

The chart shows a rock marked position doubtful in about the center of the cove, and for that reason it should be used with caution.

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 among them and also 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 3/8 mile southwestward of Point Barber.

In good weather steamers have anchored 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, and the southeast one of the three largest Porpoise Rocks in line with the end of Hinchinbrook Island, bearing 191° true, in about 10 fathoms (18.3 m), sandy bottom.

Nuchek is an abandoned 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 being at **Phipps Point.** 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 mostly shallow, but has an area ½ mile long and 3/8 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. Among them are 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 western islet, between the foul ground at the islets and a shoal of 9 to 10 feet (2.7 to 3 m) extending 600 yards eastward from Phipps Point.

To enter Constantine Harbor pass 100 yards southwestward of the western islet on a west-northwesterly course. Before coming up to the western islet on this course, care is necessary to avoid the foul

ground extending south-southeastward from the islet. 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, 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 the same time as at Cordova. The mean range of the tide at Port Etches is 9 feet (2.7 m), and the range between mean lower low water and mean higher high water is about 11 feet (3.4 m).

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 off the sand beach and southwestward of the sharp point, in about 10 fathoms (18.3), 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, visible 9 miles.

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, bead 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 lighted bell buoy.

Hawkins Island Cutoff, 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 (chart 8520) is the eastern arm of Prince William Sound, northward of Hinchinbrook and Hawkins Islands. From its entrance between Johnstone Point and Knowles Head, Orca Bay extends about 30 miles in a general 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 clear with the exception of **Middle Ground Shoal** (p. 142). 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. See page — for description of Port Gravina.

Gravina Point 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 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 1/4 mile southward and westward from the islet.

Hanks Island, small and wooded, lies 3/4 mile eastward of Sheep Point and 1/2 mile from shore. **Gatherer Rock,** 5/8 mile 124° true 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 7/8 mile southward from Hanks Island, and is marked at its south end by a lighted bell buoy.

Simpson Bay lies just eastward of Sheep Bay. The shores are fringed with numerous rocks and islets. In navigating the northerly arm, care should be taken to avoid the rock, awash at extreme low tide, which lies 400 yards southward of the eastern entrance point of the inner part of the bay. Anchorage may be had at the head of the arm between the flats and the islands southward in about 15 fathoms (27.4 m).

The east arm of Simpson Bay is clear except near the shores. Good anchorage may be had on either side of the twin islands in the upper part of the arm in 12 to 15 fathoms (21.9 to 27.4 m). Chart 8520 is the guide.

Bomb Point is the eastern entrance point to Simpson Bay.

Hawkins Island is about 20 miles long and mountainous, with elevation 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 1/4 to 3/8 mile off the spit at the south end of **Cedar Bay** in 9 to 12 fathoms (16.5 to 21.9 m), soft bottom. There is a round, wooded islet at the north end of this spit, and a larger wooded one 1/2 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).

Windy Bay is a small bay on the northwest coast of Hawkins Island about 5 miles northeastward from Canoe Passage.

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 1/2 mile wide and is called **The Narrows.** A rock with 12 feet (3.7 m) over it lies 3/8 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 3/8 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 to **Mummy Island** (p. 50). From North Island to Spike Island the western side of the inlet is shoal, and southward of Spike Island the inlet is filled largely 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. The cable is laid in the channel westward of Observation Island.

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

The **rock,** bare at low tide, lying ⅜ mile northeastward from North Island is usually marked by a stake.

Shepard Point, formed by a sand spit, lies 1½ miles northeastward from North Island. There is a cannery here and a wharf with a least depth of 27 feet (8.2 m) alongside. There is a marine railway capable of hauling out small craft up to about 65 tons. There is telephone communication with Cordova.

An idle cannery (1937) is located on the south shore of Orca Inlet about 1½ miles northeastward from Shepard Point. There is a least depth of about 35 feet (10.6 m) off the face of the wharf which is about 75 feet in extent.

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

The deepest channel and the one used by the larger vessels, is north of North Island, and then follows the eastern shore with a least width of 350 yards and a ruling depth of about 4 fathoms, and is marked by buoys. The master of the *S. S. Yukon* reports (1935) that shoaling has occurred in the main channel of Orca Inlet, northeastward of buoy N4, rendering passage for vessels of 22 feet (6.7 m) during minus tides inadvisable. A rock bare at three-quarters ebb lies 650 yards northeastward from the north end of North Island. This rock is usually marked by a stake by the local cannery people.

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. The bight extending ½ mile northward from the Ocean Dock 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 19 feet (5.8 m). At this point the channel is about 250 yards in width between the 18-foot (5.5 m) curves. Odiak Channel was resurveyed

in 1930 and the shoal to westward was found to have encroached considerably on the channel. There was but little change in the critical width. A red buoy and a black buoy mark the channel, 7/8 mile southward of Observation Island; vessels using the passage pass between the two buoys.

Orca Cannery is on the eastern shore southeastward from Observation Island. There is a least depth of 23½ feet (7.1 m) at the face of the wharf. Fresh water is available.

CORDOVA (chart 8525), 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, and by wireless or 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.

A United States **deputy marshal** is stationed at Cordova. There is a third-class **relief station** of the United States Public Health Service and a private **hospital** (p. 8). For **customs** see page 9. One of the larger cutters of the United States **Coast Guard** is stationed at Cordova (p. 11). The **Signal Corps, United States Army,** operates a radio station (WXU).

There is a Federal project to provide a sheltered harbor for small boats, with a depth of 10 feet (3.1 m) protected by a north breakwater 1,100 feet long and a south breakwater 1,400 feet long. No work has been done as yet on this project (June 1937).

The **Ocean Dock** is the terminus of the Copper River & Northwestern Railroad. It has a face of 740 feet and a least depth alongside of 19½ feet (5.9 m.) at a point near the center of the face. Wharfage charges are made. Water may be obtained at a flat rate of $10 per service. On the flood tide the current sets off the dock, making landings difficult at times. There are strong tidal currents in Orca Inlet.

The steamer on regular trips to the westward (summer schedule) uses Ocean Dock on Wednesday and contacts the Seattle steamer that night or Thursday. This wharf may be approached to observe whether or not it is clear. If not available, there is plenty of time to sheer off and proceed to an anchorage.

The **City Dock** extends from the town of Cordova over the flats toward Spike Island. It has a face of 190 feet and a least depth of about 24 feet (7.3 m) alongside (1931). This wharf is used mostly by fishing vessels. Water is free. In 1937 the face of the City Dock was reported to have been extended to 311 feet. There is no rail connection. The channel leading to this dock is marked by two lighted beacons.

The Bureau of Fisheries maintains a **float landing** at the city dock.

Quantities of copper ore are shipped from Cordova to the smelter at Tacoma, Wash.

There is good **anchorage** in the channel westward of the ocean dock and Spike Island in 8 to 10 fathoms (14.6 to 18.3 m). Buoys mark the edge of the flats on the west side of the channel.

Spike Island is about 300 yards wide and wooded.

Orca Inlet southward of Cordova to **Mummy Island** (p. 50) is filled largely with flats. The channels through the flats are subject to change and have not been surveyed in recent years.

Tides.—Daily tide predictions for ***Cordova*** are given in the tide tables published annually by the Coast and Geodetic Survey.

Currents, *Orca Inlet.*—Off Orca the average velocity of the strengths is about 1 knot. The slacks and strengths occur about 40 minutes later than at Wrangell Narrows, daily predictions for which are given in the Pacific Coast current tables.

The current sets directly off the face of ***Ocean Dock*** 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.

Off ***Cordova*** the average velocity of the strengths is about 1½ knots. The slacks and strengths occur about 10 minutes later than at Wrangell Narrows.

For ***directions,*** Cape Hinchinbrook to Cordova, see page 29.

PORT GRAVINA (chart 8519), northern arm Orca Bay, has its entrance between Gravina Point and Red Head (p. 61).

A 5½-fathom (10.1 m) **bank** lies near the middle of Port Gravina between Gravina Rock and St. Matthews Bay.

Gravina Rock lies about ¾ mile offshore near the southeastern entrance point.

Comfort Cove is a small inlet on the southeast shore about 6 miles from the entrance. The entrance is narrow and the cove is suitable for small craft only.

Beartrap Bay is a narrow bay near the head of Port Gravina. There are rocks awash and areas of broken bottom in midchannel just within the entrance. About 1¼ miles from the entrance is an island which nearly blocks the channel. The channel which is deep, lies on the north side of the island. Depths of 28 to 30 fathoms (51 to 55 m), mud bottom, will be found in the upper basin.

The upper end of Port Gravina is deep and terminates in mud flats which extend for 1¼ miles to the head of the bay.

Parsha Bay is a small bay on the north side of Port Gravina. Depths of 40 to 30 fathoms (73 to 55 m) extend nearly to the head of the bay and there is no suitable anchorage.

An extensive area of rocks, islets, and foul ground extends about 1 mile southwestward from Parsha Bay.

Olsen Bay lies 1½ miles westward from Parsha Bay. The bay shoals gradually from 20 fathoms (36 m) at the entrance to the mud flats at the head.

In entering, the western shore should be followed at a distance of ½ mile or less to avoid the foul ground extending southwestward from Parsha Bay. Chart 8519 is the guide.

St. Matthews Bay, about 3 miles long and ½ mile wide, indents the northern shore of Port Gravina 5½ miles northeastward from Red Head. The only known dangers are a reef extending ⅜ mile off the eastern entrance point and a rock awash lying 200 yards south true from the prominent point on the west side of the bay, 1 mile within the entrance. Good anchorage may be had near the head of the bay in 14 fathoms (25.6 m), mud bottom.

Between Red Head and St. Matthews Bay there are a series of lagoons. **Hells Hole** is the local name for the northeasternmost one. This shore should be given a berth of ¾ mile or more.

PORT FIDALGO (chart 8519), an eastern arm of Prince William Sound, has its entrance between Goose and Blight Islands and extends northeastward (mag.) 22 miles or more. There are abandoned 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 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 with northwest winds, but the bottom is irregular and it should be avoided by large vessels. 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.

Two Moon (Bowie) Bay indents the southeast shore of Port Fidalgo. Low divides extend through to Orca Bay from the head of its two 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 midchannel course should be followed in the arms. At the head of the southeast arm is a basin trending southward (mag.) 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, 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 midchannel.

In **Whalen Bay** 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 midchannel course, and find anchorage in 7 to 10 fathoms (12.8 to 18.3 m) in midchannel 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. 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 **east arm** at the head of Fidalgo Bay 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 northeasterly point. The head of the arm terminates in a narrow passage which opens out into a circular lagoon. It is reported that this passage is foul and should not be attempted.

Anchorage at the head of Fidalgo Bay for vessels of any size, well sheltered from wind and sea, may be found in midchannel ⅝ mile westward from the rock bare 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 midchannel, ¾ 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 ¼ mile from the west side. The channel is eastward of the island and is obstructed near the middle by a rock with 3½ 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, ¼ to 1 mile above the island, in 8 to 13 fathoms (14.6 to 23.8 m), with soft bottom in places.

Landlocked Bay is on the northwest shore of Port Fidalgo between Bidarka Point and Graveyard Point. 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. Near the middle of the narrows is Armeria Rock, with 6 feet (1.8 m) over it. The channel is northwest of the rock, 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. Water can be conveniently obtained from a fall on the south side of the bay southeastward of the old mine.

There are no commercial enterprises in this bay. The mines are abandoned and the wharves have fallen into ruins.

To enter Landlocked Bay follow the western shore at a distance of about ½ mile, pass in midchannel westward of the islets below the narrows, and pass about 50 yards northwestward of the buoy in the narrows, above which the midchannel 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 ¼ 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. The old mine wharf has disappeared.

In the approach to Boulder Bay a reef bare at the lowest tides lies ⅝ mile from Bligh Island. About ¼ mile eastward of this reef is a spot with 2½ fathoms (4.6 m) on it.

A **sunken rock,** nearly awash at low water, lies ⅜ mile from a point on the eastern shore and 1⅝ 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.

The chart is the guide for entering Boulder Bay.

Bligh Island, on the eastern shore of Prince William Sound, is 4½ miles long, 3 miles wide, and mountainous. The southwest end of the island is a steep, wooded head 1,634 feet (498 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 ¼ mile 208° true (S. mag.) from the southwest end of the island.

Bligh Reef is ¾ mile long with depths from 7 to 28 feet (2.1 to 8.5 m). It is marked at its south end by a lighted 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 day beacon, bearing 23° true, leads through the middle of the channel. The steamship *Olympia* was lost on Bligh Island Reef in 1910.

Busby Island, off the northwest end of Bligh Island, is 1¼ 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 ¼ 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 2¼ hours before the times of low water and high water, respectively, at Kodiak.

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 an Indian village on the northeast shore at the southeast end of the narrows. It is inhabited, and the houses are visible from 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.

Ellamar is on the northeast side of Virgin Bay. The mine is abandoned and the wharf has fallen into ruins. Two shoals lie in the narrows in the approach from northwestward to Virgin Bay—one with 15 feet (4.6 m) over it and the other with about 17 feet (5.2 m). The channel to the old wharf is marked by two buoys.

Anchorage can be had ¼ to ⅜ mile from the northeast shore of Tatitlek Narrows, and ½ to ¾ mile westward of the old ore dock at Ellamar, in 12 to 16 fathoms (21.9 to 29.3 m), sticky bottom.

VALDEZ ARM (chart 8519), the main northern arm of Prince William Sound, extends about 13 miles in a N. ¼ E. (mag.) direction from Busby Island and **Point Freemantle** to the northern end of Valdez Narrows, and then turns to about 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. 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. The depths are great throughout except for flats off the mouths of streams. Care should be observed in the vicinity of the narrows about 3 miles from the entrance 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 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 ¾ mile wide at the entrance and ¼ to ⅜ mile wide 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. A small vessel can anchor about 300 yards west-

ward of the islet near the lower end of the flat at the head, and the same distance from the south shore in about 15 fathoms (27.4 m).

Valdez Narrows is about 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 and is marked by a light.

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

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.

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 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 with 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 (55 m).

Fort Liscum is the site of a former army post and cannery. The buildings have been destroyed by fire.

VALDEZ is a town at the head of Port Valdez. There are stores, hotels, assay office, and ore-testing plant, and provisions and supplies 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 4 months in the year. Valdez is headquarters for the third judicial division. A United States marshal is stationed here. **Radio communication** is had through Cordova WXU. For customs, see page 9.

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 but there is no fuel oil available. Gasoline and distillate can be had.

There is no hospital at Valdez (see p. 8). A salmon cannery is operated by the Philips Canning Co.

The wharf of the Midas mine is located on the south side of Port Valdez, about 1½ miles eastward of Fort Liscum. The mine is not in operation.

Currents.—At the entrance to Valdez Arm, west of Rocky Point, the mean strength of current is about ½ knot.

Directions,* Port Valdez.—*From Hinchinbrook Entrance.—Give Cape Hinchinbrook a berth of 1½ miles, and when the lighthouse bears 70° true, distant 2¼ miles, steer **349° true,** 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, and Bligh Island Reef lighted buoy should then be on the starboard beam, distant 2 miles.

Then steer **30° true** 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** 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** 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** for 5¼ miles to a position 1 mile eastward of Point Helen Light. Then steer **26° true** for 20 miles and pass 1 mile westward of Seal Island. When Seal Island Light bears 141° true, distant a little over 1 mile, steer **51° true** for 8 miles, passing 1⅜ miles southeastward of Smith Island and to a position with the buoy bearing 281° true, distant 1⅝ miles. Then steer **24° true** 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. Bligh Island Reef lighted buoy should then bear about 79° true distant 2 miles. Then steer **30° true** and follow the directions in the preceding paragraph.

GLACIER ISLAND (chart 8519) 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** (chart 8517), near the center of Prince William Sound, form a group about 8 miles long north and south, with a greatest width of 6 miles. They are 700 to 1,317 feet (213 to 401 m) high, and are wooded to the summits.

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 (p. 88), preferably between the 50-fathom curves. See the directions for Passage Canal from Hinchinbrook Entrance, page 75.

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; 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.

PRINCE WILLIAM SOUND, NORTHWEST PART.—The principal approaches to Passage Canal (p. 75) 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).

Columbia Bay (chart 8519) lies directly westward of Point Freemantle. It is unsurveyed, but is known to be deep. **Columbia Glacier** discharges into the head of the bay. During the summer season passenger vessels often enter Columbia Bay to offer the passenger a view of the glacier.

Long Bay lies between Columbia Bay and Wells Bay. It is unsurveyed and there is no information available.

Wells Bay is a large bay just eastward from Unakwik Inlet. It is unsurveyed and there is no information available.

Unakwik Inlet (chart 8551) is a long, unsurveyed inlet lying northwestward from the Storey and Naked Island group. No description of the inlet is available. There is an abandoned salmon cannery on the east side of the inlet about 10 miles above the entrance. Some piling of the cannery wharf probably remain. A bar which crosses the inlet at a point northward of the abandoned cannery holds the glacier ice in the head of the inlet. For about one-third of the width of the channel this bar consists of a rocky ridge above the highest tides, extending from the eastern side of the inlet.

There is a rock, depth unknown, at the entrance to the cove south of the cannery ruins.

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** 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** for about 4¼ miles heading for the northern end of **Axel Lind Island.** When the north end of Naked Island is abeam, change course to **9° true,** 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 midchannel 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 771½° true 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.

The entrance to Unakwik Inlet should be navigated with caution.

Lone Island (chart 8517), about 3 miles eastward of Perry 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, in the northwestern corner of Prince William Sound, is wooded to a height of about 1,000 feet (305 m). It 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 (21.9 and 31 m) soundings shown on chart 8517.

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 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.

Wells Passage lies between Esther and Culross Islands.

Esther Island is mountainous, wooded to a height of about 1,000 feet (305 m), and the summits are bare rock. The peak on the southeast point of Esther Island, and the sharp, twin peaks 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) surrounds Esther Rock, extending ¼ to ½ mile from it.

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 (chart 8551), **Cochrane Bay,** and **Blackstone Bay** (Chart 8517) are not surveyed, some sounding having been done by exploring parties as shown on the chart. Some mining development has been done on Port Welles.

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 Hobo 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 (chart 8517) has its entrance at the southwest end of Port Welles 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 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.

Shotgun Cove, 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 selecte anchorage just below this foul ground, in 15 to 20 fathoms (27.4 to 37 m).

The bight on the southeast side of Shotgun Cove 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, 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.

Passage Canal was at one time considered as a possible terminus of the Alaska Railroad.

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** 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** 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** 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** 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** for 25 miles, heading for the 1,235-foot (376 m) peak on the east side of Naked Island until Smith Island light is abeam, distant 3½ miles. Then steer **275° true** for 7 miles, heading for Point Eleanor until the west end of Naked Island opens from its south point.

Then steer **319° true** 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** 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,** 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** 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 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-south-

easterly 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. Vessels requiring little swinging motion may anchor at the entrance of this arm in 18 fathoms (33 m), mud bottom.

The western arm is clear in midchannel 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. It is reported that there is a rock along the face of the dock near its upper end, and that deep-draft vessels can not lie there at low water.

The Copper River Packing Co. operates a **radio station** (call letters KDD or KGI) during the fishing season.

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 PASSAGE and **Knight Passage** (chart 8551), on the west and south sides of Knight Island (p. 81), are 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 (p. 78), where it is 5 miles wide, it extends 16 miles in a 196° true 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 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.

Pleiades Islands, in the middle of the bend in Knight Island Passage, are a chain of 7 wooded islands 1 mile long. The southernmost and largest is about 80 feet (24.4 m) high. The **rock,** about 400 yards westward of the middle of the chain, bares at m. l. l. w. The northern island of the Pleiades is marked by a **light** obscured

on its southwest side between the bearings 343° and 128° true (bearings are to the light).

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 (p. 71) make good a **211° true** 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. Channel Rock (p. 82), off the eastern side of the passage is a good mark.

Then steer **196° true** for Pleiades Islands with Lone Island astern; having stood 7 miles on this course, New Year Islands, on the north side at the entrance to Drier Bay, should bear about 1½ miles on the port beam. Continue the **196° true** 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** 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** 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.

Main Bay (chart 8517), on the western shore of Prince William Sound, 4 miles 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 made 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 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 of 14 fathoms (25.6 m) or possibly less, extends ⅝ mile northward from the south point at the entrance of Eshamy Bay.

Eshamy Bay, between Point Nowell and Crafton Island, affords anchorage only for small craft 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 formed by the hook is about 300 yards in diameter and apparently clear, and affords anchorage for small craft in about 5 fathoms (9.1 m).

DANGEROUS PASSAGE (chart 8515) separates Chenega Island from the mainland. The northern entrance of the passage is obstructed for a distance of about ⅝ mile off the north end of Chenega Island by a group of islets and rocks, including **Junction Island,** which is low and wooded. The northernmost obstruction of the group is a rock awash at low water. It is difficult to pick up the northern entrance at night.

About 5½ miles from the northern entrance of Dangerous Passage, the passage is restricted by a group of islets; **Delenia Islet,** the largest, lies in the middle of the passage and is wooded. A small grassy islet lies 350 yards northward of the wooded islet. A shoal of 3½ fathoms (6.4 m) lies 450 yards north of the grassy islet. The deepest and straightest channel lies between this shoal and the nearby western shore of Dangerous Passage, and it is only 225 yards wide. The channel to the eastward and southward of the wooded islet is wider, but a rock, bare only at lowest tides, must be avoided. The rock is 250 yards 100° true from the grassy islet.

The best **anchorage** in Dangerous Passage is in the vicinity of Delenia Islet. There is good holding ground about ¼ mile south-southwestward (mag.) of the islet in 15 to 20 fathoms (27.4 to 37 m). Anchorage for a small vessel may be found in the adjacent area eastward of Delenia Islet.

Granite Bay is on the north side of the northern entrance to Dangerous Passage. Depths in the bay are irregular. It is not recommended for anchorage.

Paddy Bay is about 3 miles southwestward of Granite Bay. A rock awash at low water lies 330 yards 264° true from the southern end of the island near the head of the bay and near midchannel leading to the northwestern arm. The bay affords anchorage for moderate-sized vessels in either of the two arms at the head.

Ewan Bay indents the north shore of Dangerous Passage about 5 miles from the north entrance. A number of rocks and islets fringe

both shores of the bay but midchannel is deep and clear. The entrance to the lagoon at the head of the bay is obstructed by rapids. At high tide there is a strong set into the lagoon near its entrance. Small vessels may anchor at the head but it is rather deep.

Jackpot Bay is about 3 miles southward of Ewan Bay. A wooded islet lies near the middle of the entrance. The narrows, 1½ miles above the entrance have a width of 250 yards. At the upper end of the narrows is a midchannel rock baring 8 feet (2.4 m) at m. l. l. w. This rock lies on range with the eastern tangent of the narrows and the highest point of the wooded islet at the entrance. Depths in the bay are generally too deep for anchoring. Two basins at the northern part of the bay are suitable as anchorages for small craft, but the entrances are very narrow.

Icy Bay (chart 8551) is at the southwestern extremity of Dangerous Passage. It is separated from Port Bainbridge by a narrow neck of land of moderate height. A precipitous wooded island 310 feet (94 m) high lies off the east entrance point. Active glaciers in **Nassau Fiord** and at the head of Icy Bay keep the bay filled with ice at most times and make it dangerous for small boats to enter these waters. Anchorage and good shelter from ice can be found in the bight on the west shore of Icy Bay, ¾ mile northward of the entrance to Nassau Fiord. No soundings have been made in Icy Bay.

Whale Bay is 2 miles eastward of Icy Bay. A low portage at the head of the western arm of this bay connects with the head of Port Bainbridge. Whale Bay has not been surveyed. Ice from Icy Bay often obstructs the entrance.

CHENEGA ISLAND has a bold but fairly regular shore bordering on Knight Island Passage. Its highest summit is near the center, 2,330 feet (710 m).

Masked Bay indents the south shore of Dangerous Passage 2 miles southwestward from its northern entrance. There are a number of wooded islets in the entrance leaving a channel only 100 yards wide. Small vessels will find excellent anchorage in the bay, but local knowledge is required for entering.

The south shore of Chenega Island is indented by several small bays where small vessels can find anchorage and shelter from the prevailing northeast storms. **Chenega village** lies at the head of a cove marked by three small wooded islets. A rock baring 4 feet at m. l. l. w. lies 150 yards north of the northernmost of these islets. A school and church are located at the village but practically no supplies are available. There is a prominent landslide back of the village.

Small vessels may **anchor** in the cove fronting Chenega in 5 to 15 fathoms (9.1 to 27.4 m), soft bottom. The anchorage is only partly protected from the south by the entrance islets and is not recommended in southerly weather. ***To enter,*** pass 300 yards west of the entrance islets on a **0° true** course until within 300 yards of the shore, then swing sharply to the right and head for the cross on the church, a white, green-roofed, structure. Anchor in a suitable depth.

Ice.—All the bays in this vicinity are liable to freeze over in cold weather. The ice floes from Icy Bay at times make navigation difficult west of the Pleiades Islands and extend to some extent northward into the southern part of Dangerous Passage. The discharge is con-

tinuous but irregular in volume, and the ice flow is mainly southeastward. When heavy it blocks the entrance to Whale Bay and passes southward of the Pleiades Islands. Isolated bergs of considerable size frequently drift eastward as far at Latouche and are a menace to navigation. A considerable ice floe has been known to pass southward through Bainbridge Passage and then northward into Prince of Wales Passage. No ice was observed east of Delenia Island.

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 (chart 8517) 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).

For a description of the bare rocks off the east side of Eleanor Island, see page 88.

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.

Ingot Island lies between Upper and Lower Passages. 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. 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 eastward from the southeast point of Ingot Island. A rock, with 3¾ fathoms (6.8 m) on it and which should be avoided, lies ½ mile eastward 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 Ingot Island. 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 western entrance point of Louis Bay. A rock, bare at half tide, lies 350 yards from the western shore, ¾ mile inside the northwest end of the pas-

sage. 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 from **Passage Point.** These rocks are well out of the usual track of vessels going through Lower Passage.

Entering Lower Passage ***from eastward,*** vessels sould pass southward of the two small outlying bare rocks. 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** 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, 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 225 yards from the east side.

Herring Bay, at the northwest end of Knight Island, 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 center of the bay; 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 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 depth of 17 fathoms (31 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** course. From Knight Island Passage a **98° true** 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.**

Squirrel Island, 9½ miles southward of Herring Point and ½ mile from the eastern shore, is the northernmost of the islands extending 1½ miles northward of the entrance to Drier Bay. It is 180 feet (55 m) high, and wooded.

Newyear Islands lie on the northern side of the approach to Drier Bay. They are wooded, and the largest one is 200 feet (61 m) high. A **light** is located on the most southerly timbered island of the Newyear group. Bare reefs extend 250 yards southward from the light. A rock bare at low water lies ¼ mile 19° true from the north island, and is a serious danger in the channel between Newyear Islands and the islands northward.

DRIER BAY (chart 8524) has its main approach between Newyear Islands and Mummy Island, 4½ miles northward of the Pleiades (p. 77). The southeast shore of the bay is indented by a number of smaller bays and coves.

Drier Bay has been examined by means of the wire drag from the 50-fathom (91 m) curve at the entrance to the head of the northern arm and found to be clear of dangers except for those shown on the chart.

Mummy Island, on the south side at the entrance to Drier Bay, is 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 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 from the north end of Mummy Island.

Clam Islands, two in number, low and wooded, lie between Newyear Islands and the north point of Drier Bay. A rocky patch with

3¾ fathoms (6.7 m) over it lies 600 yards southward from Clam Islands.

Range Isle, small and wooded, lies close to the north side of Drier Bay and 2 miles inside Newyear Islands. The line of Range Isle just clear of the north shore eastward of it, bearing **75° true,** 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 of Drier Bay, 2 miles from Mummy Island, is 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 ¾ fathom (1.2 m) over it.

Cathead 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 Drier Bay entrance. The shoal is marked by a red nun buoy on the northwest side of the shoal.

When **entering Cathead Bay,** favor the east side to avoid Cathead Shoal and the ¾-fathom rock, 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 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).

A salmon cannery was formerly located on the south shore of Drier Bay about 2 miles northeastward from Clump Point, the eastern entrance point of Mallard Bay. There was a wharf here with depths suitable for the largest of the coasting steamers. The cannery equipment has been removed to Port Audrey cannery.

Barnes Cove 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 northwest side of this point.

Chase Island, small and wooded, lies 700 yards from the northwest side of Drier Bay and 1¾ miles above Range Isle. A ledge bare at low water extends 300 yards southward from Chase Island.

A rock awash at half tide lies ⅜ mile 61° true 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.**

Port Audrey is the name given the northwestern arm of Drier Bay. There is a salmon **cannery** and wharf here with a least depth of 32 feet (9.8 m) at the wharf. The Alaska Pacific Salmon Co. maintains a **radio station,** call letters KTT.

A **rock,** with 10 feet (3 m) over it, lies about 400 yards 180° true from the wharf. The rock is marked by a buoy planted just westward from it. Vessels approaching the dock pass to the westward of the buoy and on leaving pass eastward of it. There is a shoal spot just eastward of the dock, and vessels leaving the dock should not forge ahead but should have the bow swung out by means of a gas boat or an anchor.

Near the cannery there is a narrow entrance to a lagoon which affords a good anchorage for small craft in 6 to 10 fathoms (11 to 18.3 m). There is about 7 feet (2.1 m) in the entrance and a flat extends 250 yards from the head of the lagoon. A sunken rock lies in the entrance 50 yards from the eastern shore and 100 yards southeast of the narrows.

Port Audrey is subject to violent winds blowing in and out of the arm. With an onshore wind it is difficult for a ship to get away from the dock.

The former post office and mine at Midknight are now entirely abandoned with only deserted shacks remaining.

Northeast Cove, on the southeast side at the head of Drier 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).

A rock with 2¾ fathoms (4.8 m) over it lies about 300 yards off the south shore 500 yards westward from the entrance to Northeast Cove.

Anchorage can be selected about ¼ mile from shore in the north end of Drier Bay, in about 20 fathoms (37 m).

***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 (p. 78) 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** for the north end of Mummy Island and pass about ½ mile southward of *Newyear Islands light.* When the light is a little abaft the beam, steer **84° true** and pass about ⅜ mile northward of Mummy Island into the bay.

From southward, steer **16° true,** with Pleiades Islands astern until about 1 mile past the southeast point of Chenega Island. Then steer **64° true** with the southeast point of Chenega Island astern and pass about ⅜ mile northward of Mummy Island.

Entering about midway between Mummy Island and the bare rocks southward of Newyear Islands, steer **84° true** for 3¼ miles, passing ¼ mile southward of Range Isle. When 400 yards from the southeast shore above Mallard Bay, steer **50° true** until Chase Island is abeam, distant about 600 yards.

Then steer **38° true** for ¾ mile, passing 250 yards southward of the black can buoy. From this point shape the course for Port Audrey, passing westward of the buoy marking the 10-foot (3 m) rock. The passage is narrow, but it has been swept by the wire drag and found to be clear. On leaving Port Audrey, pass in midchannel between the buoy and the eastern shore.

Southward of Drier Bay (chart 8523) there are two large **islands** on the east side of Knight Island Passage, separated from Knight Island by Long Channel. Mummy Island, the northern one is described on page 83. **Squire Island,** the southern one, is 3 miles long and about 900 feet (274 m) high. A ledge, bare at low water,

lies ¼ mile southward from the south end of Squire Island. Two islands lie ¼ mile off the west side of Squire Island, and from these islands a large reef extends ⅜ 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 4½ miles long and the midchannel is clear so far as known. The channel is generally ¼ to ⅜ mile wide, but narrows to 175 yards abreast Mummy Island and to 50 yards ¾ mile from the north end of Squire Island. A rock, covered at high water, lies in the northern entrance ¼ mile eastward from the north end of Mummy Island. The tidal currents have little velocity.

From southward, the midchannel courses at **22° true** for 1 mile, then **358° true** for ¾ mile to the southern end of the narrowest part of the channel abreast Squire Island, then **8° true** for 2½ miles to the northern end of the narrowest part of the channel abreast Mummy Island, and then **30° true** into Drier Bay.

Copper Bay, on the east side of Long Channel, is 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.

The Pleiades Islands are described on page 77.

Italian Bay and **Lucky Bay** are two unimportant bays indenting the south shore of Knight Island between Long Channel and Mummy Bay.

Mummy Bay (chart 8523), in the south end of Knight Island, is deep and clear, but rocks extend ¼ mile from the head. Small vessels can anchor ½ mile from the head in 15 to 20 fathoms (27.4 to 37 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 are two wharves here, the one on the south shore has a 100-foot face and 18 feet (5.5 m) at the inner end. Two herring reduction plants are operated here. Fresh water may be obtained during the summer while the plants are in operation. Thumb Bay affords anchorage for small vessels in 12 to 15 fathoms (21.9 to 27.4 m).

Little Bay, on the south side of Knight Island, 1¾ miles westward of Point Helen, is 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.

POINT HELEN (chart 8515), the southeastern extremity of Knight Island, is marked by a flashing white light 35 feet (10.7 m) high.

Hogan Bay, on the east side of Knight Island, 2½ miles northward of Point Helen, has anchorage in the middle, ⅝ 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.

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.

Discovery Point, the southern entrance point to Snug Harbor, is bold and high.

Marsha Bay, 5 miles northward of Discovery Point, 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.

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 ⅞ 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 (15.5 m); this area should be avoided by vessels.

Bay of Isles is on the eastern side of Knight 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 West 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** 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,** and pass in mid-channel westward of the islands near the southern shore. Then steer about **269° true,** 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.

Sphinx Island, a prominent wooded island, lies ⅜ mile eastward of Ingot Island (p. 81); there is deep water all around it. Two small **bare rocks,** close together and nearly awash at high tide, lie about 1 mile southward of Sphinx Island.

A rocky area of 18 fathoms (33 m) and possibly less lies 7/8 mile eastward of Sphinx Island.

Entrance Island, a 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 (p. 81).

A group of prominent **bare rocks,** close together and about 12 feet (3.7 m) high, lie over 1/2 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 1/2 mile southward of the group of bare rocks; it should be given a berth of over 1/4 mile when southeastward of it.

Near the eastern point of Eleanor Island, 2 miles southeastward of Point Eleanor (p. 81), there is a **rocky islet** with a few trees and having foul ground inside of it. A bare rock lying 1/4 mile southeastward of the islet should be given a berth of 1/4 mile.

The route from Cordova for steamers bound westward passes between Smith and Seal Islands and between Seal Island and Manning Rocks, off the east side of Knight Island.

SMITH ISLAND (chart 8551), near the center of Prince William Sound, is 3 miles long and about 1/2 mile wide. It is wooded, about 490 feet (149 m) high, and lowest at its southwest end. Broken rocky bottom extends 3 miles northeastward from Smith Island, and a lighted bell buoy is planted near a depth of 8 fathoms (14.6 m) 1 mile from the island.

Little Smith Island, close westward of Smith Island, is bluff, wooded and about 330 feet (101 m) high. Rocky patches of 7 to 18 fathoms (12.8 to 33 m) lie about 1 1/2 miles northward of the island. A rocky area of 9 to 10 fathoms (16.5 to 18.3 m) extends 1 mile southward from the 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 rock, baring 8 feet (2.4 m) at m. l. l. w., 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. A 5 3/4-fathom (10.4 m) rocky area lies 3/4 mile southward of the island.

Vessels generally use the channel between Seal and Smith Islands rather than the channels to the southeastward.

A rock, 2 feet (0.6 m) high (chart 8515), forms the highest part of the extensive, kelp-marked **reef area** lying midway between Seal and Green Islands. The reef area contains several rocks almost bare at low water and should be avoided. At the northeastern end of this area is a 4 1/2-fathom (8.2 m) spot 3 1/2 miles 162° true from the summit of Seal Island. Detached from the area's western limit is a 2 1/2-fathom (4.0 m) spot 5 1/4 miles 196° true from Seal Island summit.

The passage between Seal Island and the reef area described in the previous paragraph, has ample depth of water for a width of about 2 miles. The broken bottom within 1½ miles of Seal Island and that adjacent to the reef area should be avoided.

The passage (chart 8515) between the reef area and Green Island has ample depth for a width of about 1 mile. The 9-fathom (16.5 m) spot and the broken bottom in its vicinity, about 2 miles northwestward of the northeastern end of Green Island, should be avoided. The 25-foot elevated rock 1¼ miles off Putnam Point (Green Island) forms a good leading mark ***in entering*** the passage from the northward. Heading for this rock on a bearing **222° true** until about halfway through the passage, a vessel will navigate in a trough of deep water.

GREEN ISLAND, lying between Knight Island and the northern part of Montague Island, is wooded and about 6 miles long. The highest elevations, 494 to 520 feet (151 to 158 m), are near the eastern side of the island, and they slope gradually to the north and south ends. The vicinity of the island is very foul. Two wooded islets, 100 feet (30 m) high, several small islets, and numerous rocks and shoal spots lie along the northwest shore of Green Island. These include a prominent **outlying rock,** 25 feet (7.6 m) high, 1¼ miles off Putnam Point. A small **rocky islet** lies about 1 mile southwestward from the sharp point forming the western end of Green Island.

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 25-foot (7.6 m) rock which lies 1⅜ miles westward of the cove, steer 126° true 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 Putnam Point; and the southerly one of two rocks, bare at extreme low water, lies ⅝ mile 133° true of the outlying bare rock.

Features and dangers on the eastern side of Green Island are discussed in the paragraph: Passage between Green Island and Montague Island (p. 91).

Little Green Island, heavily wooded, 100 feet (30.5 m) high, lies 1⅛ miles south of Green Island. A fringe of rocks surround the island. A reef, marked by kelp and baring at various stages of the tide, extends 1 mile off the southern end of the island, and terminates in a 1 foot rock.

A **rock baring** 8 feet (2.4 m) at m. l. l. w. lies 1½ miles eastward of Little Green Island. There is practically no kelp and the rock lies close to the 50-fathom curve.

The Needle is a flat-topped, steep-sided rock, about 45 feet (13.7 m) high, in Montague Strait 3¾ miles from the nearest point of Montague Island and 5½ miles eastward from Point Helen (p. 863). There is a depth of 4¾ fathoms (8.5 m) 1 mile northeastward of The Needle.

MONTAGUE STRAIT (chart 8515), between Montague and Latouche Islands, is the broadest of the passages westward of Montague Island leading from the sea to Prince William Sound. It affords an unrestricted channel 4½ miles wide. The strait, however, is seldom used as vessels generally proceed via **Elrington Passage** (p. 94).

Continuing northward and inland from these passages opening to the sea, the regular steamer **route** to the eastern part of Prince William Sound is by way of the passage westward of The Needle, Green Island and Seal Island, thence through the passage between Seal and Smith Islands.

The passage (p. 91) eastward of Green Island has an irregular bottom and there may be less water than indicated. In addition there are several outlying dangers. Little or nothing is gained in using this passage instead of the one westward of Green Island.

Directions.—From a position 1 mile westward of Seal Island a **203° true** 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** course for 30 miles to a position 1 mile off the eastern shore of Latouche Island 5½ miles from Point Grace, steer **230° true** for 8 miles to a position 2 miles southeastward from Danger Island. From this position a course can be shaped as desired.

MONTAGUE ISLAND, West Coast (chart 8515).—The western side of the island is heavily wooded to an elevation of 900 feet (274 m). It is generally rugged with many cirques near its higher levels and retains numerous patches of snow and ice throughout the summer months.

Montague Point is the large, rounded, northern end of the west side of Montague Island. It has a foul shore line.

From **Graveyard Point** to the latitude of Little Green Island the shore line is cut up with numerous bays, lagoons, small islands, and rocks bare at various stages of the tide. Then it becomes fairly regular to the vicinity of Hanning Bay.

A 2¼-fathom (4.0 m) **rock,** lightly marked by kelp, lies 1⅓ miles south-southwest of Graveyard Point.

Stockdale Harbor, just south of Graveyard Point, has two small tree covered islets in the southern part of the harbor. Its northern half has clear water with the exception of the kelp-marked 1¼ fathom (2.2 m) shoal lying ½ mile off the northern entrance point. Anchorage may be had in 15 to 20 fathoms (27.4 to 37 m) near the first bight in the north side of the harbor. Small boats can find anchorage at the head of the harbor. The chain of detached shoals and rocks extending along the middle of the harbor northward of the islets, must be avoided.

Port Chalmers, 5 miles south of Graveyard Point, lies southward of Gilmour Point and extends 1¼ miles in a northeast direction. There are two small lagoons at its northeast end, the outer end having about 3½ feet (1.1 m) of water at m. l. l. w. along its southerly shore.

A small wooded **entrance island** lies 0.9 mile southwest of Gilmour Point. A rock 10 feet (3.0 m) high, lies southeast of the entrance island. A kelp-marked rock baring 4 feet (1.2 m) at m. l. l. w. lies about ½ mile northward of the entrance island, and a 1¼ fathom (2.2 m) rocky shoal lies southeastward of this rock.

The **approach** to Port Chalmers lies between the entrance island and the 1¼ fathom (2.2 m) rocky shoal last mentioned. A group of kelp-marked rocks baring 3 feet (0.6 m) at m. l. l. w., lies ⅜ mile inside the entrance island. These rocks are on line with the entrance island and the head of the port. The group is passed to the northward in entering. A reef covered at extreme high tide, makes out 150 yards from the northern shore, ⅝ mile northeast of Gilmour Point.

Anchorage for small craft may be had in all weather at the head of Port Chalmers, between the reef (making out from the northern shore) and the lagoon entrance. There is excellent holding bottom of mud in 6 to 10 fathoms (11.0 to 18.3 m) of water. A **range** (astern) consisting of the 62-foot rocky islet off the mid-eastern side of Green Island and **Horn Mountain** (Knight Island), the course of which is **80° true,** may be used in entering to pass 400 yards northward of the entrance island and to avoid the dangers in the approach. The rock ⅜ mile northeastward of **Wilby Island** bares 2 feet (0.6 m) at m. l. l. w.

Small cannery tenders frequently anchor about ¼ mile inside the first island southwestward of the entrance island (Port Chalmers) in 12 to 14 fathoms (22.0 to 25.6 m). To enter this area pass midway between the islands mentioned.

Passage between Green and Montague Islands (chart 8515).—The middle of the eastern side of **Green Island** (p. 89) is characterized by a prominent sand and gravel point sparsely wooded. A group of five rocky **islets,** the highest being 62 feet (18.9 m) and tree-covered, lie 1 mile off this point. A low sand spit terminating in a sand lump and tide rocks, extends ⅜ mile northeast by north from the group of five rocky islets.

Between the 62-foot rocky islet described above and the rocky peninsula on Montague Island, the bottom is very irregular. Several 5- to 10-fathom (9.1 to 18.2 m) spots on which there may be less water were found in this area. The best water is apparently 0.3 miles southeastward of the 62-foot rocky islet and of the sand spit extending northeastward from the rocky islet.

The channel back of the group of five rocky islets is endangered by several shoals and rocks.

A 2½-fathom (4.6 m) rock, lightly marked by kelp, lies 1⅓ miles south-southwest of Graveyard Point. Another dangerous rock previously described lies eastward of Little Green Island (p. 89).

Hanning Bay, indenting the west side of Montague Island, is 13 miles northward of Cape Cleare. It is a good anchorage with easterly winds. 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, and the north point at the entrance bearing between 5° true and 348° true, 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 Montague Strait, 6½ miles northward from Cape Cleare, is free from dangers and is an excellent anchorage, perfectly protected from all directions except the southwest. **Point Woodcock,** at the northern entrance, is a rocky bluff about 50 feet (15.2 m) high and wooded on top. The point is fringed by a rocky, kelp-covered reef. The southern entrance point is gently rounding and is marked by a fish trap, with the watchman's cabin on the beach. The head of the harbor is marked by extensive mud flats.

Directions.—In entering, favor the northern shore and anchor in 17 fathoms (31.1 m) muddy bottom, about ¼ mile off the shingle beach 1 mile from the head of the bay. In making this anchorage, care should be taken to avoid the mud flats which come up very sharply. Severe williwaws draw down through Macleod Harbor, but the holding ground is good and the anchorage is safe.

Point Bryant is a rounding point of high eroded bluffs, lying 1 mile southward from Macleod Harbor. A rock awash at extreme low tide lies about 300 yards off Point Bryant. The rocky shore here is fringed with a heavy growth of kelp.

San Juan Bay is the name given the open bight just northward of Cape Cleare. The sand beach at the head of the bight is backed by a large tidal swamp which drains through a small stream. A fish trap is located about ¾ mile northeastward from Cape Cleare. Landings in this bight are usually difficult, owing to the surf.

The best anchorage is just off the fish trap in about 9 fathoms (16.6 m), sand and gravel bottom, but the swell usually makes it uncomfortable.

Stair Mountain, lying just north of San Juan Bay, is a prominent conical-shaped peak about 1,600 feet (488 m) high. It shows unmistakably from the southward and southwestward. The summit is bare, and there is a scattering growth of trees on its slopes.

Cape Cleare, the southwestern extremity of Montague Island, is described on page 53.

Latouche Island, on the western side of **Montague Strait** (p. 90), is 10 miles long and has elevations up to 2,225 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. There is a prominent **lone tree** on the southeast point of the island.

The island is surrounded by a complex group of reefs and rocks. The channel between Danger Island and Latouche Island has a least known depth of 2¾ fathoms (4.9 m). This channel is used by fishing boats but is not recommended for large vessels.

Latouche Passage (chart 8523) has its entrance from the sea between Danger Island and Elrington Island. The entrance is covered by a **bar** having depths of 6 to 11 fathoms (11.0 to 20.1 m) which has sometimes been crossed by steamers proceeding westward from Latouche. The recommended steamer route, however, is by way of **Elrington Passage** and the northern part of Latouche Passage.

Occasionally with westerly winds large pieces of glacial ice drift into Latouche Passage from Knight Passage.

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 northward of **Bishop Rock.**

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. Avoid the eastern part of the passage in the vicinity of the crescent-shaped islet 2¼ miles southward of Chicken Island. Much kelp lies in the passage back of the islet.

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

There is a **wharf** with a loading face 200 feet in length and with a least depth of 20 feet (6.1 m) alongside. The face of this wharf is marked at its southern end by a red light and at its northern end by a green light. On the southern side of the wharf is a float landing for small vessels. There is a least depth of 10 feet (3.1 m) alongside the float. A reef, 300 yards northward of the wharf, is marked by a white beacon. Several sunken rocks lie about 80 yards north of the northern end of the wharf, having a least depth of 7 feet (2.1 m) over them. These rocks lie inshore from the line formed by the face of the wharf, and by using the face of the wharf as a danger range, these rocks will be cleared. At night the electric lights at Latouche show prominently.

Vessels must approach this wharf 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.

Latouche is a port of call for passenger steamers.

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

A **rock,** with 2½ fathoms (4.6 m) over it, lies 300 yards off the point next southward from Powder Point.

Chicken Island, 3½ miles southward from Point Grace, is separated from Latouche Island by a pass 350 yards wide with a depth of only 4 feet (1.2 m).

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).

ELRINGTON PASSAGE (chart 8523), westward of Elrington Island, is the passage leading to the sea in general use by vessels proceeding between Prince William Sound and points to the westward. It is 8 miles long, ½ to 1 mile wide, deep and clear. Anchorage is not easily found on account of the great depths.

The **aids to navigation** include a light and beacon marking the north entrance between the north end of Elrington Island and **Bettles Island,** a beacon marking the turn at the south end of Evans Island, and Lonetree Point light marking the entrance from seaward. A grass-covered **rock,** about 10 feet (3.0 m) high and with some brush on its summit, lies near the angular mountain **point** on the east side of the passage, 4 miles from the north entrance.

In the southeast angle of the passage 1⅜ miles southward of the grass-covered rock there is **anchorage** in 5 to 20 fathoms (9.1 to 3.7 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 southwest 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.

Directions for Elrington Passage are given in the table of courses and distances on page 28.

Currents.—The average strength of the flood is 1.7 knots. Predictions for Elrington Passage may be obtained from the Pacific Coast Current Tables published by the Coast and Geodetic Survey.

SAWMILL BAY (chart 8523) indents the east side of **Evans Island** near the northern entrance to Elrington Passage. Considerable development has taken place here, and there are now five wharves belonging to the various cannery and saltery companies, including the oil wharf at Port Ashton.

The end of the long point forming the southeast side of the upper part of Sawmill Bay is marked by a **light.** The light is visible through the **northeast entrance** northward of Bettles Island. The **entrance** from Elrington Passage is between two islands; black buoy 1 marking the end of the shoal ground extending ¼ mile northward from the western one of the two islands.

The bay was surveyed and wire-dragged. In the northeastern entrance a reef with a little over 5 fathoms (9.1 m) was found. This spot was cleared by the drag set at 30 feet (9.1 m). All dangers found are now marked by buoys.

Johnson Cove is a small inlet with an abandoned saltery at its head. The cove is foul, with 8 feet (2.4 m) in the basin at its head.

Bettles Island is the largest of the high wooded islands lying at the entrances to Sawmill Bay. The north shore of this island is foul.

Crab Bay is a small indentation on the northern shore of Sawmill Bay just inside the northern entrance point. There is a saltery just inside the western entrance point with a least depth of 24 feet (7.3 m) at the wharf. A short distance off the wharf is a reef with a least known depth of 2½ fathoms (4.6 m). The reef is marked by a red buoy at its southwestern end. Vessels should make a port landing and back out into Sawmill Bay when leaving the wharf.

Port Benney is a saltery located just west of Crab Bay. The dock has a least depth of 23 feet (7 m) at its face.

Caution.—In approaching Port Benney from the westward, care should be taken to avoid the rocks, awash at low tide, lying 250 yards southwestward from the wharf. These rocks are a little outside of the line of the face of the dock.

Port Ashton is on the northwestern shore of Sawmill Bay. There is a saltery with a least depth of 29 feet (8. 8 m) at the wharf and an oil wharf with 20 feet (6.1 m) at its southwest corner and 30 feet (9.1 m) at the southeast corner. Diesel oil, gasoline, and lubricating oils are available. There is also a cannery at Port Ashton.

There is a group of rocks, awash at extreme low tide, lying 115 yards offshore about 260 yards northeastward from the dock. These rocks are marked by red buoy 2. In approaching from the northeastward, the small island should be favored.

San Juan is a cannery and saltery at the southwestern end of the bay. The San Juan Fishing and Packing Co. operates a **radio telephone**, call letters KLV. There is a least depth of about 30 feet (9.1 m) at the dock. There is a good supply of fresh water.

There is a rock, with 1½ fathoms (2. 7 m) over it, lying 700 yards eastward (mag.) from the wharf. It is marked by a black buoy placed 100 yards northward from it.

There is another rock, with 2¼ fathoms (4.3 m) over it, lying 325 yards north-northeastward from the wharf. It is marked by red buoy 4 placed eastward from it. In the approach to this wharf there are some spots with less than 27 feet (8.2 m) over them. The wire drag, set at 24 feet (7.3 m) cleared them.

Careful maneuvering is required for a large vessel to get away from this wharf safely. They usually swing their stern out back toward the island where they make the turn around.

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

Anchorage.—There is no good anchorage in Sawmill Bay. Vessels sometime anchor between the oval-shaped island and the San Juan cannery, but the holding ground is poor.

Directions.—Sawmill Bay may be entered by either the northeastern or the southwestern entrance. The former is recommended because of its greater width. In proceeding toward the southwestern end of the bay, vessels may pass on either side of the small oval-shaped island. If passing on the northern side, the island should be favored to avoid the rocks mentioned under "Port Ashton."

Prince of Wales Passage (chart 8523), 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. The principal **channel** at the northern entrance is eastward of **Flemming Island,** and then westward of Iktua Rocks. 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 **Amerk Point,** the prominent low, sandy point, with a fringe of trees, lying on the west side 3 miles farther southward.

The channel westward of Flemming Island has considerable foul ground and should be avoided by strangers, except possibly small craft, at low water, and proceeding with caution.

Gage Island, wooded and with a group of partly bare rocks off its south side, 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.

Iktua Rocks, 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 midchannel 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.

Anchorage.—The only good anchorage in Prince of Wales Passage is in **Squirrel Bay,** the circular bay at the southwest point of Evans Island. Anchorage may be found near the center of the bay in 12 to 22 fathoms (21.9 to 40 m), sand and gravel bottom of fair holding qualities.

Glacial ice is some time discharged through Prince of Wales Passage.

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.

Elrington Island.—The southwest end of the island is 2½ miles across in a northerly and southerly direction and is formed by three

prominent points with two bays between, known as North Twin and South Twin Bays.

South Twin Bay is free from dangers and affords a convenient anchorage in 17 to 20 fathoms (31 to 37 m). The bottom is hard, with patches of sand and gravel. It is exposed to the westerly and southwesterly winds.

North Twin Bay is free from dangers except for a rock awash at low tide about 250 yards off the south shore ½ mile northeastward of the southern entrance point. Anchorage may be found in the center of the bay in 13 to 17 fathoms (23.7 and 31 m). Of the two bays, the best shelter is usually found in the southern one.

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.

Lonetree Point, the most northerly point at the western extremity of Elrington Island, is marked by a prominent lone tree and a light.

Procession Rocks are a group of jagged rocks, the highest one being about 70 feet (21.3 m) high. There are four principal rocks, with a number of smaller rocks and reefs surrounding the larger ones. Deep water extends close up to the rocks. The survey of 1927 showed a good channel between the rocks and the shore of Bainbridge Island.

PORT BAINBRIDGE (charts 8523 and 8528) is a deep body of water extending about 12 miles northward from a line joining Cape Puget and Procession Rocks. Depths of over 100 fathoms are carried nearly to the head of the bay. There are no habitations in Port Bainbridge, and in 1927 there was no commercial fishing.

Point Pyke, which forms the eastern entrance point to Port Bainbridge, is a prominent headland rising almost vertically to a height of 985 feet (300 m).

Swanson Bay is a long narrow bay lying just north of Point Pyke and extending 3 miles to the eastward. The bay is deep, and there are no good anchorages. An indifferent anchorage may be found near the head of the bay in 28 to 30 fathoms (51 to 55 m), mud bottom.

Hogg Bay (chart 8523), lying about 2 miles northward from Point Pyke, is the largest bay in Port Bainbridge. It is free from dangers except for a rock awash, which lies ¼ mile off the northern shore about 1 mile within the entrance, and a rock awash which lies 180 yards off the south shore 1½ miles from Swanson Point.

A fair anchorage may be found near the head of the bay at the entrance to the northern arm in 25 fathoms (46 m), hard bottom, with patches of sand and gravel. Small craft may find excellent shelter at the head of the northern arm. A beach suitable for beaching small craft will be found behind the northern island near the entrance to the north arm.

Bainbridge Passage has not been surveyed. It is used to some extent by local gas boats, but it is reported as a dangerous locality, due to the numerous rocks and strong currents in the passage.

Point Waters, which forms the northern entrance to Bainbridge Passage, is bold.

At the head of Port Bainbridge (chart 8528) the western arm extends nearly 2 miles to the northward. There is deep water in this arm, but the entrance is blocked by a gravel bar with a least depth of about 1½ fathoms (2.7 m) The best water lies close to the eastern entrance point.

Bainbridge Glacier, nearly 1 mile in width, drains into Port Bainbridge about opposite Bainbridge Passage.

Auk Bay, on the western side of Port Bainbridge, opposite Point Pyke, is a small bay affording good anchorage in 20 fathoms (37 m), muddy bottom. A rock, bare at low tide, lies about 150 yards off the northern shore about 1 mile within the entrance. The southern entrance point to Auk Bay is marked by a prominent pinnacle rock.

A prominent **brown rock** about 10 feet (3.0 m) high, lies ⅓ mile offshore 2½ miles northward of Cape Puget.

6. KENAI PENINSULA, SOUTHEAST COAST

The **COAST** between Cape Puget and Cape Resurrection (chart 8528) is high and rugged, with numerous glaciers showing in the valleys. There is no shelter except in Day Harbor, where there is a very good anchorage. The coast is clear except for a few rocks extending not more than ¼ mile offshore. The first range of mountains varies from 2,000 to 3,500 feet (610 to 1,067 m) in height, while the back range is about 5,000 feet (1,524 m) in elevation. Much of the hinterland is covered by an ice cap.

A **constant current** sets southwestward along the Kenai Peninsula, see remarks on currents under General Information (p. 4).

Cape Puget is a prominent headland with an eroded bluff. At the foot of the slope is a conical rock which is prominent from an east or west direction. There are several bare rocks off the cape, the farthest one being about ¼ mile distant.

Puget Bay, the first indentation to the westward of Cape Puget, is a funnel-shaped bay extending to the northward for about 6 miles. The bay is deep throughout and free from dangers except for rocks and reefs close inshore.

Goat Harbor is an inlet on the eastern side of the bay about 4 miles from Cape Puget. It affords a good anchorage in 12 to 14 fathoms (21.9 to 25.6 m), sticky mud bottom, but is exposed to the swell from the southwest. A gravel and shingle bar with a least known depth of 5½ fathoms (10 m) extends across the entrance.

Near the head of Puget Bay, and on the eastern side, is a small cove which affords shelter for small craft. There is a rock awash about 100 yards off the southern entrance point.

Directions.—Follow mid-channel courses into the bay and give all points a wide berth. If bound into Goat Harbor, pass midway between the detached rock on the north and the opposite entrance point. In approaching Puget Bay from the eastward, Cape Puget should be given a berth of at least ¾ mile.

Cape Junken is a bold, rounding headland with eroded bluffs and landslides. At the foot of Cape Junken there are two steps which show up prominently from alongshore. In thick weather this feature is valuable in identifying the cape.

Johnstone Bay is a large open bight lying westward from Cape Junken. There is a black sand beach across the head of the bay, and deep water extends close up, there being 50 fathoms (91 m) within ½ mile of the beach. **Excelsior Glacier** terminates in Johnstone Bay and drains through a stream which enters at the eastern end of the sand beach.

There is a small cove with a shingle beach at the eastern entrance to the bay, but it is wide open to the southwest and affords little shelter. A black rock 50 feet (15.2 m) marks the western entrance, and there is a low rock nearly awash at the eastern entrance.

Cape Fairfield (chart 8528) is a bold, rounding cape with eroded bluffs and many rock slides. There is a large **pinnacle rock** off the southeast pitch of the cape, and a 20-foot (6.1 m) detached rock lies about 350 feet off the southwestern part of the cape.

Whidbey Bay is a large open bight lying just westward from Cape Fairfield. There is a black sand beach at the head of the bay. About 3 miles up the valley there is a prominent hanging glacier.

Depths shoal to 12 fathoms (21.9 m) about 1 mile from the sand beach, and anchorage can be had in black sand and glacial silt. Both sides of the bay are foul, with numerous rocks and reefs extending 100 to 200 yards off the rocky beaches. A stream enters at the west end of the sand beach.

Cape Mansfield is bold, with high eroded bluffs and rock slides. A small pinnacle rock, which is awash at ordinary high water, lies about ¼ mile off the cape. There is deep water close up to this rock.

Lying just westward of Cape Mansfield is a small cove with a **sand beach** at its head. Except for this sand beach, the shore between Cape Mansfield and Day Harbor is rugged, with high bluffs and rock slides. There are numerous rocks at the foot of the bluffs and a short distance offshore.

Day Harbor, a spacious body of water lying just eastward of Resurrection Bay, is free from dangers except close inshore. Deep water **extends to** head of the bay which is formed by the moraine of **Ellsworth Glacier.** This glacier shows up prominently when entering the bay.

Fault Point is the eastern entrance point to Day Harbor. It terminates in a narrow point showing several remarkable faults in the rock formation.

Anchor Cove, about 2 miles northward from Fault Point, is a small cove affording excellent shelter for small craft. A short distance off the eastern shore of the cove near its head is a reef which is awash at high water. The shores here are heavily wooded.

Bowen Anchorage, which affords the best anchorage in Day Harbor, lies 4 miles northward from Fault Point. It is about 500 yards wide at the entrance, and narrows gradually to the head of the cove where there is an abandoned sawmill.

Anchorage may be had in the center of the cove in 15 fathoms (27.4 m), sticky mud bottom. In the entrance there is a small reef with a least-known depth of 5½ fathoms (10 m). This reef was cleared by the wire drag set at 25½ feet (7.8 m). Bowen Anchorage is suitable as an anchorage for a vessel up to about 400 feet in length.

Deep water extends close up to the head of Day Harbor, the 50-fathom curve (91 m) being only about 350 yards offshore.

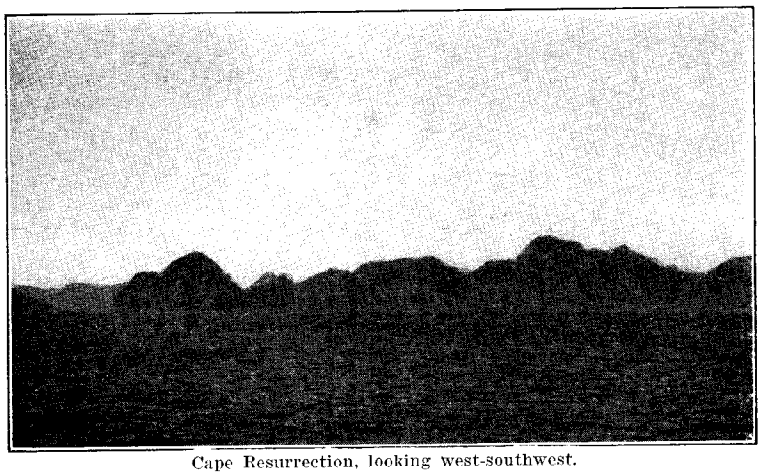
There is a flat in the northwest corner of the bay (bearing NW. true from Bowen Anchorage), where anchorage may be had ⅜ mile offshore in from 15 to 18 fathoms (27.4 to 33 m).

Talus Bay is a small cove on the west shore of Day Harbor, affording an anchorage in 10 to 15 fathoms (18.3 to 27.4 m), but it is exposed to the southeast. A rock bare at low water lies about 100 yards off the eastern entrance point.

Safety Cove is a small deep cove about 1 mile southward from Talus Bay. Anchorage may be had in the center of the cove in 25 to 30 fathoms (46 to 55 m).

Killer Bay is a small cove about 2 miles southward from Safety Cove. It is too deep for convenient anchorage, there being depths of 32 to 39 fathoms (59 to 71 m) in the middle of the bay. There is a rock 15 feet (4.6 m) high about 100 yards off the southern entrance point.

Driftwood Bay lies about 3 miles northward from Cape Resurrection. It is about ½ mile wide at the entrance and is free from dangers. Anchorage may be had in the middle of the bay in depths from 25 to 30 fathoms (46 to 55 m), hard bottom. Small craft will find excellent shelter in a bight in the south shore of the bay.



Cape Resurrection, looking west-southwest.

CAPE RESURRECTION (charts 8528 and 8529), at the eastern entrance to Resurrection Bay, is a precipitous headland of solid rock, with little vegetation except some trees on the lower slopes. From the 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 low saddle back of them, and rising to higher mountains farther north. These are the only dome-shaped peaks in the vicinity, and the cape is easily recognized for that reason.

Barwell Island, ⅜ mile southeastward from Cape Resurrection, is small, bare, rounded, precipitous, and 414 feet (126 m) high. A lighted whistle buoy is located ¼ mile southward.

There is a deep, clear passage between Barwell Island and Cape Resurrection, the mid-channel depths ranging from 45 to 48 fathoms (82 to 88 m).

RESURRECTION BAY (chart 8529) extends about 16 miles inland from Cape Resurrection. The depths are great throughout, and there are no dangers in the usual track of vessels. A flat extends

½ to ⅝ 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 land feature 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.

Seal Rocks 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 ⅛ 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.**

Agnes Cove lies just westward from **Cheval Island.** It is sheltered from the southeast, but is too deep for convenient anchorage.

Porcupine Cove is a small cove about 4 miles southward from Bear Glacier. It affords a good anchorage for small craft in all except southeasterly weather. At the head of the cove there is a gray sand beach with stumps below the high-water line which indicates that there has been a subsidence of the beach line here. There is a detached rock about 30 feet (9.1 m) high 200 yards offshore at the western entrance to the cove.

To enter, steer midchannel courses between this rock and the point opposite and anchor in 10 fathoms (18.3 m), gray sand bottom.

Bulldog Cove, the first cove southward from Bear Glacier, affords a good anchorage for small craft in southwesterly weather. In northerly weather it is exposed to the winds sweeping off Bear Glacier. The best anchorage is in the southern bight in about 10 fathoms (18.3 m), sticky mud bottom.

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

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 lies 200 yards southward from the southeast end of Renard

Island. Hive Island is marked by a **light** 80 feet (24.4 m) high located on its northern side.

The large cove indenting the southern shore of Rugged Island affords a fair anchorage in easterly weather. Anchor in the easterly cove with Pilot Rock about on range with the southern entrance point. The *Surveyor* used this anchorage frequently in 1928.

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 also anchor in the southeast arm of the two-arm bay on the eastern shore 1½ miles northward of Renard Island.

In the wintertime this bay affords better protection than Sunny Cove, which is bad for small craft in northwesterly weather. The anchorage is abreast of a cabin, in 7 to 8 fathoms (12.8 to 14.6 m), sandy bottom. The narrow bight extending to eastward is filled with a sand flat which bares at low water.

Thumb Cove, on the eastern shore northeastward from Caines Head, is ¾ mile wide. 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 (chart 8529) 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.

Caution.—A vessel alongside the railroad wharf is held broadside to the wharf by southerly winds. Considerable difficulty may be experienced particularly by a large vessel in leaving the wharf as there is practically no maneuvering room around either end of the docking space. Winter gales strike suddenly.

The oil wharf has a face of 100 feet and a least depth alongside of 31 feet (9.4 m). The wharf of the cold storage plant, about ½ mile north of the town, has a face of about 200 feet and a least depth of 27 feet (8.2 m) alongside.

Harbor of refuge.—A harbor of refuge, suitable for small craft and protected by a breakwater 580 feet long, has been constructed about 300 yards northward of the cold-storage plant. The end of the breakwater is marked by a fixed green light.

The rectangular area (500 by 350 feet) behind the breakwater is dredged to a project depth of 12½ feet (3.8 m). The dredged entrance channel lies between 32 yards and 92 yards north of green light marking end of breakwater.

Dockage and wharfage are charged at the railroad wharf. Wharfage charges vary with the commodity. Dockage charges are as follows:

Vessels under 10 net registered tons		Exempt
Vessels 10 to 50 net registered tons	per day	$1.00
Vessels 51 to 100 net registered tons	do	2.00
Vessels 101 to 200 net registered tons	do	4.00
Vessels 201 to 400 net registered tons	do	6.00
Vessels 401 to 600 net registered tons	do	8.00
Vessels 601 to 800 net registered tons	do	10.00
Vessels 801 net registered tons and over:		
First day, per net registered ton	do	.01
Each succeeding day, per net registered ton	do	.00½
Second dockage at same port on one voyage, per net registered ton	per day	.00½

The minimum charge for water is $5.

Supplies.—There is a fuel-oil station, with 10,000 to 15,000 barrels capacity.

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

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

Repairs.—There is a small machine shop where engine repairs to small craft can be made. The Alaska Railroad maintains well-equipped shops at Anchorage.

Communication.—There is wireless and cable communication with other Alaskan ports and Seattle, and telegraphic communication via the railroad to Fairbanks. It is a port of call for the regular coasting steamers from Seattle and has good service the year round.

The railroad extends to Anchorage and Fairbanks in the interior, and service is maintained throughout the year. This railroad taps coal fields and mineral areas. There is an army radio station, call letters WXR.

Hospitals.—There is a private hospital where marine cases are cared for. The Alaska Railroad maintains a well-equipped hospital at Anchorage.

A United States **deputy marshal** is stationed at Seward. There is a third-class relief station of the **Public Health Service,** see page 8. One of the largest vessels of the **Coast Guard** has its station at this port. For **customs** see page 9.

Anchorage.—Due to the great depths, there are no convenient anchorages off Seward. Vessels may anchor between the Standard Oil Dock and the San Juan Dock in 25 to 31 fathoms (46 to 57 m), with sufficient swinging room. The holding ground is good, and vessels with good ground tackle are not apt to drag. Considerable sea makes into the bay with southerly winds. The following directions lead to an anchorage in 31 fathoms (47 m): Bring the San Juan Dock in range with the right hand building of the Jesse Lee Home (on the slope back of Seward) and anchor when the house on the Standard Oil Dock comes in range with the small fish house on the rocky shore beyond the railroad dock. There is a landing float at the railroad wharf. It gets very rough at this float in southerly weather unless there is a large ship at the dock to break the seas.

Tides.—At ***Seward*** high and low water occur about 1 hour earlier than at Cordova. The mean range of tide is about 8½ feet (2.5 m), and the range from mean lower low water to mean higher high water is 10½ feet (3.2 m).

Directions.—For directions for entering and departing, see pages 30 and 35.

AIALIK BAY (chart 8529) extends 16 miles inland from the north end of Harbor Islad. 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 boulders 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** course for 26 miles will lead to a position 3½ miles 155° true from the peak of Outer 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 **Beehive Island** and the small island at the southeast end of the Harbor Island group is a **rock** which is bare at lowest tides.

Small vessels proceeding along the coast usually pass between Beehive Island and the Harbor Island Group, passing to southward of the rock described in previous paragraph and avoiding the **reef** extending off the northern end of **Matuska Island,** the largest of the Chiswell Islands. Many small vessels proceeding from Seward to westward, or vice versa, use the passage between Harbor Island and the first small island to eastward. A rock, baring at minus tides, has been reported in the narrowest part of this passage, close to eastward of the center. Vessels using this passage should favor Harbor Island when passing through this narrow opening. A breaker has been observed close to northeastward of the 8-fathom (14.6 m) spot (chart 8529) which lies nearly ½ mile southward of the narrowest part of the above passage. This breaker lies outside of the reef making off the southern end of the first island to eastward of Harbor Island.

GRANITE CAPE, the southern end of Granite Island is bold, with almost vertical rocky bluffs. Rocks awash lie a short distance off the cape.

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.

Holgate Arm is the largest indentation on the west side of Aialik Bay. The arm is too deep for anchorage and terminates in **Holgate Glacier.**

Slate Island, long and narrow and about 270 feet (82 m) high, lies close to the west shore near the head of the bay.

The head of Aialik Bay consists of sunken rocks and icebergs which are discharged from the glaciers feeding into the bay.

Coleman Bay, Tooth Cove, and **Bear Cove,** are bays on the east side of Aialik Bay. None of them afford good anchorage.

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 Three Hole 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.

Vessels can find convenient anchorage in the area about 1 mile southeast from the south end of Harbor Island. There is good shelter here with winds from north around to southeast.

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.

HARRIS BAY (chart 8529) is westward of the peninsula terminating in **Aligo Point.** The bay is deep throughout. The 50-fathom (91 m) curve extends to within ½ mile of the head of the bay.

Granite Island is a long narrow island reaching a height of 1,650 feet (503 m). Its shores are bold and its slopes are very steep except at the northern end.

Taz Basin is a remarkable cliff-walled harbor on the southwest side of Granite Island about 2 miles from its northwest end. It has depths from 18 to 20 fathoms (33 to 37 m) and forms an ideal shelter for launches and small gas boats. The entrance is narrow with a rock 5 feet (1.5 m) high in the middle of it. The best entrance is to southward of the rock, and there is a depth of about 2½ fathoms (4.6 m) in a channel about 30 yards wide. Once inside, there is plenty of room.

Granite Passage, which leads from Aialik Bay to Harris Bay, is deep and free from dangers. At the narrowest part of the passage,

just north of Fire Cove, there is a ridge with depths from 6¼ to 18 fathoms (11.4 to 33 m) extending across the passage. To avoid the 6¼-fathom (11.4 m) spot, favor the Granite Island side when going through the passage. This ridge affords a convenient anchorage in any but heavy weather.

Fire Cove is the southernmost of three coves in the mainland opposite Granite Island. It is deep throughout and affords no satisfactory anchorage. The shores are precipitous and rocky.

Ripple Cove, the next cove to the northward, is also deep and affords no anchorage except in 28 to 30 fathoms (51 to 55 m), hard bottom. The third cove is also deep and not suitable as an anchorage.

Crater Bay is a large bay lying about 1 mile northward from the north end of Granite Island. A good anchorage will be found in the bight just eastward of the projecting point on the south shore, in 25 fathoms (46 m), sticky mud bottom. This anchorage is well protected but is subjected to severe williwaws. In the southerly cove at the head of Crater Bay there is a stream where fresh water can be obtained handily.

Enter the bay in midchannel and round the projecting point on the south shore at a distance of ¼ mile. Anchor with this point just shutting out the northern entrance point to Crater Bay.

Cataract Bay, which lies just northward from Crater Bay, is another one of the characteristic small deep bays of this region. It is exposed to the southwest, and is not inviting as an anchorage. Fresh water can be obtained from streams which enter the head of the bay as cascades.

The northern part of Harris Bay is usually filled with floating ice which discharges from **Northwestern Glacier,** an extensive glacier which occupies the valley at the head of the bay.

Northwestern Lagoon is a large lagoon at the northwestern corner of Harris Bay. It is shoal and foul, and the entrance is blocked by rocks, bars, and usually by large cakes of ice.

Harris Point is a prominent point forming the western entrance to Harris Bay. It is easily recognized by a succession of rocks and islets that extend ¼ mile off the point. The outer rock of this group is 78 feet (23.8 m) high.

Cup Cove is a small indentation just eastward from Harris Point. There are depths from 7 to 9 fathoms (12.8 to 16.5 m) with mud bottom, and it affords a good anchorage for small craft except that it is exposed to easterly winds.

Sandy Bay is an indentation about 1 mile in extent lying between Harris Point and Two Arm Bay. The depths decrease gradually from 20 fathoms (37 m) at the entrance to 3 fathoms (5.5 m) at the head with sand bottom throughout. It is exposed to the southward and is suitable in fine weather only. To enter, use a midchannel course and take up anchorage as desired.

Two Arm Bay consists of two arms, Paguna Arm the north arm and Taroka Arm the west arm.

Surok Point forms the eastern entrance to Two Arm Bay. It is bold and high, with deep water extending close up to the point.

Paguna Arm is deep and affords no anchorage except at the very head, where vessels may anchor in 20 to 25 fathoms (37 to 46 m), hard bottom. There are several coves along the eastern shore where

small craft may find anchorage close to the beach. The shores are all steep and precipitous except for a small sand spit on the east shore near the head. There are numerous places in Paguna Arm where fresh water can be obtained.

To enter, steer midchannel courses throughout. There are no known dangers.

Bear Point is a bold, high point separating Paguna and Taroka Arms. A group of rocks extends 100 yards off the point.

Taroka Arm, the west arm of Two Arm Bay, is deep but affords anchorage near the head in 20 to 25 fathoms (37 to 46 m), hard bottom with occasional patches of sand and mud. Small craft can find shelter in several of the bights along the southern shore of Taroka Arm.

To enter, steer midchannel courses and take up anchorage as desired at the head.

CLOUDY CAPE, marking the western entrance to Two Arm Bay, is bold and high. On the coast about midway between Cloudy Cape and Thunder Bay there are lines of corrugated strata on two light-gray **cliffs.**

Thunder Bay is 2 miles wide at the entrance. It is about 2½ miles long with the upper end extending in an easterly direction. Safe anchorage for small craft can be had in the cove at the head of the bay in 10 to 20 fathoms (18.3 to 37 m), mud bottom. Fresh water is available from several waterfalls at the head of Thunder Bay.

There is a cup-shaped bight at the northern part of the entrance to Thunder Bay where anchorage can be had in 12 fathoms (21.6 m), gray sand and rock bottom.

There is a **landslide** on the coast about ½ mile southwestward from Thunder Bay.

Black Mountain (chart 8530), the highest peak between Thunder and Black Bays, has a large **granite boulder** at its summit. The peak is 2,075 feet (632 m) in height.

The point on the northern side of the entrance to **Black Bay** is marked by a 660-foot (201 m) hill. The island immediately adjacent to the point is wooded, 150 yards in diameter and 165 feet (50 m) high. Reddish-brown tinted **cliffs** form the base of the 660-foot hill on its seaward side.

The arm of Black Bay extending in a westerly direction is not recommended as an anchorage as it is too deep and narrow.

The northerly arm of Black Bay is nearly ½ mile wide. There is a safe **anchorage** close in near the head in 16 to 20 fathoms (29.3 and 37 m), mud bottom. A shoal of gravel and boulders extends 100 yards offshore at the easterly part of the head of this arm. The anchorage is subjected to the usual williwaws.

A light gray granite **peak** 2,060 feet (628 m) high separates the two arms of Black Bay.

The **point** 1¼ miles southward of Black Bay has a large granite rock elevated about 150 feet (46 m) and close to the southeastern side. The rock makes a good mark when it is seen clear of the point. Between this point and Black Bay is a low, grassy, wooded **ravine** extending inland from the coast. Between the ravine and Black Bay are rocky, almost perpendicular **cliffs** several hundred feet high and light gray in color.

The open bay to the westward of the point described in the previous paragraph is not recommended as an anchorage.

Chance Cove is described in connection with McArthur Pass on page 111.

NUKA BAY (chart 8530) has its main entrance between Pye Reef and Nuka Point. The bay may be entered from the eastward through McArthur Pass and Wildcat Pass and from the westward through Nuka Passage. The bay extends into the mainland above the passes and passage by means of two long arms. Good protected anchorage can be found in several small bays and coves. There are several small gold mines in **West Arm** and **North Arm**.

Nuka Bay is generally deep throughout. There is, however, a considerable area of irregular depths less than 25 fathoms adjacent to the western shores of the lower bay. Several abrupt **rocky patches** of 8 fathoms (14.6 m) were found in this area somewhat more than a mile offshore.

PYE ISLANDS, on the eastern side of Nuka Bay, are three rugged mountainous islands, densely wooded on the lower slopes. **Outer Island**, the outermost and smallest island, has a prominent **peak** 1,316 feet (402 m) high at its eastern end, which is a good landmark. This peak forms a ridge in an east and west direction, the top of which is covered with huge granite boulders. A prominent **bare rock**, 70 feet (21 m) high, lies 20 yards off the southeastern shore of the island. A large **reef**, part of which shows at all stages of the tide, lies 300 yards southward from this rock. A large, bare, granite rock, 82 feet (25 m) high, lies close off the southwestern point of the island.

A 2½-fathom (4.6 m) **shoal** that breaks lies ⅜ mile eastward of the eastern extremity of Outer Island. A 10-fathom (18.3 m) shoal lies 1¾ miles 130° true from the eastern extremity of Outer Island, and a 9-fathom (16.5 m) shoal lies ⅞ mile 200° true from the same point.

PYE REEF, awash at high water, lies 2⅛ miles 205° true (S. mag.) from the high peak of Outer Island. The line of the western ends of Outer Island and Rabbit Island leads 250 yards westward of the reef, and the line of the eastern ends of Outer and Ragged Islands leads ⅜ mile eastward of it.

Rabbit Island, the second one of the Pye Islands, is densely wooded; its highest mountain has an elevation of only 808 feet (246 m). The eastern shore of the island is bold and rocky, and there are no dangers there except close inshore.

Between Outer and Rabbit Islands is a deep body of water with no good anchorage. The body of water at its eastern end opens to the sea through a small opening called **Kitten Pass**. The pass is between a small islet and a group of three bare rocks to the northward. The small islet has a few scrub trees on it. A rock, marked by kelp, with 13 feet over it, lies in the pass; it is nearer to the islet than to the group of bare rocks.

Kitten Pass is only 65 yards wide. By favoring the group of three bare rocks on the northern side of the pass, a depth of 5 fathoms (9.1 m) can be carried through; but due to strong tidal currents and the narrowness of the pass, it should be attempted only by very small craft, at slack water, and with a smooth sea. In rough weather, breakers obstruct the pass.

Ragged Island is the third and largest of the Pye Islands. This island is very mountainous, the highest being 1,587 feet (484 m) high, and is partly wooded on the lower slopes. The island is broken by numerous coves and bights, most of which are too deep to afford good anchorage. There are no known dangers anywhere around this island except rocks close inshore, and the following offshore rocks; a rock awash at high water, lying 200 yards off the rounding point on the southestern coast of the island, 1¼ miles north of the narrow part of Wildcat Pass; and the rocks off Hoof Point, described below.

Hoof Point, 3½ miles 54° true from the narrow part of Wildcat Pass is the southeastern end of the eastern part of Ragged Island. It is bold and rocky, being at the base of a 650-foot (198 m) **hill** detached from other elevations. A bare granite rock, 105 feet (32 m) high, lies 60 yards off the point and makes a good mark. Bare ledges lie 400 yards southward of the point.

A **rock** covered at high water lies ½ mile 170° true from Hoof Point. This rock can be cleared to the southward by keeping open water showing through Wildcat Pass.

There is fair anchorage for small craft in the inside cove behind the hill at Hoof Point in 10 to 20 fathoms (18.3 to 36 m).

WILDCAT PASS is the pass between Rabbit and Ragged Islands. This pass is about 400 yards wide in its narrowest part and is deep and free from danger. A **shoal,** marked by kelp, with a least depth of 6 fathoms (11 m) over it, lies in the center of the western approach to the pass, 400 yards to westward of the line of the western ends of Rabbit and Ragged Islands. This shoal has deep water all around it. In the eastern approach the only known dangers are the rocks lying off Hoof Point. In the narrow part of the pass a **bank,** with 9 fathoms (16.5 m) over it, extends from the northern point to the center of the pass, but 20 fathoms (36 m) and over can be found 100 yards off the southern point. The tidal **currents** in Wildcat Pass have an estimated velocity of 4 to 5 knots at strength. Slack water is believed to occur about 1½ hours before the corresponding low and high waters at Kodiak. **Anchorage** can be found in the cove in the northern shore of Rabbit Island, about ½ mile southeastward of the narrowest part of the pass, in 24 to 27 fathoms (44 to 49 m), rocky bottom. Small vessels can find indifferent anchorage in the cove in the western end of Rabbit Island, close inshore, in 8 to 10 fathoms (14.6 to 18.3 m), rocky bottom.

Wildcat Cove is a large arm in the southeastern shore of Ragged Island, 2 miles northward from Wildcat Pass, and is the second cove to westward from Hoof Point. Protected anchorage for small craft can be found at the head of this cove in 11 fathoms (20.1 m) mud bottom. This anchorage is about 100 yards from the head of the cove with the two points on the eastern side of the cove nearly on range. There is also an anchorage in 22 fathoms (40 m), mud bottom, opposite the indentation on the east shore of the cove.

Roaring Cove is a small bight in the western shore of Ragged Island, 2 miles northward from the western approach to Wildcat Pass. A small wooded island lies on the northern side of the entrance, and a wooded point, resembling an island, lies on the southern side. Partially protected anchorage for small craft can be found in the center of this cove in 4 to 5 fathoms (7.3 to 9.1 m), mud bottom.

McARTHUR PASS (chart 8530), between Ragged Island and the mainland, is about 120 yards wide in its narrowest part but is straight and easily navigated. There is a **light** on the north side of the pass at the west end of the *narrows*.

There are no known dangers in the approaches, and there is a clear channel in the center of the narrowest part of the pass, 60 yards wide, having a depth of 5 fathoms (9.1 m) and over, the least depth found in the center being 35 feet (10.7 m). Both shores in the narrowest part of the pass are lined with thick kelp which extends approximately out to the 5-fathom (9.1 m) curve. The bottom in the narrowest part is composed of smooth rock and small boulders. A spit of gravel and boulders makes out from the southern shore, in the narrowest part, with deep water close-to.

The **currents** in McArthur Pass have an estimated velocity of 3 to 4 knots at strength, slack water occurring about 2 hours before the corresponding high and low waters at Kodiak. All excepting very low powered vessels will have no difficulty in proceeding through the pass at any stage of the tide, but easterly weather and ebb tide may cause dangerous seas in the entrance.

McArthur Pass is extensively used by small vessels proceeding along the coast and affords a shorter and more protected route than the route outside the Pye Islands. This route is especially valuable when used in connection with the route through Nuka Passage.

Directions.—From a position ¾ mile southeastward of Granite Cape, a course of **245° true** for 17 miles will lead to a position ½ mile southeastward of the point 1¼ miles southward of Black Bay; thence, a course **250° true** for 2 miles will lead to the entrance of the pass. Or, from a position 1½ miles northwestward of Seal Rocks, a course of **257° true** for 21½ miles will lead to the entrance of the pass, passing ¾ mile southward of the point 1¼ miles southward of Black Bay. Mid-channel courses will lead in the best water through the narrow part of the pass.

From the western end of this narrow part, course **250° true** for 9 miles will lead to the entrance of Nuka Passage. Or, if going to West Arm, hold the above course for only 1½ miles, then steer **267° true**, passing ¼ mile southward of Harrington Point.

McArthur Cove is a large cove in the northern side of Ragged Island, 1 mile southwestward from the narrowest part of McArthur Pass. Large vessels can find good anchorage near the head of this cove in 28 to 30 fathoms (51 to 55 m), mud bottom. The two small coves on the northern side of Ragged Island, westward of McArthur Cove, are deep and clear of dangers but are subject to strong williwaws in stormy weather. Indifferent anchorage for small craft can be found in the first cove to westward, in the center of the bight near its head, in 16 to 18 fathoms (29 to 33 m), rock and gravel bottom; or in 11 to 12 fathoms (20.1 to 21.9 m) in the bight on the southern side of the cove, near the center.

Morning Cove, on the southern side of the eastern approach to McArthur Pass, affords protected anchorage for small craft near its head in 10 to 12 fathoms (18.3 to 21.9 m), rocky bottom.

Chance Cove lies off the northern side of the eastern approach to McArthur Pass, opposite Morning Cove. This cove is deep, and there is no good anchorage. The lagoon at the head of the cove, called **Chance Lagoon,** has a large flat rock in its entrance. The

passage eastward of this rock is foul, but a depth of 8 feet (2.4 m) can be carried into the lagoon through the passage westward of the rock, the best water being found by favoring the western side of the passage. There is protected anchorage for small craft in this lagoon in 8 to 12 fathoms (14.6 to 21.9 m), mud and rock bottom, but anchors will not hold well here in heavy weather.

Small vessels can find good **anchorage** in the small bight on the south side of McArthur Pass, close to westward of the narrowest part, in 7 to 11 fathoms (12.8 to 20.1 m), mud bottom. This anchorage is subject to strong williwaws, and local fishermen prefer to anchor close inshore, in the open bight on the northern side of the pass, northwestward from McArthur Cove, in 10 to 15 fathoms (18.3 to 27.4 m), rocky bottom.

East Arm of Nuka Bay has an average depth of over 100 fathoms (183 m). A small rocky bank, having a least depth of 10 fathoms (18.3 m), lies a little over ¼ mile off the western shore and about ½ mile southward of a prominent pinnacle rock, 22 feet (6.7 m) high, which lies close off the rounding point in the middle of that shore.

McCarty Glacier empties into the arm at its head. The perpendicular face of this glacier lies about 1½ miles back from the head of the bay, which is formed by a terminal moraine having a depth of about 1 fathom or less along its ridge. Between the terminal moraine and the face of the glacier the water, carrying an **ice pack,** is much deeper; no bottom at 10 fathoms (18.3 m) being found in one place. The drifting ice from the pack is lifted over the terminal moraine at high tides. On flood tide a strong current sets northward across this moraine, and vessels should use caution when in this vicinity to keep from being set onto it, or across it, and into the grinding ice pack. The depths at the head shoal very rapidly.

According to the records of the Coast and Geodetic Survey, McCarty Glacier receded 1½ miles during the period from 1906 to 1927.

Ice in East Arm is thickest after spring tides and with northerly breezes will be set into the main part of Nuka Bay, into the entrance of West Arm and even into Nuka Passage, often interfering with navigation. With southerly breezes the ice will pack up at the head of East Arm, leaving the main part of the arm clear. With easterly or westerly breezes, the ice will pack along the opposite shore, leaving the main part of the bay and the lee shore free.

The square-shaped **bay** on the eastern side of East Arm, 2 miles northward from the western entrance of McArthur Pass, affords an indifferent anchorage off the southeastern side of the bay in 12 to 15 fathoms (21.9 to 27.4 m) rocky bottom. The small bight on the northeastern side of the bay is foul.

Moonlight Bay, on the eastern side of East Arm, about 1¾ miles from the head, is deep and clear. Large vessels can find good **anchorage** near its head in 15 to 30 fathoms (27.4 to 55 m), sticky mud bottom. Small vessels can find better protection in **Midnight Cove,** a long bight making off to eastward from the northern side of Moonlight Bay. Good anchorage can be found in the middle of the cove, just past the turn, in 9 to 10 fathoms (16.4 to 18.3 m), mud bottom, or near the head of the cove in 14 to 16 fathoms (25.6 to 29.3 m), mud bottom. A spit, bare at low water and covered with boulders, extends out from the head of the cove for 150 yards. This

cove is the best **anchorage** for small vessels in East Arm, since it is doubtful whether ice would drift in here in serious quantity.

The small cove lying just northward from Moonlight Bay has depths of from 5 to 8 fathoms (9.1 to 14.6 m), mud bottom, but with westerly winds the cove is apt to be filled with ice. A narrow spit, bare at low tide and covered with bowlders, extends out from the head of the cove for 75 yards.

McCarty Lagoon, on the eastern side of East Arm at its head, has not been surveyed. The entrance nearly bares at low water, but shallow-draft vessels can enter at high tide. The tidal currents in the entrance have an estimated velocity of 8 to 12 knots at strength, so that high-water slack is the only time to enter. There are reported depths of 15 to 20 fathoms (27.4 to 37) m), mud bottom, inside the lagoon. The entrance is narrow, with sand and mud bottom. The lagoon probably freezes over in the winter.

Delight Lake is a large lake draining into the head of East Arm above the terminal moraine.

James Lagoon, on the western side of East Arm at its head, is about 1 mile long and ¾ mile wide. There is a prominent **dirt cone,** 90 feet (27.4 m) high, on the northeastern side of the entrance. The entrance, about ¾ mile long, has a least depth in the center of the channel of 4 feet (1.2 m) at low water. In **entering,** favor the western shore to avoid a long sand spit on the eastern side of the channel partly bare at low water, which makes out to southward for about 300 yards from the western end of the large, flat, sandy island which forms the eastern side of the channel. The tidal **currents** in the entrance have an estimated velocity of 6 to 10 knots at strength, high-water slack occurring about 20 minutes before high water at Kodiak and low-water slack occurring about 50 minutes after low water at Kodiak. Vessels should not attempt to enter except at slack water; high-water slack is the best. The entrance is often obstructed by ice, and ice is carried through the entrance into the lagoon. The lagoon has general depths of 12 to 15 fathoms (21.9 to 27.4 m), mud bottom. Vessels should approach the shore with caution, since large mud flats make off for considerable distance, especially along the northern shore. The lagoon probably freezes over in the winter.

Harrington Point is the southern tip of the peninsula separating East and West Arms. The peninsula is bold and rocky, but the dangers consist of rocks close inshore. A **bank,** with a least depth of 10 fathoms (18.3 m) lies ⅝ mile 180° true from the point. A bank, with a least found depth of 11 fathoms (20.1 m), lies ½ mile westward of a large rock (35 feet (10.7 m) high) lying close to the southwestern side of the Harrington Point peninsula.

West Arm of Nuka Bay is about 7 miles long in a west-northwesterly direction from Harrington Point. Two streams empty into **Beauty Bay** considered as the head of West Arm, **Nuka River** on the northern side and **Ferrum Creek** on the southern side. A large mud flat makes out from the head of Beauty Cove with deep water close to.

Shelter Cove, on the southern side of Beauty Bay, is small but affords anchorage with moderate swinging room in 14 to 16 fathoms (25.6 to 29.2 m), mud bottom. At the head of the cove is a grassy flat, in front of which is a large mud flat that covers at high tide.

Diablo Peak, on the southern side of the western arm near its head, lying 1 mile westward of Shelter Cove, is 3,555 feet (1,084 m) high and is a good mark. The Alaska Hills mine is located about 3½ miles northwestward from the head of the arm, on a shoulder of the hills on the eastern side of the flat.

Yalik Bay, on the western side of West Arm, 2½ miles northward of the entrance of Nuka Passage, has a shoal with a least found depth of 3½ fathoms (6.4 m) in the center of the bay, 1¼ miles from the entrance. Depths of over 20 fathoms (37 m) can be found all around this shoal, the better channel lying to southward. This shoal is the only danger in the bay except rocks close inshore and two rocks, bare at low water, lying 150 yards off the northern shore ⅝ mile from the head of the bay.

Anchorage can be had in the center of the bay near its head in 14 to 16 fathoms (25.6 to 29.3 m), mud and gravel bottom, but there is limited swinging room for large vessels. Small vessels can find partially protected anchorage in the small bight on the northern side of the bay, ½ mile from the entrance, in 3 to 5 fathoms (5.5 to 9.1 m), sand bottom.

A **reef** makes out for ¼ mile eastward from **Yalik Point,** the southern entrance point to Yalik Bay. A least depth of 2 fathoms (3.7 m) was found at the outer end of this reef.

A rock with a depth of 1 foot (0.3 m) over it lies about ¼ mile off the northern entrance point to Yalik Bay. At the time of its discovery the rock was marked by kelp. It is possible that at certain times there is no kelp on it.

Surprise Bay indents the eastern side of West Arm. **Anchorage** can be had ⅓ mile from the entrance to the lagoon at its head, in 17 to 20 fathoms (31 to 36 m), mud bottom.

Palisade Lagoon, at the head of Surprise Bay, has a narrow entrace 40 yards wide and 350 yards long. This entrance is too narrow and crooked to be attempted by any except very small vessels. A depth of about 4 fathoms (7.3 m) can be carried through in accordance with the following directions: Favor the eastern side of the entrance until past the point forming the western side of the entrance, to avoid a rock lying close to eastward of this point. Then favor the western side of the channel into the lagoon. There is a large sand spit with boulders on it on the eastern side of the entrance at its inner end. The general depths in the lagoon range between 18 and 22 fathoms (33 and 40 m), mud and rock bottom, and afford secure anchorage, but the lagoon sometimes freezes over in the winter. There is a large sand flat, bare at low water, at the head of the lagoon. A small stream, locally known as **Babcock River,** empties into the head of the lagoon. Two prospectors have a small gold mine about 1 mile up the valley from the head of the lagoon.

Ariadne Cove is located behind **Ariadne Island** on the south side of the entrance to Surprise Bay. The island is 90 feet (27.4 m) high and prominent. There is good anchorage for small vessels in this cove in from 5 to 10 fathoms (9.1 to 18.3 m), mud bottom, but in wintertime, with northwesterly winds, this cove becomes quite rough. There are two entrance channels, one on each side of Ariadne Island. The north **entrance,** eastward of the island, has a rock, bare at low water, near mid-channel southeastward of the island; the best water

lies to eastward of this rock, but care should be taken to avoid reefs which make out from the northern shore of the cove.

The western **entrance** has a shoal of 2½ fathoms (4.6 m), lying in the mid approach. A reef, bare at low water, makes off for 125 yards northward of the point on the southern side of the entrance. The best water in this entrance is found by favoring the island, being careful to avoid a reef, awash at high water, extending 60 yards southward from the second (small) point from the entrance on the southern side of the island.

Quartz Bay lies on the eastern side of West Arm, 4 miles northwestward from Harrington Point. **Beautiful Isle,** a wooded islet with a cluster of bare rocks, lies on the southern side of the entrance. A shoal, with a least depth of 31 feet (9.4 m), lies 300 yards westward of the northwestern tip of this islet. There is also a shoal, having a least depth of 24 feet (7.3 m), lying 250 yards off the northern shore of the entrance. **Anchorage** can be found in the center of the bay, ⅓ mile from its head, in 14 to 18 fathoms (25.6 to 33 m), mud bottom. The 10-fathom (18.3 m) curve lies about 325 yards from the head of the bay, inside of which the water shoals very rapidly.

Moss Point separates Beauty Bay from North Arm. It has a number of grass-covered rocks and wooded islets close-to.

North Arm branches off for 5 miles to northward from West Arm. There is a large flat back of the head of the arm, covered with grass and alders, in front of which is a mud flat which covers. Deep water approaches to within 250 yards of the head of the arm and to within 100 yards of the low water line.

Pilot Harbor (Emsweiler Cove), lies on the eastern side of North Arm about 1 mile from its head. A bare rock, 3 feet (0.9 m) high, lies 275 yards off the southern point of the entrance and there is a submerged rock 100 yards northeastward of this rock. A large bare rock, 4 feet (1.2 m) high, lies 125 yards southward of a wooded islet close off the northern point of the entrance. There is a clear entrance between these rocks. There is a large shoal area, 200 to 300 yards wide, most of which bares at low water, extending across the head of the bay. Entering in mid-channel, a secure anchorage will be found in the middle in 14 to 16 fathoms (25.6 to 29.3 m), mud bottom.

Small vessels can **anchor** 100 yards to westward of the point, resembling a small wooded islet, on the northeastern side of Pilot Harbor in 5 to 8 fathoms (9.1 to 14.6 m), mud bottom. This is the best anchorage for small craft in stormy weather to be found in North and West Arms.

A small **cove** lies on the western side of North Arm, about 1 mile from its head. This cove is very deep, and there is no anchorage. A large, prominent **waterfall,** with a sheer drop of about 900 feet (274 m), lies about 1½ miles northwestward from the head of the cove.

NUKA ISLAND (chart 8530), on the western side of Nuka Bay, is about 7½ miles long and 3½ miles wide. The island is mountainous, the highest peaks being 2,115 feet (645 m) high, being densely wooded on the lower slopes in the northern part and grass covered in the

southern part. The eastern shore of the island rises precipitately to the mountain tops and is bare shale and talus formation. The western shore, bordering on Nuka Passage, is broken up into numerous bays and coves.

Nuka Island has been leased by a fox farmer, and the entire island is used as a farm. Numerous "No Trespassing" signs are placed on prominent points and islands along the northern and western shores of the island. The houses of this fox farmer are located on the western shore of the island, about 2 miles southward of **Hardover Point.**

NUKA POINT (chart 8530), the southern end of Nuka Island, is fairly prominent. This point is formed by a peninsula about 1 mile long and ⅝ mile wide, with a peak 769 feet (234 m) high, near its inshore end. The peninsula is connected with the main part of the island by low land, so that, from a distance, it resembles an island. The eastern and southern shores rise in sheer cliffs, making a landing impossible. Two rocks about 3 feet (0.9 m) high lie ¼ mile off the point eastward of the 769-foot peak and a reef covers the area inshore of them.

NUKA ROCK is a lone rock, 3 feet (0.9 m) high and 20 feet in extent, lying ⅜ mile 180° true from the southeastern tip of Nuka Point. Irregular depths of less than 25 fathoms (46 m) extend about 3 miles southward from Nuka Point. A rocky patch of 8 fathoms (14.6 m) lies 1½ miles eastward from Nuka Rock, another patch of 8 fathoms (14.6 m) lies about 3 miles northeastward from Nuka Rock.

Pinnacle Rock, 3 miles north-northeastward of Nuka Rock, is the most prominent landmark along this coast. The rock is 68 feet (20.7 m) high and lies nearly ⅓ mile offshore. Numerous small rocks and reefs, marked by kelp, lie inshore from this rock.

Along the coast between Pinnacle Rock and Nuka Point, and also for ½ mile northward of Pinnacle Rock, are numerous rocks, some of which are as much as 250 yards offshore. About 1½ miles northward of Pinnacle Rock is a small bight, with a cluster of rocks and islets, which is very foul.

Extending about 1 mile southward of the bight described above, and lying offshore from two prominent sand beaches, is an area with **sandy bottom.** The bottom is smooth, with gradually increasing depths to the 10-fathom (18 m) curve, which lies nearly ½ mile offshore, and to the 20-fathom (37 m) curve, which lies ¾ mile offshore.

A prominent **reef** lies about 5 miles northward of Nuka Point and about 3 miles southward of the entrance to Nuka Passage and makes a good mark. This reef is formed by two large rocks, 25 and 30 feet (7.6 and 9.1 m) high, the outermost being the smaller and lying 400 yards off the eastern shore of Nuka Island. Many rocks lie along the coast inshore of this reef, but deep water approaches within 200 yards offshore.

The small **inlet,** about 1 mile southward from the eastern entrance to Nuka Passage, is the only important indentation in the eastern shore of the island. This inlet has a width of ¾ mile at the entrance, decreasing to about 200 yards near its head. Off the northern point of the entrance is a prominent wooded islet about 70 feet (21 m)

high, the outer face of which is bare white granite. There are numerous high, bare rocks and wooded and grassy islets on both sides of the entrance. The inlet is exposed to southeastward, and the southern side of the inlet is foul, but small craft can approach its head as follows:

Enter in mid-channel and when 200 yards past the wooded islet with a "No trespassing" sign on its southern side, which lies on the northern side of the inlet, anchor in 6 to 9 fathoms (11.0 to 16.5 m), sandy bottom, favoring the inlet with the small islet in it on the northern side. If going to the head of the inlet, favor the northern side above this anchorage, to avoid submerged rocks lying almost in mid-channel. There is a large sand flat at the head, with very shoal water 125 yards offshore from it. Very small craft can anchor abreast the last point on the southern shore, 200 yards from the low-water line, in 2 fathoms (3.7 m), sandy bottom, but there is very little swinging room. This inlet affords fair-weather anchorage only.

For 1½ miles northwestward of the northern point at the entrance to the inlet there are rocks lying as much as 250 yards offshore. The last of these rocks is 2 feet (0.6 m) high, lies 300 yards offshore, and makes a good **mark** for entering Nuka Passage. Deep water lies fairly close outside these rocks, the 100-fathom (183 m) curve lying ⅜ mile offshore.

NUKA PASSAGE (chart 8530), between Nuka Island and the mainland, is about 12 miles long from the eastern entrance on the north side of Nuka Island to the southern entrance southwestward of Nuka Point.

This passage when used with McArthur Pass, affords a shorter and protected route for vessels proceeding along the coast. It is of special use to small low-powered craft. The passage is deep and is easily navigated in clear weather.

In the approach to the eastern entrance there is a **bank,** with a least depth of 8 fathoms (14.6 m), lying 1 mile southeastward of the northern point of the entrance. There are over 100 fathoms (183 m) between this bank and the northern shore of Nuka Island. A **shoal,** with a least depth of 4¾ fathoms (8.6 m), lies in mid-passage, 1 mile 228° true from the northern point of the entrance, and nearly ½ mile southeastward of a prominent wooded islet on the northern side of the pass. There are over 90 fathoms (165 m) between this shoal and the southern shore.

Division Island.—This island lies in mid-passage about 2¼ miles from the eastern entrance to the pass. It is 125 feet (38 m) high and is wooded. It is in reality three separate islands connected at low water and diminishing in size toward the west. The ship channel is to the southward of these islands.

A rock, awash at high tide, lies 180 yards southward of the eastern tip of Division Island. A rock, bare at minus tides, lies in mid-channel to the north of the island. A 6-fathom (11.0 m) **shoal** extends southward from the western extremity of the Division Island group, reaching almost halfway across the channel.

A near mid-channel course, slightly favoring and following the general trend of the south shore, is recommended in making this passage. The tidal currents here have considerable strength.

Hardover Point is the northwestern point of Nuka Island and lies 3/8 mile southwestward of Division Island. There is a prominent "No trespassing" sign on this point, but it does not show to eastward.

From Hardover Point the pass trends eastward to Nuka Bay and southward toward Gore Point. About 5/8 mile northwestward of Hardover Point, on the northern side of the channel, is a large sand and gravel flat 1½ miles wide. This flat extends northwestward for about 1½ miles to the foot of **Yalik Glacier,** which is a prominent mark. Deep water approaches close up to this flat, except at its southwestern end, where it is shoal for considerable distance offshore.

Home Cove.—This is a small cove lying about 1½ miles southward from Hardover Point, the northwest point of Nuka Island. The home of a fox rancher and trapper is located here.

Berger Island is a prominent wooded islet, 25 feet (7.6 m) high (top of trees), about 10 miles northward from Gore Point and 5 miles southward from Hardover Point. The island is the outermost of a group of small islets making off from the eastern shore, and appears from northward to lie in the center of the channel.

A rock, bare 8 feet (2.4 m) at high tide, lies 250 yards northeastward from the island. A reef baring at low water extends 85 yards off this rock. A **rock, awash at low water** and not marked by kelp, lies 1¼ miles 213° true from Berger Island.

About 5/8 mile southward of Berger Island is a grass-covered islet 45 feet (13.7 m) high surmounted by a bushy spruce **tree** which shows up well from the north or south, but blends into the background when viewed from the west. This tree is flanked by two dead trees which show up nearly white. The spruce tree in range with the west tangent of Berger Island to the north marks the 3½ fathom (6.4 m) spot in the entrance to Westdahl Cove.

Westdahl Cove is the indentation lying just southward of Berger Island. A 3½-fathom (6.4 m) shoal lies about midway between the north and south entrance points. This shoal lies on a range described in the paragraph preceding. The middle of the bay is covered by a rocky patch of 13 to 18 fathoms (23.8 to 33 m) extending nearly across the bay. The **anchorage** is inside of this rocky patch in 22 fathoms (40 m), mud bottom.

A reef baring at low water and marked by thick kelp lies ¼ mile westward of the southern entrance point.

Nuka Point, the southern point of Nuka Island is described on page 116.

Yalik Glacier is a large glacier discharging into the west side of Nuka Passage. There is a good anchorage off the southwestern end of Yalik Glacier moraine in 14 to 17 fathoms (25.6 to 31 m), soft bottom. Local knowledge is necessary to avoid anchoring too close to a 2-fathom (3.7 m) **rocky shoal** about 3/8 mile southward of the low water line of the moraine and about ¼ mile eastward of the western shore of the passage. An unusual **rocky reef,** bare at low water, extends 300 yards in a southeasterly direction from the extreme southwestern end of the moraine.

Petrof Point lies on the western side of the passage opposite the middle part of Nuka Island. It is a prominent, low, rounding point with a wide sand beach.

Petrof Glacier, which shows prominently from the southward, discharges into the west side of the passage around the base of a prominent ridge about 2 miles southward of Petrof Point.

Brown Mountain, 2,375 feet (724 m) high, lies between Petrof Glacier and Tonsina Bay. It is of a distinctive brown shade during the summer months, and has a prominent round shoulder jutting to the eastward when viewed from the southward.

Tonsina Bay is a small bay lying 7 miles northward from Gore Point. It is marked by a large island, known locally as **Long Island,** lying nearly in the center of the entrance. This island has an elevation of about 150 feet (45 m) to the top of the trees.

The entrance to the north of Long Island is to be preferred, as it is deeper and wider.

There are firm sand flats at the head of the bay where vessels of any size may be beached in an emergency.

On the north side of the northern entrance there is a bold wooded islet. About 380 yards southward of this islet is a **reef,** awash at high water. Thick kelp extends between the reef and the islet.

A rock, awash at half tide, lies 660 yards 275° true from this reef. The rock lies 250 yards south of the north shore, and there is kelp inshore of it.

There are numerous rocks and islets making off from Long Island to the north. The northernmost one is a well defined rocky islet sparsely covered with grass and about 25 feet (7.6 m) high.

Entrance should be made at low water when the various rocks and reefs are visible. **Anchorage** may be had in 22 fathoms (40 m), mud bottom, northwestward of Long Island in the basin formed by Long Island, the islets, and the mainland.

Front Point, rising abruptly to a height of 170 feet (52 m), top of trees, lies 5 miles northward of Gore Point. It is on an island which is separated from the mainland by a narrow band of water about 25 yards wide.

A reef, bare at minus tides, lies ⅜ mile 65° true from the eastern extremity of the point and there are several sunken rocks and kelp patches inshore from this danger.

The point forms the front range mark for a vessel proceeding southwestward through Nuka Passage.

The coast from the southern entrance to Tonsina Bay to the bight north of Gore Point has numerous rocks awash and kelp patches extending about ¼ mile offshore.

Anchorage may be had anywhere in the bight north of Gore Point by keeping clear of the kelp and avoiding the rock, bare 3 feet (0.9 m) at low water, which lies 300 yards northeast of the well-defined rocky point at the westerly end of the bight.

***Directions,* Nuka Passage.**—Enter the passage from Nuka Bay by keeping in mid-channel, favoring if anything the Nuka Island shore. Pass southward of Division Island, keeping in near mid-channel and following the trend of the south shore.

Round Hardover Point at a distance of 200 yards or more, and steady on **210° true.** On this course the tree line on Front Point should be in range with the slope of Gore Point. This range clears the rock 2,400 yards 213° true from Berger Island by about ¼ mile. For that reason, care should be taken to come nothing to the eastward of the range.

Follow the range until abeam the point southward of Westdahl Cove. Then change to **185° true** until Front Point is abeam, distant 1½ miles. From here steer **205° true** to pass 1½ to 2 miles off Gore Point.

In thick weather vessels usually follow the shore northward of Tonsina Bay to avoid the reefs off Berger Island.

GORE POINT (chart 8531) is the eastern end of a prominent headland, 18 miles 247° true from Pye Ledge and 16 miles 70° true from the southeast end of East Chugach Island. From eastward and westward the headland shows as an island with **Gore Peak** (elevation 1,393 feet, 424 m) near the middle and a broad, high shoulder at the ends, and separated from the high land northward by a narrow gap. The arch in **Arch Rock,** at the eastern end of Gore Point, shows over a small arc from southward, and a folding in the strata in the face of the cliff shows on the south side of the headland.

Within a radius of 1¼ miles of Gore Point, the bottom is very irregular, depths of 14 fathoms (25.6 m) being found at that distance off. A depth of 5 fathoms (9.1 m) was found ⅜ mile south of the point in general depths of 10 to 15 fathoms (18.3 to 27.4 m).

The neck joining the headland forming Gore Point to the mainland is low and wooded. On the west side of the neck is a **cove** affording indifferent anchorage with easterly winds. The south point of the cove is the west end of the headland forming Gore Point, and is a shelving ridge of bare rock. A rocky islet lies close to this point, from 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. It is recommended only as a temporary anchorage.

To enter, pass westward of the south point of the cove at a distance of ¾ mile and steer 115° true (E. mag.) for the gap in the trees, or lowest part of the neck.

PORT DICK (chart 8531), westward of Gore Point, extends north (true) for 2½ miles to the junction of its three main arms.

Abrupt shoals lie within a radius of 1½ miles about the point at the western side of the entrance to Port Dick. The areas near the point are foul.

A reef and shoal area terminating in 8 fathoms (14.6 m) extends ½ mile westward from the western end of the headland forming Gore Point. The cove just to the northward is described on page 119.

Tacoma Cove and **Sunday Bay** are branches of the arm or **bay** indenting the eastern side of Port Dick, 2½ miles above the entrance. A dangerous reef having a depth of 1¼ fathoms (2.2 m) lies ¼ to ½ mile westward from the point on the south side of the entrance to the bay. Tacoma Cove is the anchorage generally used in Port Dick.

***Directions,* Tacoma Cove.**—Stand up the middle of Port Dick on course **357° true** until the middle of the entrance to Tacoma Cove

bears 90° true. Then steer for the middle of the cove on the **90° true** bearing; a prominent wooded islet on the south side of West Arm will bear 270° true astern. Anchor in the entrance to Tacoma Cove with the shore to the southwestward open with the point at the western side of the entrance to Port Dick; selecting a depth of 17 to 18 fathoms (31 to 33 m), sticky mud bottom. In the lesser depths near the head of the cove, the bottom is rocky and has poor holding quality.

Sunday Bay has irregular depths and is not recommended as an anchorage.

Taylor Bay, the northern arm of Port Dick, extends in a northerly direction for 3½ miles and is 1½ miles wide at the entrance.

Except for rocks fringing the shores, no dangers were found in Taylor Bay.

A rock 4 feet (1.2 m) high lies 1½ miles north of the entrance and 130 yards off the first well-defined point on the east shore. At the beginning of the narrows there are 2 rocks awash at half tide about 100 yards off the eastern shore.

At the upper end of the bay there is a basin with depths of 20 to 25 fathoms (37 to 46 m) surrounded by extensive mud flats.

West Arm extends for a distance of 7½ miles and is about ¾ mile wide at the entrance. There are two coves on the north side of the arm, 1½ and 4 miles, respectively, from the entrance. The first cove has two islands in the center. **Anchorage** may be had easterward of the islands in 16 to 19 fathoms (29.3 to 35 m), rocky and muddy bottom.

The westernmost cove is practically bare at low water.

At the head of the arm on the south side are two islets, the western one marking the low water line, which extends directly across the arm at this point.

In the southwest approach to Port Dick there is a dangerous sunken rock, locally called **GORE ROCK**, having a depth of 1¼ fathoms (2.4 m) over it, lying 7½ miles 244° true from Gore Point and 8½ miles 74° true 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.

The second small **bay** to the westward of Port Dick, distant 5 miles, has good anchorage for small craft in depths of 15 fathoms (27.4 m) and less. Between Port Dick and this bay, the shore should not be approached closer than 2 miles, due to rocks awash extending 1½ miles off the shore.

Rocky Bay, the large bay north of East Chugach Island, is broken by numerous rocks, islets, rocks awash, and shoal spots. The depths are irregular and of little use as guides for navigation. For small boats there is a sheltered anchorage in Picnic Harbor: It is 220 yards wide at its narrowest part, and 300 yards wide at its widest part.

There are two rocks awash at ¾ tide, 1¼ miles southward from the large wooded island in the middle of Rocky Bay. There is also a 2½-fathom (4.6 m) spot 1⅓ miles southward from the point at the east entrance point of the bay.

Windy Bay, just west of Rocky Bay, extends 3½ miles westerly, is 440 yards wide near its head. There is a good holding bottom of mud in 8 to 10 fathoms (14.6 to 18.3 m) near its head, but it is not recommended as a desirable anchorage because of the strong westerly

breeze that draws through the bay. Boats entering this bay should favor the south side, keeping about 440 yards offshore when north of the southerly entrance point.

Chugach Bay, the larger bay south of Windy Bay, has a northerly bight with deep water close inshore, and a westerly arm, 2 miles long, with a good holding bottom of mud. This anchorage is also affected by a strong westerly breeze that draws through it. It can be used by small boats except in easterly weather. The bottom in the southern half of the entrance is broken, with a rocky spot having a depth of 1¾ fathoms (3.3 m).

CHUGACH ISLANDS (chart 8531) are three 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 1,450 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. A rock awash at low water lies ½ mile off the northeast point. The northwest point of the island is a low wooded point or **spit.**

There is considerable foul ground extending from the island into the passage to the northward. A 4¼-fathom (7.7 m) shoal with kelp lies 1⅜ miles 45° true from the spit. The passage is apparently clear between the 4¼-fathom shoal and the reef and shoal area making off the points at the entrance to Chugach Bay.

The passage between East Chugach and Pearl Islands is clear and is used by vessels passing inside of Pearl and Elizabeth Islands. For *directions*, see page 124.

About 10½ miles 178° true from East Chugach Light lies a **rock** covered by 4½ fathoms (8.2 m). The rock is in the seaward approach to the passage between the Chugach and Barren Islands-groups and in the southeastern approach to the passage between Chugach and Pearl Islands. See chart 8502.

***Directions,* inside East Chugach Island from Gore Point.**—The depths along this route leading to **Cook Inlet** are very irregular and the region cannot be considered free from dangers until it has been dragged. Vessels prefer to use the passage between East Chugach and Pearl Islands, which is considered safe and easy to navigate.

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 Gore Point, steer **265° true** with the end of the sand spit on the northwest end of East Chugach Island ahead, and in range with the south shore of Elizabeth Island. This course passes midway between **Gore Rock** and another rock, awash

at half tide, which lies 2⅜ miles 352° true from Gore Rock. Hold this course for 12 miles, until the southeast end of East Chugach Island bears 220° true, then steer **283° true** for 4½ miles heading for the *middle* of the arm forming the head of Chugach Bay, and passing 1¾ miles off the northeast point of East Chugach Island and at least ¼ mile off the kelp marking the 4¼-fathom shoal northeastward of the spit on the northwest end of the island.

When the end of the spit bears 211° true haul sharply to a **236° true** 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, and then steer **264° true** for 3¼ miles, heading for the rocks off the south shore of Elizabeth Island, to a position ½ mile off the high north **point** of Pearl Island.

Then proceed as directed for **Chugach Passage,** page 124.

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.

Pearl Island (chart 8531) is about 2½ miles long and 1¾ miles wide. It is mountainous, with elevations up to 1,660 feet (506 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. There is a flashing white light on the extreme northeastern point of Pearl Island.

Pearl Rock, 87 feet (26.5 m) high, is a prominent detached rock lying about ½ mile south of Pearl Island. A rock, visible at low water, lies 185 yards westward from Pearl Rock.

Nagahut Rocks, about 50 feet (15.2 m) high, are 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 Pearl Island and the rocks.

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 from Nagahut Rocks. It is steep-to.

There is deep water in the **passage** between Elizabeth Island and the group composing Nagahut Rocks and Dora Reef; however, a **shoal** of 5½ to 7 fathoms (10.1 to 12.8 m) lies ⅜ to ¾ mile eastward from the rocky islet close to the southeastern end of Elizabeth Island, and a shoal of 4 fathoms (7.3 m) lies 1 mile westward from the west end of Pearl Island.

CHUGACH PASSAGE (chart 8531) is the name applied to the passage inside Pearl and Elizabeth Islands and around the rounded end of the mainland in this locality. A red buoy marks the northeastern side of the channel in the turn of Chugach Passage.

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The rounded end of the mainland is fringed with reefs, and in rounding it from the eastward the outermost danger is a **rock** baring at half tide, ½ mile offshore. The half-tide rock is 300 yards southward from a small, fairly high, lone rock which rises on the western end of a ledge that bares at low water. The lone rock shows at all stages of the tide.

Chugach Passage is commonly used by vessels entering **Cook Inlet** from eastward. Depths of 8 to 10 fathoms (14.6 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 mainland. An abrupt rocky spot having a depth of 7 fathoms (12.8 m) lies about 400 yards southward of the recommended sailing course inside Pearl Island.

Elizabeth Island is about 3 miles in diameter and is composed of two mountain masses, the latter elevations up to 1,690 feet (515 m) and a low valley between them extending through in a northwesterly direction. The northeast point, marked by a light, is a sand spit awash at high water. A depth of 1½ fathoms (2.7 m) is found ¼ mile off the light. There is a prominent, large, **bare rock,** 20 feet (6.1 m) high 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.

Currents, ***Chugach Passage.***—Eastward of Elizabeth Island the strength of the flood current sets northward about 3 hours before high water at Kodiak with an average velocity of 3 knots. The strength of the ebb sets southward 3 hours before low water at Kodiak with an average velocity of 2 knots. The slack before flood occurs near the time of low water and the slack before ebb about 1 hour after high water at Kodiak.

It is reported that the turn in the current in the main passage southward of Elizabeth Island occurs earlier, possibly as much as 1 hour, than in Chugach Passage.

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, **Chugach Passage.**—From a position 1 mile south-southeastward of East Chugach Light, steer **293° true** for 8 miles, passing 0.7 mile off Pearl Island Light, to a position ½ mile off the high north point of Pearl Island. Then steer **275° true,** heading for the high south peak of Elizabeth Island. When the northeast tangent of Elizabeth Island bears 330° true steer **347° true** for 2⅞ miles, 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. This course passes 0.6 mile off *Elizabeth Island Spit Light.*

When the mouth of the stream from a waterfall, 1¼ miles southeastward of Chatham Island, bears 90° true and distant ¾ mile, steer **270° true** for 1½ miles.

Then steer **284° true** for about 2⅞ miles, with the 1,586- and 1885-foot (483 and 575 m) peaks on the mainland almost on range

astern, to a position about 1¾ miles southward of the yellow bluff at the east entrance point of Koyuktolik Bay.

Then steer **307° true** with the sharp southwest peak of Pearl Island showing over the middle of the low valley in Elizabeth Island approximately astern, to a position 1½ miles southwestward of Point Adam.

BARREN ISLANDS (chart 8532), a group of mountainous islands, lie nearly in the middle of the entrance to Cook Inlet between Chugach Islands and Shuyak Island, and cover an area about 13 miles long and 5 miles wide. East and West Amatuli Islands are bold and precipitous and devoid of trees. They are thickly covered with grass in the depressions and on the less-precipitous slopes. In general, the anchorages around Ushagat Island are preferable to the others in the group.

Tidal Currents of considerable velocity are found in the **passages** north and south of the Barren Islands, the flood current setting approximately northwestward and the ebb southeastward. Heavy tide rips occur with strong winds in the vicinity of the islands, and are frequently dangerous for small vessels. The wind among the Barren Islands is generally stronger than it is a few miles away.

In the deep water areas of the passages north and south of the Barren Islands and approaches thereto, the current is usually regular and appears to have less force than along the sides of the passages. At the edges of the banks bordering the islands and on the detached 20- and 30-fathom (37 and 55 m) banks, in fact wherever there is much change in depth, the current increases greatly in force. This condition is usually, but not always, marked by ripples, eddies, or boils.

Ebb currents set strongly to the eastward along the edge of the bank bordering the north side of the Barren Islands, to the southward between Ushagat and Amatuli Islands and to the eastward north of Sugarloaf Island. Otherwise the ebb currents are variable for a few miles southward from the Barren Islands before assuming their steady flow in a southeasterly direction.

On the flood a narrow band of strong current will be felt a few miles north of the Barren Islands. Some lee from the flood current is afforded closer inshore, but even here there generally will be found a steady set to the westward.

The current in general probably does not exceed 4 knots. Reports indicate that the slack waters do not occur at the times of local high and low tides and the navigator is cautioned against assuming such a relation to exist. (See currents for Chugach Passage, p. 124, and for vicinity of Latax Rocks, page 156.)

Caution.—Operators of small boats should take particular care to avoid being caught in tide rips off the Barren Islands. With a moderate westerly sea, wind force 4 to 5, coaming seas in series of three to four high waves have been seen north of Nord Island of sufficient height and force to seriously endanger if not swamp the ordinary fishing launch. It is recommended that small boats in these islands in moderate weather do not leave them until the current sets with the sea.

Dangers.—In the seaward approach to the locality of the Barren Islands is a **submerged pinnacle rock** having a depth of 4½ fathoms

(8.2 m). It lies 16¾ miles 88° true from Puffin Peak, East Amatuli Island. The top of the rock is of very small area. It forms apparently the high point of a larger shoal. It may or may not be marked by a current slick.

A rock awash at half tide lies 1⅓ miles northwestward from the northernmost point of West Amatuli Island.

There is a bare rock 8 feet (2.4 m) high about ¾ mile west-southwest from the northwest point of Ushagat Island. A rock awash at half tide lies 220 yards west-northwest of it and another rock awash at half tide lies ½ mile eastward of it.

A survey of the passage between the Barren Islands and Shuyak Island indicates that the breakers previously reported in this passage do not exist.

East Amatuli Island (chart 8532), at the eastern end of the group, is about 2 miles long in an east and west direction. It has high peaks along its length except ¾ mile from its southwest end, where it drops to a valley having a level of less than 200 feet (61 m). A rocky islet, 118 feet (36 m) high, lies 200 yards off its eastern end and on this islet is located a **light**. A breaker lies 250 yards eastward from the light.

Puffin Peak, on East Amatuli Island and 1,540 feet (469 m) high, is the highest peak in the eastern group of the Barren Islands. It has a conical top.

Amatuli Cove is on the north side of East Amatuli Island and close to the west end. It is about ½ mile in extent and affords fair anchorage for small craft in 6 to 8 fathoms (11 to 14.6 m), sand and gravel bottom, near the head of the cove. With a heavy northeast wind, considerable sea makes into the cove and the williwaws are heavy. Winds draw through the cove with great strength, especially when from the southeast and south. The holding ground is not good. Kelp grows along the shores, and there is a small stream at the head of the cove.

West Amatuli Island, about 2½ miles long, is mountainous. A cluster of rocks about 30 feet (9.1 m) high lies ½ mile eastward from the northeast end of the island, with a reef between. A rock 6 feet (1.8 m) high lies 370 yards off the north point of the island. A rock awash at halftide and which does not always break lies 1 mile 357° true from the above mentioned rock.

Sugarloaf Island, 1⅛ miles southward from East Amatuli Island, is about ¾ mile long. It is 1,202 feet (366 m) high, with deep water between it and the other Barren Islands. A large, grass-covered rock, 95 feet (29 m) high, lies ⅜ mile southeastward from Sugarloaf Island with foul ground between. A rock awash lies 200 yards from the southwest corner of Sugarloaf Island. A 10-fathom bank on which **tide rips** are common lies about ⅜ mile westward from Sugarloaf Island.

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 672 feet (204 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 960 feet (293 m) high near its southwestern end. Near its northeastern end is a knob 203 feet (62 m) high. Sunken rocks and rocks awash extend out 300 yards in many places around the island.

A small rocky, **grass-topped island,** 348 feet (106 m) high, lies 1⅓ miles southeastward from the southwest point of Ushagat Island. Foul ground surrounds the island and extends almost to a bare rock, 48 feet (14.6 m) high, which lies about 1 mile to the southward. A low rock lies between the island and the bare rock. There are strong tide rips in this vicinity extending to the southwest end of **Ushagat Island.** A barrier against the ebb **current** is formed by the island, rocks, and shoal area, thereby materially decreasing the strength of this current along the southeast shore of Ushagat Island.

Ushagat Island, the westernmost and largest of the Barren Islands, is 6¾ miles long and 3½ miles wide near its western end. Ushagat Island is grass-covered except on the tops of peaks and where the cliffs are steep. The **trees** are spruce, ranging from about 50 feet high near the lake to 3 feet high near the west 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 summit of the island, 1,965 feet (599 m), is the highest in the Barrier Islands. **Table Mountain,** at the northeast end, is 1,292 feet (394 m) high, and is separated from the other high land of the island by a low, narrow neck. There are several brackish lakes which are probably fresh in the spring.

Two rocks nearly awash at high water lie ⅜ mile northward from the northwest end of Ushagat Island. The dangers ¾ mile to the westward are described on page 126. Bare rocks extend ⅜ mile southwestward from the southwest end of the island.

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 ¾ mile westward from the northwest end. Then steer **92° true** 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.

Anchorage with shelter from southerly weather may be had off the north side of Ushagat Island near the head of the deep bight 2½ miles from the northwest promontory of the island. Some protection is gained here from westerly weather. Anchor in 12 to 15 fathoms (21.9 to 27.4 m) rock bottom about ½ mile off the two small sand beaches. A small boat can get more shelter by anchoring close in.

Good protection in northerly or westerly weather may be had by anchoring in the bight on the south side of Ushagat Island, northward of Sud Island. Williwaws are heavy, but a small boat can avoid the worst of them by anchoring under the cliffs to the west of the head of the bight. A large vessel should anchor in 12 to 18 fathoms (21.9 to 33 m), rock bottom.

7. COOK INLET

COOK INLET (chart 8502) merges with Shelikof Strait through a wide unobstructed passage westward of the Barren Islands. There are three passages leading from the Gulf of Alaska to Cook Inlet: **Chugach Passage** (p. 133), inside Pearl and Elizabeth Islands, and the passages northward and southward of the Barren Islands (pp. 125 and 156). A **submerged pinnacle rock**, having a depth of 4½ fathoms (8.2 m) lies about 17 miles eastward of the Barren Islands in the seaward approach to these passages.

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 from 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 boulders, 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. It was noted in places that the **boulders** rise as much as 30 feet (9.1 m) above the general level of the bottom. 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 boulders, the deposit having been sufficient, apparently, to cover them; but there are indications that boulders 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.

Fish traps.—A large number of salmon traps line the eastern shore of Cook Inlet. They are pile structures and are required to carry lights at the outer end.

Harbors and anchorages.—Port Graham, Seldovia Bay, Kahsitsnah Bay, and Coal Bay in Kachemak Bay, Iniskin Bay, Tuxedni Channel, 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. 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 peaks 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.

Traffic.—At present there is but little traffic in Cook Inlet except that connected with the salmon canneries. All freight for the interior is discharged at Seward and goes in over the railroad. The Territory of Alaska subsidizes a small vessel which makes regular trips from Seward to Iliamna Bay.

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

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 a 8 knots between East and West Forelands and probably more between Harriet Point and the south end of Kalgin Island.

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.

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.

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.—To obtain the 150th meridian times of slacks and strengths add *1 hour 10 minutes* to the predicted times for Wrangell Narrows given in the Pacific Coast current tables. The mean velocity of the current at strength of flood or ebb is about 2 knots.

At Cape Kasilof.—For a position ½ mile offshore add *2 hours 15 minutes* to the predicted times for Wrangell Narrows to obtain times of slack and strength in 150th meridian time. The mean velocity at strength of flood or ebb is about 2 knots. For a position 3 miles offshore add *2 hours and 5 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack before flood and strength of flood, and add *3 hours and 20 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack before ebb and strength of ebb, in 150th meridian time. At this location the mean velocity at strength of flood is about 3 knots and at strength ebb, 2¼ knots.

At East and West Forelands.—Add *2 hours and 15 minutes* to predicted times for Wrangell Narrows to obtain times of slack and strength in 150th meridian time. Mean velocity at strength near shore is 3½ knots but velocities of 5 knots have been observed.

Off Moose Point.—Three miles from shore the mean velocity at strength of flood or ebb is about 3 knots. Add *3 hours and 55 minutes* to the predicted times for Wrangell Narrows to obtain times of slack and strength in 150th meridian times.

Off Cape Woronzof.—Add *4 hours and 40 minutes* to the predicted times for Wrangell Narrows to obtain times of slack and strength in 150th meridian time. The mean velocity of the current at strength of flood or ebb is about 5 knots.

In Knik Arm, South of Goose Creek.—Add *5 hours and 40 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack and strength in 150th meridian time.

The mean velocity of the current at strength of flood or ebb is about 4 knots, but velocities of 5½ knots have been observed.

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 Channel.—The currents set fair with the channel. The mean velocity at strength of flood is about 1 knot, at strength of ebb it is about 2 knots. Add *1 hour and 45 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack before flood and strength of flood, and add *55 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack before ebb and strength of ebb, in 150th meridian time.

Iniskin Bay.—The currents set fair with the channel. In the lower part of the bay the mean velocity of the current at strength of flood

or ebb is about 1 knot. Add *45 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack and strength in 150th meridian time.

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 flows 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 Cove, 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 **boulders,** 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, distance 5½ miles, make good a **335° true** 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 distant 4½ miles.

Then make good a **0° true** course for 30 miles to a position with Anchor Point light abeam, distance 6 miles.

Then make good a **16° true** course for 44 miles to a position with the light at the northeast point of Kalgin Island abeam, distant 5 miles.

Then make good a **12° true** 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** course, and make good this course for 45½ 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.

A few soundings made in 1930 indicate that extensive changes have taken place in the shoal area northward of Fire Island. No directions for crossing this area can be given. By taking advantage of high water, vessels of ordinary draft should have no trouble in crossing the shoal area. When northward of the bearing 95° true on Point Woronzof, the **bar** will have been passed and a mid-channel course should then be followed until up with Carin 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), indenting the end of Kenai Peninsula northward of Elizabeth Island, 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.

Below Chatham Island the shores on both sides of the entrance are foul, but above the island 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 small cannery in Port Chatham. The cannery is at **Portlock** (local name) on the south shore opposite the low grassy spit on the north side.

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.

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 ½ mile northeastward from Claim Point. A bare rock lies 250 yards southeastward from Kelp Point, and a dangerous detached reef with rocks bare at low water lies about ⅜ mile eastward of the bare rock. This reef is covered by kelp, but usually the kelp does not show at high water.

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 1¼ fathoms (2.1 m) over it, lying ¼ mile 6° true from the light. The rock is marked by a black can buoy on its southeast side in 40 feet (12.2 m) of water. There is deep water on either side of the rock. A depth of 5¼ fathoms (9.4 m), with a possibility of less, was found 250 yards 230° true from Chatham Island Light.

The passage east of Chatham Island is foul and should not be attempted by strangers.

A rock, with 2¼ fathoms (4.0 m) over it and marked by kelp, lies ⅜ mile from the eastern shore and over ⅝ mile 165° true from Chatham Island Light.

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 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.

Just northward of the low, grassy spit is an excellent place for beaching a vessel.

Tides.—High and low water at ***Port Chatham*** occur about 25 minutes earlier than at Seldovia. The mean range of the tide is 12 feet (2.7 m) and the range between mean lower low water and mean higher high water is about 14½ feet (4.4 m). 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. Information on currents in ***Chugach Passage*** is given in the Pacific Coast current tables.

***Directions,* Port Chatham.**—The approach and port channel have been examined with a wire drag. The dragged areas are shown on chart 8588.

From Chugach Passage.—(1) Continue on course **347° true** (p. 124), heading for the prominent **white scar** in the cliff about 350 yards northeastward of Kelp Point, until Chatham Island Light bears 51° true.

(2) Then steer **29° true** for ½ mile, heading for a small point about 1 mile northeastward of Kelp Point, to Chatham Island Light bearing 102° true distant ¼ mile.

(3) From the last position steer **68° true** for 0.4 mile, heading for the tangent of the prominent point on the south side at the turn of the port, and passing 300 yards northward of Chatham Island Light and about 100 yards southward of the black buoy marking the southeast side of the 1¼-fathom (2.1 m) rock.

(4) Just after passing the black buoy on the portside, steer **44° true** for ½ mile, heading for the islet close to the north shore about ½ mile westward of the end of the grassy spit.

(5) When the northeast end of the point at the turn of the port is abeam on the last course distant 0.2 mile, steer **98° true** for ⅞ mile to the vicinity of the **anchorage.**

From Cook Inlet.—On course **90° true** (p. 124), heading for the mouth of a stream from a waterfall 1¼ miles southeastward of Chatham Island, to a position ½ mile 340° true from the large bare rock 20 feet (6.1 m) high, lying 300 yards off the north shore of Elizabeth Island.

From the last position steer **29° true** for 1½ miles, heading for a small point about 1 mile northeastward of Kelp Point, to Chatham Island Light bearing 102° true distant ¼ mile. Then proceed from (3) as above.

The **eastern shore at the entrance of Cook Inlet** (chart 8502) 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, an then extend across to the head of Turnagain Arm. The greatest elevations occur about halfway up Kenai Peninsula, where there are numerous glaciers.

Koyuktolik Bay (chart 8531) is about 3 miles westward of Port Chatham. Its north shore consists of bare rocky cliffs, while the south shores are lower, the south entrance point consisting of a low **yellow bluff.**

Temporary **anchorage** for a moderate-sized vessel in 8 to 10 fathoms (14.6 to 18.3 m), hard bottom, may be found ½ mile from the head of the bay. It is probable, however, that in any heavy weather a considerable swell reaches this anchorage. It is restricted by a sand and gravel shoal extending from the south shore and by rocks awash lying off the north shore.

Point Adam, 6½ miles 336° true from Cape Elizabeth, is low at the end, and rises in a steep grassy slope to mountains.

Magnet Rock lies 3¼ miles 345° true from Point Adam and about ⅜ mile from the coast in the vicinity of **Point Bede.** It is small, black, and prominent.

Flat Islet, 1⅛ miles 13° true from Magnet Rock, is small, flat, grass-covered, and about 50 feet (15.2 m) high, and is composed of two closely connected islands joined by bare reefs. There is a **light** on the northwest part of the island.

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** on the south side and Dangerous Cape on the north side, 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.

English Bay is an open bight southward of Russian Point. **English Bay Reef,** bare at low water, lies about 1 mile 268° true from Russian Point. There is **broken bottom** between the reef and the foul ground extending from Russian Point, and strangers should not cross this area. Dangers along the south shore of English Bay may extend farther out than shown on the chart. **Alexandrovsk,** a small Indian village with a Greek church, is on the northeast side of English Bay.

The passage northward of Passage Island and its approach is marked by several aids and is the one in general use for ***entering*** Port Graham. The unmarked passage southward of Passage Island is approached through a narrow channel with depths of 6 to 8 fathoms over a rocky bar northward of Russian Point. The bar channel slightly rounds a reef, bare at low water, extending 600 yards northward from Russian Point.

Dangerous Cape, on the north side at the entrance, lies 5 miles northward of Flat Island. A reef extends ½ mile westward from the western side of the cape; there are two rocks bare at low water, and a rock with 1 foot (0.3 m) over it lies nearly ½ mile from shore.

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. The shore reef inside of Bird Reef is composed of rocks awash and some bare rocks. A detached ½-fathom (0.9 m) **rock** lies in the channel between Bird Reef and the shore reef.

Midway between Bird 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 boulders 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. The end of this spit is marked by a **beacon** placed in 18 feet (5.5 m) of water. 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.

Above Passage Island 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 5/8 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 1 7/8 miles above Passage Island. The wharf has a face of 150 feet and a least depth alongside of 22 feet (6.7 m). Fresh water is available from about April 1 to October 1 of each year. The cannery maintains a small store and emergency supplies of coal and gasoline can usually be obtained.

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).

Tides, ***Port Graham.***—High and low waters occur about 5 minutes earlier than at Seldoyia. The mean range of the tide is about 14½ feet (4.4 m), and the range between mean lower low water and mean higher high water is 16½ feet (5.0 m).

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 Point Pogibshi, course about **41° true.** When the village of Alexandrovsk is abeam, head in with Passage Island a little on the starboard bow, course about **92° true,** and pass at least 400 yards northwestward of the light on the north end of Passage Island and steer **129° true,** passing southward of the can buoy marking the reef making off from the north shore. Continue this course to a position with the beacon marking the end of the reef off the eastern end of Passage Island in range with Russian Point, then steer

157° true, with the point on the north shore astern, and pass westward and southward of black can buoy No. 5. Then keep in mid-channel.

From northward.—Follow the shore northward of the port on a **210° true** course, and pass over 1 mile westward of Dangerous Cape. Then steer for the village of Alexandrovsk, course about **168° true,** and when Bird Reef is about ½ mile on the port beam steer for the summit of Passage Island, course about **120° true.** When a little past the black can buoy, haul northward to pass 400 yards off the light at the north point of Passage Island.

Then follow directions in the preceding paragraph.

POINT POGIBSHI (chart 8531) is a prominent, flat-topped, grassy point, with rocky sides about 50 feet (15.2 m) high, on the east side of Cook Inlet, 1½ 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 ½ mile off the bight lying 2 miles southwestward of **Point Naskowhak.**

SELDOVIA BAY (chart 8589), on the southeastern side of Kachmak Bay, eastern shore of Cook Inlet, is a secure harbor in any weather. It extends 2 miles in a 176° true direction to **Powder Island,** with a width of ½ to ¾ mile, and then turns to 147° true 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 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 mile from the shore in the bight northeastward of Seldovia Point.

Red Bluff is a prominent high reddish bluff lying ¼ mile southeastward from Gray Cliff. It is a good mark.

A **rock,** bare 4 feet (1.2 m) at low water, lies 300 yards southwestward from 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 black buoy.

A high pointed **rock** with some dead brush on top lies near the eastern shore about 300 yards northward from Watch Point.

Watch Point, on the eastern shore, 3/8 mile southward of 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 2½ fathoms (4.6 m) over it and marked by kelp, lies 150 yards 210° true 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 population of about 380 persons (1930). 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 (22.9 m) high, which at its southeast end, is joined to the shore by a low, narrow spit. There are three canneries at the village.

There is a site of an abandoned cannery and wharf on the eastern side of the harbor, 5/8 mile southward from Watch Point.

A red nun buoy marks the point of the shoal across the channel from the cannery.

The city wharf, known as **Anderson's Dock,** lies about 350 yards southeastward from Watch Point. It has a face of 92 feet and a least depth alongside of about 16 feet at mean lower low water. In approaching this wharf, care should be taken to avoid the 2½ fathoms (4.6 m) spot 150 yards south of Watch Point; in leaving or approaching, care should be taken to avoid the sunken rock a short distance south of Anderson's Dock.

Seldovia is a port of call of the monthly mail steamer from Seward. There is a privately owned **radio station,** call letters KEA.

The best **anchorage** in the harbor is in the middle, about 3/8 mile northwestward from Powder Island 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, in 5 fathoms (9.1 m).

Tides.—Daily predictions of high and low waters 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 *northeast* end of Gray Cliff, which is about 400 yards northeastward of the light, on a **137° true** 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 grassy and wooded head lying northwestward of the cannery, course **168° true.** 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, with the high, pointed rock near the eastern shore forward of the beam, steer **193° true** and pass 125 to 150 yards westward of Watch Point.

When abeam the black buoy marking the 2½-fathom (4.6 m) spot, haul to the eastward and bring Gray Cliff Light just open off Watch Point, and hold the range until the inner basin is reached.

KACHEMAK BAY (chart 8531) 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.

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 abruptedly 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.

A **rock,** bare at extreme low water and marked by a red buoy, lies ½ mile 59° true from the north end of Nubble Point. The buoy is on the northeast side of the rock and marks the **entrance** between it and Hesketh Island. 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.

There is an abandoned salmon cannery (machinery dismantled) on the shore just eastward of the southernmost island in Tutka Bay. There was a small wharf with a 40-foot face and a depth of 19 feet (5.8 m) at the inner corner. During the summer season there is a limited amount of fresh water available. It is a difficult place for large vessels.

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.

Lancashire Rocks are a group of rocks awash lying 1¾ miles from Cohen Island. They are ½ mile offshore with foul ground inshore from them.

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Gull Island is a prominent group 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 **Coal Point,** 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.

A red **light** marks the entrance to a **lagoon** just below the inshore end of Homer Spit. The lagoon can be entered by small gas boats at high water.

There is excellent **anchorage** at a distance of ¾ mile or more northward of Homer Spit Light, in 10 to 15 fathoms (18.3 to 27.4 m), soft bottom. Greater depths and abrupt shoaling are found near the wharf, where 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 northeast point 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 red square daymark on a post marks the **rock** awash which lies southeast of Halibut Cove Light.

Bear Cove, 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. Chart 8531 is the guide.

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 toward 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 bluff 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 boulders 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.

The main bluff line recedes about ⅜ mile from the shore at Anchor Point and approaches the coast again about 1 mile to the northward, thence continues close to the shore up to Cape Starichkof. The bank attains an elevation of 270 feet (82 m) 2¾ miles northward of Anchor Point and then gradually descends to the northward.

At **Cape Starichkof** (chart 8554) the bluff recedes again, is less steep and is covered with vegetation. Northward of the cape the bluff follows the shore, varies from 100 to 240 feet (30 to 73 m) in elevation, and continues nearly to **Cape Ninilchik.**

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 and distinctive highland 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. There are several small hand-pack canneries in the vicinity of Ninilchik.

North of Cape Ninilchik the coast is very foul, being characterized by immense **boulders** not marked by kelp. The boulders 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 (chart 8553) 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 boulders from 15 to 50 feet (4.6 to 15.2 m) high, of which the Sisters are the largest. There are many boulders 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 ⅝ mile from shore a little southward of Cape Kasiloff. This anchorage is exposed except in northeasterly weather.

Kasilof is the site of an old cannery, now in ruins, on the northern bank at the mouth of **Kasilof River.** An extensive flat with boulders 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. The entrance is marked by range lights maintained from April 1 to November 15 each season. The entrance should not be attempted without local knowledge.

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 and find good shelter.

To **anchor** off the cannery ruins stand for it on a **105° true** course. Keep the lead going and anchor 3 to 4 miles from the cannery ruins in a depth not less than 5 fathoms (9.1 m) at low water. It is reported that 10 feet (3.0 m) can be carried into the river at half flood.

Karluk Reef, partly bare at low water, is 2½ miles long, its southern end lying 4 miles 298° true from Kasilof cannery. There are shoals between it and the shore.

Kenai is a post office on the northern bank at the mouth of the **Kenai River.** The cannery in operation here maintains a **radio station,** call letters KYZ (Libby, McNeill & Libby). Extensive boulder 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 boulders located by the survey, and lies 2¾ miles 232° true 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 boulders 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*** near its mouth attain a velocity of 3 knots or more. Add *2 hours and 30 minutes* to the predicted times for Wrangell Narrows to obtain the times of slack and strength in 150th meridian time.

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, 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, boulder 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 boulder 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 boulders, 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.

There is a saltery at **Swanson's Creek.**

A rock awash at low water lies 3½ miles from shore and 4 miles 346° true 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 boulders 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 boulder 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 boulders 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 later 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 (7.3 m), 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.

Shoals with least depths of 2 to 2¼ fathoms (3.7 to 4.3 m) lie between Point Possession and West Point.

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. It is reported that sediment from the rivers is causing further general shoaling in the arm. 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 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. In the case of 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. These were formerly mining towns of some importance, but they are nearly abandoned at present.

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 North Foreland on the western shore.

The Alaska Railroad skirts the northern shores of Turnagain Arm.

Fire Island (chart 8557) 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. 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 *Fire Island Light.*

There is good anchorage for a small vessel off the northern part of the bight filled by a flat 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. 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.

Race Point Light is located on the north side of Fire Island near **Race Point.**

Fire Island is joined to **Point Campbell** by a flat, bare at low water. 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 was 17 feet (5.2 m) at the time of the survey. 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.

A few soundings made in 1930 indicate that extensive changes have occurred in the hydrography of the bar mentioned above. Vessels without local knowledge should cross only at about high water.

Point Woronzof lies 4½ miles northeastward from Fire Island.

Knik Arm (chart 8557) has sufficient depth for deep-draft vessels, with the exception of the bar at its entrance northward of Fire Island. 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 (14.6 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. In the spring when ice breaks in the river it is dangerous to remain at the anchorage on account of the movement of great quantities of pan **ice.**

ANCHORAGE (chart 8557), 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 railroad wharf only at near high water. In 1930, this wharf was bare 4 feet (1.2 m) at its southern end at mean low water. Most freight is handled by lighters. There is telegraphic communication with the interior and with Seward. A United States deputy marshal is stationed at Anchorage.

ANCHORAGE is the center of an extensive net of airlines serving the Bristol Bay and Kuskokwim River areas, and the areas between there and Fairbanks.

There are good stores, hotels, and machine shops, and a Federal **hospital** is maintained in connection with the railroad. Small coasting vessels occasionally call at Anchorage, but the larger freight and passenger vessels no longer make regular calls since the railroad is in operation to Seward.

Anchorage has point-to-point **radio** communication with Seward (WXR).

There are two canneries operated at Anchorage during the fishing season.

Tides.—Daily tide predictions for ***Anchorage*** are given in the tide tables.

Goose Bay is a slight indentation on the west side of Knik Arm, 7 miles above Cairn Point.

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.

On the **western shore** of **Cook Inlet** (chart 8502), from Cape Douglas (p. 238) 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 (chart 8554) 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 boulders. The shore is mountainous, with cliffs and slides in many places, and there is no timber except at the north end of the bay.

In the vicinity of **Chinitna Point** (p. 149) 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 boulders, 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 boulders 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 boulders, vessels should not pass westward of Augustine Island, and great caution should be exercised if attempting to pass south of the island.

Augustine Island (chart 8554), 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 boulders. A boulder 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, terminating in **Burr Point,** consists of numerous small mounds of boulders with slough between. The west end is detached from the main island by a lagoon, the entrances to which are partly blocked by boulders. 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 boulders on the beach and it seemed clear; it affords shelter in northerly and easterly winds. The ship ***approached*** the anchorage on a **65° true** 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 and the north

tangent of the island bearing 75° true in 8 fathoms (14.6 m), sandy bottom. Care should be taken not to get nearer the island, as there are numerous boulders. It is exposed to northerly and northeasterly winds.

Augustine Rocks lie 8 miles 168° true 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 boulder 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 northwestward from 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 a 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 (p. 384). See also Iliamna Lake and Kvichak River, page 394. This **portage** is used by travelers passing to and from Bristol Bay in Bering Sea. A small vessel makes regular trips from Seward to Iliamna Bay.

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. The island is marked by a fixed white **light.** 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 2 fathoms (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. 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** course, passing between the north point at the entrance and White Gull Island, favoring the point slightly, and anchor ¾ mile inside the entrance

on the range and bearing given above. 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-too, which extends ⅜ mile eastward (true) from the south point at the entrance to Cottonwood Bay.

Turtle Reef extends over ⅜ mile eastward from **South Head** at the entrance of Iliamna Bay. The reef is largely bare at low water, and is about 15 feet (4.6 m) high at its highest point.

Black Reef lies over ½ mile from shore and 1⅛ miles eastward from **North Head.** 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; its northern end lies 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 (chart 8554) 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, 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** 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.** **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 and largest 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, terminating in **Iniskin Rock.**

Iniskin Islet, the outer one of the three mentioned above, 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 **Iniskin Shoal,** 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. **Big Rock,** about 15 feet (4.6 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 (chart 8554) 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 ⅝ mile northeastward, and southeastward from the island. A deep channel ⅜ 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 Channel 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 boulders, extends 6 miles from the west shore between Chinitna Bay and Tuxedni Channel. 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 (816 m) high, which is a conspicuous **mark.** A reef extends about ¼ mile southeastward from the southeast end of the island. A **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 Channel, on the southwest side of Chisik Island, is a secure anchorage. Heavy williwaws occur with gales from any direction, and raise a choppy sea in the channel dangerous to open boats. There is a **cannery** on the south end of Chisik Island. The Snug Harbor Packing Co., maintain a **radio** telephone, call letters KNT. There is a cabin on the sand spit on Chisik Island 4 miles from its southeast end. Water can be had from a fall ⅝ mile northwestward of the cabin. The channel 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. The wharf is usually carried away in the winter by the ice but is rebuilt by the cannery company in the spring. There is usually 24 feet (7.3 m) at the upper end and about 36 feet (11.0 m) at the lower end.

Tuxedni Bay (chart 8554) consists largely of shoals and reefs. There is a narrow channel which extends from Tuxedni Channel nearly to the head of the bay. This channel shoals rapidly after leaving Chisik Island. There is no channel north of Chisik Island.

To enter Tuxedni Channel 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 ⅜ 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 witdh of ¾ mile. On the island side the shore is bold, but a shoal makes out ⅝ 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.

For information on **currents** in Tuxedni Channel see page 131.

From Tuxedni Channel to Harriet Point (chart 8553) the **shore** of Cook Inlet is a gravel bluff with trees on top and a few boulders

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) high, with a number of bare slides. The point is marked by a **light**. There are boulders 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 boulders at the water. A boulder 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. 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** of Cook Inlet 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 boulders were seen on those parts lying in front of marshy shore. **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 boulders.

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 1½ to 2¼ fathoms (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 boulders show at low water, however, on the shoal except near the island. The shoaling is abrupt on the sides of the shoal. 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 boulders 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 **light.**

A boulder-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 boulders 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 boulders 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, boulder-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 boulders showing in its vicinity at lowest tides. There are boulders in places on the bottom between the shoal and West Foreland.

WEST FORELAND (chart 8553) 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 boulders, which extend below low water. Between West Foreland and the shoal to the southward, the bottom is broken and there are boulders on the bottom.

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 boulders 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. 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 Tyonek 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 boulders 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 Greek Church bearing about 4° true, 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 prominent **bluff** 150 feet (46 m) high on the south side of **Threemile Creek.** Bluffs continue 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 then meets 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.

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 of 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.

Mount Susitna (chart 8553), 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.

8. KODIAK AND AFOGNAK ISLANDS AND SHELIKOF STRAIT

Kodiak and Afognak Islands, lying close together southwestward of Cook Inlet, and separated from the mainland by Shelikof Strait, are large and have numerous small islands 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 the ash deposits in quantity are no longer apparent except in a few places.

Strong winds carry **volcanic dust** from the Katmai region causing a very hazy condition. There is at times a marked division between a very clear atmosphere on the one side and the dust-filled air on the other; this condition may be observed off the eastern coast of Kodiak Island when there is a strong wind from the northwest. The snow remaining in the mountains during the summer is discolored by the dust.

There are a number of canneries engaged in canning salmon during the season, and the cod, halibut, and herring fisheries are important. The halibut fishing fleet operates on Albatross and Portlock Banks. There is a whaling station at Port Hobron and whaling steamers operate off the southeast coast of Kodiak Island.

Kodiak, on Kodiak Island, is the principal business center in this region.

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 are longer periods of good weather on these islands than on the adjacent mainland, and considerable success has been attained in growing vegetables and foodstuffs.

AFOGNAK ISLAND (chart 8556) is separated from Kodiak Island by Marmot Bay, **Kupreanof Strait** (p. 167), and the passages on either side of Whale Island. These waters provide a direct route between Kodiak Harbor and Shelikof Strait. **Kodiak** (p. 181), on the northeast coast of Kodiak Island, lies back of the islands in the northwestern part of Chiniak Bay. There are two approaches to Kodiak; one from the northward, the other from the southeast through Chiniak Bay.

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SHUYAK ISLAND appears as part of the northern end of Afognak Island, but is separated from it by Shuyak Strait. The southern portion is densely wooded with the higher hills showing bare, rocky outcrops. Proceeding northward the trees gradually disappear, and the northern part is entirely grass-covered.

The **passage** (p. 125) between the Barren Islands and Shuyak Island is readily navigable during the day, and in clear weather, however, the passage northward of the Barren Islands is generally used if bound for Shelikof Strait from the eastward.

Latax Rocks (chart 8532), the northernmost feature of the Kodiak-Afognak-Shuyak Island Group, are three rocky islets lying in the line of the trend of the west coast of Shuyak Island. They are 32, 27, and 17 feet (9.8, 8.2, and 5.1 m) high, the outer one being the lowest and the most ragged. A **rock** awash at half tide lies about 3/8 mile northward of the outermost rock, and a reef bare at half tide lies about 3/8 mile westward of the outermost rock. Several detached shoals lie in the vicinity of Latax Rocks. Ships using the passage between Barren Islands and Shuyak Islands should pass northward of Latax Rocks.

Current.—In the vicinity of Latax Rocks it has been noted that the current flows in a westerly direction on a rising tide and easterly on a falling tide with velocities reaching about 3 to 4 knots. The current appears to be less in the deeper water in the passage northward of Latax Rocks (see page 125). On one occasion slack water occurred 2 hours earlier than high water.

Tide rips in the vicinity of Latax Rocks are particularly heavy and should be avoided by small vessels. See caution as to tide rips in the locality of the Barren Islands, page 125.

Party Cape is the northwest end of Shuyak Island. It is 183 feet (56 m) high and grass-covered for a mile or more back.

Dark Island, between Party Cape and Latax Rocks, is about 3/4 mile in diameter, 108 feet (33 m) high, and grass-covered. There are several large black rocks off the southwest end of Dark Island. **Star Rocks,** bare at low water, lie between Dark Island and the eastern part of Party Cape.

The passage between Latax Rocks and Dark Island has a 5-fathom (9.1 m) shoal near the middle of it and should be avoided on account of strong currents.

Dark Passage, between Star Rocks and Party Cape, may be navigated by keeping 3/8 mile off the cape and passing northward of a rock 3 feet (0.9 m) high lying 7/8 mile westward (magnetic) of Party Cape. Due to strong currents and heavy tide rips, the passage should be avoided.

Shag Islet and the west coast of Shuyak Island are described on page 215.

The **northern coast of Shuyak Island** from Party Cape to Point Banks is very irregular and fringed with numerous rocks and islets. Heavy currents and **tide rips** are found along this coast. **Carry Inlet** and **Shangin Bay,** the main indentations, are narrow and tortuous. They may be used only by small craft with local knowledge. Carry Inlet has its entrance channel about 2 miles eastward (magnetic) of Party Cape. The narrowest part of Shangin Bay, 1 1/4 miles from its entrance, contains a mid-channel rock baring at minus tides.

Perevalnie Islands (chart 8532) lie close to the north shore of Shuyak Island and ½ mile westward of Point Banks. They are grass-covered with a maximum elevation of 95 feet (29 m). The passage between the island and the mainland may be used as a boat passage with a depth of about 5 feet (1.5 m).

Temporary anchorage during southerly weather appears feasible ⅜ mile westward of the point ⅝ mile southwestward of the western end of the Perevalnie Islands.

POINT BANKS (chart 8533) is an island about ⅜ mile long, 130 feet (40 m) high, and entirely grass-covered. The narrow passage between it and the northeastern end of Shuyak Island contains several rocks and is choked with kelp.

A rock, 33 feet (10 m) high, lying ⅞ mile northwestward from Point Banks, affords a good **landmark** from an easterly or westerly direction. Its sides are nearly vertical.

Fronting the **east coast of Shuyak Island** at a distance of 1½ to 3½ miles offshore are a series of reefs and rocks separated by broken bottom areas and extending 7 miles in an approximately true south direction—from a 2½-fathom (4.6 m) reef, 1⅜ miles southeastward of Point Banks, to the vicinity of a bare rock 52 feet (15.8 m) high. A similar series crosses the former in the latitude of Sea Otter Island.

Vessels using the **passage** along the east coast of Shuyak Island, inside the series of reefs and rocks, should proceed with caution. The bottom in this passage is extremely broken, and it is considered that only a wire-drag survey would prove the absence of all dangers. The known ***dangers*** may be avoided by rounding the southeastern end of Point Banks Island at a distance of ½ mile until the eastern end of the island bears true north. Then proceed 5¾ miles on course **175° true** until prominent group of rocks (highest, 15 feet) are a little less than ¾ mile on the starboard beam. Then steer **155° true** into Perenosa Bay. Tidal currents are very strong.

The ***main approach from seaward*** to **Andreon Bay, Shuyak Strait** and **Perenosa Bay** is southward of the rocks southeastward of Sea Otter Island and between the 52-foot (15.8 m) bare rock and Seal Islands, but its use by large vessels cannot be recommended. Indications of shoals along the approach are numerous and they have not been examined with the wire drag. There are evidently pinnacle formations in this region. A course **282° true** from seaward, passing 3¼ miles northward of Tolstoi Point, then 1⅞ miles southward of the large rock, 52 feet (15.8 m) high, lying southwestward of Sea Otter Island, and then passing 1½ miles northward of the sharp black rocks lying northward of Cape Posliedni, avoids the known areas of extreme broken bottom.

Sea Otter Island, lying 7½ miles southeastward from Point Banks, is grass-covered, ⅜ mile long, and 105 feet (32 m) high. Bare rocks and breakers extend to the east and southeast for a distance of 2¼ miles.

Little Fort Island, off the east coast of Shuyak Island and 8 miles southward of Point Banks, is grass-covered and marks the entrance to Andreon Bay (chart 8555). **Big Fort Island** forms the south side of the bay. **Big Fort Channel** separates the island from the mainland. This channel bares at half tide. Anchorage for small

boats may be had in Andreon Bay near the entrance to Big Fort Channel in 12 fathoms (21.9 m) of water, muddy bottom. The axis of the entrance channel is a little less than ⅓ the way from the northeastern end of Big Fort Island to Little Fort Island, it then follows the rounded northern end of Big Fort Island at a distance of about 350 to 400 yards.

Shuyak Strait has a navigable entrance at its western end and is described on page 216.

Perenosa Bay (chart 8556), on the north side of Afognak Island, lies between the east entrance to Shuyak Strait and **Posliedni Cape.** The northwestern part of the bay is foul. Anchorages may be found in several arms of Perenosa Bay, but the approach to the bay from seaward is characterized by very broken bottom, see page 157.

Delphin Bay is the western one of the southern arms of Perenosa Bay. The channel westward of **Delphin Island** (tree-covered) is foul. There are also rocks in the center of the passage eastward of the island and the best water is 270 yards off the eastern points of Delphin Island. Boats can anchor in 16 fathoms, hard bottom, in the center of the head of the arm, after passing the island. A heavy swell comes into Delphin Bay in northerly weather.

Discoverer Bay, the southeast arm of Perenosa Bay, has an excellent anchorage in 15 fathoms (27.4 m), muddy bottom, east of the northern island (tree-covered). A 3¾-fathom (6.8 m) shoal lies about ½ mile northwest from the east entrance point, and a 1-fathom (1.8 m) lies between the shoal and the point. Small boats can enter the channel on the west side of the island and go to the head of the arm.

Phoenix Bay (chart 8533), the arm of Perenosa Bay just west of Posliedni Cape, is a good anchorage for all weather except northwest. Anchorage can be had in 10 to 17 fathoms (18.3 to 31 m), muddy bottom, 1¼ miles from the entrance.

Seal Bay (chart 8533) in general extends from Cape Posliedni to **Cape Tolstoi.** Beginning at a point 1⅛ miles northward from Cape Posliedni there is a series of rocky islands and reefs extending in an ESE. direction across Seal Bay. Navigation in this area should not be attempted without local information.

Tonki Bay, on the west side of Tonki Cape, has two arms separated by a headland. A high rocky islet lies ¼ mile northward of the headland. Three rocks, covered at high water, lie about ¼ mile from the eastern shore and 2 miles southward of Tonki Cape. There is anchorage about ¼ mile from the head of the eastern arm in 10 fathoms (18.3 m) soft bottom, but it is not secure with northerly winds. Small boats may anchor in the small cove on the east side of the head of the eastern arm in 8 fathoms (14.6 m) muddy bottom, in any weather.

The western arm of Tonki Bay extends 6½ miles south of the headland separating the two arms. Anchorage may be had in 18 fathoms (33 m), muddy bottom, about ⅓ mile from head of the arm.

On the ***eastern part of Afognak Island*** is a series of mountain ridges with low depressions between them running through the island from north to south. From a distance Marmot Island appears 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.

Caution.—In making Tonki Cape or Marmot Strait from the northward, a very irregular set *to the westward* has been experienced. In foggy weather a vessel is liable to be too close to the breakers off Sea Otter Island unless precautions are taken. Likewise in running to this locality from Seward, abnormal set has been experienced. From the experience of a survey vessel making these runs and in lying-to offshore, there seem to be two factors for which allowance should be made. First, if the run is made during the time of a flood spring tide, extra allowance should be made for set to the westward. Second, if the course of the vessel passes over a bank or even a locality where the water is shoaled, extra allowance for a stronger current should be made.

TONKI CAPE, the northeastern end of Afognak Island, is a narrow grass-covered point 87 feet (26.5 m) high near its northern extremity. A low-lying gap connects it with the ridge separating Tonki Bay and Marmot Straits. A short reef extends northward from the cape ¼ mile, terminating in a rock awash at mean high water. It is recommended that vessels clear the north end of the cape at least 1½ miles.

Tonki Cape is marked by an unwatched flashing white light, 87 feet (26.5 m) above the water, and visible 11 miles.

Sealion Rocks lie 5½ miles east-northeastward from Tonki Cape and 4 miles northward from Marmot Island. They are two bare rocks, close together, the larger one about 35 feet (10.7 m) high, and a reef, bare at low water, lying ⅝ mile northeastward from the bare rocks.

MARMOT ISLAND, about 6½ miles long, parallels the eastern side of Afognak Island and between them is the passage called Marmot Strait. Marmot Island is 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 1,000 feet (305 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.

Shoal areas adjacent to the northwest shore of Marmot Island extend northward toward Sealion Rocks and border the north approach to Marmot Strait. A 4-fathom (7.3 m) spot in this area lies 2¼ miles off the north end of Marmot Island, and a sunken rock lies 1 mile off.

The point on the northwest shore of Marmot Island, 1½ miles from the north end, is marked by a **rock,** about 6 feet (1.8 m) high, 600 yards offshore.

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 in the bearing 288° true to the northern end of the island. The southern rock lies in the bearing 225° true to the southeastern end of the island. Two pinnacle rocks close to the southeast side of Marmot Island bear 232° true when in range—the range passes southeastward of both breakers. A vessel should pass over 2 miles outside the breakers to avoid broken bottom.

King Cove, lying 6 miles west of Marmot Cape, is an open bight 1½ miles long and indents the coast 1¾ miles. It may be used as a temporary anchorage in 7 to 12 fathoms (12.8 to 21.9 m), sand bottom. It is exposed to easterly and southerly weather.

MARMOT STRAIT (chart 8533), between Afognak and Marmot Islands, is 2½ miles wide at its narrowest part. The strait is apparently free from dangers, except along the shores. A shoal of 1¼ fathoms (2.1 m) lies 650 yards off the western shore of Marmot Strait, 6 miles from Tonki Cape. A midchannel course through the strait is recommended. Tidal **currents** have an estimated velocity of 1 to 3 knots, the flood tide setting northward through the strait. ***Directions*** through the strait en route between Kodiak and Seward are given on pages 31 and 34.

The west coast of Marmot Strait, for about 5 miles southward from Tonki Cape, is broken and rocky, with reefs extending offshore. Along this stretch there is a low bluff, with a grass- and muskeg-covered plain, extending ¼ mile inland to the main ridge, which rises abruptly. Southward to King Cove the bluffs increase in height, with the shores steep-to. From King Cove to Pillar Cape the shore line is a steep, bare bluff from 500 to 1,000 feet high.

MARMOT BAY (chart 8534) extends westward between Afognak and Kodiak Islands to Whale Island. In the center of the bay, near the entrance and northward of The Triplets, the bottom in places rises abruptly from deep water to depths of 14 to 18 fathoms. These areas should be avoided because there may be less water than that indicated.

The ***route*** from Marmot Strait to Kodiak is eastward of the broken bottom in the center of Marmot Bay entrance. However, **shoal spots** (p. 179) exist along this route eastward of Spruce Island and in the vicinity of Spruce Cape.

The ***route*** in Marmot Bay from the vicinty of Marmot Strait to the passes at Whale Island lies between the general broken ground in the center of the bay and the north shore. Pillar Cape may be rounded at a distance of 1½ miles in depths of 20 fathoms (37 m) or more. Similar depths exist ¾ mile off Izhut Cape. In the western end of Marmot Bay danger will be avoided by keeping well eastward of a line between the eastern end of Kostromitinof Cape and Stripe Rock, and eastward of this line extended southward until Hog Island is open from the northwestern side of Whale Island.

The ***route*** along the south side of Marmot Bay through Narrow Strait and Whale Passage is generally used by vessels from Kodiak bound for Shelikof Strait. Passage at the time of maximum current in Whale Passage should be avoided.

Pillar Cape, the outer end of the north shore of Marmot Bay, is a bluff over 500 feet (152 m) high, similar to the southeast side of Marmot Island. There is a high pinnacle rock at the foot of the bluff ½ mile eastward of the south end of the cape. About 1½ miles westward of the cape is an open bight from which low land extends through to the western arm of Tonki Bay.

Spruce Island, on the south side of Marmot Bay is described on page 173.

Izhut Bay, a northern arm of Marmot Bay, opens with a width of 5 miles between Pillar Cape and Peril Cape and extends about 7½

miles in a northwest direction. There are no dangers, except along the shores and in the arms of the bay. The bay proper is exposed to southerly weather, but some of the arms afford protected anchorages.

The most important of these anchorages is **Kitoi Bay,** an arm on the west side. Its head is a land-locked basin, about ½ mile in diameter. The swinging radius from the center of the basin is about 300 yards. ***To enter*** Kitoi Bay pass the north entrance point of this arm slightly less than ½ mile off on a course **305° true,** picking up the range defined by the prominent point on the north side about 1¾ miles in, and the stream at the head of the small bight at the head of the arm. Continue on course or range until ¼ mile from the small prominent midbay islet. This position is between another islet, 600 yards to starboard, and a 3-fathom (5.5 m) spot, 125 yards to port. The islet on the starboard beam lies 100 yards from the north shore. The 3-fathom (5.5 m) spot is marked by only a few streamers of kelp difficult to see. Then change course to pass southward of the islet and steer **midchannel courses** to the center of the basin, which is clear to within a few yards from shore. A low-water spit extends a few yards off the north entrance point of the basin. Anchor in 20 to 22 fathoms (37 to 40 m). There is good holding ground. Small vessels may anchor in a small bight southwest of the basin in 11 to 12 fathoms (20.1 to 21.9 m).

Two fingerlike arms in the northeast part of Izhut Bay extend northward about 5 miles. **Saposa Bay,** the easterly arm has an island about ½ mile from its entrance. A sunken rock, covered 5 feet (1.5 m) at mean lower low water, lies about 125 yards south of the island. The passage is west of the island. The controlling depth is 2 fathoms (3.7 m). Small vessels may anchor above the island in 7 to 10 fathoms (12.8 to 18.3 m), sand bottom. The westerly arm is not recommended as an anchorage.

Peril Cape, the outer end of the western shore of Izhut Bay, 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, with a swinging radius of about 300 yards, 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, 16 feet (4.9 m) high, which lies ¼ mile from the northern shore and should not be approached closely.

A round, rocky island, 163 feet (50 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 known as **Little Afognak.** 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 163-foot 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, on the northern shore of Marmot Bay, 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 **Duck Mountain,** a prominent peak, 2,080 feet (634 m) high.

Kazakof Bay (chart 8534) extends about 6 miles in a northerly direction from the northwestern part of Marmot Bay. There is an **anchorage** for vessels of any size at the head of the bay (see directions, Kazakof Bay).

The cove on the eastern side, 3½ miles above the entrance to Kazakof Bay, affords shelter for a small vessel anchored in 12 to 14 fathoms (21.9 to 25.6 m). Small craft can anchor in the southeastern end of the cove in about 5 fathoms (9.1 m). A reef extends about 100 yards off the south side of the entrance. The small bight in the eastern shore is shoal.

In the entrance to Kazakof Bay is **Parrot Islet,** round, rocky, and 70 feet (21.3 m) high. Channels for entering lie on either side of the broken ground on which Parrot and other rocky islets and rocks awash are grouped. A sunken ledge with some kelp and a depth of 3½ fathoms (6.6 m) lies about ¾ to 1½ miles southeastward of Parrot Islet, its northern end lies ½ mile off Kostromitinof Cape.

Stripe Rock, 2⅞ miles southward of Parrot Islet, is marked by a prominent white streak which extends along the entire height of the rock. It is composed of two pinnacles close together about 35 feet (10.7 m) high; and the white streak is on the higher one of the pinnacles. A large bare ledge, about 30 feet (9.1 m) high, lies between Stripe Rock and Parrot Islet.

Westward of Stripe Rock and westward of the large bare ledge mentioned in the preceding paragraph, the area extending to the shore is mostly foul and should be avoided by vessels.

Directions,* Kazakof Bay.—*From eastward, shape the course for a position about ½ mile southeastward of Kostromitinof Cape. Then steer for Parrot Islet on a **305° true** course until the southwestern end of the cape is a little forward of the beam. Then steer **330° true** and pass ¼ mile off the southwestern end of the cape and the same distance northeastward of Parrot Islet.

Then steer **359° true** with Parrot Islet astern to the head of the bay. Above Parrot Islet there are no dangers if the shores are given a berth of ¼ mile, except a low, bare rock lying ⅜ mile from the eastern shore and ⅝ mile from the head of the bay. The **anchorage** is about midway between this rock and the point separating the two arms at the head of Kazakof Bay, 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 ¼ mile from its head or in the entrance of the eastern arm.

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** for 2¼

miles to a position ¼ mile eastward of Stripe Rock. Then steer **6° true** for 1⅛ miles to a position ¼ mile eastward of a bare ledge about 30 feet (9.1 m) high. Then steer **333° true** about 1 mile. Then steer **358° true** for ¾ mile, keeping Stripe Rock open westward of the bare ledge astern until Parrot Islet is ½ mile on the starboard beam. From this position a **5° true** course will lead to the head of the bay. (Information concerning the anchorage at the head of Kazakof Bay is given in the preceding paragraph.)

AFOGNAK BAY (chart 8534) western tributary to Marmot Bay, makes into Afognak Island about 3½ miles. There is secure **anchorage** off an unused cannery at **Rivermouth Point**, near the head (see directions, Afognak Bay). **Litnik** is a small village on Afognak River at the head of the bay.

Afognak Bay may be entered easily in the daytime. The approach from Marmot Bay is through **Eastern Passage** (chart 8570), between **Hog Island** and **Big Rock**, which lie off Afognak Bay. This approach is endangered by a **rock** awash at low water and steep-to, lying ⅜ mile eastward of Big Rock. Foul ground marked by kelp extends about 350 yards from Hog Island into Eastern Passage, and shoal water borders the passage in the vicinity of Big Rock.

A straight channel leads from Eastern Passage to the central part of Afognak Bay; both channel sides, however, are bordered by dangers. On the northeast side of the channel are the Skipwith Reefs, with shoal water projecting channelward; on the southwest side are **Danger Reef**, which bares at half tide, a 3¼-fathom (6.0 m) shoal ⅞ mile east-southeastward of the reef, and a 2¼-fathom (4.3 m) depth on a rock ⅝ mile west-northwestward of Danger Reef.

Hog Island, the prominent mark for approaching Afognak Bay and also Afognak Strait is ⅜ mile long and has two wooded knolls with a saddle between them.

Big Rock, 1 mile from Hog Island with **Eastern Passage** between them, is comparatively narrow, irregular, and 100 yards long in a north and south direction.

Skipwith Reefs, a chain of bare rocks and reefs, extend 1½ miles northwestward from Big Rock to Lamb Island. The southeastern side of the rocks should be given a berth of over ⅜ mile.

Lamb Island, ½ mile long and wooded, is near the point which marks the outer end of the eastern shore of Afognak Bay. Between this point and the rock awash at low water, ⅝ mile off Big Rock, the entire area is obstructed and should be avoided.

Alexander Island, ¾ mile eastward of Lamb Island, is grass-covered and has a knob about 80 feet (24.4 m) high at its north end. Foul ground surrounds the island and extends 1¼ miles in the direction toward Stripe Rock.

Dot Island, small and wooded, is the western one of three small islands close to **Posliedni Point**, where Afognak Bay narrows to ½ mile. On the western shore opposite Dot Island is a cascade where fresh water can be obtained by boat.

Graveyard Point marks the outer end of the western shore of Afognak Bay. **Lipsett Point** is the next point inside the bay.

Village Reefs are partly bare at low water and covered with kelp and extends over 1 mile eastward from the shore around

Graveyard Point out 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 650 yards westward from Hog Island is a channel ½ mile wide. The channel is sometimes used by vessels with local knowledge to enter Afognak Bay from Afognak Strait.

For tides see paragraph, "Afognak Strait."

Directions,* Afognak Bay.—*From northeastward, keep Hog Island open from the northwestern side of Whale Island, bearing anything westward of 250° true; this range will lead about ¼ mile southeastward of the rock awash at low water, lying ⅝ mile off Big Rock. When Big Rock appears in range with the eastern end of Lamb Island, the turn is made to pass midway between Big Rock and Hog Island. (For directions to continue into Afognak Bay, see below.)

From Narrow Strait, follow the directions in table of courses, Kodiak to Shelikof Strait, on page 187, until westward of Three Brothers. Then steer **328° true** 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** for the old cannery building at Rivermouth Point, showing midway between Dot Island and Posliedni Point. Keep this range for about 2 miles until the western end of Lamb Island is abeam. Then steer **308° true** 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** for ¾ mile, favoring slightly the western shore. Anchor near mid-channel off the old cannery at Rivermouth Point in 8 to 10 fathoms (14.6 to 18.3 m). The **anchorage** is clear if Winter Island (in the west arm) is given a clearance of 300 yards and **Last Point** (on the north shore), 400 yards.

From southward, steer **359° true** with Big Rock and the southwestern end of Alexander Island on range ahead, to pass eastward of Hog Island. When the northern tangent of Hog Island is abeam, the turn is made from the range to pass midway between Big Rock and Hog Island. (For directions to continue into Afognak Bay see preceding paragraphs.)

WHALE ISLAND (chart 8534), 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.

Afognak Strait (chart 8534), between Whale and Afognak Islands, is used mostly by small vessels.

The currents are only half as strong as in **Whale Passage** (page 170). The dangers are marked by kelp, which grows in depths up to about 6 fathoms (11 m) and shows at slack water.

If precaution is taken, the navigation is not difficult on a clear day when the marks for the strait can be seen, and when the summit of Kupreanof Mountain is not hidden. The range formed by this mountain peak and Deranof Rock (off Deranof Island) effectively marks the channel through Afognak Strait, except in the central part of the strait and just inside the western entrance. In the central part of the strait the range passes close to the edge of foul ground making out from the north shore, and here a vessel should guard against going anything northward of the range. Just inside the western entrance, a 2½-fathom (4.6 m) depth on a **rock** lying 600 yards from the Whale Island shore is on or a very little northward of the range. The channel is just southward of the rock, and here it is necessary to deviate a little southward of the range to avoid the rock; the channel is only 300 yards wide between the 2½-fathom (4.6 m) rock and the reef making out from Chiachi Point, and the general depth is 24 feet (7.3 m).

A **reef** awash at low water lies a little over ⅜ mile north-northwestward from Chiachi Point or 400 yards northward of the Kupreanof Mountain-Deranof Rock range.

Most of the northern half of Afognak Strait is foul. Southwestward of Head Point the foul ground extends ¼ mile offshore and its southern edge is near the Kupreanof Mountain-Deranof Rock range.

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 in its entrance a reef 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.

Westward of Fox Bay 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 north-northwest direction

Head Point is 1⅜ miles southward of Graveyard Point (page 163), and between these points is the village and post office of **Afognak.** The church (white with green roof) is the best mark in the village and lies ¼ mile southward of Graveyard Point. Regular passenger steamers do not call at Afognak. The mail is brought from Kodiak.

Small vessels can anchor in 5 fathoms (9.1 m) near the kelp on Village Reefs, with the church in Afognak bearing 344° true, and **Head Point** in line with Deranof Rock. Little current will be felt here, but there is exposure to easterly winds.

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.

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.

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 2½ fathoms (4.9 m) lies ⅜ mile eastward of the island and 74° true from Deranof Rock.

Tides, ***Afognak Strait.***—High and low water occur about ½ hour later than at Kodiak. The mean range of the tide is about 8 feet (2.4 m) and the range between mean lower low water and mean higher high water is 10 feet (3.0 m).

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 188 to a position ¼ mile northward of Shakmanof Point. Then steer **313° true** 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; and pass ¼ mile or more southward of Hog Island and ½ mile northward of Dolphin Point.

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.** Off Head Point and for ¾ mile to the westward, 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 2½ fathoms (4.6 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, steer **238° true** and pass ¼ mile southeastward of Deranof Rock. Continue the course ¾ mile past the rock, and then steer **286° true** 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.

Raspberry Island, 17 miles long, lies between Kodiak and Afognak Islands. The western side of the island borders on Shelikof Strait and is described on page 221.

Raspberry Strait (p. 22) separates Raspberry Island from Afognak Island. **Little Raspberry Island** lies in the eastern end of the Strait which opens into Afognak Strait and Kupreanof Strait. The passages on either side of Little Raspberry Island are said to go dry at extreme low water. The passage north of Little Raspberry Island is used by local craft at high water. The strait is unsurveyed.

The western end of Raspberry Strait opens into Shelikof Strait. There are several salteries on the south shore 5 to 6 miles inside the western entrance.

KUPREANOF STRAIT (chart 8534) extends from Whale Island to Shelikof Strait between Raspberry and Kodiak Islands. The Strait is the western link of the direct route between the port of Kodiak and Shelikof Strait.

Kupreanof Strait is 1¾ to 3 miles wide and mainly clear; but there are outlying areas to be avoided as follows: (1) A **rock** having a depth of 2½ fathoms (4.6 m) near the middle of the strait, southeastward of **Bukti Point;** (2) a series of **shoal spots** between the shoal area ⅝ mile northward of the western end of Dry Spruce Island and Chernof Point, and (3) **Thomas Rock** off the southeastern shore of Raspberry Island and the shoal spots outside of the rock.

The recommended course (see Table of Courses, Kodiak to Shelikof Strait, p. 187) through the strait passes northward of the 2½-fathom (4.6 m) rock, and when abreast of the rock, Chernof Point (wooded) appears halfway between the north side of Dry Spruce Island and the opposite shore near Gori Point.

Anchorage may be had in places near the shores of Kupreanof Island, but the only secure harbor is Dry Spruce Bay.

The islands bordering both sides of Kupreanof Strait, 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.

Thomas Rock, awash at low water, lies ⅜ mile southwestward of the southernmost wooded island between Deranof Island (p. 166) and Raspberry Island. A patch with 6 fathoms (11 m) over it lies ¼ mile southwestward of Thomas Rock.

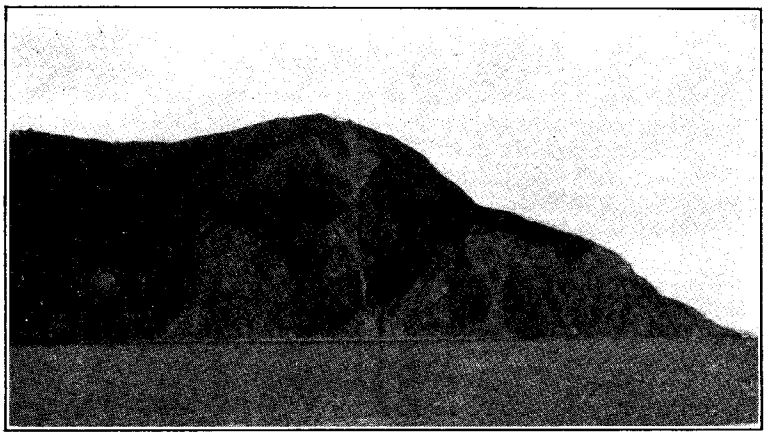
Gori Point is on the north shore of Kupreanof Strait, opposite Bare and Dry Spruce Islands. The shore on either side of Gori Point is the base of an abrupt sloping ridge, summits of which are close to the shore.

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. 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).

Malina Point, marked by a **light** visible 11 miles, is at the southern end of the mountainous headland on the southwestern part of Raspberry Island. The point itself 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).

During northeast weather, small craft can find excellent protection behind Malina Point.

RASPBERRY CAPE (chart 8534) is at the western end of the mountainous headland on the southwestern part of Raspberry Island. The cape 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 the foot of the cape.



Raspberry Cape, looking east by south.

Outlet Cape is the western end of the peninsula included between Kupreanof Strait and Viekoda Bay (page 221). 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.

DRY SPRUCE BAY, indenting the north side of Kodiak Island and adjoining Kupreanof Strait, has two navigable entrances, one on either side of Bare Island. The bay extends about 3 miles eastward of Bare Island; the southern shore of Dry Spruce Island and the impassable area eastward from the island to the mainland forms the northern limit of the bay.

A **cannery** is located on the south shore of Dry Spruce Bay opposite Dry Spruce Island. There is a wharf 200 feet long on its east face and 300 feet long on its north side. Deep water is close inshore and a portside mooring can easily be made on the east face of the wharf by large vessels. Fresh water is available and the usual supplies and machine shop of a cannery are to be found here.

The best **anchorage** for large vessels is about ½ mile eastward of Bare Island and ⅜ 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.

A mid-bay rock, bare at low water, lies ¾ mile from the head of Dry Spruce Bay.

The entrance channel northward of Bare Island is contracted to a width of about 400 yards by a low-water rock which lies 200 yards from the shore, a little inside the west end of Dry Spruce Island. The rock located about 0.3 mile northwesterly of Dry Spruce Island is marked by a green **light** during the cannery season. Shoal water extends from the eastern end of Bare Island.

The entrance southward of Bare Island is over ½ mile wide and clear. A rock awash lies about 150 yards westward of the small island. Foul ground extends over 400 yards from the south shore of Kupreanof Strait, 1¾ miles westward of Bare Island.

Bare Island, the entrance island of Dry Spruce Bay, is abreast of Kupreanof Mountain. It is ⅞ mile long and partly wooded on its eastern half. There is a fox ranch on its northeastern side. A small grassy island lies ⅜ mile westward of Bare Island; it is marked by a **light** during the cannery season.

Dry Spruce Island, northeastward of Bare Island, is 1⅜ miles long, 225 feet (69 m) high and wooded. 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 ⅝ mile westward of the western point.

A small wooded island and shoals, dry at low water, lie between Dry Spruce Island and **Drying Point,** the end of the mainland on the north side of Dry Spruce Bay.

Approaching Dry Spruce Bay ***from eastward,*** give Dry Spruce Island a berth of ¾ mile, and steer for the western end of Bare Island on any bearing southward of 226° true 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.**

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.

Chernof Point is a prominent, low, wooded point on the south shore of Kupreanof Strait, 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 ⅗ mile westward of Chernof Point and ⅕ 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 ⅝ mile 47° true from the islet.

Tides ***(Kupreanof Strait).***—At Onion Bay high and low water occur about the same time as at Seldovia. The mean range of tide is about 12 feet (3.7 m), and the range between mean lower low water and mean higher high water is 14½ feet (4.4 m). The tides meet in the strait a little westward of Dry Spruce Island. The tidal currents at Kupreanof Strait have an estimated velocity of 2 to 3 knots at the strength of the large tides.

Directions for Kupreanof Strait will be found under "Directions, Kodiak to Shelikof Strait" page 187.

WHALE PASSAGE (chart 8534), southward of Whale Island, connects Kupreanof Strait with Kizhuyak Bay (continuation of **Marmot Bay**) and is a part of the main route between Kodiak and Shelikof Strait. Afognak Strait (p. 164) is the alternate route for small vessels.

Passage through Whale Passage at time of maximum current should be avoided. There is a 2¾-fathom (4.9 m) depth on a mid-passage rock and 1 mile from the eastern end of the passage, and heavy swirls and eddies occur in the vicinity. Broken ground with a detached rock of 4 fathoms (7.3 m) lies in the eastern end north of Ilkognak Rock, where vessels enter the strait from the eastward. 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.

Navigation in the daytime is not difficult when the current is not too strong; however, careful attention to steering is required under any condition. The route is southward of the 2¾-fathom (4.9 m) mid-passage rock. Gori Point (p. 167), open a little southward of the south end of Koniuji Islet, leads southward of the 2¾-fathom (4.9 m) rock.

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.

A better anchorage can be had ¼ to ⅜ 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.

Koniuji Islet, grass-covered and about 40 feet (12.2 m) high, lies ¼ mile from the south side of Whale Passage and 2 miles westward of Ilkognak Rock. Kelp extends ¼ mile and broken ground, ¾ 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.

Ilkognak Rock, awash at high water, lies in the middle of the eastern entrance. It is marked by a light on a skeleton tower, 15 feet (4.6 m) high. The entrance channel is between this rock and Whale Island. 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 from Ilkognak Rock, and 550 yards 151° true from a **rock** awash at high water near Whale Island. A sunken reef extends 250 yards southwestward of Ilkognak Rock.

Shag Rocks, bare at half tide, lie a little over ⅜ mile southward of Ilkognak Rock, and about ⅜ mile northward of **Inner Point.**

Tidal currents in Whale Passage set westward on the flood and eastward on the ebb. During the bid tides the currents are very strong with boils and swirls. The mean velocity of the strengths is about 4½ knots. The time of slack water and the time and velocity of the maximum current may be obtained from the Current Tables, Pacific Coast, published annually in advance by the U. S. Coast and Geodetic Survey.

For ***directions,*** see Table of Courses, Kodiak to Shelikof Strait, page 189. The navigator should study the chart carefully and lay down ranges to aid him. Some of the courses are at an angle with the axis of the current.

Kizhuyak Bay (chart 8534) is the continuation of Marmot Bay and from Whale Island and Kizhuyak Point it extends southward about 14 miles into Kodiak Island. The outer bay is exposed to northeast weather, and only at or near the head is protection afforded from seas sweeping in from Marmot Bay. A landlocked anchorage for small vessels is available in Anton Larson Bay (northeastern arm of Kizhuyak Bay opposite Whale Island), but local knowledge is required to navigate its narrow entrance channel. Sharatin Bay, another arm, is exposed to seas from the northeast.

A midchannel course in Kizhuyak Bay is clear of known dangers; however, a bank of 6 to 9 fathoms (11.0 to 16.5 m), irregular in outline and rocky in places, extends across the bay, 2 to 3 miles southward of Peregrebni Point. A somewhat similar bottom exists between opposite shores in the locality of the islet, 2½ miles from the head. A small rock and a rock awash lie 300 yards westward of the islet.

Peregrebni Point, on the west side of Kizhuyak Bay, is on a wooded peninsula which is backed by a **cove.** The bottom of the cove favoring the western shore is sandy, and it rises gradually from a depth of about 2 fathoms (3.7 m) just inside the entrance to the mud flats at the head of the cove.

At Peregrebni Point the bay narrows to a width of 1½ miles. 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.

A flat extends ½ mile from the head of Kizhuyak Bay, where there is a large valley. Vessels may anchor off this flat in 19 fathoms (33 m) mud bottom; the depths are regular and there is ample room.

Kekur Point marks the northern end of the eastern shore of the narrow part of Kizhuyak Bay. A rocky patch of 6 fathoms (11.0 m) and probably less depth, lies ⅞ mile 32° true from Kekur Point.

Between Kekur Point and Cape Kizhuyak, the west shore of the outer bay is indented by Sharatin Bay and Anton Larsen Bay. The waters along the intervening shore between the two bays, from **Three Pillar Point** to **Crag Point,** contain several sunken rocks distant about ¼ to ⅜ mile from that shore; and a patch of broken ground with a depth of 9 fathoms (16.5 m) lies 1 mile offshore in Kizhuyak Bay. Off Anton Larsen Bay there is a kelp patch with a depth of only 4 feet (1.2 m), ⅞ mile 6° true from Crag Point.

Sharatin Bay, eastward of Kekur Point, has a small grass-covered islet near the center of the bay. There is a sunken rock with a depth 4 feet (1.2 m), 400 yards northward of the islet. A rock baring 9 feet (2.7 m) at low water lies 300 yards off the projecting point of the bay-shore westward of the islet. A sunken rock, with a depth of 7 feet (2.1 m), lies nearly ½ mile north-northwestward of Three Pillar Point. A tide flat extends ¾ mile from the head of the bay.

Anton Larsen Bay, between the point ⅞ mile southward of Cape Kizhuyak and Crag Point, has its entrance nearly blocked by islands; and only small craft can enter. A sunken rock, with a depth of only

4 feet (1.2 m), lies about ½ mile northward of the outer entrance island northward of Crag Point. The rock is marked by kelp. A reef, bare at minus tides, lies 260 yards 45° true from Crag Point. The passage into the bay eastward of Crag Point is very narrow. The two passages at the northern entrance are also very narrow.

The northernmost passage into Anton Larsen Bay was used by a survey tender, 77 feet long and 6½ feet (2.0 m) draft. The entrance to this passage is between the northernmost island in the bay entrance and the northern point of the bay. About ¼ mile inside this entrance and about 130 yards from the mainland there is a large, rocky patch, part of which bares at low water. The channel is southward of this rocky patch. At the narrowest part of this passage there is a small, narrow islet which hugs and parallels the mainland. The survey indicates that the channel borders close along the outer side of the narrow islet and makes a slight turn around the west end of the islet. Opposite the west end of the islet, the southwest side of the channel is bordered by rocks. Extreme caution or local knowledge is necessary.

Anton Larsen Bay, has a 3-mile stretch of water with an average width of ½ mile, extending in a southerly direction from the northern entrance passage. There is a **rock**, awash at high tide, in the middle of this stretch, about 1 mile from the entrance passage. The channel lies between the rock and the shore westward of it. A vessel may anchor about ¼ mile southward of the rock awash at high water in about 15 fathoms (27.4 m).

Cape Kizhuyak marks the outer end of the eastern side of Kizhuyak Bay. A 2¼-fathom (4.0 m) depth in a kelp patch lies about ¾ mile 210° true from Cape Kishuyak.

The broad point ¾ mile northeastward of Kizhuyak Point is partly wooded and terminates in white cliffs in places. A rock bare at half tide lies 400 yards northward from this point. Shoal water extends 300 yards northward of the rock.

Between the broad point mentioned in previous paragraph and Shakmanof Point is a cove. There is a sunken rock with a depth of 4 feet (1.2 m) near the center of this cove.

Shakmanof Point, on the southern side of Marmot Bay about 2 miles westward of the entrance to Narrow Strait, is prominent and heavily wooded. Some rocks show at low water close to the point, and it should be given a berth of over 300 yards.

The cove between Shakmanof Point and Low Island affords **anchorage** in suitable depths but it is exposed to northerly weather. Northerly winds in this locality are infrequent.

Three Brothers, 1¼ miles eastward of Shakmanof Point, is a kelp-marked reef 600 yards long and steep-to on its western side. Near its southwestern end are two rocks bare at half tide, and at its northeastern end is a rock covered at one-third flood.

Parts of the reef bare about 8 feet (2.4 m) at mean lower low water. A flashing light on a skeleton steel tower marks the southwesternmost rock awash. Kelp extends about 250 yards southward of the light toward Low Island.

Low Island lies in the middle of the bight on the southern shore of Marmot Bay between Shakmanof Point and the western entrance to Narrow Strait. 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.

Vessels cross the 7-fathom (12.8 m) **bank** or bar about ¼ mile north-northeastward of Low Island, bound to or from Narrow Strait (p. 174). A range consisting of Prokoda Islet light just open on the nearly vertical bluffs of Uzinki Point leads between a red buoy marking a sunken rock on the north side of the crossing and a black buoy marking a 3¼-fathom (6.1 m) shoal on the south side of the crossing. A wire drag examination along the range reveals a clear depth of 30 feet. It is required, however, that no deviation from the range be made. The sunken rock is 800 yards from Low Island and has less than 14 feet (4.3 m) of water over it. The 3¼-fathom (6.1 m) shoal is at the end of a reef extending northward from Low Island. These dangers are marked by kelp.

The passage south of Low Island is blocked by shoals that bare at low tide.

Narrow Strait is described on page 174.

SPRUCE ISLAND (chart 8534), on the south side of Marmot Bay, is about 6 miles long in an east and west direction. The island is rugged, with a maximum elevation **(Mount Herman)** of about 1,595 feet (482 m), 2 miles westward of East Cape. The lower elevations are in general heavily wooded, with a low wooded area ¾ to 1 mile wide extending between the eastern shore of the island and the base of Mount Herman. Grass is quite pronounced on the higher slopes of Spruce Island. The higher summits are barren. The waters adjacent to the northern and eastern shores of the island have not been completely surveyed.

About 1 mile off the western shore of Spruce Island and approximately on a line between Three Brothers and Wooded Island, are two dangers: a kelp-marked shoal with a depth of 2 fathoms (3.7 m) lying about 1 mile from Three Brothers and a rocky islet 24 feet (7.3 m) high lying ⅞ mile from Wooded Island.

Reefs extend 600 yards off the western shore of Spruce Island, ¾ mile northward of Uzinki Point (p. 176).

Wooded Island, comparatively low, lies 300 yards off the promontory on the west side of Spruce Island. It is heavily wooded and is occupied by a fox farm. A fair anchorage protected from easterly winds can be had just to the southward of the island. A 3-fathom (5.5 m) shoal lies 700 yards 98° true from the southwest end of Wooded Island.

The **Triplets**, 2 miles westward of North Cape, are a chain of three high, grassy islets extending 1 mile in a north-and-south direction. The northernmost islet is the highest of the group, with an elevation of 275 feet (84 m).

North Cape, the northern headland of Spruce Island is a wooded knob 551 feet (168 m) high. Rocky islets and rocks baring at various stages of the tide fringe the northern side of the cape within 400 yards of the shore. A shoal of 2¼ fathoms (4.0 m) lies ⅜ mile off the eastern point of the cape.

Island Bay, just southward of North Cape and opening to the eastward, has not been sounded. It affords fair anchorage for medium-size craft from westerly wind. If small craft use the head of the bay, care should be taken to pass northward of a low water rock about ¼ mile from the head.

Knee Bay is the outer portion of the indentation in the north shore of Spruce Island about 2 miles southward of North Cape. **Beelek Cove,** narrow and about 1 mile long, is the continuation of Knee Bay. The bay and cove have not been sounded. The first enclosure of Beelek Cove affords excellent shelter for small craft, but can be entered only at high tide on account of a ledge at the entrance to the cove.

The north shore of Spruce Island between Knee Bay and East Cape is bordered by rocky islets and rocks awash at various stages of the tide. Some of these lie over ¼ mile offshore.

East Cape, the northeastern end of Spruce Island, is a wooded flat extending about ¾ mile inland to the base of Mount Herman. A group of bare rocks lie within 300 yards eastward of the cape. Banks with depths partly under 10 fathoms (18.3 m) extend nearly 2 miles north-northeastward of the cape.

A rock awash at mean lower low water lies about ½ mile southward of the point of East Cape and 400 yards from the eastern shore of Spruce Island.

Two wooded islands, forming **Ostrof Point,** about 1 mile southward of East Cape, are surrounded and connected to the eastern shore of Spruce Island by a reef. The outer part of this reef terminates in a rock baring about ¼ flood tide, 300 yards eastward of the outer island. **Rocks** baring at low tide lie ¼ mile northeastward of the outer island. A rock baring about ½ tide lies 250 yards southward of the outer island.

Icon Bay is the small indentation in the eastern shore of Spruce Island halfway between East Cape and South Cape. This bay as well as the adjoining small bays to the southward have not been sounded. It is reported that a medium-size craft may find temporary anchorage in westerly weather. A rock baring near low water lies 300 yards from the head and 150 yards from the north shore of Icon Bay.

The southern shore of Spruce Island is described in the paragraphs following the description of Narrow Strait.

NARROW STRAIT (chart 8534), 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.

At the narrow part of Narrow Strait, commonly known as **Uzinki Narrows** (p. 176), vessels use the passage southward of Prokoda Islet (p. 175). The best water in the eastern part of the south passage is midway between the southeast point of Prokoda Islet and the mainland point to the southeastward (magnetic direction), and then along a mid-channel turn until abreast of Prokoda Islet Light. From abreast of the light to abreast of Uzinki Point, the route is practically a straight course and passes between Otmeloi Point and a day beacon marking a rock which bares about 6 feet (1.8 m) at low water. Careful attention to piloting is required in the Narrows as the currents will set a vessel into danger rapidly.

The western approach to Narrow Strait is southward of Three Brothers and across the 7-fathom bank ¼ mile north-northeastward of Low Island (p. 172).

The best **anchorage** in Narrow Strait is in the middle of the cove between Prokoda Islet and Uzinki (village and cannery), 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).

South Cape, the eastern end of the Spruce Island shore of Narrow Strait, is marked by a high, black, rocky islet lying 600 yards off the point. This rocky islet is 65 feet (19.8 m) in elevation; several lower ones lie just to the southward and westward thereof.

There are two islands on the north side of Narrow Strait. The eastern one is very uneven and grassy on top. A small, low rocky islet lies 400 yards eastward of the eastern island, and a rock awash at low water lies 200 yards southward of the eastern island. **Nelson Island,** the western one of the two islands, is higher and wooded. A group of rocks, baring 5 feet (1.5 m) at mean lower low water, lie 350 yards southward of Nelson Island and similar rocks lie ¼ to ⅜ mile westward of the island.

The passages leading to the cove back to Nelson Island are mainly foul or composed of broken bottom. They should be avoided by vessels of any size, except perhaps by small craft with local knowledge.

Sunny Cove, the bight on the north shore of Narrow Strait, ⅝ mile eastward of **Wooded Point,** affords anchorage for small craft in 3 to 4 fathoms (5.5 to 7.3 m), sand bottom. A sunken ledge having a depth of 1½ fathoms (2.7 m) lies ¼ mile south from the western point of the entrance to Sunny Cove. Two bare rocks lie off the middle of the entrance. A rock baring at low water lies 90 yards northwest from the eastern point of the entrance. In entering the western shore of Sunny Cove should be favored.

A rocky patch, covered by 2¾ fathoms (5.0 m) and marked by kelp, lies ¼ mile from the north shore of Narrow Strait just eastward of Black Point.

Prokoda Islet, 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 Islet is marked by a fixed white light 40 feet (12.2 m) high. The light is a guide for navigating the passage south of the islet.

The channel northward and westward of Prokoda Islet 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 Islet. The principal industry is that of fishing. There are a salmon cannery and wharf on the western side of the cove and a dilapidated wharf (which is unsafe for vessels) and an abandoned cannery on the eastern side. **Radio** communication with the Grimes Packing Co., may be had through Kodiak WXF. About 60 yards off the wharf on the eastern side of the cove, and practically on line with the northwestern side of the wharf, is a rocky patch covered by 13 feet (4.0 m) marked at times by thin kelp. This danger is otherwise unmarked.

The cannery wharf on the west side has a face of 104 feet and a least depth alongside of about 20 feet (6.1 m).

There is a small general store and a post office at Uzinki. The vessels of the Pacific Steamship Co. make regular calls here. In entering Uzinki from the eastward, care should be taken to avoid the reef which extends some distance off the southeast shore of Prokoda Islet.

Uzinki Point, southwest end of Spruce Island, is the point on the north side of the western entrance to Narrow Strait. At the point are cliffs above which a wooded slope rises steeply to a knoll about 110 feet (33 m) in elevation. The knoll is connected with the land back of it by a low, narrow, grass-covered neck.

There is kelp close to Uzinki Point and the point should be given a berth of about 125 yards.

Entrance Point, on the south side at the western entrance of Narrow Strait, is grassy with some scattered trees, and a rock 12 feet (4 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 Entrance Point.

Neva Cove, between Entrance Point and the Otmeloi Point provides good anchorage for medium-size craft from all winds except northwesterly, in 13 fathoms (23.8 m), soft bottom.

UZINKI NARROWS (chart 8534) is the name given to the narrows of Narrow Strait in the vicinity of Otmeloi Point and Prokoda Islet.

Otmeloi Point is on the south shore of Narrow Strait about ⅜ mile from the west entrance. A **rock,** showing about 6 feet (1.8 m) at low water and marked by the **day beacon** previously mentioned, lies about 275 yards northward of Otmeloi Point. It is 40 yards southward of a line from the southern end of Prokoda Islet to Uzinki Point.

The channel southward of the rock, marked by a day beacon, has a depth of 7 fathoms (12.8 m) and is 125 yards wide between the rock and a **shelving spit** with kelp which extends 125 yards from Otmeloi Point. Vessels pass southward of the day beacon and at a distance of 80 yards to avoid the shelving spit at Otmeloi Point.

In the passage south of Prokoda Island (Uzinki Narrows) shoal water of 5 fathoms (9.1 m) or less extends 200 yards southeastward of the island, and shoal water of 4 fathoms (7.3 m) or less extends 200 yards northward from the **small mainland point** ½ mile eastward from Otmeloi Point.

Between these shoal-water areas, described in the preceding paragraph, there are depths of over 10 fathoms (18.2 m) for a width of 150 yards. Vessels pass midway between Prokoda Islet and the *small mainland point* and then along a mid-channel turn until abreast of Prokoda Islet Light. From abreast of the light to abreast of Uzinki Point the route is practically a straight course and passes 80 yards southward of the day beacon.

Course Point, on the south shore of Narrow Strait, 2 miles eastward of Otmeloi Point, is prominent and is marked by a small, rocky grass-covered islet 150 yards from shore.

A tall pinnacle rock, 70 feet (21.3 m) high, lies near the south shore of Narrow Strait about ⅞ mile south-southeastward of Course Point. The cove southeastward of the pinnacle is foul except for a small area

in the center. There is a 4¼ fathom (7.9 m) shoal 400 yards from the south shore near **Azimuth Point.**

Termination Point is the eastern limit of the southern shore of Narrow Strait. Foul ground extends nearly ½ mile northward of the point.

Monashka Bay, just eastward of Termination Point, is clear inside except within ¼ mile of the shore. Anchorage depths may be found near the southeast part of the head of the bay, but there is full exposure to northeast weather.

Miller Point, on the eastern side of Monashka Bay entrance, is partly wooded and terminates in a rocky bluff. High, bare rocks extend more than 200 yards off the point, and rocks baring at various stages of the tide lie outside of them. The outermost rock bares 9 feet at low water and is ⅝ mile, 40° true from Miller Point. The range, consisting of the northeastern end of Long Island, open northward of the outer Hanin Rock, clears the rocks off Miller Point.

The **tidal currents** are weak except in the western entrance of Narrow Strait, where the mean velocity of the strengths is about 1½ knots. The times of the slacks and strengths may be obtained from the Pacific Coast current tables.

Directions for **Narrow Strait** are given in table of courses, Kodiak to Shelikof Strait, page 188.

CHINIAK BAY (charts 8534 and 8535) is the indentation in the northeast end of Kodiak Island between Spruce Cape and Cape Chiniak. Kodiak is on the northwest shore of the bay, back of the islands close to that shore. The northern approach to Kodiak is off Spruce Cape; the southern approach is southward of the two large islands in the northern part of Chiniak Bay.

Caution.—The narrow passage (chart 8545) westward of Near Island leading to the wharves at Kodiak, requires careful piloting and strangers are advised to study the coast pilot, sailing directions and chart carefully before attempting it.

The northern part of Kodiak Island westward of Chiniak Bay is mountainous and there are several prominent peaks near the shore. Spruce Cape, Cape Chiniak, and the islands overspreading the northern part of the bay, are comparatively low.

Devils Prongs are three prominent peaks southwestward of Monashka 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 and sharp.

Pillar Mountain, a short ridge 1,206 feet (367 m) high, rises steeply from the western shore just back 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.

Northern approach to Kodiak (charts 8534 and 8545).—In coming from Marmot Island, the routes pass over or near shoal spots off Spruce Cape. There is a 6½-fathom (12 m) spot 3½ miles eastward of Spruce Island. Several **shoal spots** of 5½ to 6½ fathoms (10 to 12 m) lie 2 miles northeastward of Spruce Cape. These areas have not

been examined with the wire drag. In coming from Narrow Strait, the route passes northward of St. George Rock and Hutchinson Reef.

In coming from the eastward toward Spruce Cape, the recommended route is northward of **Williams Reef** (p. 179) and northward and westward of the 3¾-fathom (6.8 m) shoal lying 1⅝ miles westward of the reef.

The channel off Spruce Cape leading to Kodiak passes eastward of Hutchinson Reef, eastward of the reefs near the east side of the cape, westward of the 4- and 4¾-fathom (7.3 and 8.4 m) shoals lying ⅞ mile 105° true from the cape and westward of the 1½-fathom rock marked by a lighted whistle buoy lying ¾ mile 145° true from the cape. Between the northwest side of Woody Island and the mainland, the channel passes westward of the shoal area off Woody Island light, eastward of the 4¼-fathom (7.8 m) shoal distant ¼ mile from the mainland and northward of the shoal areas extending from Bird and Holliday Islands. At the north entrance to the narrow passage (p. 180) westward of Near Island the channel passes northward of the lighted bell buoy marking Cyane Rock.

The northern approach 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 cannot be depended on as a guide to the entrance or to avoid danger. Strangers should make a complete and careful study of the Coast Pilot and chart before entering the narrow passage westward of Near Island.

Courses and sailing directions for the **northern approach** to Kodiak are given on page 186.

Southern approach to Kodiak.—In coming from the vicinity of Cape Chiniak, the route passes northward of Humpback Rock and southward of Long Island. If coming from the eastward to pass southward of Long Island, a vessel should keep well southward of the 4¼-fathom (8 m) rock lying about 3 miles eastward of the island. The rock breaks in a heavy swell.

After passing southward of Long Island and continuing to Kodiak, one route is by way of the passage between Woody and Bird Island, the other by way of the passage between reefs ⅝ mile northward of Cliff Point.

The route by way of the passage between Woody and Bird Islands passes southward of Inner Humpback and the dangers immediately south of it, westward of the 3-fathom (5.5 m) spot lying ⅝ mile westward from the south end of Woody Island, and eastward of the 3½-fathom (6.4 m) spot lying about ¼ mile eastward from Bird Island. It then joins the route from the north described under "Northern approach to Kodiak."

The route by way of the passage between reefs, marked by buoys, ⅝ mile northward of Cliff Point, passes southward and westward of the reefs extending about ⅜ mile southwestward from Puffin Island (St. Paul Harbor) and southward and westward of the reefs extending from Gull Island. This route through St. Paul Harbor has been examined by the wire drag and has been found clear to a depth of about 25 feet (7.6 m) at mean lower low water.

An extensive submarine ridge and an adjoining valley bisect Chiniak Bay (see p. 184 under Kalsin Bay).

Courses and sailing directions for the southern approach to Kodiak are given on page 185.

WILLIAMS REEF (chart 8534), 3¼ miles 26° true from the northeast end of Long Island, is composed of two rocks, 100 yards apart. The rocks bare at the lowest tides, deep water is close-to, and breakers generally occur, except near high water with a smooth sea. Mt. Herman bears 306° true from the vicinity of the reef. 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,** 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,** leads about ⅜ mile northwestward of Williams Reef.

A small patch with 3¾ fathoms (7.0 m) over it lies 1¾ miles 288° true from Williams Reef. Hanin Rocks light bears 265° true from the vicinity of the patch. The ranges given in the sailing directions for the northern entrance clear this patch.

Kodiak Rock, covered with 7 feet (2.1 m) of water, lies about half-way between Williams Reef and Long Island (p. 182). Extensive reefs, partly marked by kelp and having some high bare heads, extend ⅝ to ⅞ mile northward from the northern shore of Long Island. There are shoal spots between the end of these reefs and Kodiak Rock.

Shoal rocky spots lie within 1¾ miles eastward of Kodiak Rock; and 1¾ miles to the westward there is a sunken rock with a depth of 2¾ fathoms (5.0 m).

Caution.—Care must be exercised in approaching from seaward to avoid Williams Reef, Kodiak Rock, and the other dangers in this general locality. Vessels making the northern entrance to Kodiak should keep northward of Williams Reef and northward and westward of the 3¾ fathom (7.0 m) patch lying 1⅜ miles westward from the reef.

SPRUCE CAPE, the northwest point of Chiniak 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 flashing every 10 seconds. A reef, mostly bare at low water, extends 250 yards northward of Hanin Rocks.

Hutchinson Reef, ¾ mile off Spruce Cape, is ¼ mile in extent. It is partly bare at low water. There is a large kelp patch between the reef and Hanin Rocks. A bell buoy is moored ⅜ mile northeastward of Hutchinson Reef to mark the western side of the northern approach to Kodiak.

On the *eastern* side of the channel to Kodiak, southeastward of Hutchinson Reef, is some broken ground with a depth of 4¼ fathoms (8.0 m).

On the *western* side of the channel, ⅜ to 1 mile southward of Spruce Cape, are two bare reefs. The outer edges of the reefs are about 600 yards from shore. **Channel Rock,** on the southern reef, is a black rock about 10 feet (3.0 m) high amid extensive ledges. Kelp surrounds the reefs and extends south-southwestward of Channel Rock, gradually trending toward the shore and joining the shore kelp. Deep water extends close to the edge of the kelp at 150 yards off Channel Rock.

A rock with 1½ fathoms (2.7 m) of water over it lies ⅞ mile southeastward from Spruce Cape. It is marked by a lighted whistle buoy. The channel is westward of the rock.

The eastern side of the passage between **Woody Island** (p. 183) and the mainland is marked by a flashing green **light.** The light is on a white box structure at the top of the bluff on the western side of the northern point of Woody Island. The outer limits of foul ground and kelp surrounding the northern part of Woody Island lie ⅜ mile westward from the light and ½ mile north-northeastward from the light.

A kelp patch of a 3¼-fathom (6.1 m) shoal lies ⅜ mile 255° true from Woody Island light. Another kelp patch of a 4-fathom (7.3 m) shoal lies ⅝ mile 47° from the north end of Holiday Island. The recommended channel lies between these shoals.

Westward of Woody Island is a group of islands, of which **Holiday Island,** the northernmost, is wooded on its northern half and is 165 feet (50 m) high to the tops of the trees. The large clump of trees on the northern part of Holiday Island is prominent from the northern channel. **Bird Islet,** close eastward of Holiday Island, is 68 feet (21 m) high and grass topped. Foul ground and kelp extend 550 yards northward of Bird Islet. There is a bare rock close to the southern end of Bird Islet. **Near Island** the largest of the group is 202 feet (62 m) high and grass covered.

The outer **anchorage** or roadstead is off **Shahafka Cove,** ⅞ mile north-northeastward 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, 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. The rocky patch with 4 fathoms (7.3 m) over it, lying ⅝ mile 47° true from the north end of Holiday Island, should be avoided when anchoring. The cove is shoal, and there are some shacks on it.

PASSAGE Westward of Near Island (chart 8545).—The **Kodiak wharves** and float landing are located on the northwestern side of the slight enlargement of this narrow passage. It is possible at slack water for a vessel of less than 200 feet in length to turn around in the passage opposite the wharves, but this should not be attempted by a stranger. Except during a strong flood (northerly) current, vessels are advised to pass through to the inner basin (St. Paul Harbor) to make the turn there and then make a port landing at the wharves. An eddy is generally felt alongside the main wharf which will carry a vessel off unless the lines are gotten out very fast. It is difficult to get away from the wharf in case of a strong easterly wind.

In approaching the main wharf to make a port landing, care must be taken to avoid the **shoal** extending into the passage from the waterfront southwestward of the wharf. In backing, the stern of a single screw vessel will tend to swing toward the shoal.

The channel on the northwest side of Near Island has a controlling 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; sometimes the kelp grows also in the channel.

Cyane Rock, in the midde of the northern end of the passage west of Near Island, is bare at lowest tides. The entrance channel to the passage is between Cyane Rock and foul ground, which extends nearly 200 yards from the bight in the western shore. Cyane Rock is marked on its northerly side by a lighted bell buoy.

The northern end of Near Island, inside the line between its northwest side and Cyane Rock buoy, is mainly foul; but the northwest side, bordering the narrow part of the channel, is bold. The western side of the passage is foul nearly to the middle of the passage until through the narrowest part.

From the waterfront of Kodiak, southwestward of the main wharf, **shoal ground** extends out into the passage and endangers the approach to the wharf. The stern of a vessel making a port landing should be kept clear of this area. From this part of the waterfront, shoal ground also extends ⅜ mile in a southwesterly direction; 300 yards of it bares at low water, and there is a depth of 3 fathoms (5.5 m) of water near its outer end abreast of the opening between Near and Uski Islands, where it is marked by a red buoy.

A shoal, the outer end of which is marked by a **light,** extends 200 yards northwestward from Round Island. The light is fixed white and is on a 3-pile dolphin driven in 4 fathoms (7.3 m) of water.

The inner anchorage, known locally as the **Winter Anchorage,** is about ½ mile southwestward of Kodiak 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 sometimes heavy and may cause the vessel to 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.

In the narrows off ***Kodiak*** the mean velocity of the tidal current is about ¾ knot. The flood sets northeastward. Subtract 30 minutes from the predicted times for Wrangell Narrows to obtain the times of slack and strength in 150th meridian time.

KODIAK (chart 8545), a town and post office on the northwestern shore of Chiniak Bay inside Near Island, is the principal settlement of Kodiak Island and the adjacent mainland. A United States Commissioner and Deputy Marshal are stationed at Kodiak.

The main wharf is large and substantial with a face 200 feet long and 20 to 26 feet (6.1 to 7.9 m) of water alongside. A depth of 9 feet (2.7 m), at a point of shoal, extending from the waterfront of Kodiak is about 50 yards south by east from the southeast corner of the wharf. Fresh water is piped to the face of the wharf.

There are several smaller wharves, including a United States Bureau of Fisheries' wharf. An oil station, with a float landing, supplies diesel oil, gasoline and lubricating oils. There are good general stores. Coal can be obtained only in limited quantity. Minor repairs to small craft can be made at a small machine shop.

There is **communication** by mail steamers with Seattle and Seward, and with points westward to Unalaska and in Bristol Bay. A radio station is maintained by the Signal Corps of the United States Army, call letters WXF.

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 are two wharves close together, the limiting depth alongside from the southwest corner of one to southwest corner of the other is 12 feet (3.7 m). The eastern wharf has a depth of 7 feet (2.1 m) alongside the face near its eastern end.

LONG ISLAND, the easternmost island in the northern end of Chiniak bay, is 3½ miles long, about 240 feet (73 m) high, hilly, with cliffs at the water, and wooded except toward its northern end.

The northeastern end of Long Island is formed by two grass-covered knolls; the eastern one is joined to the other by a narrow neck almost covered at high tide. The northwest corner of the island is a prominent vertical bluff more than 100 feet (30 m) high, rising to a grass-covered knoll 179 feet (55 m) high. Two prominent pinnacles 60 feet (18 m) and 50 feet (15 m) high, with lower bare rocks nearby, lie off the northern extremity of the island. Extensive reefs, partly marked by kelp, with some high bare heads extend ⅝ to ⅞ mile northward from northern side of the island. Kodiak Rock and Williams Reef and other dangers northward of Long Island are described on page 179.

The southeastern side of Long Island is fringed with rocks and kelp, and detached dangers lie ¼ to ½ mile from the shore. **Refuge Island,** a small steep, grass-covered rocky islet, 80 feet (24.4 m) high, connected with Long Island by a reef, lies off the southern extremity of Long Island. It is prominent from eastward.

A 4¼-fathom (8 m) rock, which has been observed to break in heavy weather, lies 4¼ miles 95° true from Refuge Island. This submerged rock is near the center of a bank, 1½ miles long in a southwest-northeasterly direction and about ¾ mile wide, characterized by very broken bottom.

Humpback Rock, 3 miles 143° true from the south end of Long Island, is low and of small extent. There are numerous reefs between the rock and the southern shore. Vessels should pass not less than 1 mile northward of Humpback Rock to avoid broken ground extending in that direction from the rock. ***A lighted whistle buoy*** has been established 0.6 mile 49° true from Humpback Rock.

The well-enclosed **bay,** making in from the west side of Long Island, is accessible to small vessels and affords good shelter and holding ground of mud. An island lies just inside the middle of the opening and it is connected with the eastern bay shore by a bar. A black rock about 6 feet (1.8 m) high lies between the island and the south point of the opening. ***To enter*** the southern part of the bay steer **179° true** and pass between the black rock and the south point, slightly favoring the rock and then the west bay shore at the point. Anchor in the center of the basin. Access to the northern part of the bay requires local knowledge. There is a fox farm on Long Island.

Woody Island, westward of Long Island, is 2½ miles long and 260 feet (80 m) high to the tops of the trees. The island is heavily wooded except for a high grass-covered bench at the southern end of the island and a small area back of Icehouse Point, the site of an orphanage. The orphanage buildings, especially the tall white church tower, are conspicuous from the westward. Foul ground extends 1¼ miles northward from the northeast side of the island. **Vasilief Shoal** lies about halfway between the south point of Woody Island and Refuge Island. The shoal has a depth of about ½ fathom (0.9) and is marked by kelp.

Inner Humpback Rock, a pinnacle 10 feet (3 m) high, lies ½ mile 170° true from the south point of Woody Island; the intervening area is foul. Foul ground extends 600 yards southwestward of Inner Humpback Rock.

A detached rocky patch, having a depth of 3¼ fathoms (5.8 m) of water over it, lies ½ mile westward (true) from the south end of Woody Island.

A **rock** awash at mean lower low water lies about ⅜ mile southwestward of **Icehouse Point,** the western end of Woody Island; and a shoal of 3¾ fathoms (6.7 m) lies 600 yards 348° true from the point. A rock bare at low water lies between the 3¾-fathom shoal and Bird Island. The recommended channel in the **passage** westward of Woody Island, lies between Icehouse Point and the 3¾-fathom shoal.

There is a flashing green light on the bluff on the northwest extremity of Woody Island, see page 180.

ST. PAUL HARBOR (chart 8545) is southward of Kodiak and westward of the many reefs and islets between Cliff Point and **Crooked Island,** the island just eastward of Near Island. The northern entrance is made by way of the passage westward of Near Island (p. 180). With additional aids to navigation established, entrance is made practicable through the passage between reefs, ⅝ mile northward of Cliff Point. This buoyed passage and the route in St. Paul Harbor from the passage to the vicinity of the cannery wharf westward of Kodiak, has been examined with the wire drag. A controlling depth of 25 feet (7.6 m) is indicated.

For ***directions*** to St. Paul Harbor, see directions, Kodiak Harbor, Southern Approach, page 185.

Puffin Island, near the center of St. Paul Harbor, is small, grass-covered, and 82 feet (25 m) high. The top of the island near its eastern end is marked by a light. Foul ground extends 600 yards southwestward from the island. A detached shoal of 4¾ fathoms (8.5 m) lies 750 yards westward (true) from Puffin Island.

A rock baring 3 feet (0.9 m) at low water lies 350 yards southwestward from **Gull Island.** A shoal of 4¼ fathoms (mud bottom) lies near mid-channel westward (true) of Gull Island. Foul ground extends northwestward from Gull and Uski Islands; its extremity is marked by a light (p. 181).

English Bay has its entrance at the southern end of St. Paul Harbor, between Cliff Point and the shore near **Buskin River.** Comparatively shoal water extends across the entrance and the controlling depth is about 3 fathoms (5.5 m) in a narrow channel near High Island. Womens Bay is the arm back of the large peninsula extending from the northwestern shore of English Bay. A narrow **sand pit,**

bare at low tide, extends about 650 yards in a true southwesterly direction from the end of the peninsula.

To enter English Bay from St. Paul Harbor over a least depth of 3 fathoms (5.5 m) and to proceed to anchorage, make good the following courses: (1) **213° true** passing 200 yards west to High Island, to south tangent of High Island abeam. (2) **246° true** for ¾ mile, to southwest end of small islet near southeastern shore 0.2 mile on port beam. (3) **217° true** for ⅞ mile, to ⅛ mile past the beam bearing of the southwest tangent of the peninsula on the northwest side of the bay. (4) Then pass **midway** between the end of the peninsula and the small island near the head of the bay and anchor in 10 fathoms, mud bottom, off the entrance to **Womens Bay.**

Cliff Point, 4 miles southward of Kodiak, is the end of a prominent headland about 210 feet (64 m) high. The headland is covered with grass and scattered brush.

Middle Bay has its entrance between Broad and Cliff Points. **Viesoki Island,** small and flat-topped, 101 feet (31 m) high with sheer rock bluffs, lies near the mid-entrance. A rock bare at low tide lies 650 yards 36° true from the island. The bay is exposed to northeasterly weather.

Broad Point is the end of a long peninsula in the southwestern part of Chiniak Bay, separating Middle Bay from Kalsin Bay. Broken ground, on which there are some dangers, extends about 1½ miles northward from the point.

Kalsin Bay (chart 8535) is the largest of a series of tributary bays extending inland and south-southwestward from Chiniak Bay. An abandoned Government cattle experimental farm is located at the head of Kalsin Bay. Several houses and barns remain in a habitable condition. The low valley extending between Kalsin and Ugak Bay is used as a portage.

Queer and **Kalsin Islands,** in the western part of the entrance to Kalsin Bay, are fox farms; and there are three houses on Kalsin Island. Protection from all weather cannot be had between this pair of islands and the peninsula forming Broad Point.

A large expanse of reefs overspreads the eastern part of Kalsin Bay, leaving a well defined channel along the eastern shore. The leading marks in this area are **Pinnacle Rock,** 30 feet (9.1 m) high; **Middle Island; Svitlack Island;** and **Kekur Island,** 45 feet (13.7 m) high. The channel along the eastern shore leads to the **V**-shaped cove southeast of Svitlack Island, where excellent **anchorage** for small vessels in any weather is afforded. Directions are given below.

An extensive **submarine ridge,** characterized by extremely broken bottom, extends north-northeastward for 9 miles in Chiniak Bay from the reefs and islands in the eastern part of Kalsin Bay. Some of the dangers on this ridge are the 4¼-fathom breaker (p. 182) eastward of Long Island, Humpback Rock (page 182), and **Kalsin Reef** which is awash at mean higher high water.

Bordering the western side of the submarine ridge is a distinctive **submarine valley.** Its seaward outlet leads around the northern end of the ridge. Inside, the valley leads into Kalsin Bay. In the center of Chiniak Bay it enlarges to form a deep basin southward of Long Island.

Directions, Kalsin Bay.—From a position 1 mile north (true) of Humpback Rock steer **227° true** 4¾ miles to the northeast end of

Queer Island abeam, distant ¾ mile. When inside the bay favor the west shore to avoid a rock baring 4 feet (1.2 m) at mean lower low water 1 mile 260° true from **Svitlak Island.** Also avoid the rock, baring 9 feet (2.7 m), mean lower low water, ½ mile south of Isthmus Island. The recommended anchorage is in 9 to 10 fathoms (16.5 to 18.3 m) off the eastern shore about ½ mile north (true) from the bluff point 1½ miles from the eastern part of the head. This anchorage would probably be untenable during a northeast storm.

To reach the **V-shaped cove** southeast of Svitlak Island from a position 1¼ miles northward of Cape Chiniak light, steer **267° true,** heading for Kekur Island with Middle Island summit on range, until the sharp point on the west end of Isthmus Bay bears S. mag. Then turn left to course **240° true** and head for the large square rock south of Svitlak Island until abeam of the north end of Svitlak Island, then turn left to **220° true** and head for the point at the south entrance of the cove until the large square rock bears four points on the starboard bow. Then steer **180° true** and anchor in 6½ to 7 fathoms 400 yards off the south shore. To go farther into the cove requires local knowledge. The channel abreast Svitlak Island is narrow with shoal water on both sides and caution should be exercised to avoid depths less than 10 fathoms. The shoal water on the east side of the channel is extensive and surrounds the point forming the northern limit of the cove.

Isthmus Bay (chart 8535), just east of Kalsin Bay, affords anchorage for vessels in southerly weather. The range of Kekur Island and the summit of Middle Island, course **267° true** clears the dangers off the eastern end of Isthmus Bay. In an emergency a vessel may be beached on the sand at the head of the bay.

CAPE CHINIAK, the southeastern point of Chiniak Bay, is low and wooded for ¾ mile back and then rises to higher land. A flat grass-covered islet and numerous high, bare rocks extend 1⅛ miles northeastward from the cape.

Cape Chiniak light is located on the northwest side of the island lying ½ mile off the cape.

A ship anchorage with protection from southerly weather may be had 1¼ miles 320° true from Cape Chiniak Light in 18 to 20 fathoms (33 to 37 m). It is reached by rounding the rocks at the cape 1¼ miles off.

***Directions,* Kodiak Harbor.**—Kodiak Harbor, including St. Paul Harbor and approaches are characterized by broken ground in many places and pinnacle rocks are a common feature. As a measure of safety, vessels should proceed with caution in the vicinity of shoal areas of less than about 10 to 12 fathoms (18.3 to 21.9 m) that rise abruptly from deep depths.

The usual draft of vessels entering Kodiak is less than 20 feet (6.1 m). The northern approach is used by most commercial vessels entering or leaving Kodiak. The southern approach by way of the passage westward of Woody Island is used frequently by fishing vessels and occasionally by a commercial steamer; it is not recommended for deep draft vessels.

***Southern approach* (Kodiak).**—Approaching from the southward or eastward, Ugak Island (p. 190) will be made unless the

weather is thick. This island can hardly be mistaken, as it is well detached from Kodiak Island and 1,015 feet (309 m) high. Cape Chiniak will be recognized by the islets and rocks extending northeastward from it and by the light on the islet ½ mile off the cape.

The following courses lead from the vicinity of Cape Chiniak to Kodiak Harbor by way of the passage (p. 179) between Woody Island and Bird Island.

(1) **317° true** for 5½ miles, *from* 2 miles NNE. of Chiniak Island light *to* 1 mile NNE. of Humpback Rock. (2) **288° true** for 5½ miles, Puffin Island light ahead, passing ⅝ mile south of Inner Humpback Rock, *to* the range Icehouse Point—Spruce Cape. (On this course guard against the flood current which sets strongly northward at times.) (3) **25° true** for 1⅝ miles, the range Icehouse Point—Spruce Cape ahead, *to* ½ mile E. mag. of south end of Holiday Island. (4) **Various courses** for ⅞ mile, rounding Icehouse Point 300 to 350 yards and then following the shore of Woody Island at that distance, *to* the range of the northern points of Near and Holiday Islands. (For dangers in the passage westward of Woody Island see "Woody Island" p. 183.) (5) **335° true** for ⅜ mile, Shahafta Cove ahead, *to* the bearing 265° true on Cyane Rock lighted bell buoy. (6) **265° true** for ¾ mile, *to* northward of Cyane Rock lighted bell buoy close aboard. (7) **249° true** for 0.2 mile to 75 yards off the north tangent of Near Island. (8) **238° true** for 0.8 mile to 50 yards southward of Kodiak Harbor buoy 4, the shore tangent of the mainland northeastward of Cyane Rock is astern on this course, in the narrowest part of the passage (p. 181) the Near Island shore is favored, the course passes midway between the waterfront just westward of the main wharf and the opposite shore.

The following **courses** lead from the vicinity of Humpback Rock to Inner Anchorage (Kodiak) direct by way of the buoyed channel between reefs ⅝ mile northward of Cliff Point and through St. Paul Harbor.

From a position 1 mile NNE. of Humpback Rock (see course 1 above) steer **273° true** for 5.4 miles heading for north tangent of Cliff Point; when 1¼ miles from Cliff Point (south tangent of Cliff Island is then in range with north tangent of High Island) steer **305° true** for 1¼ miles, hearing for the mouth of Buskin River if discernible, passing 300 yards southwestward of Buoy 2, to a position 200 yards off Buoy 4; steer **339° true** for 1 mile to a position 110 yards off Buoy 6; steer **18° true** for 1 mile heading for 1,108-foot cairn of Pillar Mountain; when Gull Island Shoal Light comes on range with church spire in Kodiak, steer **46° true** for 0.6 mile to a position midway between the light and cannery wharf; then proceed to anchorage as desired.

Northern approach* (Kodiak).—*From seaward, keep northward of the line to Spruce Island summit bearing 294° true, until the cliffs near the southwest end of Long Island are well open westward of the sheer cliff at its northwest corner. Then steer (1) **241° true** for about 4 miles, Barometer Mountain ahead and Spruce Cape slightly to the right, *to* 250 yards southeast at Hutchinson Reef bell buoy. (The broken ground (p. 178) about 1½ miles east-northeastward of Hanin Rocks should be traversed with caution, it has not been wire dragged.) (2) **223° true** for 2⅝ miles, passing 300 yards westward of horizontal striped buoy and 400 yards eastward of Channel Rock, east tangent

of Bird Island ahead, *to* Woody Island light abeam, distant ¼ mile. (3) **235° true** for ¾ mile, northern point of Holiday Island slightly to right of ahead, *to* the bearing 265° true on Cyane Rock lighted bell buoy. (4) **265° true** for ¾ mile, *to* northward of Cyane Rock lighted bell buoy close aboard. Then follow courses (7) and (8) given under "Southern Approach."

From northward.—Directions from Marmot Strait to the entrance are given on page 31.

Or, for vessels approaching eastward of Marmot Island, from a position 3 miles 135° true from Marmot Cape, steer **221° true** for 23½ miles, which should lead 2⅞ miles westward of Williams Reef. The channel between Woody and Kodiak Islands should be made ahead and the course and distance made good should lead to a position about 250 yards southeast of Hutchinson Reef bell buoy. (The broken ground about 3½ miles eastward of Spruce Island and 1½ miles east-northeastward of Hanin Rocks should be traversed with caution, it has not been wire dragged.) From here follow the directions given in paragraph "From seaward."

Or, passing 1½ to 2 miles eastward of East Cape of Spruce Island, steer for the middle of Long Island, course about 180° true, which will lead about ½ mile eastward of Hutchinson Reef bell buoy. When the buoy is sighted, shape course to round it on its eastern side at a distance of 250 yards and then follow directions given in paragraph "From seaward."

From Narrow Strait.—Directions are given in the table below (reverse courses between positions 8 and 1).

Courses and distances

KODIAK TO SHELIKOF STRAIT (VIA NARROW STRAIT AND WHALE PASSAGE)

Positions, to and from which courses and distances apply, numbered 1, 2, 3, 4, etc. In reading this table, the course, for example, from 4 to 5 (direct) is 85°, from 6 to 5 (reverse) is 235°	Course (true) *reverse course in italics*	Distance along course
	°	*Nautical miles*
1. **Midway between Gull Island Shoal light and Cannery Wharf**, St. Paul Harbor:		
Direct	90	0.3
Reverse	***270***	*0.3*
2. **Kodiak Harbor buoy 4** bearing northwestward distant 50 yards:		
Direct: The shore tangent of mainland (northeastward of Cyane Rock) ahead and appearing ⅓ the way from the Near Island shore to the opposite shore—before approaching the narrowest part of passage. At narrowest part of passage favor the Near Island shore	58	0.8
Reverse: The shore tangent of the mainland northeastward of Cyane Rock astern. Favor the Near Island shore at the narrowest part of the passage. Pass midway between the waterfront westward of the main wharf and the opposite shore	***238***	*0.8*
3. **Eastern end of Narrows**, 0.2 mile from Cyane Rock bell buoy and 75 yards off the north tangent of Near Island:		
Direct	69	0.2
Reverse	***249***	*0.2*

***Courses and distances*—Continued**

KODIAK TO SHELIKOF STRAIT (VIA NARROW STRAIT AND WHALE PASSAGE)

Positions, to and from which courses and distances apply, numbered 1, 2, 3, 4, etc. In reading this table, the course, for example, from 4 to 5 (direct) is 85°, from 6 to 5 (reverse) is 235°	Course (true) *reverse course in italics*	Distance along course
	°	*Nautical miles*
4. **Cyane Rock** lighted bell buoy bearing south and distant about 30 yards:		
Direct: Cyane Rock buoy astern after leaving it	**85**	0.8
Reverse: Cyane Rock buoy ahead before approaching it	***265***	*0.8*
5. **Bird Island (east end) bearing 211° true and Cyane Rock buoy bearing 265° true:**		
Direct: Holiday Island 131-foot summit astern	**52**	0.7
Reverse: Holiday Island 131-foot summit ahead	***232***	*0.7*
6. **Woody Island light** bearing 133° true distant a little more than ¼ mile:		
Direct: Bird Island east end astern. Pass 400 yards east of Channel Rock (page 179) and 300 yards west of the lighted whistle buoy 1	**43**	2.7
Reverse: Bird Island east end ahead	***223***	*2.7*
7. **Hutchinson Reef** lighted bell buoy bearing northwest distant 250 yards:		
Direct: Long Island northeastern end astern	**324**	0.9
Reverse: Long Island northeastern end ahead	***144***	*0.9*
8. **Hanin Rock light** bearing 210° true distance ¾ mile:		
Direct: Uzinki Point just open from the southern shore of Narrow Strait ahead	**300**	4.5
Reverse: Uzinki Point, as above, astern	***120***	*4.5*
9. **Nelson Island** abeam distant ½ mile:		
Direct: Prokoda Islet north point ahead	**304**	2.6
Reverse: Prokoda Islet north point astern	***124***	*2.6*
10. **Black Point** bearing 35° true distant 0.3 mile:		
Direct: Rock, 12 feet high, near shore, ⅝ mile eastward of Black Point, astern; Otmeloi Point ¼ Point or starboard bow	**272**	0.3
Reverse: Rock, described above, ahead; Otemeloi Point a little to port astern	***92***	*0.3*
11. **Midway between Prokoda Islet southeast Point and small mainland point to the southeastward:**		
Direct: mid channel	**turning**	0.2
Reverse: mid channel	*turning*	*0.2*
12. **Midway between Prokoda Islet light and shore opposite:**		
Direct: Course passes 80 yards southward of daymark off Otmeloi Point	**290**	0.5
Reverse: Course passes 80 yards southward of daymark	***110***	*0.5*
13. **Uzinki Point** abeam distant 125 yards:		
Direct: Three Brothers Light ahead	**306**	0.3
Reverse: Three Brothers Light astern	***126***	*0.3*
14. **Entrance Point** bearing 180° true distant ¼ mile:		
Direct: Prokoda Islet light just open on the nearly vertical bluffs that form Uzinki Point, astern; this is a safe range for crossing the bank between a red buoy and black buoy (p. 175)	**286**	0.8
Reverse: Prokoda Islet light, as above, ahead (p. 175)	***106***	*0.8*
15. **Three Brothers light** bearing north (magnetic) distant 0.3 mile:		
Direct	**317**	1.1
Reverse	***137***	*1.1*

Courses and distances—Continued

KODIAK TO SHELIKOF STRAIT (VIA NARROW STRAIT AND WHALE PASSAGE)

Positions, to and from which courses and distances apply, numbered 1, 2, 3, 4, etc. In reading this table, the course, for example, from 4 to 5 (direct) is 85°, from 6 to 5 (reverse) is 235°	Course (true) *reverse course in italics*	Distance along course
16. **Shakmanof Point** bearing south (magnetic) distant ½ mile:		
Direct: Approaching Whale Passage, the southeast end of Whale Island appears as a wooded head, and there is a rock awash at high water close-to. Keep this end of the island aboard distant about 350 yards, pass about 300 yards southward of the rock and pass ¼ mile northward of Ilcognak Rock light. Strict attention to steering is important on account of heavy swirls	° **262**	*Nautical miles* 6. 8
Reverse: The course passes ¼ mile northward of Ilkognak Rock light, 300 yards southward of rock awash at high water and about 350 yards off the southeast shore of Whale Island	***82***	*6. 8*
17. **Ilkognak Rock light** bearing 118° true distant ½ mile; and Inner Point bearing 173° true:		
Direct: Gori Point in range with or open a little southward of the south end of Koniuji Islet, ahead (p. 170)	**298**	0. 7
Reverse: Gori Point in range as above, astern; Ilkognak Rock light ahead (p. 170)	***118***	*0. 7*
18. **Narrows Point** abeam distant 0.3 mile: Direct: Southwest end of Whale Island ahead	**317**	0. 8
Reverse: Southwest end of Whale Island astern	***137***	*0. 8*
19. **Koniuji Islet** bearing south distant ¼ mile:		
Direct: The course passes ⅜ mile off Chernof Point	**292**	7. 8
Reverse: Passing ⅜ mile off Chernof Point	***112***	*7. 8*
20. **Gori Point** abeam distant 0.4 mile:		
Direct: Summit of Whale Island astern. The course passes ⅞ mile off Outlet Cape (see p. 168 concerning midstrait rock)	**286**	10. 2
Reverse: Passing ⅞ mile off Outlet Cape and heading for Whale Island summit (see p. 164 concerning midstrait rock)	***106***	*10. 2*
21. **Malina Point Light** abeam distant ½ mile.		

If bound southward in Shelikof Strait from position 21 in the table above, make good a **244° true** 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** 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.

For directions from Shelikof Strait to the westward, see page 3.

KODIAK ISLAND, southeast coast.—A comprehensive survey was made of the waters along the southeastern coast of Kodiak Island to and including part of Albatross Bank. A vessel equipped with echo sounding apparatus would be aided in determining its position by soundings taken while cruising over this area.

The shoaler, outer parts of two extensive submarine plateaus form **Albatross Bank** (p. 205). A trough of deep water lies between them

and branches extend into both entrances of Sitkalidak Strait and toward Sitkinak Strait. A very regular trough, northeastward of Albatross bank, leads directly from seaward to Chiniak Bay.

A **depth of 8½ fathoms** (15.8 m) rocky bottom is located in latitude 56°22.5′ N. longitude 152°56.5′ W. on Albatross Bank.

Canneries are located at Shearwater Bay, Lazy Bay, and Olga Bay. There is a whaling station at Port Hobron.

Cape Greville (chart 8535), 2 miles southward of **Cape Chiniak** (p. 185), is fronted by several rocky islets. Broken bottom extends ¾ mile in a northeasterly direction from the cape. In approaching from the vicinity of Ugak Island, Cape Greville should not be mistaken for Cape Chiniak.

The land is thickly wooded for about 5 miles southward from Cape Chiniak, then to Narrow Cape it is bare except for scrubby brush in the gulches and valleys and some grass and scattered clumps of small spruce trees on the lower slopes.

A 10-fathom (18.3 m) bank is located 8¼ mile 166° true from Cape Greville.

Eight miles southward from Cape Chiniak the shore bends westward to meet a valley that terminates in a sand beach. Northward from here the shore is marked with sunken rocks and rocks awash to a distance of ½ mile offshore; southward to a distance of 1 mile offshore, with thick kelp in the vicinity of Narrow Cape. Outside these areas the bottom consists chiefly of sand and gravel with some rocky sections off the points. No anchorages are recommended along this coast.

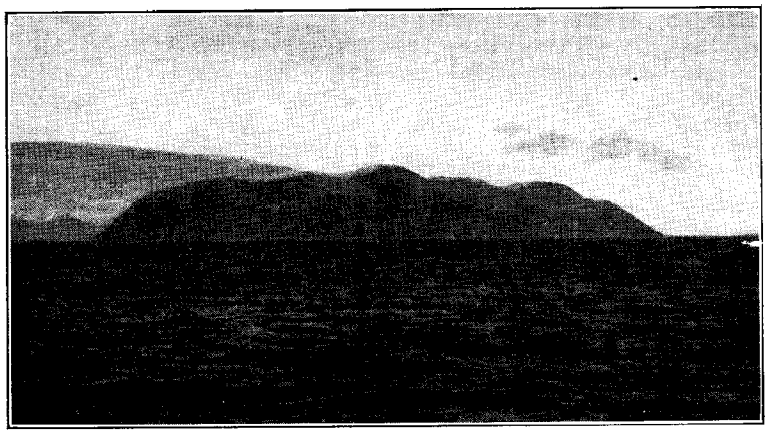
Narrow Cape is 13 miles southward from Cape Chiniak. Its southeast face is an abrupt grass-topped cliff about 100 feet high and 1⅛ miles long. The cape is flat—but gradually drops close to sea level about ¼ mile back of the cliff, giving the cape the appearance of an island when seen from the vicinity of Cape Chiniak. From this low part, grassy slopes with a few scattered spruce trees roll gradually upward to the mountains north of Ugak Bay. Reefs and sunken rocks extend ¼ mile off the points of the cape.

UGAK ISLAND (chart 8535) lies 2½ miles off Narrow Cape. A ridge over 1,000 feet (305 m) runs the full length of the island close to the offshore side. From well out to sea, Ugak island is generally readily discernable against the distant background of higher mountains. The shore is steep and rocky and fringed with rocks and reefs, except at the northwest end where a grassy slope spotted with a few scattered spruces descends gradually to a sand spit. Several shacks of a fox farm are built near the spit.

Across the **passage** between Ugak Island and Narrow Cape, a bar composed of rock and hard sand extends from the sand spit on the island to the southern tip of Narrow Cape. The least depth found near the middle of the passage on the bar is 6½ fathoms (11.9 m). Although not wire dragged, the passage is considered safe for moderate-sized vessels and is regularly used by fishing boats and whalers of from 8 to 10 feet (2.4 to 3 m) draft. Tide rips are experienced, particularly on and near the bar, except at slack water. These rips increase with strong northeast winds, producing breakers and causing the false impression that the passage is foul. At such time the passage is dangerous for small craft.

Currents.—The current floods in a northeasterly direction through the passage between Ugak Island and Narrow Cape. There are strong cross currents north and south of Ugak Island and tide rips near the shores.

In going from the passage between Ugak Island and Narrow Cape to Ugak Bay, there are several **dangers** to be avoided. A rock awash at minus tides lies ¾ mile southwest of the southern tip of Narrow Cape. A rocky shoal of 4 fathoms (7.3 m) lies 1⅛ miles southeastward of Pasagshak Point. A ½-fathom (0.9 m) rock lies 1 mile southeastward of the 127-foot (39 m) island inside Ugak Bay entrance.



Ugak Island, looking northwest, 2 miles away.

UGAK BAY (chart 8535) has its entrance between Pasagshak and Gull Points and extends 19 miles in a general westerly direction, its inner end branching into a basin at the north and a narrow arm at the south. In entering, vessels should pass southward of the ½-fathom (0.9 m) rock lying a little northward of mid entrance. Depths of 40 to 55 fathoms (73 to 101 m) will be found 1 mile off the points along the south shore from the entrance to Saltery Cove, then the bottom abruptly shoals to about 16 fathoms (29.3 m) and deepens again to about 45 fathoms near the junction of the basin and arm at the head of the bay.

Pasagshak Point, 4 miles westward of Narrow Cape, is a prominent, narrow, mountainous headland 894 feet (272 m) high. The point presents the appearance of a pyramid when viewed from a southwest direction.

Pasagshak Bay is rectangular shaped, 1 mile wide at its entrance, and has its eastern side formed by Pasagshak Point. It is shallow a short distance inside and exposed to any existing swell.

The 127-foot (39 m) **island** off the north shore westward of Pasagshak Bay is rocky and grass-topped. It is surrounded by reef and numerous rocky islets. There is foul ground between the island and the north shore and 1¼ miles southeastward of the island.

Portage Bay (local name) is the rounded bight 4½ miles westward of Pasagshak Bay. This bay is identified by a small, flat-topped, sheer-bluff islet 42 feet (12.8 m) in elevation. This islet is located in

the middle of the entrance, and a pinnacle rock 34 feet (10.4 m) in elevation lies 270 yards southwest from it. Both are surrounded by deep water. The bottom has a gentle slope toward the head of the bay.

Saltery Cove, on the north shore of Ugak Bay and 8½ miles above the entrance, is a half-moon shaped bight. It is marked on its eastern extremity by a reef point surmounted by a pinnacle rock 32 feet (9.7 m) high. The cove has a gently sloping sand and mud bottom, but shoals abruptly to flats along the shore. A high-water rock lies just outside of the flats near the head of the cove. The recommended anchorage is along the 10-fathom curve near the eastern end of the bight. This is regarded as the best general anchorage in Ugak Bay.

Hidden Basin, the northern branch at the head of Ugak Bay, has a slightly curving bottle-neck entrance. The controlling depth through the approach is only 5 feet (1.5 m). The channel is along the western shore of the approach. Strong currents are encountered in the entrance.

The southern branch at the head of Ugak Bay is about 7 miles long and has an average width of ½ mile. A rock bare at about ½ tide lies near the middle of the constricted part of the arm. The channel lies southward of the rock and may be avoided by keeping 200 yards off the south shore in 10 fathoms (18.3 m).

Eagle Harbor is an open cove on the south side of Ugak Bay, 5½ miles from the entrance. Its northwesterly point is marked by two pinnacle rocks. There are several shacks of a deserted village at the northwest shore of the cove. There is no secure anchorage here. The cove is exposed to easterly swells.

There are **portages** between Portage Bay and Kalsin Bay, and between Eagle Harbor and Shearwater Bay.

Gull Point and the point 1¾ miles southward have bold rocky faces with islets of massive rock close by. The small cove on the south shore of Ugak Bay westward of Gull Point provides anchorage for small boats in southerly weather. There is a sand beach at the head.

The cove about 3 miles southward of Gull Point is connected by a tidal channel to a marsh which is flooded at high tide. The bottom at the entrance to the lagoon and along the beach for about 1 mile northward is sandy and apparently free from rocks. A sunken rock having a depth of 2½ fathoms (4.6 m) of water over it lies ¾ mile northeastward from the rocky point at the south end of the cove. The coast southward of the cove to Dangerous Cape is the base of a steep ridge. The coast of Kodiak Island southeastward of Gull Point is practically devoid of trees.

DANGEROUS CAPE (chart 8536) on the southeast coast of Kodiak Island between Ugak and Kiliuda Bays, is the southern end of the ridge described in the previous paragraph. On the south side of the cape is a bluff reaching an elevation of over 500 feet (152 m). A large rock about 30 feet (9.1 m) high lies about 400 yards southward of the cape.

An unwatched **light** is located on the west side of Dangerous Cape at an elevation of 192 feet (58 m), but it is obscured for vessels approaching the cape from the northeast until the light bears about 305° true.

Boulder Bay, just westward of Dangerous Cape, affords poor anchorage on hard sand bottom. There are numerous rocks lying sev-

eral hundred yards offshore. These rocks are mostly submerged or awash at high water, and extreme care should be taken in navigating this bay.

Inner and Outer Right Capes form a double cape lying 3½ to 5 miles southwestward of Dangerous Cape. The outer cape is comparatively low with eroded bluffs about 100 feet (30 m) high; however, there are extensive landslides extending almost to the summit of the mountains along the coast 1 mile northeastward of the outer cape. On a clear day these are recognized a long distance offshore. The inner cape rises to a height of 512 feet (156 m). Broken ground extends about 1 mile offshore between the outer and inner capes.

KILIUDA BAY (chart 8536) has its entrance between Left Cape (p. 194) and Inner Right Cape. It extends about 4 miles in a WNW. direction and then about 6 miles in a WSW. direction.

Indenting the northeast side of Kiliuda Bay are Santa Flavia Bay and Shearwater Bay. The shore between these bays is fringed with islands and rocks.

Kiliuda Rock, 2 feet (0.6 m) above mean high water and about 1 mile westward of Inner Right Cape, is on the range of the tangents of Inner and Outer Right Capes and about on the range of the small points along the western shore of Santa Flavia Bay. The rock is surrounded close to by depths of 17 fathoms (31.1 m).

Santa Flavia Bay, between Inner Right Cape and **Ermine Point,** is apparently clear in the center with depths of 13 to 15 fathoms (23.8 to 27.4 m) sand bottom, but is exposed to swells and seas accompanying southeasterly weather. Kiliuda Rock should be avoided in entering.

SHEARWATER BAY, the northeast arm of Kiliuda Bay, is about 2½ miles in extent. Rocks awash extend from either side of the entrance. In the entrance channel between the rocks there are depths greater than 20 fathoms (37 m) for a width of ⅜ mile. The rocks extending ¼ mile westward of Pillar Point bare at low stages of the tide, and shoal water extends about 200 yards channelward from the outermost rock. Near the outer end of the group of rocks on the northwest side of the entrance, is a dry patch of rock elevated 3 feet (0.9 m) above mean high water. The outermost rock bares at low water and lies 300 yards from the dry patch in a direction toward the head of the bay.

Pillar Point marks the southeastern side of the entrance to Shearwater Bay. A **light** is established on the islet adjacent to Pillar Point. **Bluff Point,** ½ mile farther inside the bay, is marked by the eroding bluff of a knoll which overlooks the lowland back of Pillar Point.

The small enclosure, back of the narrow strip of land at Bluff Point, provides secure shelter for small craft with local knowledge.

About ¾ mile from its head, Shearwater Bay contracts to a width of about ⅜ mile between **Observation Point,** the site of a **cannery,** and the opposing point on the southeast side. Anchorage may be had about ¼ mile beyond this contraction midway between the shores in about 6 fathoms (11 m), mud bottom, avoiding shoal water extending 200 yards northward of the opposing point and the shoal depths adjacent to the flats along the northwest side at the head of the bay.

The face of the cannery wharf is 140 feet long, the depth alongside is 22 feet (6.7 m). Fresh water is piped to the wharf. Timber skidways for hauling out launches are laid on the beach on the north side of the cannery site. The company operates a machine shop where emergency repairs might be made.

***Directions,* Shearwater Bay.—*From the southwestward.*—** Round Cape Barnabas at a distance of 2 miles and make good the following courses: (1) **331° true** for 9½ miles to Pillar Point Light bearing 66° true distanct 1½ miles; this course passes 1⅛ miles off Left Cape and heads for Shearwater Point. (2) **48° true** for 1.3 miles to Pillar Point Light abeam distant 0.4 mile; this course heads for the Cannery wharf at Observation Point. (3) **56° true** for 1.3 miles to abreast of the Cannery in Shearwater Bay.

From the northeastward.—Round Dangerous Cape at a distance of 3½ miles and make good the following courses: (1) **276° true** for 3½ miles to Outer Right Cape (eastern end) bearing 0° true distant 2½ miles. (2) **305° true** for 3.4 miles to Inner Right Cape bearing 52° true distant 1.6 miles; this course heads for the tangent of the bold shore about 2 miles northwestward of Left Cape. (3) **331° true** for 3.8 miles to Pillar Point Light bearing 66° true, distant 1½ miles; this course heads for Shearwater Point. Then follow courses (2) and (3) of the preceding paragraph.

The northern side Kiliuda Bay is idented by an open bay about 1¼ miles wide between **Shearwater Point** and **Coxcomb Point.** Foul ground extends ⅓ of the way from Shearwater Point to Coxcomb Point. A rock 4 feet (1.2 m) high lies ½ mile east of Coxcomb Point. The entrance channel is 200 yards eastward of this rock. A northerly course leads to the center of the open bay which has a depth of 3 fathoms (5.5 m). The bottom has a gentle rise to the extensive sand beach at the head. A vessel may be beached here in the event of an emergency.

A **rock** 45 feet (13.7 m) high and ½ mile southwestward from Coxcomb Point, marks the outer limit of shallow depths. There is a triangular-shaped **bank** outside the line drawn from the rock 45 feet (13.7 m) high, to Shearwater Point. It extends across Kiliuda Bay, to terminate in 15 fathoms (27.4 m), sounding ½ mile northwest from **Pivot Point.** The **anchoring** depths on the bank are 14 to 17 fathoms (25.6 to 31 m) sand bottom.

The point on the northern side of Kiliuda Bay about 3 miles to the westward of Coxcomb Point is a low grass-covered sand spit. The axis of a channel of deep water is 300 yards from the sand spit, and the 40-fathom (73 m) depth curve is only 150 yards from the spit. Just southward of this channel the depths are very irregular and the area should be avoided.

Left Cape is a bold headland separating Kiliuda Bay from Sitkalidak Strait (eastern part). The southeastern face of the cape is covered with a series of long rock slides extending almost to the mountain summit back of the cape. There are numerous boulders close inshore and submerged rocks fringe the cape.

SITKALIDAK ISLAND (chart 8536), about 18 miles long, is centrally adjacent to the southeast coast of Kodiak Island, but it lies mainly within the general trend of that coast. The island is grass

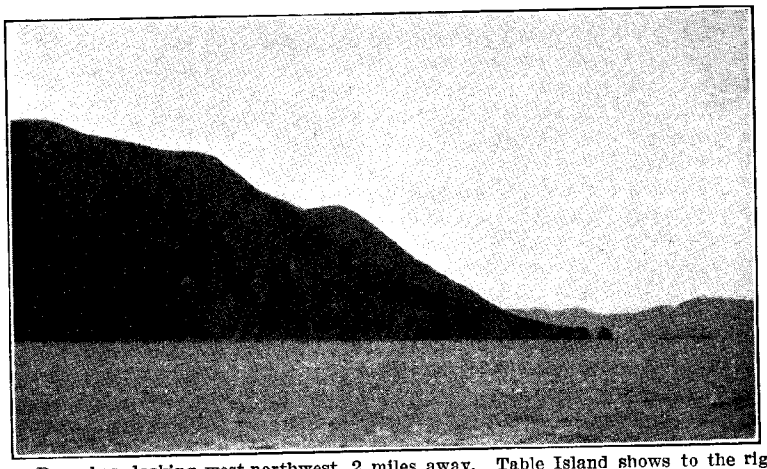
covered and in general devoid of trees. The easternmost mountain summit at Cape Barnabas is a good landmark from the eastward and southeastward. On the coastal ridge northeastward of Black Point are two tips, 1,646 feet (502 m) and 1,527 feet (465 m) in elevation, between which the ridge sags in a smooth curve. This feature may be readily recognized from seaward even against the distant background of higher mountains.

SITKALIDAK STRAIT (chart 8536) borders both the northern and western sides of Sitkalidak Island, separating that island from Kodiak Island. Sitkalidak Passage is the name applied to narrow part of the strait.

That part of **Sitkalidak Strait northward of Sitkalidak Island** extends from the eastern entrance between Dangerous Cape and Cape Barnabas to Sitkalidak Passage. The broken bottom northeastward of Barnabas Rock has been examined with the wire drag and no dangers were revealed. This part of the strait is navigable by all vessels to as far as Sheep Island, and offers several secure anchorages. The minimum depth through Sitkalidak Passage at mean lower low water is 12 feet (3.7 m). The passage and its eastern approach is marked by lights.

During the months of June and July thick white fogs occur around the south end of Kodiak Island and sometimes last for several days. These fogs generally drift about the sea, but frequently do not enter the strait and adjacent bays. The east entrance to Sitkalidak Strait is frequently clear when a thick fog lies less than 1 mile offshore.

CAPE BARNABAS, the eastern end of Sitkalidak Island, is marked by a conspicuous mountain 1,705 feet (520 m) in elevation. There are rock slides on the slopes of this mountain and a series of eroded bluffs along the northeastern face. Submerged rocks and rocks above high water border around the cape and numerous kelp patches lie several hundred yards offshore. In thick weather this cape is usually easier to pick up than Dangerous Cape.



Cape Barnabas, looking west-northwest, 2 miles away. Table Island shows to the right of the cape.

Vessels making Sitkalidak Strait from the southeastward should pass Cape Barnabas 2 miles off and steer **321° true** heading for the northeast tangent of Left Cape until Table Island light bears 195° true, then change course to **252° true** and follow directions on page 198.

BARNABAS ROCK is a rock bare about 3 feet (0.9 m) at mean lower low water, and lies 0.8 miles 75° true from Table Island. The sea breaks over this rock at high tide when there is a moderate swell, but often in calm weather at high tide there is no indication of the rock. It has no kelp. The passage between the rock and Table Island is apparently clear and has been used by steam whalers operating from Port Hobron; but due to uncertain currents the passage is not recommended. The water between Table Island and Sitkalidak Island is foul with submerged pinnacles.

Table Island is a flat-topped island about 100 feet (31 m) high lying 2 miles west-northwest from Cape Barnabas. A **light** has been established on the northern end of Table Island 106 feet (32 m) above sea level.

Tanginak Bay, the bight eastward of the entrance to McDonald Lagoon, is a good anchorage in southerly weather, but there is a rock awash at low water about ½ mile off the eroded bluff forming the western end of the bight. Shoal water lies between the rock and the point.

McDonald Lagoon, about 4½ miles westward of Table Island, almost bisects Sitkalidak Island. It has a bottle-neck entrance. The bar channel, 13 feet (3.9 m) deep, is westward of the ½-fathom (0.9 m) shoal lying ¼ mile northwestward of the bottle-neck and follows the northern side of the west entrance point until about 200 yards westward of the bottle-neck; here it is necessary to avoid a small shoal making out from the northern side of the point. Strong currents run in the entrance and in northerly weather the bar breaks all the way across. Small vessels with local knowledge may enter the lagoon which deepens inside and has good holding ground.

PORT HOBRON is the second deep-indenting bay along the northern side of Sitkalidak Island westward of Table Island. The bay is a good harbor for all vessels except during a northeasterly gale, when a comparatively heavy sea enters the bay.

There is a **whaling station** and a good wharf on the eastern side of Port Hobron. The face of the wharf is 155 feet long and has a least depth of 29 feet (8.8 m). **A rock** awash at low water lies about 150 yards northward of the wharf and in line with its face. Fresh water is piped to the wharf. A store is maintained, provisions and boat supplies may be obtained in limited quantities. There are some machine shop facilities. The station maintains a supply of fuel oil for its own use. A caretaker is stationed here during the winter.

At the head of Port Hobron is a small settlement known as **McCord.** A company operating a cattle ranch has built a small wharf on the south side of the sand spit on the east shore. The wharf has a face of 80 feet, with a least depth of 22 feet (6.7 m) alongside. The water shoals suddenly south of the dock and maneuvering room is scant. There is no fresh water on the dock.

Cathedral Island, the largest island in Sitkalidak Strait, lies in the middle of the strait at the entrance to Port Hobron. The island

is 192 feet (58 m) high and is covered with grass. It is dome-shaped, with steep eroded cliffs on all sides except on the southerly side. The best water is found passing south of the island.

Nut Island, lying 7/8 mile westward from Cathedral Island, is of small extent and 29 feet (8.8 m) high. It is marked by a fixed white light.

Aberdeen Rock lies in the middle of Sitkalidak Strait about 3/4 mile westward of Nut Island and has a least depth of 6 feet (1.8 m). It is unmarked and breakers occur over it only in the heaviest northeasterly weather at extreme low tide.

The recommended **passage** in the vicinity of the three mid-strait obstructions—Cathedral Island, Nut Island, and Aberdeen Rock—is to the southward of them. To avoid Aberdeen Rock when using this passage and when in the vicinity of the rock, do not go northward of the line between Nut Island and Bush Point lights. The passage northward of the three mid-strait obstructions is clear and is used by local craft. **Three Sisters Rocks,** near the north shore, are low; after passing southward of these when bound westward in the northern passage, care must be taken to stand well over toward the north shore in vicinity of Aberdeen Rock.

Amee Bay, about 2 miles westward of Port Hobron, is clear in mid-channel and offers fair anchorage, but violent williwaws blow out of this bay in southerly weather.

Shag Rock, 6 feet (1.8 m) high, is about 150 yards northward of **Cub Island** which in turn is about 2 3/8 miles westward of Cathedral Island. Shag Rock forms an important turning point for vessels using the narrow parts of Sitkalidak Strait. It is reported that with a flood tide a southerly set is noticeable between Shag Rock and Bush Point.

Bush Point, is on the north shore of the narrow part of Sitkalidak Strait 2 3/4 miles westward of Cathedral Island. It is marked by a light.

Midway Bay (sub-plan, chart 8536), known locally as Sheep Bay, is that part of Sitkalidak Strait located between the narrows at Bush Point and Sitkalidak Passage. **Sheep Island,** 57 feet (17.3 m) high covers the central part of Midway Bay. The bay affords the best anchorage in the general vicinity of the Strait. The recommended anchorage for large vessels is between Sheep Island and Bush Point; small vessels usually anchor northeastward of Sheep Island in 5 fathoms (9.1 m) sticky bottom.

The through passage is southward of Sheep Island. A shoal bar strewn with boulders extends westward from the shoal area surrounding Sheep Island to the eastern end of the northern shore of Sitkalidak Passage. The channel for entering Sitkalidak Passage borders the south side of the shoal area and bar. The shoal on the south side of this channel is marked by a fixed red light on a single pile in 13 feet (3.9 m) of water. The spit extending southwestward from the west end of Sheep Island was marked by a beacon in 1932.

SITKALIDAK PASSAGE (sub-plan, chart 8536) separates the northwestern end of Sitkalidak Island from Kodiak Island and is the link between the two sections of Sitkalidak Strait (pp. 195 and 199). There is a controlling depth of only 12 feet (3.7 m) at mean lower low water through the passage. The passage is fairly straight and about 1 mile long. Inside the eastern entrance (see preceding para-

graph) the channel slightly favors the northern shore; in the western half of the passage it slightly favors the southern shore.

Currents.—The tides seem to meet at Sitkalidak Passage under ordinary conditions of wind and weather, but in strong southerly weather the current occasionally flows northeasterly continuously. No current velocities have been measured, but it is estimated that the maximum velocity never exceeds 3 knots. Slack water occurs at about the time of high and low water.

Directions, Sitkalidak Strait from east entrance

	Course (true)	Distance in nautical miles
1. Dangerous Cape bearing NNW., distant 3.5 miles to **Table Island Light** abeam on port hand, distant 2.6 miles. In approaching from northward, give Dangerous Cape a berth of 2 miles	° 276	6.5
2. To east end **Cathedral Island** on starboard beam, distant ½ mile	252	7.5
3. To **Shag Rock** bearing S. by E., distant 150 yards. Pass 200 yards southward of Nut Island light and 400 yards southward of Aberdeen Rock	298	2.9
4. To **Bush Point Light** abeam. Keep in midchannel	276	0.5
5. To west end of **Sheep Island** bearing NNW., distant 400 yards	254	1.0
6. To entrance **Sitkalidak Narrows.** Pass 65 yards east of lighted beacon. Make slow left turn to enter narrows. In turning avoid the shoals westward of Sheep Island	Variable	0.3
7. To 0.3 mile past **light** at Southwest end of narrows. Keep in mid-channel favoring southeast side opposite white light	238	1.0
8. To **fish trap** at Old Harbor on starboard beam. Keep 350 yards off beach on port hand	225	.6
9. Out through **south entrance**	218	--------

Directions, Sitkalidak Strait from west entrance

	Course (true)	Distance in nautical miles
1. South entrance to fish trap at Old Harbor on port beam. Steer mid-channel course. Avoid submerged rocks about 1 mile south of sand spit at south side of Barling Bay. Steer for midway between fish trap and east shore	° Variable	--------
2. To **narrows** well open. Keep 350 yards off east shore to avoid rock south of narrows	45	0.6
3. To **north end of narrows.** Favor southeast shore opposite white light and then mid-channel	58	1.0
4. To a position 400 yards SSE. from the west end of **Sheep Island.** Swing right and pass 65 yards northeast of lighted beacon to position 400 yards SSE. of west end Sheep Island. In turning, avoid the shoals westward of Sheep Island	Variable	0.3
5. To mid-channel off **Bush Point Light**	74	1.0
6. To Shag Rock on starboard beam, distant 150 yards	96	0.5
7. To east tangent **Cathedral Island** on port beam distant ⅜ mile. Pass 400 yards south of Aberdeen Rock and 200 yards south of Nut Island Light	118	2.5
8. To **Table Island Light** on starboard beam, distant 2.3 miles	74	6.6
9. To **Dangerous Cape** bearing NNW., distant 3.5 miles	93	7.5

Outer Coast of Sitkalidak Island.—For several miles westward from Cape Barnabas, the outer coast is particularly bold and rocky and seldom free of breaking seas. A series of mountain peaks stands close to the rounded outline of this projecting coastal section.

About 5 miles westward of Cape Barnabas, a channel navigable by launches in moderate weather leads to a **lagoon.** Practically all of the lagoon goes dry at low water.

The **cove** having a small islet in the center and separated from McDonald Lagoon (p. 196) by a low narrow neck of land is foul.

Ocean Bay (chart 8536) the pronounced indentation of the outer coast of Sitkalidak Island, has a wide sand beach several miles long. The waters adjacent to a long section of the beach are apparently free of rocks. A sheltered anchorage during prevailing southwesterly weather may be found in 4 fathoms (7.3 m) of water in the lee of the prominent rocky point marking the southern end of the sand beach.

On the coastal ridge between Ocean Bay and Black Point is a distinct feature which is described in the paragraph on Sitkalidak Island, page 194.

BLACK POINT, the southwest end of Sitkalidak Island, is a low grass-covered cape sloping gently to the adjacent hills. It does not show darker than the surrounding country, but there are some low eroding bluffs around the cape and scattered bowlders along the shore.

A coastal shelf, approximately defined by the 18-fathom (33 m) depth curve around Black Point, extends 4 miles off shore and spreads fan-shape about the point. Very broken bottom exists on the shelf. In some places the survey indicated rather deep water where live kelp appeared. It is recommended that Black Point be given a berth of at least 4 miles by passing vessels.

That part of **Sitkalidak Strait westward of Sitkalidak Island** (chart 8536) extends from its southern entrance between Black Point and Two Headed Island to Sitkalidak Passage (p. 197). At the entrance Ship Rock should be given a wide berth to avoid the broken bottom extending about 1 mile from the rock on range with Puffin Island and also the 11-fathom (20.1 m) bank lying about 1¾ miles west (true) of Ship Rock. A 9-fathom (16.5 m) spot lies in the middle of the strait about 2⅛ miles southeastward of Cape Kasiak. In the upper reach of this section of Sitkalidak Strait, a cluster of dangerous rocks lies ⅝ mile from the western shore southward of Barling Bay.

The most prominent point on the southwest end of Sitkalidak Island is at the western extremity of the coastal ridge back of the low land in the vicinity of Black Point. **Puffin Island** and **Ship Rock** lie respectively ½ and 1⅛ miles off this point on the seaward extension of the line of the ridge. Broken bottom extends 1 mile farther in this direction. The passages on either side of Puffin Island are not considered safe.

Puffin Island is a grass-topped irregular mass of rock 75 feet (22.9 m) high. Several bare rocks, some of the pinnacle type, lie near the island. Ship Rock is only 6 feet (1.8 m) high.

Rolling Bay, the first bay on the eastern side of Sitkalidak Strait from the southern entrance, has a sand beach and tide lagoon at the head, and a valley leads to Ocean Bay. The bay is exposed to the prevailing southwesterly swell.

A prominent rock, 83 feet (25.3 m) high, having vertical sides and terminating in a dome-shaped top, lies on the extensive reef projecting from the north point of Rolling Bay. A needle-top rock 40 feet (12.2 m) high lies near the point.

Sitkalidak Lagoon is the upper part of **Natalia Bay,** the 5-mile inlet just northward of Rolling Bay. The restricted entrance to the lagoon around the end of the spit is navigable only by small craft.

The rectangular, mountainous headland, on the eastern side of Sitkalidak Strait opposite Cape Kasiak, has two knolls; one of these is at the northwest end of the headland, the other is at **Natalia Point,** the southwest end. A 3½-fathom (6.4 m) shoal lies ½ mile off the headland.

Newman Bay is on the eastern side of Sitkalidak Strait opposite Three Saints Bay. A 5-fathom (9.1 m) shoal lies ½ mile off the northern entrance point. There are several dangers near the southern shore. A shoal of 4 fathoms (7.3 m) extends 400 yards northward of the point marked by a 50-foot (15.2 m) elevation which appears as an island from a distance. Anchorage is available in 8 to 9 fathoms (14.6 to 16.5 m) in the center of the upper bay.

Old Harbor is a native village on the west side of Sitkalidak Strait 1 mile from the western end of Sitkalidak Passage. There are a Government school and a trading post in the village. The trader has a small wharf with a face of 25 feet and a least depth at mean lower low water of 7 feet (2.1 m). There is a fish trap extending 350 yards out in the channel from a point about 50 yards southward of the wharf. Generally there is a light at the end of the trap.

Between Old Harbor and the round point on the opposite shore, Sitkalidak Strait narrows to ½ mile in width. The western half of this part of the strait is a sandy shoal having depths less than 3 fathoms (5.5 m). A small reef baring 4 feet (1.2 m) at mean lower low water lies 100 yards off the eastern shore of the strait opposite Old Harbor.

Barling Bay is the first bay southward from Old Harbor. In northwesterly weather violent williwaws blow out of the bay. The bay near its head affords excellent holding ground for small craft and is secure except in northwest weather. The anchorage for large vessels is just inside the entrance.

A broad grass-covered sand point projects into Sitkalidak Strait forming the south entrance point of Barling Bay. One mile southward of the point and about ⅝ mile off the western shore of the strait are a cluster of dangerous rocks marked by kelp. The least depth of water over them is 1 foot (0.3 m) at mean lower low water. The outermost rock is 0.9 mile 204° true from the point. The area between the rocks and the western shore is shoal.

Three Saints Bay (chart 8536), on the west side of Sitkalidak Strait, affords anchorage at the head in 14 to 18 fathoms (25.6 to 33m) mud bottom. At the entrance a shoal borders the southwest shore. A black can buoy marks the northeast end of the shoal. A 4-fathom (7.3 m) shoal lies ½ mile inside **John Island** (outer islet in the en-

trance) and ¼ mile off the northeast shore. A course through the middle of the entrance leads between the two shoals.

The cannery in Three Saints Bay was destroyed by fire in 1931. The face of the cannery wharf remains. The depth at the northeast corner of the wharf is only 11 feet (3.4 m) and about 5 yards farther inshore it is only 4 feet (1.2 m). At the downstream corner the depth is 24 feet (7.3 m). Southeastward of the wharf the low water shore areas extend beyond the line of the face of the wharf. A port landing was always made. With a heavy wind broadside on, it was found impossible for a vessel under her own power alone to leave the wharf.

There is an excellent anchorage for small vessels in the enclosure formed by a long sand spit inside the entrance on the southwest side of Three Saints Bay. A vessel about 65 feet in length may anchor here. The native village of **Nunamiut** has been abandoned.

Two streams enter at the head of Three Saints Bay draining separate valleys. The south valley is said to have a **trail** leading across Kodiak Island to Uyak Bay.

The three rocky peaks on the ridge that terminates at the headland at the turn of Three Saints Bay are locally known as **The Three Saints.** The peaks are over 3,000 feet (914 m) in elevation and when clear form a leading mark at sea for identifying the south entrance to Sitkalidak Strait.

Cape Kasiak is a prominent headland on the western side of Sitkalidak Strait southward of the entrance to Three Saints Bay.

Kaiugnak and Kiavak Bays, collectively known as **Wide Bay,** indent the western shore of Sitkalidak Strait between Cape Kasiak and **Cape Kiavak.** A small shoal of 3½ fathoms (6.4 m) lies 1 mile southwestward of Cape Kasiak. A shoal of 2 fathoms (3.7 m) lies near the middle of the upper part of Kaiugnak Bay. A rock baring 5 feet (1.5 m) at low water lies ½ mile northeastward of Cape Kiavak. There are two lagoons, one at the head of each bay; neither permits entrance except at high water. There is a large waterfall in the northwestern branch of Kaiugnak Bay.

Anchorage for all weather except easterly gales is provided in the southwestern part of Kaiugnak Bay. Large vessels should not proceed westward of a line bearing South (true) from the small island off the projecting point at the head of the bay.

Knoll Bay, the first cove on the western shore of Sitkalidak Strait northward of Two Headed Island, affords anchorage in about 12 fathoms (21.9 m) during westerly weather. Small craft may anchor under the bluff in the southwest corner of the cove.

TWOHEADED (NASIKAN) ISLAND (chart 8537), lying off the southern extremity of the western shore of Sitdalidak Strait, has two irregularly rounded peaks, the highest of which is 1,838 feet (560 m), and a ridge of an average elevation of 1,440 feet (439 m) extending along the eastern part of the island. The coast of the island is bold and precipitous. There are numerous large boulders and rocks awash along the shores. Two bare rocks 24 and 28 feet (7.3 and 8.5 m) high lie near the southwest shore. The 28-foot rock is block shaped and the 24-foot rock is shaped like a finger pointing up from a heavy base. There is a fox farm on this island; the house is on the north shore.

In the passage north of Twoheaded Island, a large group of rocks baring 6 feet (1.8 m) at mean lower low water, lies ½ mile off the

point on the north side of the passage. Heavy kelp beds lie immediately east of the group of rocks. The channel in the passage has a width of ¾ mile. Twoheaded Island should be favored in navigating the passage.

Jap Bay (chart 8537) has its entrance 2 miles northwestward of Twoheaded Island. There is a sunken rock of 2 fathoms (3.7 m) in the middle of the entrance and broken bottom extends northeastward from it to a group of large rocks which overspread the eastern part of the entrance. The channel for entering is westward of the sunken rock. The rock is generally not marked by kelp.

Vessels may anchor near the head of the outer bay. After entering proceed midchannel until the inner tangent of the group of large rocks in the entrance is in range with the outermost of the two high rocks off Twoheaded Island. Then anchor in 15 to 16 fathoms (27.4 to 29.2 m), mud bottom.

The restricted entrance to the inner bay is about 190 yards wide. The channel curves around the end of the gravel spit but has a depth of 11 fathoms (20.1). There is an excellent anchorage in the inner bay just north of the spit. The swinging radius is about 270 yards in a basin having depths of 9 to 10 fathoms (16.5 to 18.3 m) mud bottom. A vessel may be beached on the north side of the spit.

Cape Kaguyak is about 2 miles southwest of Twoheaded Island and between them is the passage leading to Jap Bay. The area in the vicinity of the cape is foul. The 163-foot rocky islet at the southeastern tip of the cape has the appearance of a hugh sun dial. The outermost danger is a sunken rock with a depth of 2½ fathoms (4.6 m) lying ⅝ mile northeastward of the cape. **Kaguyak Bay,** immediately westward of the cape, affords anchorage at the head of the bay in 6 to 9 fathoms (11 to 16.5 m) for westerly and southerly winds. With northeast winds small craft may find a fairly comfortable anchorage under the bluff on the southeast side of the head of the bay.

The native village of **Kaguyak** is at the head of Kaguyak Bay. No supplies are obtainable.

The **COAST** of **Aliulik Peninsula** (chart 8537) from Cape Kaguyak to Cape Trinity, the southwestern extremity of Kodiak Island, is bordered more or less by foul ground. Extensive foul areas also surround Geese Islands and Aiaktalik Island which lie along this coast. The outstanding **danger** is a 2½-fathom (4.6 m) rock (p. 203) lying about 3 miles eastward of Geese Islands and 5 miles off the mainland. Geese Channel is not navigable except for small vessels and ships proceeding along this coast pass through Sitkinak Strait (p. 204). Old Kaguyak Bay and Russian Harbor provide anchorage for small vessels.

The southernmost **peak,** 2,200 feet (671 m) in elevation, on Kodiak Island is about 5 miles westward of Cape Kaguyak. This detached mountain is regular in outline and forms a distinctive mark. There is a long gradual slope from the mountain toward Cape Trinity.

Flat Island, about ⅞ mile off the entrance of Old Kaguyak Bay and 6 miles southwestward of Twoheaded Island, is flat topped with a general elevation of 100 feet (30 m). The island has sheer rocky bluffs. A pinnacle rock, 38 feet (11.6 m) high, and another rock outside of it lie close to the southwest end of Flat Island. The rocky reef extending ⅞ mile to the northeastward shows in small groups of rocks.

A channel exists between Flat Island and the mainland, its width is narrowed by heavy kelp beds lying on either side.

Old Kaguyak Bay affords protection to small craft in northerly weather. A rock, 28 feet (8.5 m) high, lies in the center of the entrance and a rock baring at ⅓ tide lies 100 yards southwest of the elevated rock. To enter pass between the elevated rock and Boot Point but favor the shore around Boot Point to avoid the rock that bares at ⅓ tide. Anchor in about 3 fathoms (5.5 m) sandy bottom, a little northward of the center of the bay.

Boot Point, forming the western side of the entrance of Old Kaguyak Bay, is marked by a humped hill 496 feet (151 m) high.

About ½ mile southwestward of the western extremity of headland forming Boot Point are two islets close together. The highest part, the northern end of the western islet, is 41 feet (12.5 m) in elevation. The islet ¼ mile farther offshore is 19 feet (5.8 m) high. The islet ⅛ mile inside is 10 feet (3 m) high.

Geese Islands, three in number, are flattened in apperance, the easterly and highest one being 150 feet (45 m) high. The passages between the islands are dry at extreme low tide and the area for a distance of 1 mile south of the islands is foul.

A reef and shoal area extends 3 miles eastward from the eastern Geese Island, terminating in a **submerged rock** having a depth of 2½ fathoms (4.6 m) of water over it. The submerged rock breaks in a moderately heavy sea and not in ordinary weather. The reefs, 1 mile inside of the submerged rock, bare 4 to 7 feet (1.2 to 2.1 m). It should be noted that the bottom shoals very abruptly in this locality.

Aiaktalik Island shows as two knolls, the eastern one being the sharper and higher, 308 feet (94 m). The island is approximately 3 miles in diameter and there is a native village with a Greek church on the cove on the northwest side of the island. The natives of this village move to Alitak Bay to work in the canneries during the summer, but at the close of the cannery season they return for the winter. The area south of the island is foul for a distance of 1½ miles.

A cylindrical rock, 50 feet in diameter and 58 feet (17.7 m) high, stands on the shore reef at the western end of Aiaktalik Island. The top of the rock is covered with grass.

Sundstrom Island lies just off the southwest end of Aiaktalik Island. Several wart-like projections rise above the general level of the island which is about 70 feet (21.3 m). The shores consist of rocky bluffs.

The **passage** between Sundstrom and Aiaktalik Islands should prove useful to small craft in that it avoids the tide rips around the southwest point of Sundstrom Island. Both sides of the narrow passage are lined with heavy kelp but the mid-channel is clear of kelp and has a controlling depth of about 2⅔ fathoms (4.9 m).

The **passage** between Aiaktalik and Geese Islands is navigable for small vessels and has a controlling depth of about 6 fathoms (11 m). The chart is the best guide.

The **passage** between Kodiak Island and the chain composing Aiaktalik Island and Geese Islands (by way of Geese Channel and Russian Harbor) is used considerably by small local vessels.

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Geese Channel (chart 8537) the passage back of Geese Islands, has a controlling depth of about 3¾ fathoms (6.4 m). Shoals and reefs lie scattered in the passage. The recommended course is **64° true** passing ½ mile off the northern shores of the east and west islands of the Geese Islands. At the western end of the passage the course passes about 200 yards off the northern edge of heavy kelp and south of a thinner kelp patch. The heavy kelp marks the shoal patch ½ to ⅞ mile westward of the west island of the Geese Islands. If available, a natural range on Aiaktalik Island as a mark for this channel would greatly simplify its navigation.

Russian Harbor, between Aiaktalik Island and Kodiak, is a temporary ship anchorage in moderate weather, in about 8 fathoms (14.6 m) hard sand bottom. There is but little shelter and strong tide rips are frequent.

In **Aiaktalik Cove,** it was found that the seas and wind sweep around the point in even moderate weather, making the cove an uncomfortable anchorage. The best anchorage for small vessels affording excellent protection from the prevailing northeast weather is on the Kodiak Island side of Russian Harbor. This anchorage is ¾ mile northward of the point located 4⅜ miles eastward of Cape Trinity, opposite a stretch of sand beach in a break of the shore reef. The anchorage is in 4 fathoms (7.3 m) soft sand bottom.

In general it is difficult to make courses good in passing through Russian Harbor due to strong currents, swirls, and eddies. The recommended course from the west entrance to abreast of the north point of Aiaktalik Island is 69° true giving the Kodiak shore a berth of about 0.4 mile. There is a middle ground area of 2½ fathoms (4.6 m) in Russian Harbor.

SITKINAK STRAIT is the broad strait lying between Trinity Islands and Kodiak Island. It is navigable for large vessels.

The eastern approach is marked by Geese Islands on the north and **Sitkinak Cape,** the eastern end of Sitkinak Island, on the south. As viewed from seaward, this end of Sitkinak Island shows as precipitous dark rock and shale bluffs dominated by two peaks or heads, the northern one 605 feet (184 m) high and the southern one 821 feet (250 m).

Two groups of two bare rocks each lie ½ and 1 mile, respectively, off the northeast point of Sitkinak Island. The outer group, light gray in appearance, is 17 feet (5.2 m) high, and the inner group is 13 feet (4.0 m) high. Rocks awash lie outside of the outer group of bare rocks.

The vicinity of the Geese Island is foul, see page 202.

An extensive reef, the limits of which are marked by thick growing kelp, extends in a fan-shaped manner from 2 miles east to 1¼ miles south of the southeast point of Aiaktalik Island. It is made up of two rocky ledges and many individual rocks, most of which uncover at mean lower low water. It is believed that the rock on which the *Pavlof* struck is located near the edge of this reef.

A **bank** of considerable extent on which a least depth of 4 fathoms (8.5 m) was found, lies near the middle of Sitkinak Strait about 2 miles north of Whirlpool Point.

Whirlpool Point, northern point of Sitkinak Island, is low, flat, and sandy. It is backed by high land which rises steeply. The shore is lined with gravel.

Currents.—The currents in Sitkinak Strait set westward on the flood and eastward on the ebb. There are heavy tide rips in the strait particularly southwest and west of Aiaktalik Island. So far as observed, they are heaviest with a westerly wind and a flood current. The tide rips are often dangerous for small craft and troublesome for small vessels. At times when the current opposes seas from eastward in the vicinity of Whirlpool Point, the seas become very steep.

Predictions giving the times of slack water and the strength of the current may be obtained from the Pacific Coast Current Tables published annually in advance by the Coast and Geodetic Survey.

DIRECTIONS, Sitkinak Strait.—A rocky ridge on Albatross Bank on which a depth of 8½ fathoms (15.5 m) was found, lies in the seaward approach to Sitkinak Strait from the southeastward. The ridge lies about 42 miles 105° true from the summit of Sitkinak Island. It should be avoided.

Enter the strait on a **270° true** course passing about 4 miles north of Sitkinak Cape and 1⅛ miles off Whirlpool Point. The latter point is marked by a prominent sand spit. Continue on this course for 3¾ miles until Dolina Point bears 190° true. Then change to **0° true** and continue to a position 2 miles west true from Cape Trinity.

If bound to the westward, steer **270° true** for 12 miles with Cape Trinity astern and then **256° true** for 75 miles to a position 10 miles 134° true from Foggy Cape. Further directions are given in table No. 7, page 31.

If bound for Alitak Bay, follow directions given on page 213.

Due regard must be had for the strong currents in this strait.

ALBATROSS BANK (chart 8502) lies about 45 miles off the southeast coast of Kodiak Island. The depths on this bank range from 8½ fathoms (15.5 m) to about 61 fathoms (112 m).

A shoal having depths ranging from 12 to 20 fathoms (21.9 to 36 m) and covering an area of the bank of approximately 50 square miles, lies between the parallels 153°00′ W. and 153°10′ W., and between the meridians 56°20′ N. and 56°28′ N. The bottom characteristics noted on this shoal include gray mud, fine black sand and gravel, and rock. Captain Knutsen, of the halibut vessel *Grant*, reports having seen kelp on this shoal at various times. When the *Surveyor* anchored on this shoal at occasions, moderate tide rips were noted.

There is a rocky shoal a short distance to the eastward of the large shoal just described. The depths range from 8½ to 20 fathoms (15.5 to 37 m) with a very irregular rocky bottom. The shoalest part consists of a sharp rocky ridge of 8½ fathoms. It is located in latitude 56°22.5′ N., and in longitude 152°56.5′ W. **Currents** having a velocity of about 3 knots were observed in this area. It should be avoided in heavy weather on account of possible breakers.

Captain Shroeder, of the whaling vessel *Tanginak*, reports a 15-fathom (27.4 m) sounding near the edge of the Albatross Bank,

position 56°39′ N., 152°09′ W. He has observed moderate rips and troubled water in this vicinity on several occasions. Incomplete surveys to 1932 show a least depth of 16 fathoms (29 m) in this locality. This shoal is separated from the shoals previously described by an extensive trough of deep water. This trough extends in a northerly direction and branches extend into both entrances of Sitkalidak Strait and toward Sitkinak Strait.

TRINITY ISLANDS (chart 8556) lie off the south end of Kodiak Island. There are two principal islands, Sitkinak and Tugidak. Unsurveyed areas include the southwest coast of Sitkinak Island and all of Tugidak Island except the northern end. Soundings in these unsurveyed areas are from reports.

Fresh water can be obtained from the ravines and pools on the islands. Landings can readily be made when the wind is offshore. The sea makes up fairly rapidly. The beaches are heavy shingle, gravel, and in places fine sand. 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 and trappers in the winter. Some prospecting has been done on Tugidak Island.

Sitkinak Island (chart 8537).—The summit of this island is **Sitkinak Mountain,** 1,640 feet (500 m) in elevation. The mountain has a smooth rounded top and with its dominating height, the top presents a distinctive mark at sea to the limit of its visibility.

The east end of Sitkinak Island and Whirlpool Point have been described under Sitkinak Strait, page 204. The northwest side of the island, southwestward of **Dolina Point,** is composed of earth cliffs several hundred feet high, broken by narrow ravines.

Sitkinak Island is divided by **Sitkinak Lagoon** which is navigable through the north entrance by a small vessel, except during easterly swells or seas. The south entrance should be attempted only during a calm sea. Scattered rocks, baring at low tide, fringe the entrance on the south coast. A small launch may enter at high tide. The lagoon is a flat traversed by tidal channels. These channels are fairly deep near and inside the entrances, but only 3 feet (0.9 m) deep at high water in the connecting channel between them, Sitkinak Island eastward of the lagoon is composed of many hills some of which are separated from one another by low valleys.

The south coast of Sitkinak Island is foul and should be avoided. Kelp beds extend ½ to 2 miles off the eastern and southern shores. A **bank** having its center 9½ miles south-southwestward from Sitkinak Cape has not been fully surveyed. The depths on this bank range from 11 fathoms (20.1 m) to 20 fathoms (37 m). The bank covers an area varying from ½ to 1½ miles in width, 6 miles in length, and extending in a NNE. and SSW. direction. The bank is an extension of an extensive area along the south coast of Sitkinak Island having depths less than 20 fathoms (37 m) with irregular bottom in most places.

There is a temporary **anchorage** off the south entrance to Sitkinak Lagoon. This part of the south coast of the island is recognized offshore by the flat land at the lagoon. A prominent rocky point with

an **arched opening** 50 feet (15.2 m) high marks the entrance to the lagoon. To ***reach*** this anchorage from outside the 20-fathom curve, steer for the point with the arched opening bearing **26° true,** and anchor in not less than 11 fathoms (20.1 m) at mean lower low water, about 1 mile from the point.

Tugidak Passage (chart 8537), between Sitkinak and Tugidak Islands, has very strong and freakish tidal currents and rips. Only the north approach has been surveyed. The south approach is apparently blocked by shoals. The tide rips in the middle of the passage are extremely dangerous to small boats and should be avoided by hugging the Tugidak Island shore.

Tugidak Island, in its northern part, is chiefly sand flats, but little above high water. A level boulder patch baring at low water lies ½ mile off the north coast of Tugidak Island, 5 miles westward of Tugidak Passage.

The higher parts of the island are low grassy sand hills which terminate in bluffs in places along the shores. The northern part is separated from the southern or higher part by a large **lagoon** having one entrance from the southeast.

The lagoon mentioned above is reported to bare at low water, except near the southwestern side of the entrance where there is a pocket or basin of about 5 to 6 fathoms (9.1 to 11.0 m) sand bottom. The basin is suitable for anchoring a small boat, protection from the sea being afforded by a long sand spit extending eastward from the entrance point on the southwest side. A narrow channel leads from Tugidak Passage to the basin. This channel follows the southeast side of Tugidak Island. It is almost bare at low water so passage in and out is possible only at half or greater tide.

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 boulder reefs with little depth may be expected. There are strong currents and heavy rips and overfalls.

The waters off the northern end of Tugidak Island have been surveyed. The general absence of kelp in this comparatively shoal area may be taken as an indication of the existence of but little if any ledge rock. The bottom apparently is composed of loose material including boulders leveled down by the action of the sea to form the more or less flat area of this region of 5 to 7 fathoms (9.1 to 12.8 m). Slight shoaling occurs in patches where apparently there is a predominance of boulders resisting the general leveling action of the sea.

The north and west sides of Tugidak Island may be generally approached as close as 1½ miles 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.

Ptarmigan were found in enormous number on Tugidak Island during the late summer of 1931.

CHIRIKOF ISLAND (charts 8881, 9196) lie 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. It is visible for many miles in clear weather.

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 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.

The wide **passage** between Chirikoff Island and Tugidak Island has not been adequately surveyed. From widely scattered soundings taken in this locality, it appears that a submarine ridge with depths less than 19 fathoms (35 m) extends from one island to the other. Foul and broken bottom extends about 10 miles southward from Tugidak Island (p. 207). Fairly regular depths across the ridge are indicated in the more closely sounded area 10 miles northward of Chirikof Island. **Tugidak Island** is low and featureless and cannot be used as a navigational guide in the passage. Vessels bound for Chignik from the eastward use this passage.

Currents.—Between Sitkinak and Chirikof Islands the general set of the current is reported to be about 249° true, 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 and varies from 0.3 to 0.7 knot.

On three runs between Chirikof Island and Castle Rock, Shumagin Islands, the *Surveyor* experienced a southerly set each time, an average of as much as 1.5 knots having been noted.

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.

ALITAK BAY (charts 8537, 8575), at the south end of Kodiak Island has its entrance between Cape Alitak and Cape Trinity, and extends 26 miles in a northerly direction to the head of Deadman Bay. Lazy Bay is a good anchorage, convenient to Cape Alitak and the site of a salmon cannery operated by the Pacific American Fish-

eries. The cannery of the Alaska Packers Association is located on Olga Bay at the head of the northwest arm of Alitak Bay.

The country is treeless and except for outcropping ledges of bare rock on the knolls and peaks, the land is covered by thick moss and grass. A herd of reindeer is maintained in the vicinity of Lazy Bay by the natives.

There is no mail service except that furnished by the cannery steamers during the fishing season. During the winter there is no communication other than an occasional halibut boat or trading schooner.

The prominent feature in the approach is Twin Peaks on the peninsula between Lazy Bay and Kempff Bay. It can be seen from off Cape Ikolik on a clear day. The peninsula between Kempff Bay and Olga Bay is mountainous and rises to heights of 2,000 feet (610 m).

Cape Trinity, the southern entrance point to Alitak Bay, is a table land terminating in an almost vertical bluff. Rocks and reefs extend a short distance off the cape.

CAPE ALITAK, the northern entrance point, is the south end of a sloping ridge with numerous knolls. It is partly grass covered, with much bare rock. Deep water extends close up to the cape on its southwest side, but a long shoal of fine gray sand makes off its southeastern side in the direction of Cape Trinity. The 10-fathom (18.3 m) curve extends 3 miles off the cape and the 5-fathom (9.1 m) curve lies about 1¼ miles off. At the outer end of the shoal the depth increases rapidly to 20 fathoms (37 m).

Cape Alitak is marked by a **light,** 63 feet (19.2 m) above the water. It is obscured from 190° to 263° true (from seaward).

LAZY BAY (chart 8575), lying 4 miles northward from Cape Alitak, is well marked by Twin Peak sand Egg Island on its north side, and some white rocky ledges close to its southern entrance point. The shore south 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.

A **cannery** with a wharf is located on the north shore about 1 mile from Egg Island. The wharf has a face of 87 feet and a least depth of 25 feet (7.6 m) alongside. The cannery maintains a store the year-round and there is a **radio station,** call letters KPS or KJZ, which is operated during the fishing season. There is also a slipway capable of hauling out vessels up to about 75 tons.

The northern part of the bay beyond the sand spit above the cannery consists of mud flats and many boulders.

Anchorage in 9 to 15 fathoms (16.5 to 27.4 m) mud bottom, may be had between the cannery and the eastern entrance point to Rodman Reach. With easterly gales the wind blows directly in Lazy Bay and there is little room in case of dragging or parting a cable. Northwesters blow with great force into Lazy Bay from over the ridge back of the head of the bay. Small craft can find excellent shelter and smooth water in the entrance to Rodman Reach during easterly weather.

Rodman Reach is a narrow arm which extends southwestward from Lazy Bay and inside of **Tanner Head** to Cape Alitak where it forms a shallow basin from which **Alitak Lagoon,** also shallow,

extends 3 miles northwestward, being separated from the sea by a narrow shingle spit.

About 100 yards off the eastern entrance point is a rock which bares 9 feet (2.7 m) at mean lower low water. Excellent shelter for small craft will be found in the entrance to Rodman Reach.

Egg Island is the low flat rocky islet off the northern entrance to Lazy Bay. It is marked by an unwatched **light** shown from a small white boxlike structure.

The light is maintained from May 1 to September 30 of each year.

Twin Peaks, between Lazy and Kempff Bays, are a mark from as far westward as Cape Ikolik. The higher one is 1,495 feet (456 m) high and the southerly peak is 1,310 feet (399 m) in elevation. Both peaks are fairly definite, devoid of vegetation, and very rocky and stony. From the westward they are first raised as an island.

Kampff Bay, on the north side of Twin Peaks, has too deep water for convenient anchorage and on its north side has broken bottom that should be avoided. There are neither settlements nor improvements in Kempff Bay.

Favoring somewhat the south shore through the bay, **anchorage** can be selected near the head in about 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.

A reef covered at high water, lying inside **White Rock,** extends ½ mile from the shore just southward of Kempff Bay. White Rock should be given a berth of ¼ mile when passing east of it in Alitak Bay and the same distance when passing north of it entering Kempff Bay.

Akhiok is a native village on the beach about 1½ miles northeastward from Kempff Bay. There are a school house and a Greek Catholic church. A foot trail leads from the cannery at Lazy Bay to Akhiok. Akhiok is best reached in launches via the passage from Kempff Bay. This passage is shoal and there are many rocks. A pilot can usually be obtained at the Lazy Bay cannery.

Round Hill, 193 feet (59 m) high, is a symmetrical, round grassy knoll on the east end of **Akhiok Island** which forms the north side of the entrance to Kempff Bay.

Akhiok Reef, awash at extreme high water and always showing, is a group of black jagged rocks lying about ⅝ mile off the southeast point of Akhiok Island. In clear weather the reef makes a good landmark. There is a **deep pocket** of 30 fathoms (55 m) 350 yards southeast of Akhiok Reef.

Small vessels, with local knowledge, when bound from Lazy Bay to Moser Bay pass between Akhiok Reef and Akhiok Island. Strangers are advised to keep to the east of Akhiok Reef.

MIDDLE REEFS (chart 8537) cover an area about 2 miles long in the central part of Alitak Bay. The northwest end of the reef-area is marked by a group of **black rocks** that bare about 7 feet (2.1 m) at m. l. l. w., and will usually be seen bare or breaking. A kelp-marked **rock** baring 2 feet (0.6 m) and a **ledge** baring 5½ feet (1.7 m) at m. l. l. w., lie along the eastern side of the reef-area. The kelp-marked **shoal** at the southern extremity has a depth of 2¾ fathoms (5.0 m). There is little if any warning of shoaling of the general depths of the bay adjacent to the reef-area.

Nelson Reef, which has a least known depth of 2½ fathoms (4.6 m), lies 1½ miles northward of Middle Reefs and 2¾ miles east-southeastward from the entrance to Moser Bay. A thin growth of kelp is sometimes seen on this reef.

MOSER BAY, the large northwest arm of Alitak Bay, has depths of 10 to 14 fathoms (18.3 to 25.6 m), soft mud bottom. It is a secure harbor and an excellent **anchorage.** The entrance is between **Bun Point,** low and sandy, and **Amik Islet,** rocky, on the south it is obstructed by a rocky shoal which makes northward from Amik Islet for nearly ½ mile. The north end of the shoal is marked by a black **buoy** moored in 27 feet (8.2 m) of water.

The **channel** between Bun Point and the Northern end of the rocky shoal is 175 yards wide and lies close to Bun Point. It has a least depth of about 7 fathoms (12.8 m) and strong tidal currents flow in the direction of the axis of the channel.

About half way between Bun Point and Point Fassett there is a shallow **shoal** which extends half way across from the northeast shore toward a spit on the opposite shore. The shoal has a depth of 3 fathoms (5.5 m) at its outer end which is marked by a red **buoy.** In 1929 a large steamer grounded on this shoal and sustained serious damage to her plating.

A **gravel shoal** bare at low tide extends to 400 yards east-northeastward from the spit on the south shore opposite the shoal described above.

A range consisting of two white square targets on the hill behind Bun Point clears both shoals mentioned above. This range was built and is maintained by the Alaska Packers Association.

Fassett Point, 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.

Trap Point is the low point across the channel from Fassett Point. The Alaska Packers Association maintains a warehouse, wharf, and ways for hauling out scows here. The **wharf** has a face of 100 feet and a least depth of 34 feet (10.4 m) alongside.

Snug Harbor, the cove southwestward from Fassett Point, shoals gradually to its head. A pass between the mountains extends from Snug Harbor to the sea.

Chip Cove is on the west shore of Moser Bay 1½ miles northward of Fassett Point. Shoals extend from the shores of the cove and a flat extends about ⅜ miles from its head. Vessels can anchor off the entrance, favoring slightly the western shore of Moser Bay, and small craft can select anchorage near the middle of the cove.

Olga Passage connects Moser Bay with Olga Bay. It is possible to carry about 21 feet (6.4 m) through the passage only by carefully following the narrow and crooked channel. It should not be attempted except with local knowledge. Shoals make off irregularly from the shores. A shallow area makes out ¼ mile from the 1½-mile length of shore northward of Fassett Point.

The **current** in the narrows of Olga Passage attains an estimated velocity of 8 knots. At maximum tides there is no stage at which there is slack water the entire length of the narrows. At minimum tides there is a slack-water interval varying from ½ to 1½ hours.

This slack water occurs from 1½ to 3 hours after high water at Trap Point.

Olga Bay (chart 8537) is an irregularly shaped body of water 17 miles long. The western end is separated from the ocean by a strip of land 1 mile wide at a point 6 miles north of Low Cape. The shores of Olga Bay are rocky except at the western end where there are low grassy bluffs from 10 to 80 feet (3.0 to 24.4 m) in height. On the north and south shores of the bay the land rises abruptly to heights of 800 to 2,000 feet (244 to 610 m).

The bay has the appearance of a lake and the rise and fall of the tide is only from 1 to 2 feet (0.3 to 0.6 m) at the **cannery** which is on the north shore about 8½ miles above the Narrows. There is a store open the year around where a limited amount of supplies can be obtained. During the season fresh water may be obtained at the wharf, where the depths vary from 7 to 11 feet (2.1 to 3.4 m).

Anchorage for fishing craft can be found at several places along the shores. The best anchorage is in Anchor Cove on the south side of Olga Bay, 5½ miles above the north end of the narrows. The cannery company has dolphins here where small boats are tied up over the winter period.

Deadman Bay is deep except near the head where it divides into two arms. The northerly arm terminates in a mud flat, while the easterly arm, known as Alpine Cove, affords an excellent **anchorage.** The northwest shore of Deadman Bay is fringed with numerous rocks and reefs, while the southeast shore is bold and unusually clear. There are no settlements in the bay. There is an occasional cabin used by trappers during the winter season.

Between Bun Point and Fox Island there are several off-lying islets and rocks and much foul ground. The shore here should not be approached closer than 1 mile except with local knowledge.

Fox Island, lying about ½ mile off the west shore near the entrance to Deadman Bay, is bordered by bluffs and is about 90 feet (27.4 m) high. It is grass-covered and comparatively flat. It is a good mark in entering Deadman Bay.

Alpine Cove, the easterly arm at the head of Deadman Bay, is a beautiful cove surrounded by high rugged mountains. There is an excellent anchorage near the entrance in 12 to 15 fathoms (21.9 to 27.4 m), mud bottom, and sheltered from all winds and seas.

Portage Bay (chart 8537) opens into Alitak Bay from the northeast. **Bert Point,** a dark rocky point, separates the two arms of the bay. **Sulua Bay,** the main or western arm, extends about 3½ miles in a northerly direction from this point. A stream enters through the flats at the head.

The eastern arm of Portage Bay is short and terminates in a large shoal lagoon extending 2½ miles in a northeasterly direction. A stream enters through the flats at the head of this lagoon.

The shores of Sulua Bay are precipitous except at its head. There are several short gravel spits extending from the west shore and on the first two of these are cabins used by fishermen during the season. Mooring piles are driven on the north side of these spits.

There are two rocks in Sulua Bay. The southerly one bares 2 feet (0.6 m) at m. l. l. w., and lies 1¾ miles from Bert Point, and 330 yards off the east shore. The second rock is located about ½ mile north of the first and about 550 yards off the same shore.

A 3½-fathom (6.4 m) shoal lies 875 yards southwestward from Bert Point.

Reefs and rocks extend as much as ½ mile off the 2½-mile length of shore eastward of Cape Hepburn.

There is good **anchorage** about ½ mile southeast of a 44-foot (13.4 m) pinnacle rock at the head of Sulua Bay in 10 fathoms (18.3 m), mud bottom.

***Directions,* Alitak Bay.**—Coming from the westward, steer **75° true** for 88 miles from Foggy Cape bearing 327° true distant 10 miles. This will lead to a position in the middle of the entrance to Alitak Bay 3.6 miles 145° true from Cape Alitak. The southern-most peak (p. 202) on Kodiak Island should be about 3° on the port bow while passing Cape Alitak on the course given.

If following the southwest coast of Kodiak Island in approaching Alitak Bay, follow the directions given on page 235 to Cape Alitak bearing 10° true distant 1½ miles. Then steer **121° true** for 2¾ miles in order to clear the shoal making southeastward from Cape Alitak. This will lead to the *mid-entrance position* 3.6 miles 145° true from Cape Alitak.

***To enter* Lazy Bay: (1)** from Alitak Bay *mid-entrance position* given above, steer 15° true for about 5½ miles until the south shore of Lazy Bay is abeam. Then change to **309° true** until Egg Island is abeam on the starboard hand, distant 350 yards, then change to **284° true** and enter the bay. **(2)** If coming from Sitkinak Strait, follow directions given on page 203 to a position 2 miles west true from Cape Trinity. Then steer **1° true** for about 8 miles until the south shore of Lazy Bay bears 287° true. Then change to **309° true** until Egg Island is abeam on the starboard hand, distant 350 yards. Then change to **284° true** and enter the bay.

***To enter* Moser Bay: (1)** From Alitak Bay mid-entrance position given above, steer **34° true** for 9¼ miles until Akhiok village bears 297° true, distant 3 miles. Then change to **348° true,** heading 150 yards off Bun Point. This course leads 300 yards off the fish trap on the starboard hand.

When nearly up to Bun Point change to **5° true,** passing 150 yards off the high-water line at the point. Watch for the range on the hills to starboard, and haul westward so as to come around on the range on a **290° true** course, passing about 275 yards northward of buoy 1.

Continue on the range for 1 mile until past the red buoy marking the end of the long shoal which makes out from the northeast shore. Then haul to the northward and anchor as desired.

Strong tidal currents will be found at Bun Point setting along the axis of the chanel. Large vessels should wait for slack water.

(2) If coming from Sitkinak Strait, follow directions given on page 205 to a position 2 miles west true from Cape Trinity. Then steer **19° true** for 11½ miles until Akhiok Village is abeam on the port hand distant 2⅝ miles. Then change **348° true** heading 150 yards off Bun Point and follow directions given above for entering Moser Bay.

***To enter* Deadman Bay.**—From a position with the northwestern Middle Reefs bearing 121° true, distant 1½ miles, make good a **41° true** course for about 4 miles until the south end of Fox Island is on the port beam, distant nearly 1 mile. This course leads ½ mile

northwestward of Nelson Reef, a shoal with a least known depth of 2½ fathoms (4.6 m). When the south end of Fox Island is abeam haul to the northward and steer mid-channel courses up Deadman Bay, if anything favoring the southeastern shore.

SHELIKOF STRAIT (charts 8502 and 8556) separates Kodiak and adjoining islands from the mainland of Alaska. From the eastward the strait is reached by way of the passages north and south of the Barren Islands (p. 125) or by way of Kupreanof Strait.

The western shore has not been surveyed, but the prominent points and most of the offlying islands are correctly charted.

The hydrography of the main part of the strait has been done from Barren Islands to Cape Ikolik. Depths ranging from 80 fathoms (146 m) in the north end to 140 fathoms (256 m) in the southern entrance will be found in mid-channel. Along the eastern shore, the 100-fathom (183 m) curve lies from 1 to 3 miles off the various headlands. Suitable depths for temporary anchorage will be found near the shores in most places.

In thick weather when not sure of the position, depths should not be shoaled less than 50 fathoms (91 m). For deep draft vessels it is considered safer to favor the eastern shore.

Currents.—Current observations 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 to 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 appears to set into Shelikof Strait from both ends. 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 setting westward 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.

During the summer of 1929 good weather with a preponderance of westerly winds prevailed throughout June, July, and August. Southeast gales were of frequent occurrence in September, but no northwesterly gales were experienced until after October 1.

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, however, in the wake of the Katmai region, the air may be hazy due to volcanic dust.

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.

During strong westerly winds, the atmosphere often becomes filled with a fine **volcanic ash** reducing visibility to a distance of 1 mile or less.

Little **fog** was encountered during the season, but blinding snowstorms were frequent early in spring.

The **western coasts of Shuyak and Afognak Islands** (chart 8556) trend 218° true and the distance from the northernmost **Latax Rocks** (p. 156) to Raspberry Cape is 48 miles. From Raspberry Cape the eastern coast of Shelikof Strait trends 230° for 45½ miles to Cape Karluk.

Party Cape, Dark Island, and the north coast of Shuyak Island are described on page 156.

The western side of **Shuyak Island** (p. 156) is irregular and fringed by a chain of islets and rocks about 1 mile from shore. Between them and the island there are many rocks and kelp patches. The outer ones lie nearly on a line through Gull Island from Black Cape, bearing 214° true.

Shag Islet (chart 8532), a group of grass-covered islets, is 36 feet (11 m) high and lies ⅞ mile westward of Party Cape. A bare rock 3 feet (0.9 m) high lies ⅝ mile northward of Shag Islet.

Wonder Bay, lying southeastward of Shag Islet, is rock strewn and should not be entered except by launches with local knowledge.

Gull Island (chart 8556) lies 2¾ miles southwestward of Party Cape and has a distinctive dome-shaped top, grass-covered, 83 feet (25.3 m) high. Several large reddish rocks lie to the north of it. It marks the entrance to **Western Inlet,** which is shallow and foul.

Gull Island is connected to the large island at the entrance of Western Inlet by a sand spit which bares at minus tides. This area is extremely foul.

Neketa Bay is a small bay east of Green Island, very shoal, with a reef extending nearly across its entrance.

Big Bay is of considerable size, having a main arm branching into four smaller arms at its head. While the main arm has a controlling depth of 3½ fathoms (6.4 m), and would afford protection in northeasterly weather, it should not be attempted without local knowledge, as its entrance is infested with numerous rocks, many of which bare only at minus tide. The smaller arms are not accessible except for very small craft.

SHUYAK STRAIT (chart 8573), between Shuyak and Afognak Islands, is not recommended as a through passage for ships by reason of its restricted eastern entrance and broken bottom in the seaward approach from the eastward (p. 158). Its western approach in Shelikof Strait is characterized by less uneven bottom and the western entrance is mainly clear and 1½ miles wide.

Islets and rocks bare at low water lie on both sides of the **western approach** to Shuyak Strait. The best water is found by favoring the north side of this approach.

Shuyak Strait is apparently 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. Wooded hills, about 400 feet (122 m) high, line the rocky shores on both sides, and there is practically no low flat land.

Rocky Islet, bearing 100° true and distant about 4 miles from Lighthouse Point, lies on south side of the western approach to Shuyak Strait. It is a bare rock about 12 feet (3.7 m) high and about 100 feet wide. Midway between Rocky Islet and Lighthouse Point but southward of a line between them, is a **reef** bare at half tide. The reef is marked by kelp and surrounded by shoal water.

The outermost danger on the north side of the western approach to Shuyak Strait is a **rocky shoal** of 2 fathoms (3.7 m) lying about 3 miles 52° true from Rocky Islet. A **rock** baring at minus tide lies 400 yards northeastward of the rocky shoal and the area inside of them to **Green Island** and thence to the shore at Neketa Bay is foul.

A **rocky bank** of 12 to 17 fathoms (21.9 to 31 m) lies about 1½ miles northeastward of Rocky Islet. In approaching the western entrance of Shuyak Strait it would be advisable to pass northward of the bank.

Alligator Island, so called from the resemblance from certain directions, is a grass-covered island about ¼ mile in diameter and 64 feet (19.5 m) high, lying 1¼ miles southward from Rocky Islet. Alligator Island is marked by a **light** 70 feet (21.3 m) high.

Cape Newland, the southwestern extremity of Shuyak Island, is about 75 feet (22.9 m) high and grass covered for several hundred

feet up to the tree line. Rocks awash at various stages of the tide lie detached 400 yards westward and about 600 yards southward from the cape. Broken bottom extends into the entrance to Shuyak Strait about ⅓ the way from the cape to Lighthouse Point.

Lighthouse Point, the point on the south side of the western entrance to Shuyak Strait, is marked by a **light** 60 feet (18.3 m) high. The point is grass covered up to the tree line. The bight just east of the point is foul.

Two **bare rocks,** 12 and 5 feet (3.7 and 1.5 m) high and 100 yards apart, lie in mid entrance to **Shuyak Harbor** (Shaw Harbor). The bare rocks are surrounded by rocks awash and are nearly connected at low tide. A sunken **pinnacle rock** having a depth of ¾ fathom (1.2 m) lies in the harbor passage eastward of the mid-entrance rocks, leaving a narrow channel adjacent to the shore.

The better channel into Shuyak Harbor is westward of the mid-entrance rocks. The harbor has a swinging room of about 200 yards in diameter. The salteries in this harbor have been abandoned and the wharves are no longer in serviceable condition.

Port Lawrence is a bight on the north shore of Shuyak Strait, 1½ miles from the western entrance. There is a small grass-covered islet in the eastern part of the bight. There is an abandoned herring plant here. The wharf is in bad condition and cannot be used.

Port William, ½ mile east of Port Lawrence, is 0.3 mile wide and ½ mile long. A cannery is operated here. The wharf has a face of 60 feet and a least depth of 22 feet (6.7 m) at low water. Fresh water is piped to the wharf. A **radio telephone** station (KNS) is operated by The Washington Fish and Oyster Co.

A **rock,** bare 2 feet (0.6 m) at mean lower low water, 200 feet in diameter, and marked by kelp lies 250 yards offshore between Port Lawrence and Port William. Near by and closer inshore is a rock about 10 feet (3 m) high.

Daylight Harbor is ½ mile east of Port William. The herring plant here has been abandoned, and the wharf is in ruins. From this harbor to **Cape Current,** a distance of about 2 miles, there are no important indentations and very little traffic.

A **dangerous patch** of small rocky heads with a least depth of 2¾ fathoms (5.2 m) exists about in the middle of the strait 2¼ miles from its eastern end. This danger is abreast of two small islets, the western one of 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.

Cape Current Narrows form the eastern end of Shuyak Strait, and are about 1 mile long. Rocky obstructions in the narrows near the eastern end greatly reduce the width of the channels on either side of them. Of these, the channel along the north shore is preferred.

The Shuyak Island shore of the narrows 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.

The western part of the narrows apparently is clear with general depths over 10 fathoms (18.3 m). **Broken ground** with numerous **rocks,** either above water or baring at various stages of the tide, extends from the south shore near Cape Current 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 exists through the middle of the narrows, passing between the rocks on the broken ground, but it cannot be recommended to those without local knowledge.

The **tidal currents** at Cape Current Narrows are strong, and bad tide rips are frequent. Predictions of the times of slack waters and of the time and strength of the maximum current will be found in the Pacific Coast Current Tables published annually in advance by the Coast and Geodetic Survey.

There is a large kelp patch off the eastern entrance to the narrows just south of **Big Fort Island** (p. 157).

Redfox Bay, the largest indentation on the south side of Shuyak Strait, has general depths of less than 20 fathoms (37 m), mud bottom and is an excellent anchorage in any weather. The swinging room just inside the entrance island is about 700 yards in diameter.

The southern half of the entrance island in Redfox Bay is wooded. Opposite this island and 100 yards off the western shore of the bay are some rocks that bare 2 feet (0.6 m) at m. l. l. w. The channel between these rocks and the island is about 200 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 1½ feet (0.4 m) at m. l. l. w., lies off the entrance to a small cove on the eastern shore of Redfox Bay ¾ mile southward from the entrance island.

The bay over 1 mile eastward of Redfox Bay is foul in places. The bottom is irregular.

The mean range of the **tide** in Redfox Bay, ***Shuyak Strait,*** is about 11 feet (3.3 m), and the range between mean lower low water and mean higher high water is 13½ feet (4.1 m).

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.**

Chart 8573 is the guide and it should be carefully followed.

The **west coast of Afognak Island** from Shuyak Strait to Black Cape is irregular, rocky, and wooded to an elavation 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 (chart 8573), indenting the shore of Afognak Island southwestward from Lighthouse Point, has an entrance about 2 miles wide.

Teck Island, Hogg Island, and **Bear Island** are the three principal islands overspreading the entrance and the area inside of Bluefox Bay. Hogg Island is used as a fox farm. There is a **herring reduction plant** and wharf with fresh water on the south side of Bear Island. The plant is operated by George Hogg. Radio communication may be had through Kodiak WXF.

Channels.—Three channels lead into Bluefox Bay. The western channel has been used by small craft, but it is foul and is not recommended.

The eastern channel is the one in general use, but it also contains several dangers and should be navigated with caution.

A rock with a least found depth of 3¾ fathoms (6.7 m) lies in mid-channel about 200 yards off the middle of the east side of Hogg Island.

A rock with a least depth of 1 fathom (1.8 m) lies 375 yards east true from the southeast point of Bear Island.

A rock bare at low tide lies about ½ mile south-southeastward from the same point. At this rock the tangents of Hogg and Bear Islands are nearly in range.

A rock with 2¼ fathoms (4.0 m) over it lies 200 yards off the southeast point of the small island just south of Bear Island.

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 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 3¾ fathom (6.7 m) spot mentioned above. The navigation beyond Bear Island is difficult and chart 8573 should be followed closely. No directions of value can be given.

Devil Inlet (chart 8556), 3 miles 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; however, the approaches and the inlet itself are unsurveyed.

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 unsurveyed 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.

The lower levels of Afognak Island in general are **wooded** with the exception of the eastern coast and the southwestern end southward of Paramanof Bay.

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.

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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 1,830 feet (558 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.

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.

Malina Bay (chart 8556), indenting the west coast of Afognak Island, lies between the mountainous peninsulas terminating 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, known as Malka Bay, 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 Malka Bay. 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 Malka Bay 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** elevated 15 feet (4.6 m), with a small one close westward, lies 400 yards northeastward of the islet. The best **channel** lies between the 30-foot islet and the 15-foot elevated rock. A rock bare at low water lies 400 yards eastward of the 15-foot elevated rock and over 300 yards from the northern shore.

To pass through the neck, pass 200 yards northward of the island, steer **121° true,** 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.

Malka Bay 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 Malka Bay, steer **163° true,** 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 in ***Malina Bay*** occur about 10 minutes earlier than at Seldovia. The mean range of the tide is 12 feet (3.7 m) and the range between mean lower low water and mean higher high water is 14½ feet (4.4 m).

Raspberry Strait, between Afognak and Raspberry Islands, is not surveyed. Its southeast end is bare at extreme low water. In 1937, there were 3 salteries on the south side of the strait, 5 to 6 miles from the western entrance.

Cape Nuniliak, on the north side of the entrance to Raspberry Strait is marked by a flashing white **light. Dolphin Point,** on the north side of Raspberry Strait and about 5 miles inside the western entrance, is marked by a fixed green **light** in latitude 58°07′15″ N., longitude 153°10′45″ W.

The western side of **Raspberry Island** (p. 166) is mountainous and grass covered, 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.

Kupreanof Strait is described on page 167.

Viedoda Bay (chart 8534) is on the eastern side of Shelikof Strait between Outlet Cape and Uganik Island. It extends about 15 miles into Kodiak Island in an east-southeasterly direction to a narrow head. Uganik Passage enters Viekoda Bay on the south side about 7 miles inside the entrance.

Good anchorage for moderate size vessels in 12 to 17 fathoms (21.9 to 31 m) may be had ½ to 1 mile west-northwest from the islands 1½ miles from the head of Viekoda Bay.

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 from the north end of Outlet Cape and 166° true 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 north-

ward 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 (chart 8534) 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 several miles southward from the turn of Uganik Passage at the southeast end of Uganik Island. The main part of the bay is clear with the exception of three rocks, each of which lies about 300 yards from the western shore, as indicated on the chart.

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** 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.** Keep close on this line, passing midway between the island and an islet near the south shore ¼ mile southwestward 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 the 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.

Cape Uganik, the northwest end of Uganik Island, is low and flat for about ¼ mile back and then rises to elevations of 1,200 to 1,500 feet (366 to 457 m). For a distance of 1½ miles southward from the cape foul ground extends for ¼ mile and more offshore. Vessels should give the cape a berth of 1 mile.

UGANIK BAY (chart 8542) is on the eastern side of Shelikof Strait between Cape Uganik and Miners Point. In general the bay and its arms with exception of East Arm have depths too great for anchoring. There are several small shoal spots rising abruptly from the general level of the bottom. One of these lies in mid channel about 1 mile northwestward from Mink Point at the junction of East and South arms, two others lie in the passage between Sally Island and the shore at Starr Point.

The shores of Uganik Bay rise abruptly from cliffs in places and are generally covered with grass and alder bushes.

Two salmon canneries are located in Northeast Arm. During the fishing season communication by **radio** telegraph may be had with the Uganik Fisheries Inc. (call letters KLP), and by radio telephone with San Juan Fishing and Packing Co. (call letters KLY). A saltery is located in East Arm.

Anchorage.—The best anchorage in Uganik Bay will be found in East Arm where there is plenty of swinging room and depths of 10 to 15 fathoms (18.3 to 27.4 m), sticky mud bottom.

Noisy Islands lie ½ to ⅝ mile from Uganik Island and 2½ miles southward from Cape Uganik. The group consists of two

islands, the northern one being the larger one. It is rolling with round-topped, grass-covered hills, the highest of which being about 192 feet (59 m) high. A light, 90 feet high is located on the western bluff of the northern Noisy Island.

The southern Noisy Island is also grass covered, but is low and flat. There are two fine sand beaches near the northern end of this island and a house near by. When off Uganik Bay, these islands are sometimes hard to pick up as they merge into the brown hills of Uganik Island. Noisy Islands should be given a berth of 1 mile.

Noisy Passage, between Noisy Island and Uganik Island, has been sounded and appears to be clear in mid-channel with a least known depth of 7½ fathoms (13.7 m). It is in constant use by small coasting vessels but is not recommended for deep-draft vessels.

Vessels using this channel should be careful to avoid the rock awash, which lies about ⅜ mile northward of the northerly Noisy Island.

Miners Point, 4½ miles northeastward from Cape Ugat, is distinctive in appearance as it terminates in 3 **mound-like hills,** the inner one being 390 feet (119 m) high, and the outer one about 190 feet (58 m) high.

Broken Point, at the eastern entrance to Uganik Bay, is low and flat for ⅜ mile back and then rises to the high land back of it. The outer end of the point is detached and appears as if it had been broken off. A reef which bares on a 2-foot (0.6 m) minus tide lies about 250 yards off the point. The point should be given a berth of ¾ mile.

A stream enters the bay in the bight 1¾ miles southward from Broken Point. There is good **anchorage** sheltered from southerly to westerly winds off the mouth of the stream in depths of 8 to 15 fathoms (14.6 to 27.4 m).

West Point is a comparatively low rocky cliff which rises rapidly to the high land behind it.

East Point, 5 miles eastward from Broken Point, is the northwest extremity of the peninsula separating Uganik Bay and Passage. There is a flat rock with bluff sides close to the point and from the point there is a long gentle slope to the high land.

Rock Point, the southern entrance point of **Northeast Arm,** is marked by several bare rocks which extend 250 yards off the point.

Starr Point is the low rounding point on the northeast side of Northeast Arm where the channel is split by Sally Island. A rock which is awash at extreme high tide and attached to the shore at low tide, lies a few yards off this point. There is deep water close up to this rock which is marked by a **light.**

Sally Island, nearly 2 miles in extent, occupies a central position in the basin at the head of Northeast Arm. It is covered by grass and alder bushes and is about 1,100 feet (335 m) in height.

Sheep Island is a small island just off the southeast point of Sally Island. It is connected to the latter by a gravel spit which is covered at high water.

Canneries.—The Uganik Fisheries' cannery lies east true from the north end of Sally Island. The wharf here has a least depth of 25 feet (7.6 m) alongside. In approaching this wharf care should be taken to avoid the spit which bares 150 yards off a small stream ¼ mile westward from the wharf. Deep water extends close up to

the spit. The San Juan Cannery, located 1 mile southeast from the other cannery, has a well-built wharf with a least depth of 27 feet (8.2 m) alongside. Both canneries have an abundant supply of fresh water and operate radio stations during the fishing season. Call letters are given above.

Deep water surrounds Sally and Sheep Islands except for the narrow passage between Sheep Island and the mainland, where it is nearly bare at low water.

A **shoal** with a least known depth of 5¼ (9.8 m), sand and gravel bottom, lies about 300 yards north true from the northern tip of Sally Island.

Anchorage may be had off either cannery in about 30 fathoms (55 m).

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 ¼ mile below the unnamed island in the bight on the south side of the arm. Depths range from 15 fathoms (27.4 m) at the entrance to 3 fathoms (5.5 m) near the flats. The arm is clear except for a rock 450 yards northwestward from the unnamed island on the south shore. This rock bares 2 feet (0.6 m) at m. l. l. w. Between this rock and the shore is another rock which bares at m. l. l. w. There is a saltery located on the south shore near the unnamed island. It has a small wharf that goes bare at low water. In approaching the saltery care should be taken to avoid the rocks mentioned above.

East Arm affords an excellent **anchorage** for vessels of any size in depths from 10 to 15 fathoms (18.3 to 27.4 m), sticky mud bottom. It is subject to heavy williwaws during southerly gales.

South Arm extends 5½ miles southward from Mink Point, the southern entrance point to East Arm. The arm near its head is only ¼ mile wide. A **sunken rock** with ½ fathom (0.9 m) over it lies 225 yards off the eastern shore ⅝ mile southward of Mink Point. Between the point and the sunken rock is a rock which bares 2 feet (0.6 m) at m. l. l. w., lying 200 yards offshore.

Anchorage may be had near the head in 16 fathoms (29.3 m), sticky mud bottom, where the arm is ¾ mile wide.

Village Islands are numerous islands and rocks 2 to 3½ miles southward from West Point. There is a hand cannery back of the village islands. There is an abandoned native village in the cove just south of the islands. Anchorage for small craft may be had here in 6 to 12 fathoms (11.0 to 21.9 m), but the approach is over broken ground making it safe for launches only. There are apparently no continuous channels between the various rocks and islands.

***Directions,* Uganik Bay.**—From northward, round Cape Uganik at a distance of 1 mile and steer **222° true** for 3½ miles to a position 1 mile westward of Noisy Islands. Round the islands at a distance of 1 mile and steer **158° true** for a distance of 5 miles to a position midway between East and West Points.

From southward, give Cape Ugat and Miners Point a berth of 1½ miles and Broken Point, a berth of ¾ mile. Then steer **143° true** 4 miles to a point midway between East and West Points.

To enter Northeast Arm.—From a position midway between East and West Points steer **163° true** for 2¼ miles until the north tangent of the largest and most northerly of the Village Islands is on the

starboard beam. Then change to **133° true** for 1¾ miles until a small grassy islet is on the port beam, distant about ½ mile. Then change to **101° true** for 1½ miles. Then change to **132° true,** heading about ¼ mile off Starr Point. Round Starr Point at a distance of ¼ mile or less and continue in mid-channel along the east side of Sally Island to anchorage or wharf.

To enter South Arm.—From a position midway between East and West Points, steer **163° true** for 2¼ miles until the north tangent of the largest and most northerly of the Village Islands is on the starboard beam. Then change to **190° true,** heading ⅓ mile off Mink Point which separates East and South Arms. From mid-channel off Mink-Point, steer mid-channel courses taking care to avoid the rocks which lie as much as 225 yards offshore for ¾ mile southward from Mink Point.

To enter East Arm.—Follow courses as above until off East Arm and then enter on a mid-channel course taking up anchorage as desired.

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 cliff at the point of the cape. A short distance off the cape is a small rocky grass-covered islet which can be seen for a distance of 15 miles up and down the coast on a clear day. A reef that covers at ⅔ tide lies about 175 yards west of this islet. Between the islet and the cape there is a channel which is used by the local cannery tenders. **Little River** is a meandering stream which enters the strait a short distance southward of Cape Ugat.

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. On the summit back of the cape there is a peculiar and prominent **clump** of rocks.

UYAK BAY (chart 8542) is on the eastern side of Shelikof Strait, southward of the mountainous peninsula terminating in Capes Ugat and Kuliuk.

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 from Harvester Island. The shores of the bay rise in steep slopes to elevations of 2,000 to 4,000 feet (610 to 1,219 m), and there are many mountain streams. There is no timber except the alders in the gulches and some cottonwood trees at the heads of the bays. Uyak Bay is an important salmon fishery, and there are 4 canneries located in the bay, two of which were not operated in 1937.

The best **anchorages** in Uyak Bay will be found southward of Harvester Island, and in Zachar Bay. These will be described later.

Chief Point, on the north shore of Uyak Bay opposite Harvester Island, is formed by an island which is grass covered, about 90 feet (27.4 m) high, and has several ridges and small hills. About ¼ mile west true from the northwest point of this island there are several rocks that bare at low tide. The highest of a group of rocks ¾ mile southeastward from Chief Point is 110 feet (34 m) high.

Chief Cove is the narrow strait behind the island forming Chief Point. A rock which bares 6 feet (1.8 m) lies in the northern en-

trance. The southern entrance is very shoal. There are depths of 8 to 12 feet (2.4 to 3.7 m) in the northern part of the cove. It is used as an anchorage by cannery tenders and pile drivers during the fishing season.

Spiridon Bay opens into Uyak Bay northeastward of Harvester Island. It extends 12 miles inland in an easterly direction. **Broken ground** extends about 1¼ miles northwestward from the point on the southern side of the entrance. **Clover Rock** is a rocky islet ¼ mile off the south shore and 1½ miles from the southern entrance point. It is 34 feet (10.4 m) high and is connected to the mainland by a gravel shoal which bares on the minus tides. A large stream of water enters the bay just east of Clover Rock.

Thistle Rock is a small islet consisting of black jagged rocks about 10 feet (3.0 m) high lying a short distance eastward of Clover Rock. It is always bare and affords a good mark in clear weather. A rock which bares at half tide lies about 300 yards northwestward from Thistle Rock.

Ditto Islets, a pair 30 feet (9.1 m) high, lie in the middle of Spiridon Bay about 7 miles inside the entrance. The bottom between the pair and the south shore is broken and contains several rocks bare at low water and a rock 25 feet (7.6 m) high. A group of islands in a foul area adjacent to the south shore lie southwestward of the Ditto Islets; of these **Anguk Island** is the largest.

Telrod Cove is a small cove on the north side of the bay about 10 miles from Chief Point. It affords good shelter in westerly weather for small craft. The cove shoals rapidly with mud flats at its head. Anchorage may be had in 7 to 15 fathoms (12.8 to 27.4 m) sand and shell bottom. A large stream enters the bay here.

Weasel Cove forms the western arm at the head of Spiridon Bay. It is ¼ mile in width with depths of 6 fathoms (11.0 m), sand and mud bottom. The cove forms excellent anchorage for small craft.

Anchorages.—There are no good anchorages for large vessels in Spiridon Bay except at the head where anchorage may be selected in 13 to 16 fathoms (23.8 to 29.3 m), sand and mud bottom. Care should be taken to avoid the 2¾-fathom (4.9 m) **shoal** lying ⅓ mile off the eastern shore and 1¼ miles southeastward from Telrod Cove. A temporary anchorage can be had in 16 to 18 fathoms (29.3 to 33 m) about ½ mile northward from Clover Rock. The bottom is volcanic ash, which has the appearance of yellow sand and has fair holding qualities.

Directions.—In entering Spiridon Bay from the northward, Chief Point should be given a berth of 1 mile. In approaching from the southward, the point separating Spiridon and Zachar Bays should not be approached closer than 1 mile to avoid the rock which lies nearly ½ mile off the point.

From a position 1½ miles south true from Chief Point steer **97° true** for a distance of about 8 miles until Ditto Island is abeam to starboard, distant about ⅓ mile. Then change to **138° true** and take up anchorage as desired.

To enter Weasel Cove keep from 250 to 300 yards off the western shore and enter the cove in mid-channel, taking up anchorage as desired.

ZACHAR BAY lies about 7 miles southeast true from Harvester Island. It is ¾ mile wide at the entrance and extends to the south-

eastward for a distance of 5½ miles where the bay terminates in an extensive mud flat bare at low tide. This mud flat affords an excellent place for beaching a vessel in an emergency.

Carlsen Point, the southern entrance, is low and shows as a bluff when off the entrance.

Carlsen Reef is a dangerous reef lying about ½ mile northwest true from the northeast tip of Carlsen Point. It bares about 9 feet (2.7 m) at m. l. l. w.

A dangerous rock with 17 feet (5.2 m) over it, lies about 1¾ miles northwestward from Carlsen Point. It is marked by a black can buoy placed about 50 yards to the westward of it.

There is a **cannery** on the north shore of Zachar Bay 3 miles above the entrance. It has a wharf with a face of 40 feet and a least depth of 24 feet (7.3 m) alongside. The cannery and wharf ½ mile above have been abandoned. The shore plant and wharf of a floating cannery on the south shore of Zachar Bay have been abandoned.

A large stream enters the head of the bay. There are a number of large cottonwood trees along the stream and Kodiak bears are numerous in the locality.

Anchorage.—Excellent anchorage sheltered from all winds may be had in 12 to 15 fathoms (21.9 to 27.4 m), mud bottom, off the mud flats at the head of Zachar Bay. The anchorage is subjected to moderate williwaws.

In anchoring, care should be taken to avoid the mud flats which extend 1½ miles from the head of the bay.

Directions.—In entering Zachar Bay, the shore on the port hand should not be approached closer than 1 mile and a course should be laid to pass 250 yards off the black can buoy marking the 17-foot (5.2 m) rock. From this point steer **127° true** until Carlsen Point is abeam on the starboard hand, then change to **145° true** and continue, keeping in midchannel.

Amook Island, formed by a mountainous ridge, divides an 8-mile stretch of Uyak Bay into two passages. The eastern passage is narrow and obstructed in places, and as a through route should be used only by small vessels with local knowledge. Reefs extend ¼ mile northward from the north end of Amook Island.

The **ship passage** is westward of Amook Island. **Aleutian Rock,** marked by a black **buoy** on its southwest side, lies ¼ mile off the southwest shore of Amook Island, in the southern end of this passage. This **dangerous** rock bares 1 foot (0.3 m) at m. l. l. w., and there is no kelp around it. Vessels should pass between Aleutian Rock and Alf Island. The steamship *Aleutian* was lost here in 1929.

There is a **cannery** on the west shore of Uyak Bay opposite the south end of Amook Island.

In the **bight** on the western side 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.

The **passage eastward of Amook Island** for a distance of about 2½ miles from its north end has suitable depths and sufficient width for anchoring vessels of moderate size. The passage then **narrows** to 300 yards, and from the **point** on the eastern side a **kelp-marked reef** extends westward and northwestward more than halfway across, leaving a narrow channel between the reef and the western shore. Near the northwest end of the reef is a **bare rock.** An anchorage for small vessels may be found on the west side at the south end of the narrows, around the point, in 5 to 8 fathoms (9.1 to 14.6 m). A small vessel can also anchor 300 yards off the narrow entrance of the shallow lagoon ⅜ mile northeastward of the point of the narrows, in 5 to 6 fathoms (9.1 to 11.0 m). A 2¼-fathom (4.1 m) spot lies about 500 yards off the lagoon entrance.

Thence for a distance of 2 miles the passage is clear to the **second narrows.** Here 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 island 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.

During the fishing season a floating cannery is usually moored near the old mining camp on the east side of the strait.

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.

The safer and recommended passage is eastward of the chain composing **Alf Island.** Broken bottom extends about 300 yards into the passage from the central islets of the chain and directly opposite a reef extends 200 yards from the eastern side of the passage, but the reef is marked at its outer end by a bare rock visible at all times.

A fox rancher and fisherman resides on Alf Island.

At the south end of the chain of islands there is a small **inlet** in the west shore about ¾ mile long and 300 yards wide, affording anchorage in about 12 fathoms (21.9 m).

From 3 to 6 miles southward of Alf Island, Uyak Bay shoals gradually from 20 to 7 fathoms (37 to 12.8 m) and **anchorage** may be selected in any depth desired. The swinging room is about 1,400 yards in diameter.

The upper end of Uyak Bay is bordered by high snow-covered mountains and is a well-known hunting ground for the large Kodiak brown bear.

LARSEN BAY (chart 8822) is on the western side of Uyak Bay, 6 miles southward from Harvester Island. There are depths of 30 to 40 fathoms (55 to 73 m) near its northern side and less on the opposite side. From its head, a trail leads over a low divide to the Karluke River. A large **cannery** is maintained by the Alaska Packers Association in the bight just southward of the inner south entrance point. A **radio station** is maintained during the fishing season, call letters KHA. There is a marine railway for a 75-foot vessel.

The **entrance** is through a narrow crooked channel and is marked by beacons built and maintained by the cannery company. A **reef**

which bares at low water lies in mid entrance and is marked by a skeleton steel **beacon** painted red. The spit which extends southward from the northern entrance point is marked by a pile dolphin.

The channel between the mid entrance reef, marked by a red beacon, and the 20-foot (6.1 m) elevated rock, 200 yards southeastward from it, is marked by a **range.** The front mark is a dolphin on the flats bearing a yellow wheel-like device, and the rear mark is a yellow circular disk painted under the gable of a building. This channel carries a least depth of 24 feet (7.3 m) on the range mentioned above.

The wharf is built out over the shoal water and has a depth of 8 feet (2.4 m) at its outer end.

Currents.—A strong tidal current sweeps through the entrance with an estimated maximum velocity of 4 to 5 knots.

Anchorage.—A good anchorage for larger type vessels will be found about 400 yards northwestward from the small island on the south side of the bay, and about 700 yards off the cannery wharf in depths of 20 fathoms (37 m), mud bottom. In westerly weather winds blow down the bay with great force, but the holding ground is good. In former years the cannery company moored its sailing vessels here during the summer months.

Directions.—Small vessels can enter Larsen Bay at any stage of the tide, but large vessels should choose a high-water slack with calm weather for entering or leaving.

Enter on the range (yellow dolphin on a yellow circle painted under the gable of a cannery building) and pass midway between the reef marked by a red beacon and the 20-foot (6.1 m) rock, 200 yards southward from it. Hold this range, **248° true** until within about 300 yards of the yellow dolphin and then make good a **292° true** course passing 100 yards off the pile dolphin at the end of the spit on the starboard hand and 150 yards off the inner entrance point on the port hand.

When the inner south entrance point is a little abaft the beam change to **263° true** for ¼ mile, then haul southward and take up anchorage as desired.

A deeper channel exists on the north side of the reef marked by the red beacon, but the use of this channel necessitates a more difficult turn, and for this reason the channel south of the red beacon is recommended. A range of the yellow dolphin on the twin cannery stacks marks the northern channel.

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 (chart 8822) is one of the best harbors 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) 1/4 mile northwestward of the site of a former cannery. The best anchorages is about 1/2 mile northwest of the cannery site, 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, 1/4 to 3/8 mile southeastward of the cannery site and 1/4 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 5/8 mile southeastward of Harvester Island and 300 yards from shore. A **spit,** bare at low water and steep-to, extends 425 yards southward 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 lighted beacon placed in 12 feet (3.7 m) of water.

The northwest entrance is 3/8 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. The cannery on the southwest side of Uyak Anchorage opposite the south end of Harvester Island has been abandoned. There is a depth of 20 feet (6.1 m) at the wharf. There is considerable undertow, and good fore and aft spring lines are needed with westerly weather. Currents are sometimes troublesome in making this wharf.

Uyak is a port of call for the monthly mail steamer from Seward.

Tides.—At ***Uyak Anchorage*** high and low water occur about 10 minutes earlier than at Seldovia. The mean range of the tide is about 11 1/2 feet (3.5 m) and the range between mean lower low water and mean higher high water is about 14 feet (4.3 m).

Directions,* Uyak Anchorage.**—From northward,*** round Cape Ugat at a distance of about 1 1/2 miles and steer **220° true** for 6 miles to a position 2 1/2 miles off Cape Kuliuk, bearing 102° true. Then steer **172° true** for 10 miles, giving the eastern shore a berth of about 2 miles, to a position 1/2 mile eastward of Harvester Island.

Then steer **237° true,** passing about 1/4 mile southeastward of Harvester Island. Anchor 500 yards northeastward of 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 beacon at a distance of 100 yards, and steer **341° true** 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.—Give Cape Uyak, Rocky Point, and Bear Island berths of 1 mile or over, and follow the eastern shore of Harvester Island at a distance of 1/2 mile or more. Then follow directions as given above.

In passing Rocky Point care should be taken to avoid Walcott Reef which lies 1/3 mile off the point and bares only at extreme low water.

Sevenmile Beach (chart 8541) is the name given the long boulder-strewn beach from Bear Island to Rocky Point. It is backed by low cliffs from which a broad grassy valley extends back several miles toward Karluk Lake.

Rocky Point is a double point on the south side of the approach to Uyak Bay. It consists of bold cliffs which rise rapidly to the ridges of which the point is a termination.

Walcott Reef is a dangerous group of rocks that bare at extreme low tide. It lies ⅓ mile off the easterly spur of Rocky Point. There is a channel between the reef and the point with a least known depth of 4 fathoms (7.3 m). This channel is used by local cannery tenders in fine weather.

CAPE UYAK, on the east side of Shelikof Strait about 4 miles southwestward from Rocky Point, 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. A **light**, 93 feet (28.3 m) high, marks the cape.

Northeast Harbor is the bight on the south side of Cape Uyak. In northeast weather it affords excellent shelter for small craft that can anchor close under the shore in 3 to 5 fathoms (5.5 to 9.1 m), sandy bottom. Larger vessels anchor farther out in 9 fathoms (16.5 m) with some protection but subject to an uncomfortable swell.

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.** Beach seining is carried on here during the season, and there are a number of fisherman shacks on the beach at the foot of the cliffs.

Karluk (chart 8822) lies 5½ miles southward from Cape Uyak and 1½ miles eastward from Cape Karluk. It is a native village with a school and a church, and fishing is the principal industry. The old cannery buildings are still standing but they are no longer used, as the fish are now taken to Uyak Bay for canning. A strong set southward toward the shoals inshore has been experienced.

There is a **radio station** operated by the Alaska Packers' Association, call letters KYK, operated throughout the year.

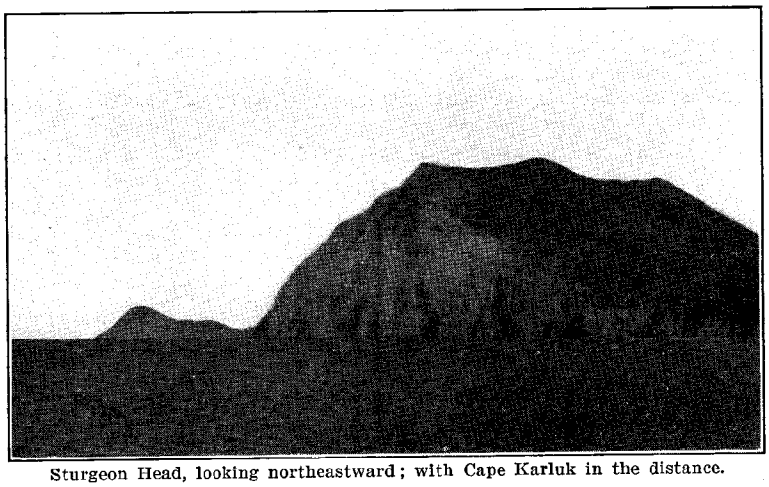
The entrance to **Karluk River** is through a narrow channel at the south end of a spit and is only passable by launches at high water. There are some wharves just inside the mouth. About 1½ miles up the river is a weir where the salmon are counted as they ascend the river. The weir is removed during the winter season.

Karluk Anchorage off Karluk is sheltered from offshore winds but is exposed to winds from the southwest around through west to northeast. Vessels should be prepared to move on short notice. Anchorage may be had off the town in 12 to 14 fathoms (21.9 to 25.6 m), sandy bottom. During the fishing season a number of scows and launches will usually be found moored in the roadstead.

The abandoned cannery buildings and the Greek Catholic Church, with its green roof and dome, are the principal objects to be seen in approaching Karluk.

Tanglefoot Bay is the local name for the bight adjacent to Cape Karluk on its eastern side. It is separated from Karluk by a high cliff, the base of which is not passable by pedestrians at high water. The beach, known as Tanglefoot Beach, is very steep and there is a bad undertow. Landing here is dangerous if there is any surf.

CAPE KARLUK (chart 8541) is the most conspicuous landmark along the west coast of Kodiak Island roughly 20 miles inside the southwestern end of Shelikof Strait. The cape is a prominent, projecting head, 1,398 feet (426 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.



Sturgeon Head, looking northeastward; with Cape Karluk in the distance.

Sturgeon River has its mouth about 2 miles southward from Cape Karluk. The entrance is between 2 shingle spits covered with driftwood. It can be entered by small boats at half tide or better. For about a mile back of the beach the river flows through a mud flat, all of which is covered at high water.

Sturgeon Head is a high whitish eroded headland 5 miles southward from Cape Karluk. There are several rocks and reefs lying as much as 200 yards offshore at the foot of Sturgeon Head.

Cape Grant lies about 10 miles southward of Cape Karluk and 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 **rock** which is nearly awash at m. l. l. w., lies ¼ mile off the southwest tip of Cape Grant. Shoal water extends some distance beyond this rock and vessels rounding the cape into Halibut Bay should give it a berth of ¾ mile.

Halibut Bay is the large bight lying just southward from Cape Grant. The bight is bordered by eroded bluffs and a broad sand beach. A stream enters the sea at the southern part of Halibut Bay. Vessels anchor in 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.

Anchorage can also be had in the northern corner of the bay, but care should be taken to avoid the reef which makes out from the southwest tip of Cape Grant.

There is a **cannery** in Halibut Bay, at the entrance to the lagoon, operated by Alaska Red Salmon Packers, Inc. Radio communication may be had through Kodiak (WXF).

MIDDLE CAPE, the westernmost promontory on Kodiak Island, consists of two headlands having precipitous, rocky cliffs facing the sea, and smooth grassy slopes facing inland. The northern headland is the higher, being a little over 1,000 feet (305 m) in elevation. Its summit consists of three rocky clumps, the middle one of which is the highest. These rocky clumps are prominent and easily distinguished from the northward.

A prominent **high pinnacle rock** lies at the foot of the northern slope of Middle Cape.

Tombstone Rocks consists of two detached rocks about 100 yards apart lying ¾ mile off Middle Cape. The southerly rock is 99 feet (30.2 m) high while the northerly rock is only a few feet high. From some directions these rocks appear as the headstone and footstone of a grave. There is deep water close to the rocks.

Mushroom Reef, which bares 13 feet (4.0 m) at m. l. l. w., lies about ⅓ mile offshore and 1 mile southeastward from Middle Cape. This rock when exposed by the tide is round and has the appearance of a huge mushroom. There is deep water close up to it.

A prominent pillar-like shaft of rock 170 feet (52 m) high with overhanging sides, lies about 100 yards offshore and east true from Mushroom Rock.

Middle Bay is a small bight lying about midway between Cape Middle and Cape Ikolik. The 5-fathom (9.1 m) curve lies about ⅓ mile off the beach.

Gurney Bay is the bay immediately northeastward from Cape Ikolik. The head of the bay is shoal with a sand beach strewn with boulders.

Anchorage may be had in 10 fathoms (18.3 m), sandy bottom, midway between the two entrance points. This is a comfortable and secure anchorage in easterly weather.

CAPE IKOLIK (chart 8540), 4 miles southward of Middle Cape, is a rugged headland 980 feet (298 m) high, with its summit forming a ridge lying in a northeast and southwest true direction.

Outer Seal Rock, lying 1¾ miles westward from Cape Ikolik, resembles a sail and is 89 feet (27.1 m) high. The rock has deep water close to except about 200 yards to the southwest where there are sunken rocks. Outer Seal Rock is a sealion rookery.

Inner Seal Rock, which lies ⅓ mile west true from Cape Ikolik, is a steep-sided bare rock 141 feet (43 m) high, surmounted by a rocky nub which gives it the appearance of a lighthouse. From some directions it appears as a huge bell.

Bumble Bay lies 2½ miles east of Cape Ikolik. The western point of the bay is marked by three pinnacle rocks, while the eastern point is marked by a single pinnacle rock 127 feet (38 m) high. Small craft will find shelter from easterly winds in the eastern part of the bay, while large vessels will find anchorage in the center of the bay in 12 fathoms (21.9 m) sand bottom.

Ayakulik Island is small and about 220 feet (67 m) in height. A reef extends eastward from the east point of the island to a sand spit on the mainland of Kodiak Island. At a distance of 300 yards west and north of the island there are bare rocks and rocks awash.

Small launches will find shelter in southeasterly or easterly weather in 5 fathoms (9.1 m), 300 yards northeast of the island. Larger vessels will find shelter from easterly weather in 7 fathoms (12.8 m), ½ mile north of the island.

Ayakulik River (known locally as **Red River**) discharges at a point 1¾ miles southeast of Ayakulik Island. With local knowledge, the river can be entered at high tide in smooth weather by small launches. The Bureau of Fisheries maintains a station here during the salmon season.

From a point 3 miles north of Ayakulik Island to Low Cape, the shoreline runs in a nearly north and south true direction and is marked by earth bluffs varying from a few feet to 268 feet (81 m) in height.

A prominent high dark-colored earth **bluff** lies a little over 3 miles north of Low Cape, and in approaching from Cape Ikolik, this bluff is apt to be mistaken by a stranger for Low Cape.

LOW CAPE, lying 11½ miles 323° true from Cape Alitak is the western extremity of the low land in this vicinity. The extremity of the cape is marked by a peak-shaped, light-colored earth bluff about 90 feet (27.4 m) high. A spit, bare at low water, extends nearly ¼ mile off the cape. The water deepens gradually, the 10 fathom (18.3 m) curve lying 2¼ miles off the cape.

From a position 2 miles westward of Low Cape a heavy kelp bed extends in an east-southeasterly direction. Soundings in this kelp showed depths of from 3 to 7 fathoms (5.5 to 12.8 m), but much shoaler water probably exists.

In passing, Low Cape should be given a berth of about 3 miles.

Sukhoi Bay has its entrance about 6 miles south of Low Cape. The entrance is narrow and lies between two sand bars. It has a depth of about 6 feet (1.8 m), but should not be attempted except with local knowledge.

The coast from Low Cape to Cape Alitak apparently has no off-lying dangers.

Cape Alitak.—See page 209 for a description of this cape.

***Directions,* Cape Karluk to Cape Alitak.**—From a point 2 miles off Cape Karluk, steer **222° true** for 5½ miles to a position with Sturgeon Head (a high white eroded cliff) abeam. Then change to **213° true** for 11½ miles until Tombstone Rock is on the port beam, distant 2 miles.

Then change to **196° true** for 4 miles or until Outer Seal Rock (a sail shaped pinnacle) is a little abaft the beam, distant 2 miles.

Then change to **154° true** for 23¼ miles to pass 2¾ miles off Low Cape. On this course Low Cape should be passed in a depth of 14 fathoms (25.6 m).

When Low Cape Bears 83° true, distant 3 miles, haul to **132° true** for 12½ miles passing about 1¼ miles off Cape Alitak to a position with the cape bearing 10° true, distant 1½ miles.

If bound to Alitak Bay, follow directions on page 213.

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9. 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 cannot 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 them, 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. In mid-winter small vessels ice down.

Fog and mist may be expected at any time from spring until fall and often last for several days.

All harbors on the south side of the peninsula are free from ice and open to navigation throughout the year. Pack ice has been known to drift through Isanotski Strait and interfere with navigation in Ikatan Bay.

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. During the summer of 1929, the vicinity of Shelikof Strait was almost free from fog. Fog is much more prevalent on the southeast side of Kodiak Island than in Shelikof Strait. See page 309 for statistics of fog at Scotch Cap.

Winds.—During the winter and early spring, very strong northwest winds predominate, often reaching gale intensity; but there are intervening days of fine weather with little or no wind. During the summer months the winds are variable but are mostly southeast to southwest. With September the northerly 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, these last from 1 day to 1 week.

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.

It is good practice to plot the movement of storms from daily weather reports by radio, see page 20. Some storms reach the Alaska Peninsula from the south or southeast, but most of the disturbances are cyclonic storms approaching from the west.

CURRENTS, *Alaska Peninsula.*—There is a continual current of considerable strength following the coast all the way from Shelikof Strait to the Aleutian Islands. This coastal current flowing to the westward is considered as an eddy which accompanies the general eastward drift across the Pacific southward of latitude 50° N., and forms a part of the general circulation of the North Pacific Ocean.

The current along the Alaska Peninsula 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. Westerly winds weaken the current. 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.

On three runs made between Chirikof Island and Castle Rock, the *Surveyor* experienced a southerly set indicating an average strength of current of as much as 1½ knots.

The **tidal currents** in the locality of the Alaska Peninsula are in general weak, probably never exceeding 1½ knots.

Kelp.—The navigator cannot rely on seeing kelp or 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 cannot 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, King Cove, and False Pass; stops are made at other places on payment of a bonus. Many other vessels irregularly use the south Alaska Peninsula passage, however, in voyages between southeast Alaska and Bering Sea.

From about March to September, the vessels of the Pacific American Fisheries make regular trips from Bellingham, Wash., to the following canneries: Zachar Bay, Lazy Bay, Squaw Harbor, King Cove, Ikatan, and Port Moller on the north side of the peninsula. These vessels are common carriers.

Practically all the canneries operate radio stations during the fishing season. Government radio stations are located at Kodiak, Squaw Harbor, and Dutch Harbor.

Local attraction has been reported in the vicinity of Arch Point, in the passage between Dolgoi and Goloi Islands, and off King Cove.

CAPE DOUGLAS (chart 8556), the mainland promontory on the western side of the northern end of Shelikof Strait (p. 214), 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.

Note.—Cape Douglas and other prominent points and most of offlying islands on the western side of Shelikof Strait are correctly charted with respect to the surveyed coast of Kodiak and Afognak Islands. Otherwise this stretch is inadequately surveyed.

Shaw Island (chart 8554) 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 between this point and the northern point of Sukoi Bay 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.

The **bight** (chart 8556) 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, in 6 fathoms (11 m), sandy bottom.

Mount Douglas, 7,064 feet (2,151 m), and **Fourpeaked Mountain,** 6,903 feet (2,100 m) high, are two snow-covered mountains lying west and southwest, respectively, from Cape Douglas.

DOUGLAS REEF, lying 5½ miles 187° true 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 from the rock, and vessels should keep well clear of the reef.

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 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 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 northwest 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 from Kiukpalik Island. From the rock a semicircular reef, partly bare at low water, extends southward and westward to the south end of the chain of grass-covered **Shakun 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 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 the southeastward, a

vessel of the Coast Guard anchored in about 7 fathoms (12.8 m), hard sand bottom, with Cape Chiniak bearing 205° true, Shakun Rock 86° true, and the settlement rock 346° true. 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 midway between Ninagiak Island and Cape Nukshak. The reef is bare in places at low water, is covered at high water, and has no kelp.

CAPE NUKSHAK, 17½ miles northward of Cape Kuliak, terminates in an island ½ mile long and 133 feet (40 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, 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 (chart 8851) 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.

There was a clam cannery located in Kukak Bay. It was destroyed by fire in 1936 and will be rebuilt. The wharf had a face of 65 feet and a least depth of about 20 feet (6.1 m). The piles of the wharf rest on rock bottom and will not stand much warping. Fresh water is obtainable in limited amounts. Care should be exercised in backing away from this wharf with an ebb current, as a vessel will be carried into the bight to the northward and find difficulty in keeping off the beach in turning around.

The *Steamer Starr* calls at Kukak Bay during the summer season.

Devils Desk, Kukak Volcano, Mount Stellar, and **Mount Denison** are a group of high snow-covered peaks on a ridge lying about 10 miles northwestward from Kukak Bay.

CAPE UGYAK lies 9¾ miles northward of Cape Kuliak. 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 (chart 8556) is the outermost of the headlands on the mid section of the western shore of Shelikof Strait. The cape rises gradually from a crumbling bluff at the end to high mountains inland.

Between Capes Kuliak and Atushagvik is **Missak 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 from Cape Kuliak. It has a low bluff at the water, and rises in a gentle slope to a prominent knoll, 904 feet (276 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. **Kinak Bay,** the northeastern one, is 8 miles or more long in a direction 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 Anchorage,** 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 bay from the entrance 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 Kinak Bay by a high peninsula. No sounding has been done, but there is secure anchorage at its head. Takli Island lies in the entrance. About ⅝ 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 ⅜ 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 Kinak Bay 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.

A fox rancher lives on the island.

Note.—The **coast** from Amalik Bay 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.

This section of the coast is still covered with the yellow volcanic ash from the Katmai eruption of 1912, and is almost devoid of vegetation. It has the appearance of a desert country.

CAPE ILKTUGITAK, lying just southward of Takli Island, is fairly low, but rises rapidly to the high land back of it. There is an island just off the tip of the cape. The chart shows a group of sunken rocks 2 miles southeastward from the cape, but the survey steamer *Surveyor* saw no indication of the rocks when in the vicinity in 1929.

The steamer *Golden Forest* was lost on the south side of Cape Ilktugitak in 1929.

Dakavak Bay is a large open bay lying between Cape Ilktugitak and Katmai Bay. It is unsurveyed, and no information is available.

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.

The country back of Katmai Bay is covered with ashes and has a very desolate and desertlike appearance.

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.

Katmai Volcano, 7,500 feet (2,280 m) high, is often seen smoking. It is part of a high ridge and is not easily distinguishable from the strait unless smoking.

Mageik Volcano, 7,250 feet (2,210 m) high, lies about 10 miles southwestward from Katmai Volcano. It has a more definite summit and can be identified from the strait.

Cape Kubugakli is bold and rises rapidly to **Mount Kubugakli,** a prominent mountain with two summits. The southerly peak is the highest, 2,920 feet (890 m) high.

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.

CAPE KEKURNOI, on the western shore of the southern end of Shelikof Strait, is fairly low, but rises to the high land back of it. It lies between Alinchak and Cold Bays. A long reef extends several miles southward of the cape.

Cold Bay (chart 8502).—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** to a position with the northern tangent of Cape Aklek bearing **336° true,** 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** 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 these reefs, 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 (chart 8666).—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 to 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, Jute Bay.—Head into the entrance on a **321° true** 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.

PORTAGE BAY (chart 8666) is an 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 Portage Bay. Since the discontinuance of oil drilling in this vicinity, Kanatak has been practically abandoned and there are only a few people there at present. There is a fur trader who maintains a store. It is a point of call for the local mail steamer.

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 1½ fathoms (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. A **lighted range** marks this channel.

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, Portage Bay.—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

follow the **lighted range** (course **334° true**) and pass 100 yards southwest of the red **buoy** marking the 1½ fathoms (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 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.

Cape Igvak is marked by a flashing white light located 80 feet (24.4 m) above the water.

WIDE BAY (chart 8666) is a commodious bay formed by a chain 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 (Wide Bay).—The only entrance channel recommended is that between Channel Rock and East Channel Island, which has been surveyed. The northern entrance is foul and should not be used. The channels between the islands southward of West Channel Island have not been completely surveyed and should not be attempted by strangers.

Channel Rock, about 40 feet (12.2 m) high, lies between East and West Cannel Islands and is unmistakable. There are several rocks and reefs 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 one of the large islands of the chain, second 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, Wide Bay.—From sea, a course of **290° true** 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** 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 **280° true** course will clear the reef on the west side of East Channel Island. Channel Rock should not be approached closer than 350 yards.

Note.—The **coast** from **Cape Kayakliut** at the south end of Wide Bay to Cape Kumlik (the cape nearest to Sutwik Island) is unsurveyed, and there is no detailed information concerning it.

KILOKAK ROCKS (chart 8502) are two high rocks about 100 yards apart lying 2½ miles offshore and 15 miles southward of Wide Bay.

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 Wrangell.—A sketch of Port Wrangell 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 PROVIDENCE is a prominent cape lying between Port Wrangell and Chiginagak Bay.

Chiginagak Bay is a large open bay. It is unsurveyed and there is no information available.

AIUGNAK COLUMNS are a group of pinnacle rocks lying about 5 miles south true from Cape Providence. There is no detailed description available.

Cape Kuyuyukak lies about 9 miles southwestward from Cape Providence.

Nakalilok Bay and **Yantarni Bay** are two open bays lying between Cape Kuyuyukak and **Cape Kunmik.**

Ugaiushak Island lies about 7 miles off Nakalilok Bay. No description is available.

Amber Bay, large and open, lies just southward of Cape Kunmik. It is separated from **Aniakchak Bay** by **Cape Ayutka,** off which there is a reef with several islets.

CAPE KUMLIK (chart 8710), promontory on the Alaska Peninsula nearest to Sutwik Island, 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, ¾ mile from the eastern end of Cape Kumlik has an elevation of 1,064 feet (324 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 cape is apparently clear and is constantly used by the cannery tenders when running between **Aniakchak Bay** and Chignik.

SUTWIK ISLAND (charts 8502 and 8710), about 7 miles off the Alaska Peninsula and about 90 miles southwestward from Kodiak Island, is 13 miles long and 4 miles wide. 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 has steep shores and is also foul along an 8-mile stretch of shore from Foggy Cape. The 8-mile stretch should be given a berth of not less than 2 miles in passing.

The northwest side of Sutwik Island has a length of shore of about 4 miles. Paralleling this shore is a channel having depths of 20 to 39 fathoms (37 to 71 m). The channel passes between a visible rock near the northwest shore and a **reef** about 2 miles offshore. The reef bares 3 feet at high water and is the outer one of several isolated dangers extending in a chain from Cape Kuliak.

A small vessel **anchorage** protected from south to southwest winds may be had in the small bay on the north side of Sutwik Island about 9 miles from Foggy Cape, 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 for the middle of the bay.

FOGGY CAPE (chart 8502), 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.

Passage between Foggy Cape and Semidi Islands.—A vessel drawing 10 feet (3 m) has reported striking a rock about 3 miles 180° true from Foggy Cape. The area has not been sounded, but tide rips were observed in this locality and it should be regarded as dangerous. The **ship track** through this passage is 10 miles off Foggy Cape or about midway between the cape and the northern Semidi Island.

SEMIDI ISLANDS (chart 8801), about 90 miles southwestward from Kodiak Island, and about 35 miles from the Alaska Peninsula, consist of two large islands and several smaller ones. The islands are high, 1,200 to 1,500 feet (366 to 457 m), and their shores are bold. Only a few soundings have been taken in the locality, these indicate deep water adjacent to the islands. The **breaker** shown southwestward of **Chowiet Island** is reported by some navigators to lie much closer in than charted.

There are strong tidal currents among the Semidi Islands which form bad tide **rips** in the channels and off the point especially when the wind is strong and opposes the current.

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.**

The latter anchorage was used by the survey steamer *Discoverer* in 1925. It should be approached from the southward owing to the foul ground which extends northwestward from **Aghik 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.

In 1925 there was no one living on the islands. Fox trappers go there occasionally.

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 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, and the rock was not found.

In 1930, a halibut boat reported a **rock** baring at low water, lying about 11 miles E. ¾ S. from Lighthouse Rocks. The area in this vicinity should be avoided if possible.

Between Lighthouse Rocks and Chirikof Island a **current** having a southerly set is generally experienced, see page 208.

Kujulik Bay (chart 8710), known locally as **Sitkum Bay,** has its entrance about 14 miles westward from Sutwik Island. It 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.

Unavikshak Island, off the entrance to Kujulik Bay, 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.

To enter Kujulik Bay.—From a position 1½ miles off the detached island off the northeast point of Unavikshak Island, steer **316° true** to a position with the 35-foot (10.7 m) rock 1½ miles northward of Cape Kumlium on the port beam, distant 1½ miles. Then steer **7° true** to a position mid-way 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 Kujulik 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 sunken rock which lies about 1¼ miles from the north shore. Anchor in 8 fathoms (14.6 m).

Cape Kumlium, southward of Kujulik Bay, 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.

CHIGNIK BAY (chart 8710), indenting the Alaska Peninsula, is about 60 mile westward from the Semidi Islands. Entrance may be made either to the northward or southward of Nakchamik Island. The bottom in the southern part of the bay is irregular but deep. There are important salmon fisheries in Chignik Bay.

NAKCHAMIK ISLAND (chart 8710) is an irregular island lying in midentrance 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 (21.9 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 (7.6 m) high, and one at the southeast end about 80 feet (24.4 m) high. There is a small rock awash a short distance off the west side.

CASTLE CAPE, formerly called **Tuliumnit Point,** is on the south side of the entrance to Chignik Bay. The cape is narrow and precipitous, **stratification** is a conspicuous feature. The strata are of many shades of light-colored rocks varied by bands of black. The cape

has been worn into many curious pinacles and buttresses, which suggest its name.

A pair of **towering eminences** near the end of Castle Cape reach an elevation of 1,200 feet (366 m) and this forms a most distinctive feature. Between the towers are needle peaks of lesser elevation. About 300 yards back from the feature is a buttressed wall forming part of the 1,500-foot (457 m) summit of the cape.

Castle Bay.—The bay 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. In the arm on the south side, about 6 miles from Cape Castle, broken rocky bottom makes off the southeastern shore.

Small boats can anchor along the south shore of Castle Bay about 4 miles westward from Castle Cape, where the bottom and shore slope gradually to form a sand and gravel beach. The remaining shore 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 (sub plan, chart 8710) lies west of the fourth ridge from Castle Bay, the ridges forming a succession of headlands on the south shore of Chignik Bay. 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 100 feet (31 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 end of the **spit** is marked by a **light.**

The bay is easily recognized by the bluff headland forming the west entrance point with Eagle 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. 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 (Anchorage Bay) 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; however, this anchorage should now be avoided because of an old wreck which is likely to foul an anchor. The best anchorage is in the middle of the bay, favoring the west side under the cliffs in heavy westerly weather.

CHIGNIK is on the east side near the head of Anchorage Bay. The cannery at the village of Chignik has been abandoned and the wharf is in bad condition. The post office is located here and the monthly mail steamer from Seward makes regular calls.

The cannery of the Alaska Packers Association is located on the south shore of the bay. There are two wharves. The west one has a face of 62 feet with a depth of 18 feet (5.5 m) alongside, while the east dock about 90 feet distant, has a face of 50 feet, and a depth of 21 feet (6.4 m) alongside. Vessels of over 16 feet (4.9 m) draft should approach the wharf head-on and maneuver alongside. There is a line of dolphins driven on both sides of the wharves. There are depths of 8 fathoms (14.6 m) 50 feet off the dolphins.

The Alaska Packers Association maintains **radio station** KHC.

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 idle cannery 2 miles above the sand spit forming the lagoon proper.

A cannery is located on the west shore of Chignik Lagoon 4 miles from the entrance.

The best anchorage is off the east shore 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 Kuiukta Bay.

Reef.—A reef with 4½ fathoms (8.2 m) of water over it lies 3 miles 40° true 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 is 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 highwater 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. If anchoring near the head of the bay, avoid dragging onto the shoals, which rise abruptly.

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Weasel Mountain, 2,410 feet (735 m) high, standing 1 mile south of Hook Bay, is the most prominent mountain in this vicinity.

There is a group of bare rocks about 1 mile south of the southern coast of Cape Kumliun. The highest of the group is 39 feet (11.9 m) in elevation. 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 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,* Chignik Bay.**—With Foggy Cape on the starboard beam distant 4 miles, and on course **216° true,** continue for 5 miles to avoid the position of the reported rock southward of the cape, then change to **263° true** to a position 1 mile north of Nakchamik Island. Then steer **259° true** to a position with Chignik Head ½ mile on the port beam. Change to **247° true,** and when Eagle Rock bears 317° true change to **213° true,** passing Chignik Spit Light at a distance of about 600 yards. When the light is a little abaft the beam, haul to **169° true** 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** 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 Chankliut Island and the mainland has been surveyed and found free from dangers.

Necessity Cove (chart 8710), 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 Warner Bay or Ross Cove.

Warner Bay, about 11 miles southwestward from Castle Cape, is also called **Prospect Bay** because of a copper prospect there. It is unsurveyed. The entrance is 6 or 7 miles west-southwest of the west

end of Chankliut 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 (chart 8502), unsurveyed, 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.

The headland 3 miles eastward of Cape Ikti is locally called **Seal Cape.** Foul ground extends seaward from Seal Cape. The bay between Warner Bay and Seal Cape has been called **Devil Bay.** There is a small anchorage on the eastern side of Devil Bay in 12 fathoms (21.9 m). There is no anchorage in the bay between Cape Ikti and Seal Cape.

CAPE IKTI (chart 8502) is a headland on the Alaska Peninsula, 61 miles west (true) from the southern end of the Semidi Island group. The cape 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.

Kuiukta Bay (known locally as **Dorai Bay**) is a large bay with a comparatively 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 Lagoon. The bay has an average width of about 1½ 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 4¾ 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.

Foot Bay and **Windy Bay** are the only two which have names among the twelve bays 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.

Mitrofania, a former native village, is now nearly abandoned. There is an excellent anchorage in the inlet leading to the village in 19 fathoms (35 m), mud bottom. From the anchorage the village cannot be seen as it lies behind the point forming the entrance to a lagoon which can be entered by small craft only.

***Directions,* Chignik to Mitrofania.**—Coast Guard vessels have used the following directions:

From 1 mile off Castle Cape proceed to pass on either side of Chankliut Island to a position about 2 miles off Cape Ikti, the cape bearing 350° true. Then steer **260° true** for 6 miles to a position about 1 mile southward of the headland on the western side of the entrance to Kuiukta Bay. Then steer **278° true** for 2.3 miles, until a prominent left tangent bears 347° true. Thence **round** headland on the eastern side of Mitrofania Bay entrance at a distance of 1 mile. When the cove south of Mitrofania is open and bearing 90° true, stand in and select an anchorage off the village in 16 to 20 fathoms (29.3 to 37 m).

Mitrofania to Perryville.—From the anchorage off Mitrofania steer **244° true** for 5 miles to West Brother Island bearing 153° true distant 1 mile. Then steer **203° true** for 3 miles to a position 1 mile off the point about 2 miles west of West Brother Island. Then steer **247°** true for 4.1 miles until the right tangent of Coal Cape bears 21° true distant 1 mile; then haul to steer **297° true** for 4.8 miles to a position off the village of Perryville (p. 255).

Perryville Westward.—From Perryville anchorage steer for a position midway between Three Star Point and Chiachi Island. See directions, Cape Ikti to Kupreanof Point (Inside route) on page 257.

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.

Brother Islands (two 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** course.

Veniaminof Volcano sends out a spur which is flanked both east and west by extensive plains, and the 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 1,965 feet (598 m). The anchorage shown on the chart is not recommended. An anchorage, used by the *Manning* is on the north side of Chiachi Island behind a long sand spit which makes out from that island. Directions for reaching the anchorage are not available.

Four islands lie near the northeast shore of Chiachi Island; 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*, however, it has been reported that an **underwater ridge** having depths of about 9 fathoms (2.7 m) extends from the rocks on the Perryville shore in a southerly direction to Shapka Island (chart 8881).

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. ***Directions*** to Perryville are given on page 254. The anchorage is just a little to the eastward of the village in 20 fathoms (37 m). Care must be used in approaching as the depths shoal abruptly from 40 fathoms (73 m) to the beach.

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 **shoal** with kelp lies about 200 yards off the point. The bottom is visible at low water with a southwesterly wind.

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 Ivanhof 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 extends from Egg Island more than halfway across the passage toward Paul Island. From the end of the reef a ridge of sand and gravel extends across to Paul Island. Nothing less than 7 fathoms (12.8 m) has ever been encountered in crossing this ridge.

A **light** marks the sandspit on the northwest shore of Paul Island, on the south side of the passage between Paul and Egg Islands.

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 257. 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. 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. 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.

One may anchor anywhere in Ivanof Bay above the island, avoiding the mud flats in the northeastern part and those near the lagoon; however, the sand bottom at the head of the bay is reported to be of poor holding quality.

There is a **wharf** near the middle of the head of Ivanof Bay having a depth of 22 feet (6.7 m) alongside; a shoal of 1¼ fathoms (2.3 m) is reported to lie about 120 yards SSW. from the southwest corner of the wharf. The shoal is on range with a water tank in the canyon and a native barabara near the beach.

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.

***Directions,* Cape Ikti to Kupreanof Point (inside route).**—This route has not been completely surveyed, but sounding lines have been run over the courses given below and they are believed to be safe. The principal points have been located by triangulation, so the courses and distances are correct.

Pass 1.6 miles off Cape Ikti and steer **252° true** 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** 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 mile distant steer **195° true** for 3.1 miles and pass 0.9 mile off the next point, passing midway between the smaller Brother Island and the mainland, and heading about 1 mile to westward of Mitrofania Island. Then steer **242° true** 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 1 mile distant, steer **301° true** for 3.6 miles, heading for Perryville. There is an under-water ridge (p. 255) extending from Perryville to Shapka Island. When the west tangent of Shapka Island is abeam, 1 mile distant, and closed on Chiachi Island, steer **236° true** 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 more than half way across the passage; 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. A light (p. 256) marks the passage between Egg and Paul Islands. When past Paul Island, with the west tangent of it abeam, steer **204° true** 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** through the middle of the westerly entrance, and when the northern point at the entrance is abeam 0.3 mile distant steer **45° true,** 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 (chart 8802) is the southeastern end of a long peninsula extending from the coast of the Alaska Peninsula in the locality of the Shumagin Islands. The end of the peninsula 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 (2½ miles westward of Gull Rock) to Cape Swedania are more broken and may have dangerous shoals.

Gull Rock lies 0.6 mile off the northern shore of Stepovak 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-pit 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 shore is foul from Ramsey Bay around the points 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 pont, 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, on the south side of the entrance to Orzinski Bay, 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** 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** 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,** adjacent to the south side of the peninsula forming Elephant Point, 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, San Diego Bay,** and **Renshaw Point.** The bays were not thoroughly reconnoitered.

Guillemot Island (chart 8700) 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.

SWEDANIA POINT 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** (p. 388) on the other side of the Alaska Peninsula, 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 for 3½ miles inside the entrance has been surveyed. A reef extends 600 yards off the entrance point and then fringes the shore to the northward at a distance of 200 to 450 yards offshore. Outside the reef the water deepens rapidly to the middle of the bay, see chart 8700.

Albatross Anchorage 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 offshore, 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 around. The summit is broad and flat, and about 2,000 feet (610 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.

Cape Aliaksin is distinguished with difficulty from westward, but it comes out clearly from eastward.

UNGA STRAIT (chart 8700) separates the Shumagin Island-group from the Alaska Peninsula. The strait 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. The sand spit is marked by a light. 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 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. See remarks on currents, Alaska Peninsula, page 237.

In ***Unga Strait*** a current will generally be found setting westward, its velocity varying with the stage of the tide, but seldom exceeding 1 knot. In the northern part of Popof Strait a tidal current with a mean velocity of about ½ knot at strength sets northward on the flood and southward on the ebb. The times and velocities of the tidal currents in Unga and Popof straits may be obtained from the Pacific Coast Current Tables.

SHUMAGIN ISLANDS (charts 8700, 8802), a group of 15 sizable islands and many islets and rocks, extends for a distance of 60 miles from the coast of the Alaska Peninsula from which the group is separated by Unga Strait.

The **inside passage along the Alaska Peninsula** in the vicinity of the Shumagin Islands is through Gorman, Korovin, and Unga Straits, and northward of Jude Island. See directions on page 31.

In general, the Shumagin Islands are bold and mountainous, and the shores are broken in many places 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.

The **surveys** accomplished in the region of the Shumagin islands 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.

SIMEONOF ISLAND (chart 8881), the most easterly of the Shumagin Islands, 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 inlet known as Simeonof 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 makes in from 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 (chart 8802) 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 (chart 8802) is the most southerly of the Shumagin Islands. 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 (chart 8802), the northern and largest one of the eastern group of the Shumagin Islands, is about 11 miles in length and about 6 miles in width at its widest or southern end. The island 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. **Cape Thompson** 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 Big Koniuji 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 from Peninsula Island which is 3½ miles northward from Spectacle 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, between Big and Little Koniuji Islands, 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 Cape Thompson, 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).

EAST NAGAI STRAIT (chart 8802) separates Nagai and Big Koniuji of the Shumagin Island-group and has an average width of 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, 3½ miles northward from Spectacle Island and the most northerly island in East Nagai Strait, 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 boulder 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 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, in the southern approach to East Nagai Strait near Nagai 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 (charts 8700, 8802), in the center of the Shumagin Island-group, 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 pointed headland with a rounded, sloping hill 749 feet (228 m) high. 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 **light,** 60 feet (18.3 m) high and visible 11 miles.

Mountain Point (chart 8802), the southerly end of Nagai 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 (chart 8700) 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,** 40 feet (12.2 m) high, on the north side of the cove, on a **286° true** 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 northeastward 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 1¼ 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 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 (11 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 (chart 8700), on the east coast of Nagai Island, about 3 miles southward of the entrance to Mist Harbor, is about 3¼ 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** 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 its center.

Larsen Bay on the eastern side of Nagai Island opposite Turner Island, 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 (chart 8802), off the west side of Nagai Island about 8 miles northward of Mountain Point, 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 (chart 8700), on the west side 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, on the west side of Nagai Island 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 is about 1¼ to 1½ mile wide, and has depths 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.

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Sanborn Harbor is on the west side of Nagai Island about 10 miles from Cape Wedge. 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 because 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 (p. 265) 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 of the Shumagin Island-group, 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 is 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 boulder 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 (chart 8700), one of the Shumagin Island-group, lies westward from the north end of Nagai Island. The 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 north point of Andronica Island is marked by a **light.** Eastward of the point a prominent **conical-shaped rock,** 280 feet (85 m) high, lies off the north point of Andronica Island. This rock is very useful under conditions of low visibility in aiding the mariner to identify the north point of the island; for a sight of this feature assures him that he is not getting into the wrong passage. Andronica Island Light is obscured by the rock.

There is a **rock awash** at low water 0.4 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 a **bare 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, 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 survey is made.

The **currents** in ***Gorman 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 (chart 8700)), in the north central part of the Shumagin Island-group, has two summits; low land and marsh occupies the middle portion; the eastern end has a rocky cliff and is 1,200 feet (366 m) high; 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 885 feet (269 m) high joined to the remainder 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, lies in the passage between Karpa and Korovin Islands. The location of the rock is

uncertain; it has been reported as being 1 mile northward of Scotland Point.

Grosvold Bay, 2 miles westward 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, 4 miles northeastward from Korovin 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.

The passage between Karpa and Korovin Islands is endangered by a **rock** awash at low water. The position of the rock is not known and the region should be avoided by strangers.

POPOF ISLAND (chart 8700), close eastward of Unga Island in the Shumagin Island-group, 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 **light** on the bluff on the north side of the entrance.

High Island, ⅜ mile off the northeast part of Popof Island, is ¼ mile in extent 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 Island 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 1¼ miles long in a south-southwesterly direction. If 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 midharbor.

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 ½ 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.

Sand Point and **Sand Point Village,** *two* cannery sites on the western side of Popof Island, are described below in connection with Popof Strait.

POPOF STRAIT (chart 8700), between Popof and Unga Islands of the Shumagin Group, contracts at its northern end. A **channel** leads through the northern end; it is narrowed by rocky ledges, but these are marked by lighted aids.

In the northern entrance of Popof Strait is a 4-fathom (7.3 m) shoal about 700 yards northwestward from Range Island. The S.S. *Victoria* reported striking bottom in the northern entrance during a low tide.

There is a **sunken pinnacle rock** in the broad part of Popof Strait eastward of Egg Island with a depth of 1¼ fathoms (2.4 m) over the rock. Kelp seldom grows sufficiently long to be seen at the surface of this danger. The dangerous rock lies on a line drawn from the north end of Egg Island to Popof Head (direction 111° true) and about midway between the island and the head. It is a little

more than a mile off the point about midway along the south shore of Popof Island.

There is about 5 fathoms (9.1 m) on a **rocky shoal** 1,000 yards 110° true from the first pinnacle rock on the beach south of the entrance to Baralof Bay; there may be less.

The bottom of the southeastern part of Popof Strait is broken and irregular but no hidden dangers other than those described were found by the survey.

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 (chart 8700-sub plan) 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.

On the north side of the spit at Sand Point (1½ miles southward of Humboldt Bay) are prominent **cannery** buildings and a wharf. This wharf has a depth of 26 feet (7.9 m) along its 90-foot frontage. Fresh water is available. There are two marine railways, one capable of handling a 10-ton boat and the other a 50 to 100-ton barge. There is a **radio station,** call letters KKN, operated by the Alaska Pacific Salmon Co. at Sand Point.

Minor repairs to vessels can be made at the cannery shop.

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 Light steer for Sand Point Wharf on a **56° true** 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, and Range Island 30 yards open from the land.

Sand Point (Village) Wharf, *located on the north side of Humboldt Harbor*, has a frontage of 60 feet and a depth of about 16 feet (4.8 m) alongside. There is a general store here where provisions, ship chandlery, and hardware may be obtained. Gasoline, kerosene, lubricating oil, and Diesel oil may be had in limited quantities. Minor repairs to small craft can be made here. Fresh water, for which there is no charge, is available.

The post office is known as ***Sand Point.*** The monthly mail steamer from Seward makes regular calls, and it is the starting place for the Shumagin-Herendeen mail route. Sand Point is an outfitting point for big-game hunters, and power boats are always on hand for charter.

A large white frame structure 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 (Village) 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 (Village) Wharf. The 2¼ fathoms (4.1 m) spot ¼ mile south-southwestward from the shoalest part of the reef is marked by a **lighted buoy.**

Unga Reef, the eastern side of which is marked by a **light** (white dolphin), extends 0.7 mile south-southeastward from the western shore of Popof Strait, in the narrowest part opposite Sand Point, Village) Wharf. A small patch lying about ¼ mile off the point on the Unga Island shore, 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.**

A small **rocky shoal** of 2¾ fathoms (5.2 m) lies in the middle of Popof Strait ½ mile 212° true from Range Island light. A **sunken rock** lies about 200 yards westward from the shoal. A **lighted buoy** is located 200 yards southwestward of the sunken rock.

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. Range Island is marked by a **light** located at its northwestern point.

East Head, on the east side of 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.

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.

Directions,* Popof Strait.—*From eastward pass 1 mile southward of Popof Head and steer **288° true** for about 5 miles for Hardscratch Point, which leads 1.1 miles southward of the 1¼-fathom (2.4 m) rock. When Egg Island bears 323° true steer **334° true** for 4.2 miles, passing 700 yards eastward of Egg Island and round *Sand Point Light,* ¼ mile off.

Entering from southwestward.—From a position ½ mile off Kellys Rock steer **337° true** for 8 miles, passing 700 yards eastward of Egg Island and round *Sand Point Light* ¼ mile off, as before.

After rounding *Sand Point Light* at a distance of ¼ mile steer **56° true** for Sand Point (Village) Wharf for about ⅝ mile, until Egg Island begins to close on the bottom of the hillside at Sand Point.

Then steer **0° true** passing midway between *Popof Reef* and *Unga Reef Lights,* and heading a little to the left of *Popof Strait Shoal Light.* This course should head just inside the point opposite Range Island. When up to *Popof Strait Shoal Light,* change to course **27° true** passing 350 yards westward of *Range Island Light.* When *Range Island Light* comes in range with the point where Sand Point Village wharf is located, change to course **0° true.** The course through the northern entrance of Popof Strait should be navigated cautiously by deep draft vessels, taking care to avoid the 4-fathom (1.2 m) spot lying to the westward of the course.

Bound westward.—After passing West Head, at the north end of Popof Strait, 0.4 mile distant, on a **0° true** course, run 1.1 miles, and change course to **289° true** 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 32.

Bound eastward.—After passing through the strait as above directed, pass about ⅝ mile off East Head and steer **86° true** to pass 0.9 mile northward of High Island. Then follow directions on page 33.

UNGA ISLAND (chart 8700), the largest and most important of the Shumagin Group, has several large indentations, 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 and 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 poor landfall when approaching from seaward in unfavorable weather, and the currents cannot be foretold. However, all dangers on this side are within ½ mile of the shore.

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 Baralof 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 **wharf** at the cannery with a frontage of 162 feet and a depth of about 28 feet (8.5 m) alongside. Fresh water is piped to the wharf and is available during the summer season.

Vessels of the Pacific American Fisheries sailing from Bellingham, Wash., make regular calls. There is a general store and small amounts of coal, fuel oil, and gasoline can usually be obtained in emergencies. There is a codfishing station with a wharf across Baralof Bay from the cannery, and a trail leads overland to Unga.

There is a **radio station,** call letter KJT, operated by the Pacific American Fisheries.

In the middle of Baralof Bay and 1,000 yards from its head is a small **rocky shoal** having a depth of 3 fathoms (5.5 m). The rocky shoal is surrounded by sandy bottom. There is a sandy shoal extending ¼ mile off the south side of 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** which is about 1¼ miles northward of Baralof Bay.

The northern entrance point to Baralof Bay is marked by a **light.**

Kellys 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 Kellys Rock.

A fish trap extends from the beach toward Kellys Rock, but there is a passage between the ends 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 with a depth of 1 fathom (1.8 m) at m. l. l. w., lies about ⅓ mile offshore 1 mile south of the south point of Baralof Bay.

DELAROF HARBOR (chart 8700 sub-plan), 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.

The **point** on the south side of the entrance to Delarof Harbor is a narrow projecting rocky mass 155 feet (47 m) high. The name **Elephant Rock** is applied to the point. The base has been hollowed out by the action of the sea and from Unga the point resembles an elephant somewhat. 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 from the southeast end of Cross Island. 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 3¼ fathoms (6.1 m) at mean lower low water lies in the center of the anchorage off the town, about 650 yards 122° true 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** 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,** 81 feet (24.7 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. As mentioned before, the anchorage off Unga is not recom-

mended except perhaps at a time when most favorable conditions exist.

There is a **United States marshal** at Unga. 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 1,402 feet (427 m) high, with an exceedingly rough surface 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 281.

The west side of Unga Island is unsurveyed.

Bay Point, or **Nigger Head,** is a rocky headland of rounded profile, 315 feet (96 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 **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 from Unga Spit. Small vessels can anchor closer to shore off the western side of the 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 37 feet (11.3 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 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 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** course for the west end of Round Island in range with the middle of a saw-toothed mountain, which leads ¼ mile westward of North Head through a narrow channel. The middle of the sawtoothed mountain is a little to the eastward of the highest tooth. To use the highest tooth as the back range might bring a vessel dangerously close to the shoal making off 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 3¼ fathoms (6.1 m) over it lies 300 yards westward of **North Head.** An extensive shoal makes out from the western shore between **White Bluff** and 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, 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 a distance of 300 yards. The principal danger is a **spit,** bare only at extreme low water, which extends 600 yards 120° true 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. 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 is described on page 260, **West Head** on page 273.

Along the **Alaska Peninsula westward of Cape Aliaksin,** the surveys consist of a few lines of soundings in the coastal channel to Cape Tolstoi and of complete surveys from there along the steamer route to Cape Pankof.

Beaver Bay (chart 8700) lies west of Cape Aliaksin and is 3½ miles wide at the entrance. The bay is unsurveyed and little informa-

tion is available. 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.**

On the western side of Beaver Bay the land is low and rises gradually for 12 miles west-southwestward.

A single line of soundings at a distance of 2 miles from the shore showed depths less than 10 fathoms (18.3), 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 from Bay Point, Unga Island.

Seal Cape, at the entrance to 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. The extremity of this point is marked by a **light** known as *Seal Cape Light.* One mile east-northeastward of the light is a rocky **ledge** 0.8 mile offshore and showing 8 feet (2.4 m) above water. It may be picked up when skirting the shore in thick weather. Abreast this ledge, about ½ mile inshore from the beach, is a **hog-backed 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 from Seal Cape Light. The lead gives no warning of these breakers. A depth of 10 fathoms (18.3 m), irregular bottom, and not developed by further sounding, was found 1 mile south-southeastward of Seal Cape.

Coal Bay (chart 8704) is a good shelter for small vessels in northerly weather. It looks east-northeastward up a broad valley inland of the bog-backed mountain already mentioned, and is entered on a **65° true** course. 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), indenting the southeast coast of the Alaska Peninsula, has its entrance about 30 miles westward from Unga Island of the Shumagin Group. It is an open bay leading to a landlocked arm (Canoe Bay) through a very narrow pass.

Flat and Lump Islands and a **bank** of 11 fathoms (20.1 m) lie in the entrance to Pavlof Bay. The bank is 2½ miles southward of Flat Island; although volcanic ash bottom is indicated, the bank itself is probably of rock structure and there may be less water. Another bank having a depth of 12 fathoms and possibly less, lies in the center of the bay westward of Settlement Point.

Except for several 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. Along the outside coast 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 about ⅝ mile northward of Settlement 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 Pavlof 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 Canoe 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 in Canoe Bay 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.

A flat-bottom area makes out from the shore about 8½ miles southwestward from Black Point, affording a good **anchorage** in depths of 14 to 15 fathoms (25.6 to 27.4 m) on the outer part of the flat area. The anchorage is useful for vessels waiting for the weather to clear before attempting the passage among the islands. In 1924 a tripod was erected on a small shore **dune** abreast of the southern limit of the anchorage.

Ukolnoi 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.

The northwest point of the island is marked by a day beacon.

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 light.

A rock with 1¾ fathoms (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 5¾ fathoms (10.4 m) and which should be avoided, extends ½ mile eastward from the 1¾ fathoms (3.4 m) spot.

Local magnetic attraction exists near Arch Point; it is 10° greater (easterly) than the normal magnetic variation.

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 flats at 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.

PAVLOF ISLANDS (chart 8704) lie near the Alaska Peninsula and westward of the Shumagin Island-group, consisting of Wosnesenski, Ukolnoi, Poperechnoi, Dolgoi, Goloi, and the two Iliasik Islands.

The **inside passage along the Alaska peninsula** in the vicinity of the Pavlof Islands is northward of Jude Island and of Ukolnoi Island and through the following passages: (1) between Arch Point and Dolgoi Island, (2) between Moss Cape and Goloi Island, (3) between the Inner and Outer Iliasik Islands, and (4) between Bold Cape and Deer Island. See directions on page 31. The inside route has been surveyed from Cape Tolstoi to Cape Pankof and with aid of the charts may be used with confidence. Between Unga Island and Dolgoi Island, the rocks and islands have been approximately located by reconnaissance.

Direct route, Acheredin Point to the Iliasiks.—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 particuarly **dangerous breaker** lies 2 miles southward from Dolgoi Cape and a second breaker is reported to lie ⅔ mile eastward of the other breaker. Breakers were observed between the two small islets 3 miles southeastward of Poperechnoi Island. 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.

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. **Bluff Point** is described on page 234. 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. A breaker is reported to lie ⅔ mile 90° true from the reef.

DOLGOI HARBOR (charts 8703 and 8851) has been considered the safest and most commodious harbor in this part of Alaska, having given perfect shelter and freedom from violent williwaws; however, the commanding officer of the U. S. S. *Gannet* reports that the bottom is apparently of volcanic ash and of poor holding quality causing his vessel to drag freely. He further states that radical changes of weather occur frequently and with remarkable suddenness. 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** 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.** 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 course **208° true.** This channel obviates the turn between the two islands, which is somewhat difficult for long ships, especially during southeast winds.

Anchorage in Dolgoi Harbor can be selected anywhere above the islands in depths of 7 to 10 fathoms (12.8 to 18.3 m), mud bottom, with no outlying dangers. It is reported that the best anchorage is at a point 1½ miles northward of the northern one of the two large islands lying within the entrance.

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 from the east end of Goloi Island; the other rock lies 0.9 mile 222° true from the cluster of rocks at the southeast side of the entrance of Dolgoi Harbor.

Jude Island (chart 8700) lies about 8½ miles westward from Unga Island shore and about 7 miles off the coast of the Alaska Peninsula. The **route** from Unga Strait to the Pavlof Islands follows the coast of the peninsula and passes northward of Jude Island. See directions on page 281.

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 2 miles or more to the northward.

Wosnesenski Island (chart 8704), the easternmost of the Pavlof Islands, 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 Ukolnoi 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.

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The northwest point of Ukolnoi Island is marked by a **day beacon.**

The north point of **Dolgoi Island** (page 282) is an overhanging cliff.

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.

Arch Point and the **dangers** in the passage between the cape and Dolgoi Island are described on page 281.

The sand spit making out from **Moss Cape** is marked by a **day beacon** and the spit on the west end of Goloi Island is marked by a **light.** Care must be taken in the passage between the two spits in order to avoid the foul ground making out from either side.

Goloi Island, within the western limit of the Pavlof Island group, 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 a 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. Growing kelp has been seen midway between the islands in the middle of the summer.

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 Bold Cape 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.

The southwest point of Inner Iliasik is marked by an unwatched **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 boulder 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 boulder 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 boulder.

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.

SANDMAN REEFS (chart 8802), 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 should be avoided. From Deer Island these reefs appear as an unbroken series from the vicinity of the Iliasiks around to **Hague Rock** (page 302).

Belkofski Point (chart 8703), the first point on the Alaska Peninsula westward of the Iliasiks of the Pavlof Island group. The point is marked by a cliff 40 feet (12.2 m) high and by a **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, a native settlement on the eastern side of Belkofski Point, 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 boulder 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.

Belkofski Bay is deep and free from hidden dangers, except for reefs and ledges near the shore. There is **local magnetic attraction** on the eastern side of the bay; it is 5½° greater (easterly) than the normal magnetic variation.

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 (chart 8703) 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, 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 in places.

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 2-mile stretch of beach 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, distant about 600 yards. This is the best small-boat harbor along this section of the coast.

***Directions,* Captain Harbor.**—Round the prominent point at the southern entrance to Kitchen Anchorage at a distance of ⅜ mile, and steer **30° true** to a point 250 yards off the southeastern entrance to Captain Harbor. Then steer **54° true** and take up anchorage as directed.

To enter the inner harbor, continue on the **54° true** course until midway between the end of the shingle spit and the opposite shore; round the spit and steer **3° true** 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. The survey ship *Pioneer* found this anchorage by far the best in this section except for southerly weather, and the Fox Island Anchorage (p. 288) the best for southerly winds.

Slavna Point is the high rocky point on the western side of the 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.

A **rock** with ¼ fathom (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, on the Alaska Peninsula opposite Deer Island, is a rugged headland faced with vertical cliffs, above which the mountain rises in steep, rock-strewn slopes. Several prominent boulders stand a few yards off the shore.

KING COVE, westward of Bold Cape, reaches 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.

Morgan Point, the western entrance point to King Cove, is marked by a **light**.

There is a salmon **cannery** and a **wharf** at King Cove. Vessels of considerable size (4,800 gross tons) can lie across the two faces of the wharf. In going alongside the faces of the two wharves, vessels should make a starboard landing on an ebb tide and a port landing

on a flood tide. The ebb sets out of the lagoon at the head in a southeasterly direction with considerable strength, such that a port side landing with an ebb tide is almost impossible whereas a starboard landing should easily be made. A **permanent mooring buoy** with a 10-ton anchor has been placed off the wharf in a southwesterly direction to assist vessels in hauling themselves out from the wharf when unmooring. The use of this mooring is necessary only when there is a strong southerly wind.

There is fresh water on the wharf, but as the supply is limited it is not always available for vessels. The Pacific American Fisheries, Inc., maintains **radio station** KMS.

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.

During the summer season (April to September), vessels of the Pacific American Fisheries, sailing from Bellingham, Wash., make regular calls, and the monthly mail steamer from Seward makes regular calls.

***To enter* King Cove,** 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.

King Cove Lagoon.—At the head of the outer bay of King Cove a long spit on which the cannery is located, projects from the eastern side. This spit is slightly overlapped by a **rounding 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** formed by the rounding spit 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 to the lower basin 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 upper 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 (chart 8703), near the coast of the Alaska Peninsula westward of the Pavlof Islands, is separated from the Peninsula by Deer Passage. The passage is a part of the **inside route along the Alaska Peninsula.** The island consists of 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 surveyed, but the limit only of the southern end, **Fawn Point,** is definitely shown.

Stag Point at the north end of Deer Island 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, distant 14 miles, unless the weather is exceptionally clear. **West Cape** of Deer Island shows as a flat-topped sugar loaf, appearing as a detached island, but later is recognized 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 **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 southward of the red buoy 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 and marked by a buoy. The southwest side of Deer Island has not been surveyed; 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, between Deer Island and the mainland, is marked by a red buoy off Thin Point and by a black buoy near the 3-fathom (5.5 m) shoal about 1 mile west of West Cape. The bottom between the buoys is smooth and regular and consists of sand, shells, and gravel. By passing 1¼ miles southeast of the red buoy, least depths of 9 and 10 fathoms (16.5 and 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.

COLD BAY (chart 8703), indenting the coast of Alaska abreast of Deer Island, 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. There is **local attraction** at this point, the magnetic variation being about 14° greater (easterly) than the normal magnetic variation. The variation at Thin Point, across the bay, is 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 Kaslokan Point, then steer **3° true,** which should lead the vessel through the natural channel to the deep water 1 mile north of Kelp Point. From this point chart 8703 is a sufficient guide.

The northern shore of Cold Bay is bordered by many **boulders** 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 boulders 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 boulders 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 lies ¼ mile off the southern shore of Lenard Harbor. This reef constricts the anchorage near its head to an effective width of about ⅜ mile. The water shoals abruptly to the mud flats at its head and to the reef.

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 from all directions is 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 miles 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.

Thinpoint Cove (chart 8701) 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 are connected with Thinpoint 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 **Thinpoint 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, about midway between Deer Island and Cape Pankof, is a small, grass-covered, and rocky island about 250 feet (76 m) in height. It is surrounded by deep water. The **route** from Deer Passage to Cape Pankof passes northward of Sozavarika and Umga Islands.

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 place 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 the last bay indenting the coast of the Alaska Peninsula, being about 15 miles eastward of Isanotski Strait. It has a broad, deep entrance with no known dangers except a rock with 12 feet (3.7 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.

Cape Tachilni, forming the eastern side of the 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 autoumn 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.

Boiler Point, on the southwestern side of Morzhovoi Bay, 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. The region is approached by steamers from the inside route along the Alaska Peninsula through Deer Passage, from seaward through the passage between Sanak Island and Hague Rock, and from the westward through the passage between Cape Pankof and Sanak Island.

IKATAN BAY (chart 8701), on the north side of the Ikatan Peninsula, is deep and free from dangers except for the area north of Sankin Island. There is an abandoned cannery at the southwest corner of the bay. The wharf is worm-eaten and unsafe. The larger buildings have been demolished.

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. For several years, during the

early part of the fishing season, two or three floating salmon canneries have operated from the anchorage just west of Sankin Island. After the middle of July, they usually move to the Bristol Bay region.

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), between the end of the Alaska Peninsula and Unimak Island, 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 **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 southern entrance to Isanotski Strait, 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 southern entrance to Isanotski Strait. There is a good wharf 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 P. E. Harris & Co., maintains a **radio station** (call letters KJL) 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 (4.0 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 wharf. Due to the strong currents and changeable eddies this wharf must always be approached with caution. Often it will be slack water at the face of the wharf with a strong current running a hundred feet out in the stream.

***Directions,* Ikatan Bay to the cannery.**—In entering Isanotski Strait from Ikatan Bay the Unimak side should be favored to avoid the **reef** off Kabuch Point. Follow the Unimak shore until almost up to Whirl Point; this shore drops off abruptly and can be passed close-to. The **reef** making off Whirl Point when covered is generally made evident by swirls of current. 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 of the strait. Careful steering is required to offset the effect of this current.

After rounding the reef at Whirl Point stand directly for the cannery, taking care to avoid being set too near either shore. A range consisting of the end of the wharf and some mark on shore back of the wharf would be helpful along the reach from the turn at

Whirl Point direct to the wharf. 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. Large vessels should enter only at slack water.

Times of slack waters.—The predicted times of slack water and the strength of the current will be found in the Pacific Coast Current Tables, published annually in advance by the Coast and Geodetic Survey.

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.

Tides.—The tides at ***False Pass*** are somewhat irregular and become diurnal at the time of the moon's maximum declination. The mean range of the tide is about 2½ feet (0.8 m) and the range between mean lower low water and mean higher high water is about 4½ feet (1.4 m).

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.

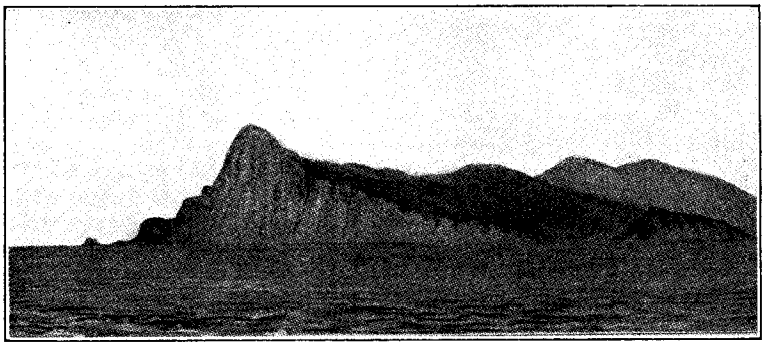
It has been reported that during northeasterly gales, the wind in the locality of Traders Cove is deflected to such an extent as to blow in an opposite direction.

Bechevin Bay, which is an enlargement of the northern end of Isanotski 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 and southward of the end of the Alaska Peninsula, is about 13 miles long and is composed of several mountain masses separated by low depressions. The wind blows through the low depressions of the land with great force. The south shore of the peninsula is fringed with rocks and breakers.



Cape Pankof, looking westward.

CAPE PANKOF, the eastern end of Ikatan Peninsula, is a sheer rocky headland consisting of a single 1,243-foot (379 m) peak dropping immediately to a bluff which forms the southeast side of the cape. The slope of the top of the bluff descends gradually from the peak to the northward, whereas to the southward the descent is broken in the form of vast steps. Viewing the cape from the southward the peak has a sharp outline and an abrupt rise from the sea.

Another prominent **headland,** 1,070 feet (326 m) in elevation, rises precipitously from the bluffs on the south shore of Ikatan Peninsula, 1½ miles westward of the southern extremity of Cape Pankof. The mountain masses of the two headlands are separated by a low depression ¾ mile westward of the cape. The bluffs are rust and gray in color. The slopes are grass covered (in the summer) with frequent bare spots. There is evidence of recent small rock slides on the higher bluffs.

The southern extremity of Cape Pankof is marked by a **light,** placed on a rock about 82 feet (25 m) high.

A **sunken rock** which breaks with a light swell during low stages of the tide lies about 1 mile westward from Cape Pankof light and about 300 yards offshore. Another offshore danger lies off the eastern point of the entrance to West Anchor cove, see page 296.

Pankof Breaker is a sharp pinnacle rock with 3 feet (0.9 m) over it, lying a little over 2 miles 53° true 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 2½ fathoms (4.6 m) over it, lies 7¾ miles 104° true 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, is the most prominent landmark between Capes Pankof and Aksit. From the south, the island appears as a single elevated rocky mass, rounded but somewhat ragged in outline; the highest point, 775 feet (236 m), is a knob readily identified. Steep sides, fringing rocks and breakers make a landing very difficult. The only practical landing place is on the north tip having a steep beach of rather coarse gravel.

A **bar,** consisting of a sunken reef, connets Bird Island with the western point of the entrance to Dora Harbor. A depth of 5½ fathoms (10.0 m) may be carried across, but passage is not recommended. This bar depth is obtainable on the line passing through the peak 1¼ miles northward of Cape Aksit and the summit on the western point of the entrance to West Anchor Cove. The line crosses the bar a little more than halfway from the point (on the north) to Bird Island. A sunken rock on the bar lies a little less than halfway from the point to the island. The rock does not break in ordinary weather.

West Anchor Cove, the largest indentation on the south side of Ikatan Peninsula, affords indifferent anchorage. Anchorage in East Anchorage Cove is recommended. The anchorage for all but small craft is confined to the open part of West Anchor Cove, which is exposed to southerly and southwesterly weather, always accompanied by heavy ocean swells. The bottom in West Anchor Cove is fine, dark gray, sand, which affords good holding ground. The entrance is wide and clear but rocky reefs extend from the points on either side. There is a narrow shelf of rocks along the shore at the eastern point of the entrance, the outer edge of which shows at half tide and probably breaks all the time. A rock, with depth of 2½ fathoms (4.6 m), lies off this ledge, distant ½ mile and southwesterly from the point. This is the outermost danger in the approach from the eastward.

A prominent **flat rock,** 4 feet (1.2 m) high, lies ½ mile off the round point on the eastern side of West Anchor Cove and about the same distance inside the entrance. This feature marks the *western* limit of the dangers on the eastern side of the cove and has been found useful for making the anchorage in thick weather. A detached **shoal** of about 3 fathoms (5.5 m) and possibly less, lies in the middle of the inner part of the cove about 1.2 miles from the head. The shoal marks the upper limit of anchorage for all but small craft. Rocky ledges extend from the north and south shores but not over 300 yards. A rock column, 46 feet (14.0 m) high, on the south side and near the head, stands out prominently.

The **bight** between West Anchor Cove and Dora Harbor is small and exposed. Rocky reefs extend about 400 yards from the shore off the entrance points. A prominent rock (uncharted 1937) 32 feet (9.8 m) high, lies 330 yards off the west side of the headland at the east end of the bight. A prominent **rounded, rocky hill,** 789 feet (240 m) high, dominates the headland.

Dora Harbor, on the south side of Ikatan Peninsula and abreast of Bird Island, affords the only good anchorage (with protection from all winds and sea) on the south side of **Unimak Island;** but the harbor is limited to small vessels. The entire shore of the harbor is fringed with 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 outer anchorage, however, is seldom used.

There is low table land terminating in bluffs at the shores on both the eastern side of Dora Harbor and the middle point of the western side.

The **inner harbor** of Dora Harbor is a slight expansion at the head with depths of 9 to 15 feet (2.7 to 4.6 m) in the middle. A heavy swell from the southward will cause also this anchorage to be uncomfortable.

In ***entering*** Dora Harbor care should be taken to avoid a **rock** awash at low water lying 0.3 mile 220° true from the eastern point at the entrance. The rock is detached and distant 200 yards from the edge of the shore reef. In calm weather, when the rock is covered, a light swell may not cause a breaker. Favor the western side in the entrance to avoid the reef extending about ¼ mile westward from the point on the east side of the entrance, and then steer mid-harbor courses to the inner harbor, where anchorage with somewhat restricted swinging room is afforded vessels of 7 feet (2.1 m) or less draft. Care must be taken to hold the mid-harbor course in entering the inner harbor in order to avoid reefs that make out 325 yards from the points on each side.

Otter Cove, known locally as **Big Badger Bay,** is an open bight between Ikatan Peninsula and Cape Aksit. The shores on both sides are characterized by high bare rocky cliffs. The sand beach forming the head is bordered by a series of grass-covered dunes. Other dunes in the form of ridges lie further inland.

Otter Cove is exposed to southerly winds and ocean swells, 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 northeastern corner. Two rocks close together and baring 1 foot (0.3 m) at m. l. l. w., lie 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.

Cape Aksit, the western point of Otter Cove, is bold and rugged.

Cape Lazaref and the south coast of Unimak Island are described on page 307.

SANAK ISLANDS (chart 8860), the last group of islands along the Alaska Peninsula, lie east-southeastward of Ikatan Peninsula with a 13-mile expanse of water between the group and Cape Pankof. The **inside route along the Alaska Peninsula** emerges here, passing between Cape Pankof and Westdahl Reef (p. 295). Following the

north side of the Sanak Island group, a route from the sea to the vicinity of Cape Pankof passes southward of Hague Rock and between Westdahl Reef and Crowley Rock.

The group consists of two large islands, Sanak and Caton Islands, and a great number of small islands and rocks southward of the main islands; all are **bare of trees.** They cover an area about 20 miles long and 10 miles wide.

The mountain mass at the northwest end, the summit of which is **Sanak Peak,** elevation 1,700 feet (518 m), is an important **landfall.** A lower peak, elevation 700 feet (213 m), lying 1½ miles westward of Sanak Peak, is often visible when the latter is hidden by clouds. On the eastern side of the mountain mass a ridge rises to more than 200 feet (61 m). All the remainder of the land in the Sanak Group is low in comparison, being a little more than 100 feet (30 m) on the northern side and decreasing to less than 40 feet (12.2 m) high among the southern islands and rocks of the group.

Crowley Rock, lying 1½ miles off the north side of Sanak Island and 348° true from Sanak Peak, is composed of several small pinnacles very close together. The least depth found on the rock is ½-fathom (0.9 m) with depths of 25 fathoms (46 m) or more surrounding it, except to the northwestward. There is a good passage inside Crowley Rock. The rock is not always marked by kelp and does not break unless the water is much disturbed. However, a prominent slick is evident on occasion.

The western end of Sanak Island is fringed with rocks. The western most **breaker** of the rocks which form a continuous barrier from shore, lies nearly 2 miles, 281° true, from Point Petrof, or 1 mile, 267° true, from the northwesternmost bare rocks of the barrier. **West Breaker** lies 6 miles west true from Point Petrol.

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 from Hennig Rock, is the southernmost rock of the reef. It lies 5 miles from Clifford Island and 224° true from Sanak Peak.

A narrow bank about 6 miles long, in an east and west 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 from Sanak Peak.

ALEKS ROCK is in latitude 54°20′ N., longitude 163°10′ W., and lies 16¾ miles 241° true 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 Lenard Rocks on Davidson Bank, southwest of Sanak Island, long of doubtful existence, have been *removed from the charts.* No trace of them has been found in the survey of this region. All reported positions place the supposed rocks along the edge of Davidson Bank. The bank along its seaward edge drops abruptly to great depths, and tide rips are often seen here. Naviga-

tors may have concluded that the rips were occasioned by shoal rocky areas.

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 (chart 8841), 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 (1.3 m).

There is a **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. Caution should be used in this harbor, as there may be dangers, other than those indicated on chart 8841 (1938). The **sunken rock** shown 235 yards 277° true from Sanak light is reported to have a depth of 7 feet (2.1 m) and to be marked by heavy kelp. Temporary anchorage may be had about ¼ mile northeast of Point Petrof, in 10 fathoms (18.3 m).

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 (p. 298) in coming from the eastward is to keep within ¾ mile of the north shore of Sanak Island.

Approaching Sanak Harbor *from the northwestward* steer for the western hill of Sanak Mountain on any bearing between 140° true and 176° true, taking care to avoid Westdahl Reef. When off the entrance, steer **193° true** 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 south-

erly and westerly winds. There are some rocks close to the west point at the entrance.

Northeast Bay (chart 8841), at the northeast end of Sanak Island, affords temporary anchorage about ¼ mile south-southeastward from Northeast Point in about 13 fathoms (23.8 m). Small vessels may anchor between Northeast 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. The bay is exposed to easterly winds.

Northeast Point, forming the north side of Northeast Bay, is about 100 feet (30 m) high. **Eagle Rock,** about 50 feet (15.2 m) high, lies near the middle of the bay; it is surrounded close-to by a ledge which covers, and a sunken reef connects it with the head of the bay. Water can be obtained by boats at the head.

There are steep and prominent rocky bluffs on the northeast shore of Sanak Island just to the northwestward of **Finneys Bay.**

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 Lida Anchorage *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 Lida Anchorage *from westward* steer for the southwestern side of Caton Island on a **144° true** 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 is rolling but comparatively low, the grass-covered land rising in places to elevations of 120 to 170 feet (37 to 52 m). There are steep and prominent bluffs on the northwest point of the island. The eastern side is low and fringed with rocky ledges to an average distance of ½ mile offshore. The southern side is also fringed with rocky ledges to as far as 1 mile offshore. Heavy breakers extend a considerable distance offshore, and the entire south side of the Sanak Islands excepting perhaps Peterson Bay is dangerous to approach by a stranger.

The beaches on Caton Island are for the most part composed of rocky ledges or boulders and gravel.

Whale Bay, on the northeast side of Caton Island, is extremely shoal.

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. These waters provide the best all-weather anchorage for small vessels in the Sanak Islands. Fresh water in small quantities may be obtained.

Princess Rock, off the west end of the islet in the center of Caton Harbor, is the most prominent feature in the vicinity.

The best entrance channel to Caton Harbor is from the northward. It is narrow and is close to the west end of Caton Island. To enter the harbor from the south through **Devils Pass** (westward of Elma Island) or through the pass eastward of Elma Island requires local knowledge to avoid reefs and breakers. These passes should not be attempted by a stranger. Surveys in progress (1937) indicate a controlling depth of 1½ fathoms (2.7 m) in the approach to Devils Pass with deeper water through the narrow part of the pass. The tide rips in Devils Pass are at times dangerous to small craft.

***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,** 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** 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. 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 (chart 8841), 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. It is reported that during heavy northeast winter gales a heavy swell makes into the bay. The entrance is nearly ½ mile wide. In the widest part of the bay near the head there are depths of 12 to 14 feet (3.7 to 4.3 m). There is a 1¼-fathom (2.4 m) spot in mid-channel about ½ mile inside the south entrance point. Another shoal of 1¾ fathoms (3.3 m) marked by heavy kelp lies about 350 yards off the south shore and about ¼ mile inside the south entrance point. The mean rise and fall of tide is about 4½ feet (1.3 m).

***To enter* Peterson Bay.**—In approaching from eastward give the east and southeast sides of Caton Island a berth of about 2 miles to clear the reefs and the breakers which extend more than 1 mile offshore, and steer **262° true** 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.** 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,** until the south point at the entrance bears 177° true. Then steer **294° true** for the middle of the bay but avoid the 1¼-fathom spot southward of the course, and select anchorage according to draft.

The survey ship *Discoverer* in 1937 did not enter Peterson Bay but anchored in 12 fathoms (21.9 m) 0.9 mile 112° true from the tip of the south entrance point.

Hague Rock, 9 miles north-northeastward from Sanak Island, is a rocky, grass-covered islet, about 40 feet (12 m) high, with deep water close-to, except on its northern side. A reef extends about 1 mile in a northwesterly direction. The channel between Hague Rock and Sanak Island was surveyed in 1936 and found to be clear and deep. Two E. D. rocks charted previous to 1937 as lying in this channel do not exist, and this channel may be safely used by ships bound from seaward to Ikatan Bay and False Pass. Caton Island should not be approached closer than 1½ miles. The foul area to the eastward of Hague Rock has not been surveyed. The **channel between Hague Rock and Sanak Island** has been used several times by large steamers proceeding directly to sea from Ikatan Bay.

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.

10. ALEUTIAN ISLANDS

This chain of islands (charts 8802, 9102) is a prolongation of the formation of the Alaska Peninsula, sweeping in an arc 900 miles or more to the westward and forming the southern limit of the Bering Sea. 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 off-lying 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. **Surveys** are being carried westward from Unimak Island and in 1937 have progressed to and including parts of Unalaska and Umnak Island. The regions to the westward are imperfectly charted with the exception of Nazan Bay. The charts are compilations from various sources and based principally on early Russian explorations.

In addition to the lack of surveys, navigation in this region is made difficult by the prevailing thick weather and further by the lack of knowledge of the currents which attain considerable velocity at times.

A great many of the Aleutian Islands are now utilized as fox farms and owners object to landing on the islands or any other interference, claiming that if the foxes are disturbed in any way, especially in the spring or early summer the yield of pelts is diminished. In some cases, a keeper lives on the island, usually in the winter. Sheep raising is an industry on some of the islands and it is reported that there are now 12,000 head of sheep on Umnak Island.

CURRENTS, Aleutian Islands.—Southward of Latitude 50° N., there is an eastward drift across the Pacific. An eddy, accompanying this flow sets westward along the south shore of the Alaska Peninsula and the Aleutian Islands and then drifts through the passes into the Bering Sea. These currents form a part of the general circulation of the North Pacific Ocean.

Through the Aleutian Island Passes, the velocities of the currents caused by tidal and wind effect are sufficiently large to mask the continual northward drift through the passes. In the past, numerous reports have been received to the effect that the flood currents flowing into the Bering Sea are very much stronger than the ebb currents. These reports have been largely discounted by observations over a period covering several tides, which reveal equally strong ebb currents flowing through the passes from the Bering Sea. It is believed that on account of the large diurnal inequality in the tide of

this region, mariners have been deceived by the length of the duration of the flood.

All passages in the Aleutian Islands have strong currents. On account of the scarcity of reliable observations definite current predictions cannot be made. The effect of the tidal currents has often been felt offshore at a considerable distance from the passes, resulting in unexpected sets. Mariners should guard against such contingency. In the region of 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.

Tidal currents and rips, *Fox Island Passes.*—In the vicinity of the passes the tidal currents are strong and their direction and times of change are uncertain; they are somewhat influenced by winds. In navigating near the entrances, these currents should be kept in mind as they may be felt at a considerable distance. Precautions should be taken to guard against being set into dangerous localities, especially in thick weather. In bad weather, the currents cause much heavier seas, and this effect has been noticed as much as 20 miles off the passes.

In general, tide rips occur to the southward of the passes on the ebb and to the northward on the flood, furnishing a rough means of determining the set of the current, although local tide rips may be caused by detached banks.

Tide rips even well off the entrances may appear as broken, choppy seas, with a few steep, short swells near the edge. In rough weather, the effect is to make the seas higher and steeper. The tide rips are much more noticeable during periods of tropic tides.

Whirls are more likely to occur in the passes near the times of slack water.

A characteristic of the currents in the vicinity of the passes is the sudden change from slack to strength of flood. A change from slack to almost 2 knots in 10 minutes has been noted, and in many cases the maximum flood occurs within 1½ hours after slack. It is therefore probable that the worst tide rips occur at the first of the flood, and under exceptional combinations of weather and tropic tides an effect resembling a bore may be caused in the narrower passes.

In ***Unimak Pass*** (p. 308) the **current** is probably strongest between Scotch Cap Light and Ugamak Island, where at strength of flood and ebb the velocity averages about 3 knots, but the maximum may exceed this figure considerably. A maximum ebb of 5 knots was observed.

The current has a large diurnal constituent which at times of tropic tides may cause the current to set continuously in a flood direction for as much as 18 hours. The ebbs preceding and following these long flood periods have larger velocities but, of course, much shorter duration than the floods.

The predictions for Unimak Pass published in the *Pacific Coast Current Tables* give an indication of what current may be expected, but these predictions are based on meagre data and should be used with caution.

The set of the flood between Scotch Cap Light and Ugamak Island averages about 295° true. Farther to the westward it is about 325° true. The variation in the set of the current increases the difficulty of navigating Unimak Pass. A vessel proceeding from Unimak Pass

toward Avatanak Strait will experience a set when off Ugamak Strait and off Derbin Strait. When crossing the deep, usually marked by tide rips, northward of Derbin Strait, a strong set in the direction of the axis of the deep is often experienced. Only weak currents are noted along the north shore of Tigalda Island, but farther to the northward strong ebb currents, setting toward Avatanak Strait, have been encountered; these should be guarded against when northward of Tanginak Island.

Tide rips occur off the eastern end of Ugamak Island and in places where there is a sudden change of depth.

Instances have been reported of vessels hove to north of the pass and 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*** (p. 326) the **currents** have an estimated velocity of about 4 knots at the strength of flood and ebb, but a velocity of 6 to 7 knots has been reported.

Due to lack of observational material, satisfactory current predictions for Akutan Pass are not available.

There are strong **tide rips** in Akutan Pass during the periods of largest tides. With a heavy northwest wind, the rips are menacing in the vicinity of the 18-fathom (33 m) spot just south of Cape Morgan. They are confused and make a vessel very uncomfortable, and they would be dangerous for small craft. 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, 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*** (p. 328) the **current** at strength of flood and ebb averages about 4 knots in the center of the pass northward of Fishermans Point. Velocities of about 9 knots have been reported. The maximum velocity occurs in a short stretch between Fishermans Point and Unalga Island, and the strength of current can be avoided by favoring the Unalga Island shore. The current along the south side of Unalga Island will rarely exceed 2 knots.

Due to lack of observational material, satisfactory current predictions for Unalga Pass are not available.

The **tide rips** in Unalga Pass accompanying a flood current are most pronounced northeastward of Erskine Point. With an ebb current the most pronounced tide rips occur off Brundage Head. During the periods of tropic tides, however, tide rips may occur throughout the length of the pass. Small boats can avoid the tide rips by keeping close to the Unalga Island shore.

Treacherous **seas** caused by wind or ocean swell opposing the current may be encountered in the narrow part of Unalga Pass, see page 329.

When tide rips are heaviest in ***Akutan and Unalga Passes,*** the water is broken into heavy choppy seas which board a vessel and make it difficult to control the steering. Tide rips are dangerous for small vessels even if there is no wind or sea.

Weather.—A large percentage of the atmospheric depressions (lows) traveling eastward across the North Pacific follow approximately the axis of the Aleutian Chain, causing storms to occur at fairly frequent intervals. As a depression approaches, southeasterly to easterly winds or gales occur. Southeasterly winds are almost always accompanied by rain or mist. As the depression passes, the wind shifts to northwest or west, bringing clouds and fog from the Bering Sea, which may be stopped by the high ranges in the eastern Aleutians, but drift through the passes and over the low land. Under such conditions, there may be some clear weather on the south side; but the fog is liable to drop down suddenly, especially in July. See remarks on weather and fog, Bering Sea, page 383.

If the depression passes to the northward, the wind will shift to the southwestward, bringing fog and low clouds.

The few spells of clear calm weather occur when the barometer is moderately high. But a high barometer may bring calms with fog or sometimes strong northwesterly winds. A fine day is usually followed by a southeast or southwest wind.

In the early part of September there is usually a spell of good weather, but some time about the middle of the month the interval between depressions decreases and their intensity increases.

The westerly and northwesterly winds predominate during the summer, but the southeasterly winds are generally stronger. Many of the depressions in the summer time travel slowly and eventually fill up, causing a long spell of uncertain weather.

UNIMAK ISLAND (chart 8860), the first of the Aleutian chain, almost forms a part of the Alaskan Peninsula, being separated from the end of it by a very narrow pass (Isanotski Strait also called False Pass, see p. 293). This pass is practically closed by shoals at its entrance from the Bering Sea.

Ikatan Peninsula, joined to the eastern part of Unimak Island, is described on page 295.

The higher peaks on Unimak Island 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 (see Sanak Island, p. 297) and objects near the sea level are generally the only landmarks available.

Shishaldin Volcano, 9,387 feet (2,861 m) in elevation, near the center of Unimak Island, 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. Shishaldin has been in eruption several times in recent years.

Isanotski Peaks is a mountain 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 it were composed of great vertical rock masses. This mountain is known locally as **Ragged Jack.**

Roundtop Mountain is a rounded summit 6,155 feet (1,876 m) high, surrounded by snow fields.

Pogromni Volcano, about 8 miles from the western end of Unimak Island, 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** (p. 308) both from southward and from Bering Sea.

Unimak Island is one of the group known as the **Fox Islands,** the others being Unalaska and Umnak and their associated islands. All these islands are bare of trees and generally grass covered. They are frequented by birds in enormous numbers, and immense flocks are frequently met with in the vicinity of these islands.

The **south coast of Unimak Island** 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 westward of **Ikatan Peninsula** (p. 295). 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, on the south coast of Unimak Island, is the southwesternmost of three high cliffs, with sand beaches between them, and is 1,000 feet (305 m) high. The northeastern cliff of the series is at **Cape Aksit.** 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 northeastward 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 westward and 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 **(Cape Rukavitsie),** 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, which is described in connection with Unimak Pass.

UNIMAK PASS (chart 8860) is the first **ship passage** on a westbound voyage leading into the **Bering Sea.** It is about 10 miles wide between the southwest end of Unimak Island and Ugamak Island, which is one of the smaller islands of the Krenitzin Group.

Note.—Isanotski Strait (False Pass, p. 293), between the northeast side of Unimak Island and the Alaska Peninsula, is shoal at its northern end, making it impassable as a through route to the Bering Sea except for small craft having local knowledge.

Unimak Pass is the widest and most generally used of three passes for deep draft vessels in this locality, known collectively as the **Fox Islands Passes.** The other two, **Unalga** and **Akutan Passes,** on either side of Unalga Island and some 50 miles farther to the westward, are convenient under certain conditions particularly if bound for Unalaska (Dutch Harbor). Of the three, Unimak Pass is the only one that is adequately lighted; also, there is a radiobeacon on the north side of the pass. It is free from outlying dangers, but the **currents** (see pp. 304 to 306) and prevailing thick weather make it necessary to exercise unusual care in navigating and in approaching the pass, especially from the southward.

Besides being simply a gateway to the Bering Sea, Unimak Pass is also used by some vessels to effect a shorter and better weather route across the North Pacific via the Bering Sea. The practicability of this route, however, has not been entirely established due to the lack of surveys in the western Aleutians. See ocean depths southward and westward of Attu, page 379.

The transpacific route via the Bering Sea avoids the prevailing head winds and heavy seas on a westbound trip that are encountered southward of the Aleutians.

The Krenitzin Islands furnish considerable protection from southerly and southwesterly weather, but during easterly or northerly weather, the seas in Unimak Pass are accentuated by the current. For remarks on the currents see page 304.

SEAL CAPE, on the north side of Unimak Pass in entering from the Pacific, is not particularly noticeable, but the locality is well marked by Promontory Hill, Arch Point, and Scotch Cap.

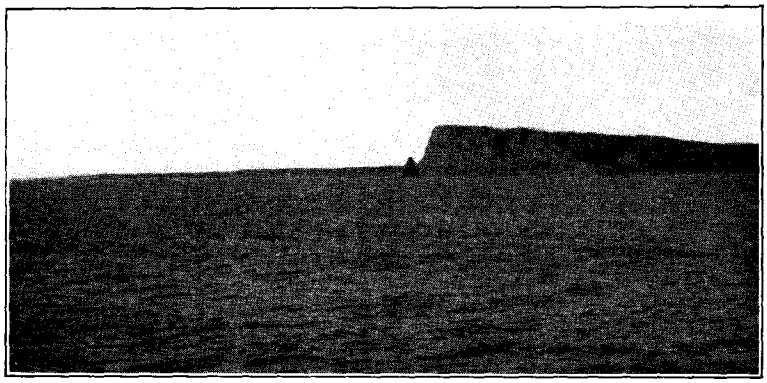
Arch Point, 3 miles northeastward of Seal Cape, is a rocky projection 172 feet (52 m) high with an arch through the point near its extremity.

Promontory Hill, 5 miles northeastward from Seal Cape, is a short ridge, about 1,100 feet (335 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.

From Seal Cape around to Cape Sarichef, a distance of 19 miles, the coast of **Unimak Island** (p. 306) 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 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.



Pinnacle Rock, Scotch Cap, looking northwestward.

Scotch Cap Lighthouse marks the northern side of Unimak Pass and is about 1¾ miles eastward of Scotch Cap. The structure is a white tower (black lantern) on an octagonal building. There are a number of buildings near it. The light is 90 feet (27.4 m) above high water and is flashing white every 6 seconds with a flash of 2 seconds duration. 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.

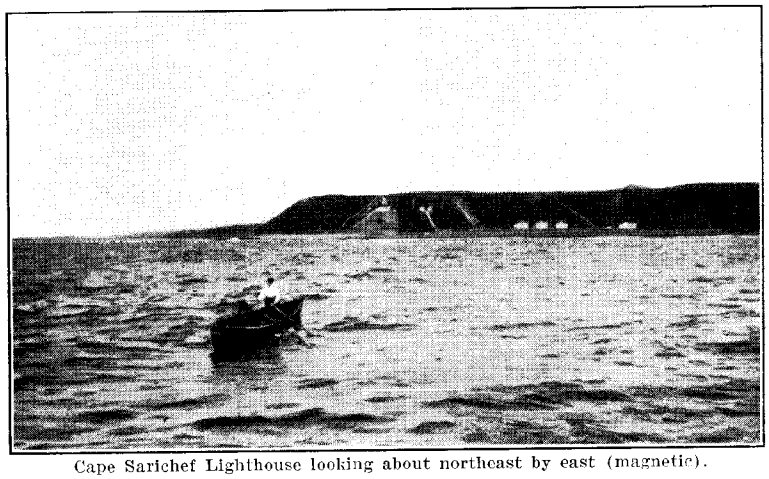
Records over a period of years show an average of about 1,000 hours per year of fog.

There is a **radiobeacon** which sends out signals consisting of groups of 2 dashes on a frequency of 300 kilocycles. It operates for the second 10 minutes of each half hour during clear weather, and continuously during foggy weather. The signals are sent for 60 seconds followed by a silent interval of 120 seconds.

Middle Point, about halfway between Scotch Cap and Cape Sarichef, is a fairly pronounced projection of the shore, with a small bight on either side. According to the Coast Guard, a **boat landing** may be made on the western side of the point back in the bight while a fairly heavy swell is running in Unimak Pass. The native fox trappers use this landing and report that landings may be made on the east side of the point in moderate westerly weather.

A landing in very smooth weather is occasionally made off the buildings of Cape Sarichef Lighthouse, but the beach is steep and a very strong undertow occurs if there is any sea at all. Landing

should not be attempted except with an experienced boat crew. Boats usually approach the beach with an anchor to seaward and float whatever freight they have through the surf. These remarks apply also to landings on the shore anywhere on the Bering Sea side. The lighthouse keeper will advise landing conditions and direct the boat crew to the proper landing.



Cape Sarichef Lighthouse looking about northeast by east (magnetic).

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 forms a table land and slopes gradually upward to **Pogromni Volcano** (p. 307). 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 about 3 miles westward 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 bank appears 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 away both north and south of the anchorage. A reef is reported to extend about ¾ mile from the shore about 1 mile northwestward from the lighthouse.

The *Chelan* anchored in the bight just northwestward of Middle Point, but this is recommended only as a temporary anchorage because of the current and swirls encountered.

Cape Sarichef Lighthouse, a white tower (black lantern) on an octagonal building, 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 to 18½° true, 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.

Shishaldin Volcano and other high peaks on Unimak Island used as landmarks in clear weather are described on page 306.

UGAMAK ISLAND (chart 8860), on the south side of Unimak Pass in entering from the Pacific, is the eastern one of the **Krenitzin Islands** which extend westward to Akutan Pass. The island is rugged with a sharp peak, elevation 1,041 feet (317 m), at the eastern end; when viewed from the southeastward, several pinnacles protrude from the slope to this peak giving an extremely rugged appearance. Near the middle of the island is a **knob** 905 feet (276 m) high. The island is mainly tundra covered. The shore is backed by bluffs 50 to 1,000 feet (15.2 to 305 m) high. Of the southeast point of the island is a **conical pinnacle,** 310 feet (94 m) high, which is separated from the island by a narrow gorge 10 to 15 yards wide. About ¼ mile off the southeast end are two rocks awash, generally marked by breakers. Twin grassy islets, the northern one of which is 127 feet (39 m) high, lie ⅝ mile southward of the east point of Ugamak Bay, a cove on the south side of Ugamak Island. The islets are separated by a deep gorge and appear as one islet. The collective name of **Round Island** is applied to them.

Strong currents sweep around the east end of Ugamak Island and heavy tide rips occur here. It is advisable to give this end of the island a berth of about 2 miles.

Aiktak Island 558 feet (170 m) high lies southward of the western part of Ugamak Island, the two islands being separated by a pass ½ mile wide and 6 to 10 fathoms (10.1 to 18.2 m) deep. Small vessels use this pass for temporary anchorage, but moderately strong currents make the anchorage rather unfavorable. On the south side of Aiktak Island are sheer bluffs, the tops of which approach the highest parts of the island. The islet off the northeast end is grass covered and less than 100 feet (30 m) in elevation.

Temporary anchorage in northerly weather may be found in **Ugamak Bay** in depths of about 16 fathoms (29.3 m) about ½ mile from shore. In southerly weather, some shelter may be found on the north side in a small bight 1½ miles west of the east end of the island in 16 to 20 fathoms (29.3 to 37 m) ¼ mile from shore.

Akun Island, on the west side of the approach to Unimak Pass from the Bering Sea, is described on page 318.

***DIRECTIONS,* Unimak Pass** (chart 8860).—In the directions following no allowance has been made for the tidal currents, which have considerable velocity in Unimak Pass; this should be kept in mind in order to make the courses good.

Emerging from the **inside route along the Alaska Peninsula** at Cape Pankof, the directions for continuing to the westward through Unimak Pass to Unalaska will be found in the table of courses and distances on page 32.

***Approaching* Unimak Pass from the Pacific.**—A survey of this approach including Davidson Bank, in much greater detail than charted at the present time (1937), is in progress. A larger number of soundings on the chart to indicate more definitely the limits and

depths of the banks and deeps will materially aid vessels in thick weather navigation, particularly if the vessel be equipped with echo sounding apparatus. (See appendix p. 468).

Care must be taken to avoid the Sanak Reefs and **Aleks Rock** (p. 298). A good rule is to make **longitude 164° W.** while still south of latitude 54° N. and then stand northwestward to make Seal Cape.

***Approaching* Davidson Bank** from seaward, southeastward of Unimak Pass, the depths decrease rapidly from deep water to the 50-fathom (91 m) curve marking the seaward edge of the bank. 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.

***Crossing* Davidson Bank** the depths vary between 35 and 50 fathoms (64 and 91 m). At times there is a marked change in the color of the water from blue to green when passing from deep water to the bank.

Along the shore of Unimak Island, west of Cape Lutke, no dangers were found more than 0.4 mile from the beach. In thick weather, when approaching Scotch Cap Light from the eastward, the 30-fathom (55 m) depth curve is a good guide and may be followed from Cape Lutke to Seal Cape. At Seal Cape the 30-fathom (55 m) curve is 1 mile from shore and continues 270° true to a point 1¼ miles south of Scotch Cap Light. West of the light the 30-fathom (55 m) curve is irregular and difficult to follow. Between Cape Lutke and Scotch Cap Light, the 30-fathom (55 m) curve is quite definite and regular and follows the general trend of the coast. At no point is it more than 1½ miles or less than 1 mile from shore, and this knowledge should prove of value to a vessel in this region in thick weather.

South of Unimak Pass there is a basin or tongue of deeper water the outline of which has not yet been fully determined, so that depths of 50 fathoms (91 m) may be met with when 5 miles southward of Scotch Cap Light.

In the vicinity of Seal Cape the coast is bold and may be approached with caution close enough (from ½ to ¼ mile) in moderately thick weather 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.

Vessels approaching Unimak Pass on a great circle course should verify their position before porceeding far on soundings. A northeaster will augment the prevailing southwesterly current along the Alaska Peninsula. In recent years several large steamers, intending to approach the pass, have been wrecked on Ugamak and Avatanak Islands.

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 Unimak Pass, it will appear as a number of small detached islands, but

when seen closer to, it is one island with six distinct short mountain ridges or peaks.

A **355° true** course heading for Pogromni Volcano will lead nearly for Seal Cape, passing about 4 miles eastward of Ugamak Island.

Some navigators prefer to stand farther to the westward than **longitude 164° W.,** in approaching from seaward, so as to sight **Tigalda Island** or **Ugamak Island** (p. 314). These islands often show when Unimak Island is fogged in.

The comparatively low land in the depression on the middle part of **Avatanak Island** (p. 316) is often clear when no other land is showing, especially in northerly weather. There are many grotesque irregularities of the surface making it easy to identify the locality. If approaching the land from the southward, this stretch probably offers the best chance for identification of surroundings, especially since it is easy of approach and comparatively free from current.

Surveys show a uniform gradual shoaling from the 100-fathom curve (20 to 25 miles offshore) in the Pacific to the vicinity of the chain of islands extending southwestward from Unimak Pass to Rootok Island. Approaching these islands on soundings, therefore, is feasible provided that care is exercised to avoid projecting ledges.

Through Unimak Pass.—If the land is recognized 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 from Cape Sarichef Lighthouse.

In foggy weather a vessel should guard against being set on Tanginak Island (p. 318) by an ebb current drawing into Avatanak Strait. A 4 fathoms **shoal** (7.3 m) was located (in 1938) about 4¾ miles northward of Tanginak Island.

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** course for 10 miles to a position with Scotch Cap Lighthouse bearing 72° true, distant 5½ miles. Then steer **332° true,** 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, distant 6 miles.

Vessels equipped with a *radio direction finder* will be aided in making the approach to Unimak Pass by taking bearings on the radiobeacon at Scotch Cap Lighthouse. Cross bearings on Dutch Harbor station (NPR) may be found useful. The keeper at Cape Sarichef has a radio telephone transmitter and keeps daily schedules with Dutch Harbor, and schedules for testing Scotch Cap radiobeacon may be made in advance through Dutch Harbor.

Ugamak Strait, between Ugamak Island with Aiktak Island (p. 311) on the north and Kaligagan Island on the south, has a width of 3 miles. A detached shoal of 10 fathoms (18.3 m) was found in the northwestern end of the strait. Between this shoal and the west end of Ugamak Island depths of 18 to 25 fathoms (33 to 46 m) were found and the ledge which was reported and previously charted here was not disclosed; however, at certain stages of the tide, heavy tide rips occur in this area.

The following ***course*** has been used: From a position 1½ miles southward of Aiktak Island, make good a **288° true** course heading approximately for the south side of the 1,600-foot headland on the northeast end of Akun Island, and pass about 1¼ miles northward of the northernmost rock north of Tigalda Island. The **current** which attains a velocity of 3.8 knots or more sets across this course and allowance must be made for it to make the course good.

TIGALDA ISLAND, one of the Krenitzin Group, has its south side in latitude 54°04′ N. The island is 11 miles long, 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 island as others in this locality is covered with tundra and grass. 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 478 feet (146 m) high. There is a shack at the head of the small bight at the northwest end of Kaligagan Island.

A large number of **bare rocks** or **islets** extend 2½ miles westward and northwestward of Kaligagan Island. The northernmost, about 60 feet (18.3 m) high is the highest and lies about 1¾ miles north of the Tigalda Island shore. Passages between groups of these rocks are deep and safe for small craft. In rounding the east end of Tigalda Island small craft should ***enter*** the **passage** between Kaligagan and Tigalda Islands heading for the innermost of the small rocky islets on a course of **298° true,** to a point 250 yards off the northeast point of Tigalda Island, then steer **278° true** for ½ mile until abeam of the western extremity of largest islet of the inner group, then steer **290° true** 1⅜ miles to the middle of the passage (⅜ mile wide) between two of the westerly groups of islets. On this course the northeast point of Tigalda Island is directly astern. In ***entering*** **Tigalda Bay** from this point care should be taken to avoid a group of rocks awash extending 270 yards off the north side of the entrance point of the bay. These rocks are marked by thick kelp. Currents in the passage between Kaligagan and Tigalda Islands are approximately half as strong as in the main passage of Ugamak Strait and currents are present among the groups of islets. Allowance should be made for these currents in making the courses good.

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. On account of the poor holding bottom, the anchorage is not secure in strong winds. An anchorage off the entrance to the bay in 12 to 15 fathoms (21.9 m to 27.4 m) gravel bottom is to be preferred, and furnishes just as good shelter in southerly and easterly weather. The mean range of **tide** is about 2 feet (0.6 m).

***To reach* Tigalda Bay** *from the eastward*, pass 1½ miles off the northwesternmost bare rock (60 feet high) which is the highest of the group of rocks extending about 295° true from Kaligagan Island. Steer **245° true** for 1½ miles from the beam bearing on the 60-foot rock. Then steer **180° true,** heading for a low place in the island, for 2¾ miles. This course passes over an area with depths of about 12 fathoms (21.9 m). Tigalda Bay should then be open on the port beam. To enter the bay steer midchannel course **112° true,** and select anchorage near the middle, taking care not to approach the head nearer than about ⅜ mile.

***Approaching* Tigalda Bay** *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** 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.

The small **bay** just east of Tigalda Bay is not recommended as an anchorage for small craft on account of the swell making in from the north or west, which is not broken up by the groups of islets.

Welcome Cove, just west of Tigalda Bay, is an open bay ¾ mile wide. At the head, a narrow passage leads to a lagoon largely bare at extreme low water. The passage at its narrowest part is 90 yards wide and 2½ fathoms (4.6 m) deep. There are two shacks of a fox farm, on the east side of the lagoon. The bay anchorage is in 15 fathoms (27.4 m) sand and gravel bottom, ⅜ mile from shore. An anchorage for small craft is in 4 to 6 fathoms (7.3 to 11.0 m) sand bottom at the entrance to the passage. Both are exposed to northerly weather.

Kelp Bay, on the north side of Tigalda Island and 2 miles from the western end, provides temporary anchorage in southerly weather. The width of the entrance is reduced by a reef extending ¼ mile from the west entrance point. The point to the eastward of the bay is marked by several offlying rocks, the outermost being 9 feet (2.7 m) high. On account of a shoal area extending ¾ mile northward of the point, large vessels should pass at a distance of not less than 1 mile. Anchorage is found in the center of Kelp Bay in 7 to 10 fathoms (12.8 to 18.3 m) ⅛ mile inside the entrance.

A small **bay** 2 miles east of Kelp Bay provides anchorage for small craft in southerly weather. Care should be taken to avoid sunken rocks 170 yards off the east entrance point and others 150 yards offshore on the west side. Anchorage in 7 fathoms is found ¼ mile from the head of the bay.

South side of Tigalda Island.—At the western end of the south shore of Tigalda Island is a **high pinnacle rock,** 165 feet (50 m) in elevation and about 100 yards offshore, showing prominently in a southeast and northwest direction. The point about 3 miles eastward of the west end is marked by **Derbin Island** about ⅜ mile long and 206 feet (63 m) high lying close to the shore. Eastward of this point the south shore of Tigalda Island consists of high cliffs intersected by low valleys. About 2½ miles eastward of Derbin Island, there are **two round bare rocks,** 85 and 27 feet (25.9 and 8.3 m) high, about ⅜ mile from the shore. The section of the coast abreast of the rocks

is composed of a steep rocky bluff reaching a point 1,520 feet (463 m) high. About 2½ miles eastward of the two rounded rocks is a 191-foot (58 m) **pinnacle** near the shore. An **arch** through the pinnacle rock gives it the appearance of a huge chair.

The **bight** east of Derbin Island provides temporary anchorage in northerly weather. The recommended anchorage is in 16 to 18 fathoms (29.3 to 33 m), ½ mile from shore and ¾ mile from Derbin Island. The eastern shore of the bight is foul, with a sunken rock 300 yards southwestward of a 134-foot (41 m) rocky islet. Small craft should favor the western shore of the bight in running to anchorage in 7 to 10 fathoms (12.8 to 18.3 m), ⅜ mile from the head of the bight. Vessels should give the south shore of Tigalda Island a berth of at least 1½ miles.

A small indentation ¼ mile long and ⅛ mile wide is one mile southwest of the eastern extremity of Tigalda Island. On account of the rocky bottom and several rocks awash lining the shores, this is not recommended as an anchorage except in case of emergency. The depth ranges from 5 to 7 fathoms. A low pass extends N.W. across the island to Tigalda Bay.

Derbin Strait, separating Tigalda and Avatanak Islands, is a little over 1 mile wide. There are no known hidden dangers greater than ¼ mile offshore. A **mid-channel course** through the strait, **326° true,** with the northeast headland of Akun Island ahead, is considered safe. On the eastern side of the southern entrance is Derbin Island, 206 feet (63 m) high. On the western side of the southern entrance is a **bare rock,** 30 feet (9.1 m) high and 400 yards off the eastern extremity of Avatanak Island. A **reef** awash at half tide extends 330 yards westward from the 165-foot (50 m) **pinnacle rock** about midway on the eastern side of Derbin Strait. On the west side of the north entrance is a bare rock 2 feet (0.6 m) high, 400 yards off the northeastern point of Avatanak Island.

Tidal currents in Derbin Strait, with estimated velocity of 8 knots, set northwestward with the flood and southeastward with the ebb. In midchannel, with wind and current opposing, the strait becomes exceedingly rough. A swell from southwestward to southeastward makes into the strait and the current accentuates the swell. There are numerous eddies and cross currents nearer shore. The ebb current causes tide rips a considerable distance offshore, especially on spring tides. Small boats should avoid the channel except under favorable conditions. Rootok Strait is easier to navigate, especially in southwesterly weather.

AVATANAK ISLAND (chart 8860), lying southwestward of Tigalda Island, is separated from Akun Island by Avatanak Strait. The island is 9 miles long and 3½ miles wide at its eastern end but the western half of the island averages less than ¾ mile in width. The middle of the island is a **depression** less than 100 feet in elevation, the sides of which slope gently upward to maximum elevations of 1,635 and 1,276 feet (498 and 389 m) on the east and west ends respectively. The low land of the depression is often clear when no other land is showing especially in northerly weather. There are many grotesque irregularities of the surface.

The most southerly extension of the island terminates in a sharp **bold point** with a ragged chain of rocks and rocks awash extending

for ¼ mile in a southerly direction. The southernmost of these rocks is a symmetrical oval rock 6 feet (2 m) in elevation.

Two pinnacle rocks lie west of the western extremity of the island, the highest and most distant being 200 yards offshore, elevation 60 feet (18 m).

Near the center of the island on the southern side is **Chimney Cove** affording temporary protection to small craft from northerly weather. It is exposed to the ocean swell. The cove is marked by a vertical chimney shaped slab of rock, over 200 feet in elevation (61 m) which projects from the ground surface on the west point of the cove. This rock also shows in Avatanak Strait over the low lying middle ground. Larger vessels may find temporary **anchorage** in depths of 15 to 20 fathoms (27.4 to 37 m) southward of this rock, well clear of any currents.

Rootok Strait, separating Avatanak Island from Rootok Island, is a little more than 1 mile wide; but the clear channel is reduced to about ½ mile by a reef extending from the east side and by rocks extending from the west side. The reef, composed of separate rocks and heavily fringed with kelp, bare at various stages of the tide, and extends 525 yards in a southwesterly direction from the highest of the two pinnacle rocks lying off the western extremity of Avatanak Island. The rocks on the west side extend 250 yards from the Rootok Island shore. Depths less than 10 fathoms (18.3 m) extend almost ½ mile northward and northeastward from the northeast point of Rootok Island.

A detached **shoal** of 3½ fathoms (6.4 m) was found near the middle of the southern entrance, about 1 mile northeastward of the east end of Rootok Island.

A flat topped **rock** about 20 feet (6.0 m) high lies just off the east end of Rootok Island and other rocks extend 400 yards from the rock into the strait.

In the **bight** indenting the eastern shore of Rootok Island, there is a **rock** awash only at low tides, about 500 yards from the shore. Several pinnacle rocks fringe the southern shore of this bight.

The following ***directions*** lead in midchannel in depths of 25 to 40 fathoms (46 to 75 m): Steer for the north end of Rootok Island on a **298° true** 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** and pass in **midchannel** between the bare rocks off the west end of Avatanak Island and those close to the north end of Rootok Island.

The **currents** in Rootok Strait have an estimated maximum velocity of 4 knots. Tide rips and whirls occur off the northern entrance, but as this area is sheltered from winds from most directions they are mild compared to the rips that occur in other passes.

Rootok Island, the westernmost island on the southern side of Avatanak Strait, is 3 miles by 2¼ miles in extent. The island's most prominent features are the **twin peaks,** 1,545 and 1,532 feet (471 and 467 m) high, 600 yards apart in an east-west direction. The higher of the twin peaks is to the westward. There are no other peaks approaching them in elevation. The southern side of the island is a continuous cliff broken only by a small valley slightly eastward of the center. A flat topped rock about 20 feet (6.1 m) high lies off the

east point of Rootok Island. The island is fringed with rocks and kelp and there is no secure anchorage. It is used as a fox farm, the buildings being in the southern valley of the bight on the eastern side; see description of Rootok Strait.

AKUN ISLAND (chart 8860) lies 23 miles southwestward of Unimak Island, being the northernmost island of the Krenitzin Group. 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 af about 2,500 feet (762 m) in an extinct crater at its northwest end on the north side of Lost Harbor.

The northern ends of Akun Island are **AKUN HEAD** and the unnamed headland 4 miles to the eastward. They are massive heads separated by Little Bay, both having precipitous sea faces rising about 1,200 feet (366 m) with grassy saddles southward of their summits. Akun Head has a flat top 1,632 feet (479 m) high. The bluffs on its northern and western sides are marked by rust colored stratification. It is an important landmark for approaching **Unimak Pass** (p. 308) from the Bering Sea.

Little Bay indents the northern end of Akun Island. A spit makes out from the western shore. The area south of the spit is closed by a rocky bar. Only boats drawing a few feet can enter. Anchorage outside of the spit may be had in 8 to 10 fathoms (14.6 to 16.3 m) sandy bottom.

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. 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). Small vessels can find fairly good shelter from all directions in the southern part of the northern bight, behind a reef marked by kelp extending northwestward from the entrance point. There are no known dangers in the bay except close to shore. There are freshwater 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.

Off the northern point of the eastern extremity of Akun Island is a tall **twin pinnacle** 230 feet (70 m) high, which marks the southeastern end of Akun Cove. A **gully** indents the cliff at the most easterly point of the extremity. **Tanginak Island,** of small extent but 295 feet (90 m) high, with steep sides, lies 2¼ miles off the east end of Akun Island. While having the appearance of one rounded island, it is in reality composed of two islets separated by a narrow channel. There is a deep passage between the island and Akun Island, but strong currents sweep through it with tide rips and swirls.

In the approach to Akun Cove a 4 fathoms (7.3 m) **shoal** was located (in 1938) about 4¾ miles northward of Tanginak Island.

Note.—The sides of Akun Island bordering on Avatanak Strait, Akun Strait, and Akutan Bay are described in connection with these respective bodies of water.

AVATANAK STRAIT is a broad passage separating Avatanak and Rootok Islands from Akun Island. The strait has a general 245° true direction and is 3 miles wide at its narrowest part. It furnishes a convenient route from Unimak Pass to Akutan or Unalga Pass, especially in northerly weather. There are no hidden dangers over ¼ mile from shore and its navigation is not difficult in clear weather. It is reported that strong northwesterly winds draw heavily through Akun Strait into the west end of Avatanak Strait.

Currents with a velocity of 4 knots in Avatanak Strait have been observed, but average maximum is about 2.5 knots. The ebb sets to the westward, and the strength of the current is felt well to the westward of Rootok Island, but to the eastward of the strait along the north side of Tigalda Island the currents are weak. Current differences and constants for Avatanak Strait are given in the *Current Tables, Pacific Coast.*

Tide rips and swirls occur in the narrowest part, off the entrance to Akun Strait, and among the islands off the south shore of Akun Island. A pronounced set is often experienced when crossing the narrow submarine valley abreast of Derbin Strait, and light tide rips occur here.

Deep water is found within a few yards of **Tanginak Island** (p. 318), lying on the north side of the eastern approach to Avatanak Strait. The passage between Tanginak and Akun Islands is clear if the east end of Akun Island is given a berth of at least ½ mile, but strong currents sweep through the passage.

Basalt Rock in Avatanak Strait lies 1 mile north of Avatanak Island (p. —). It is a symmetrically rounded rock 50 feet (15 m) high. The island is steep to and the channel inside of it is clear, with depths of 9¾ to 20 fathoms (17.7 to 36 m).

Round Head, the southeastern extremity of Akun Island, is a rounded steep sided headland 485 feet (147.4 m) high. A pinnacle 52 feet (15.2 m) high lies slightly to the eastward of its southern point. The shore between the **tall twin pinnacle** (off the north point of the eastern extension of Akan Island) and Round Head is steep and rugged, with a **gully** indenting the cliff line at the most easterly point.

From Round Head the shore of Akun Island trending westward for 3 miles is less rugged. It then turns to the southward for 1½ miles to **Cross Point** (name applied by field party) forming an indentation konwn as **Seredka Bay.** Roomy **anchorage** with good shelter from northerly and westerly winds can be found in depths from 10 to 20 fathoms (18.3 to 36 m) about ⅜ mile from the shore. The northeast side of Cross Point near its end is fringed with rocks and kelp.

Cross Bay is an indentation about 1 mile long on the southeast side of Akun Island and to the northward of Tangik Island. Rocks extend about 300 yards off its middle point. The channel north of Tangik Island is clear, but the channel west of the island has depths of 4 fathoms or less and should be avoided.

Tangik Island lying about ⅝ mile southward of Cross Point is about ⅜ mile long and 220 feet (67 m) high at its eastern end. It is surrounded by rocks, and a reef extends about 350 yards southwestward from its southwest end.

Poa Island lying about 1 mile southwestward of Tangik Island is steep sided, about 5/8 mile long in an east-west direction, and about 305 feet (93 m) high. A pinnacle rock about 30 feet (9.1 m) high lies about 200 yards off its southwestern shore, and another of about the same height lies about 100 yards off the western shore.

The channel between Tangik and Poa Islands is clear except for reefs close to the south side of Tangik Island, which should be given a berth of at least 1/4 mile.

TRIDENT BAY, 2 miles northward of Jackass Point (southern end of Akun Island) is about 3/4 mile wide and 1 mile deep. The width of the entrance is reduced to less than 1/2 mile by an unnamed islet 82 feet (24.9 m) high lying at the northern entrance point and a chain of rocks extending from the opposite shore and terminating in a flat topped rock 32 feet (9.7 m) high. Three small coves indent the shore at the head of the bay. A **rock** awash at low water lies about 225 yards off the point between the middle and southerly coves. The heads of the coves are shoal.

Anchorage can be found in the middle of Trident Bay in 20 fathoms, with good protection from all directions but the southeast, however, the islands off the entrance provide some protection from this direction. With a southwesterly swell, small boats find better protection at the entrance to the western cove in 2 to 6 fathoms (3.6 to 10.9 m). The *Surveyor* while engaged on survey work in this vicinity, found this bay the **best sheltered** in the vicinity, with sufficient swinging room.

***Directions,* Trident Bay.**—From a position 1 mile southwestward of Poa Island steer **350° true** heading for the west tangent of the islet at the north entrance point. Pass midway between Poa Island and the land to the westward. When the outermost flat topped rock is abeam to port swing sharply to **300° true** heading for the sand beach in the middle cove with the south tangent of Poa Island directly astern. In making this turn, favor the flat topped rock which is steep to, as the currents eddying around the entrance to the bay have a tendency to keep the ship's head from coming around. A bank of 8 fathoms (14.6 m) extends across the entrance channel.

Jackass Point, the southern extremity of Akun Island, terminates in a chain of irregularly shaped rocky islets, the highest of which is 82 feet (25 m) high. A tall conspicuous **pinnacle** rock 145 feet (44 m) high lies 1/2 mile west of Jackass Point 1/4 mile offshore.

With northwesterly winds in the summer time, a bank of fog frequently streaks through Akun Strait, but under such circumstances, vessels navigating Avatanak Pass will usually sight the south shore of Akutan Island.

Easy Cove lying eastward of Jackass Point is 3/8 mile wide and about the same length. Small vessels may find temporary shelter from northerly winds in depths of 8 to 10 fathoms (14.4 to 18.2 m).

From Jackass Point the shore trends west-northwestward to a low point with an **arch,** marking the entrance to Akun Strait.

Akun Strait (chart 8860), between Akun and Akutan Islands, is roughly 1 mile wide at its narrowest part, but the navigable channel is reduced to barely 450 yards by reefs extending from the eastern shore and by **Race Rocks;** the latter are a group, composed of a **flat rocky islet** 25 feet (7 m) high and some smaller bare rocks, lying near the northern end of the strait, 1/4 mile from its western

shore. Shoal water and heavy kelp surround Race Rocks for a distance of about 250 yards and a rock (Swirl Rock) awash at ½ tide lies 250 yards northward of the flat rocky islet. Swirl Rock is made readily discernable by the heavy overfall and swirls. The current here is said to reach a velocity of 12 knots. The main channel having a least depth of only 4½ fathoms (8.2 m) lies to the east and north of Race Rocks and Swirl Rock. The channel to the westward of Race Rocks has a least depth of 2½ fathoms (4.5 m) and the currents are just as strong as in the main channel.

Although local vessels, principally whalers from the Akutan whaling station, use Akutan Pass extensively under favorable conditions, its use is not recommended without thorough local knowledge. Vessels should approach the whaling station (Akutan Harbor) from the north by way of Akutan Bay.

Currents in Akun Strait attain an estimated velocity of 12 knots in the narrowest part, setting northward with the flood. The slack period is very short. Tide rips, swirls, and overfalls occur and with a northerly wind or swell are extremely heavy. By skirting the kelp off the eastern side of the islet on the west side of the channel and passing within 100 yards to the northward of Swirl Rock which can be recognized when covered by the swirls in its vicinity, local vessels are able to keep out of the strength of the current.

Green Bight indenting the southeastern shore of Akutan Island at the entrance to Akun Strait offers temporary anchorage in depths of 6 to 8 fathoms (11 to 14.5 m) ⅜ of a mile from shore. It is convenient while waiting for slack water to pass through the strait.

The **western** (Akutan Island) **shore of Akun Strait** is low, except in the middle where a rounded peak 650 feet (198 m) high forms a steep cliff, marking the northern point of Green Bight. Shoal water marked by heavy kelp extends about 500 yards eastward from this point.

From the **low point with an arch** (1⅝ mile westward from Jackass Point) the eastern shore of Akun Strait extends northwestward for about 2 miles to a point marked by a **flat grassy islet,** 80 feet (24 m) high, close by. Shoal water marked by heavy kelp fringes this shore.

A **rounded rock,** 10 feet (3 m) high, lies 650 yards northwestward from the low point with an arch. A group of rocks, bare only at low water, lie about 500 yards northwestward of the rounded rock and about the same distance off the eastern shore of the strait.

The western end of the flat grassy islet, mentioned above, may be approached 200 yards channelward, but shoal water marked by heavy kelp extends about 700 yards southward from the western point of the islet. A **flat islet,** 200 feet (61 m) high lies ⅜ mile northward of the flat grassy islet. The passage between the two islets is obstructed and foul.

AKUTAN BAY opens into the Bering Sea between Akun Head (p. 318) and North Head (Akutan Island, p. 323). This approach from the Bering Sea is used to reach Akutan Harbor and other arms of the Bay. Akun Strait, described above, connects Akutan Bay with Avatanak Strait and the Pacific, but it is comparatively shoal and contracted and is not recommended.

Open Bight is an indentation just east of North Head. No depths greater than 10 fathoms (18.3 m) are found in the bight. It is exposed to the northerly swell from the Bering Sea and is not recommended as an anchorage.

A rock awash lies about 250 yards off the rounded point just eastward of Open Bight. A sunken rock (breaker) lies inside of the rock awash.

Hotsprings Bay is a wide indentation in Akutan Island opening into Akutan Bay. The north point at the entrance is a high, rocky cliff. The south point at the entrance, **Ridge Point**, 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.

A **sunken rock**, least water 2 fathoms (3.6 m), lies ½ mile from the southeast shore and 1½ miles 243° true from Ridge Point. There are no other known dangers in the bay. Anchorage in southerly and westerly weather may be found in the west part of the bay ½ mile from shore in 14 to 16 fathoms (26 to 29 m) sandy bottom. Ridge Point bears east true from this part of the bay.

Sandy Cove is a small bight just east of Hotsprings Bay. Small craft may find anchorage in the center of the bay in about 5 fathoms (9.1 m) sandy bottom. The cove is exposed to the northeast.

AKUTAN HARBOR (chart 8860) opens into Akutan Bay on the north side of the eastern extension of Akutan Island. 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 and taking care to keep clear of the kelp. Heavy williwaws are encountered during gales. The bottom is very sticky and anchors should be sighted frequently.

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 keeps a supply of fuel oil on hand, but it is reported that none is for sale. Fresh water may be obtained when the plant is in operation.

There is a wharf with ample depths for the coasting freight and passenger vessels. The loading face of the wharf is on the northwest side. The eastern face of the wharf will accommodate only small boats.

A **radio station** (call letters KVF) is maintained by The American Pacific Whaling Co.

***Approaching* Akutan Harbor** *from Akun Head*, follow the northwest shore of Akun Island, giving it a berth of 1 mile or more until abreast the old crater on the island (a reef extends 580 yards

westward from Akun Head), and then steer about **178° true** with Akun Strait on the port bow. The light at the north point of 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 the light over ¼ mile on the starboard hand, round it at this distance, and then steer **251° true** 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*, leave it 1 mile or more on the starboard hand and steer about **107° true,** 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** about 4 miles; the light at 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 light over ¼ mile on the starboard hand and enter the harbor as directed in the preceding paragraph.

Surf Bay opens into Akutan Bay just northward of the southwestern end of Akun Island. It is an open bight exposed to the westward and northward. A group of rocky islets 64 feet (19.5 m) high lies in the middle of the bay about ⅞ mile from shore. A group of rocks awash at low water lies about ⅓ mile northward of these islets, and irregular bottom with least depth 2¼ fathoms (4.3 m) is found ½ mile northward of the islets. The channel southward of the islets is clear and anchorage can be found in 10 fathoms (18.3 m) ⅜ mile from shore with good shelter in southerly and easterly weather. On the east side of Surf Bay is a sand beach about 1 mile long.

Lost Harbor indents the western side of Akun Island and opens into Akutan Bay. The harbor affords fairly good shelter although in northwest weather considerable swell rolls into the bay. A sandspit makes off the northern shore, but depths of 6 fathoms (11.0 m) or more will be found at a distance of ⅜ mile. A prominent stack and buildings mark the remains of a former sulphur mine on the north shore.

Approaching Lost Harbor *from westward* pass about 1 mile northward of North Head (of Akutan Island) and make good a **102° true** course for 10 miles, which should lead to the middle of the entrance. Then steer about **56° true,** 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** 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 1 mile or more until in the middle of the entrance to Lost Harbor, and then proceed as directed in the preceding paragraph to the anchorage. A reef extends 580 yards westward from Akun Head.

AKUTAN ISLAND (chart 8860), largest of the Krenitzin Group, lies about 9 miles northeastward from Unalaska Island and is separated from the latter by Akutan and Unalga Passes.

Akutan Peak, elevation 4,244 feet (1,294 m), rises about 600 feet (183 m) on the south rim of a crater about 1¼ miles in diameter to form a sharp summit. It is the highest peak between Unimak and Unalaska Islands. Steam was observed coming from the crater in 1935.

NORTH HEAD, the northern end of Akutan Island, 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.

Note.—The shore of Akutan Island bordering on Akutan Bay and Akun Strait is described in connection with those bodies of water.

Lava Point, 6 miles southwestward of North Head, is a fairly flat lava bed varying in elevation from 150 feet (45.7 m) along the shore to 300 (91 m) at the base of the hill back of it. The cliffs all around the point are nearly vertical except in places where they are broken down. There are numerous tunnels under the cliffs. The northwest face of the hill back of the point is concave and very steep.

At the end of Lava 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.

The **bight** just southward of Lava Point provides temporary anchorage in southerly and easterly weather. On the south shore of the bight are several waterfalls, including a large one to the eastward of a group of small ones. The anchorage is in 12 to 15 fathoms (21.9 to 27.4 m) sandy bottom, ½ mile from shore, with the large waterfall bearing 160° true.

A large **circular reef** lies off the west coast of Akutan Island at a point 2½ miles southward of Lava Point. The outer edge of the reef is about ⅞ mile from the shore. It is marked by heavy kelp and is studded with numerous rocks bare 3 feet (0.9 m) at m. l. l. w. The western part of North Head open of Lava Point is a good range to clear this reef if passing to the northward of it. There is a passage for small craft inside the reef with about 3 fathoms (5.5 m) in a channel, clear of kelp, just east of the reef. Small boats use the channel to avoid the disturbed waters outside.

Reef Bight, just north of the western extremity of Akutan Island, is not recommended for anchorage on account of poor holding ground.

Reef Point (name given by survey party), the western extremity of Akutan Island, is steep and rocky, and reaches a height of 500 feet (152 m). A low rock 150 yards off the point has the appearance of a stranded freighter as seen from the northward or southward.

Cape Morgan is described on page 325.

The **south shore of Akutan Island** between **Green Bight** (p. 321) and Sarana Bay is a steep rocky bluff with numerous boulders extending about 200 yards off the shore. A **rectangular shaped rock** 75 feet (22.9 m) high, lies 225 yards offshore about 1 mile southwestward from the south end of Green Bight. A rock awash at

½ tide lies 1½ miles eastward from the eastern entrance point to Sarana Bay, and 400 yards offshore. Numerous waterfalls are visible along this shore in rainy water.

Talus Point (name given by survey party), the eastern entrance point to Sarana Bay, is marked by the end of a rocky ridge, about 1,700 feet (518 m) high, having several massive pinnacles split from the top. It is more easily distinguished than Battery Point from offshore.

Sarana Bay lying between Talus Point and Battery Point is 4 miles wide at its entrance, narrowing rapidly to an inner cove about ¾ mile wide and ⅝ mile deep. The eastern entrance point of the inner cover is marked by a flat-topped rock 45 feet (14 m) high, and a reef extends 450 yards southeastward from it.

Anchorage in 5 to 10 fathoms can be found in the inner cove, but the shores should not be approached closer than about 450 yards. The bay is wide open to the southward and in a southerly swell is very uncomfortable.

Battery Point, the south headland of Akutan Island, is marked by a peak with a distinctively shaped conical top resembling a liberty cap. It is faced by steep, high cliffs. Large vessels should give Battery Point a berth of 1½ miles to avoid a 7-fathom (12.8 m) spot 1¼ miles offshore in a southeast direction. Swirls and tide rips mark the shoal. A 4-fathom (7.3 m) spot marked by kelp lies ⅜ mile off the southeast part of Battery Point, and a rock awash lies 370 yards off the southwest part of the point.

Broad Bight and **Cascade Bight** are the east and west bights, respectively, between Cape Morgan and Battery Point. This region may be used only as a temporary anchorage in northerly weather. The heads of the two bights have beaches of sand and gravel and each is backed by a low grassy valley. The bights are separated by a ridge terminating in a bold rocky headland with steep cliffs 800 feet (244 m) high. Anchorage in Broad Bight may be found in 16 to 20 fathoms (29 to 36 m) sandy bottom, ¾ mile from the beach and 1⅛ miles 105° true from the point of the headland. Anchorage in Cascade Bight may be found in 14 to 16 fathoms (26 to 29 m) sandy bottom ¾ mile from the beach and ⅝ mile west of the same point.

About 1¼ miles southwestward of Cascade Bight is a group of **rocky islets,** one of them 298 feet (91 m) high is ¾ mile east of Cape Morgan. There is deep water (14 fathoms) close to these islets on the offshore side.

CAPE MORGAN, the southwest end of Akutan Island projecting into Akutan Pass, is a prominent headland with steep, high cliffs intersected by dikes of hard rock and characteristic color. **Triplets Rocks** are 3 pinnacle rocks 8 to 15 feet (2.4 to 4.6 m) high and lie in Akutan Pass 600 yards off the cape. Other rocky islets extend off the southeast side of the cape, one of them 298 feet (91 m) high is ¾ mile east of Cape Morgan. In passing through Akutan Strait, The Triplets should be given a berth of over ½ mile.

Flat Bight is northward of a bold headland which forms the northwestern part of the Cape Morgan peninsula. At the headland, foul ground with thick kelp extends ½ mile offshore and a sunken rock lies near a rock awash within a ¼ mile northward of the headland.

The bight is bordered by a long gravel beach 1 mile in extent which in turn is backed by a low grassy valley. Temporary **anchorage** in easterly weather may be found 5/8 mile from shore in 12 fathoms (21.6 m) sandy bottom.

A large **low rock** with an elevation of 2 feet (0.6 m) lies 1 mile southward of Reef Point and 400 yards from shore. A depth of 12 fathoms (21.9 m) can be carried to the face of this rock. There is no kelp around it. Several other rocks lie inshore of this one but they are inside of the kelp line. A **rock awash** lies 3/4 mile farther to the southward and 250 yards from shore.

The shore for about 1½ miles from Reef Point to Flat Bight is an eroded **bluff** from 300 to 600 feet (91 to 183 m) high, then descending to the low shore bordering Flat Bight. When close by a reddish outcrop is discernible.

A low rock 150 yards of **Reef Point** (p. 324) has the appearance of a stranded freighter as seen from the southward and northward.

AKUTAN PASS and Unalga Pass (chart 8860), on either side of Unalga Island, are ship passages secondary to Unimak Pass for entering the Bering Sea from the Pacific through the eastern part of the Aleutian Chain. Akutan Pass is 2½ miles wide in its narrowest part, between the Babylands on the southwestern side of the pass, and Triplets Rocks, a group of three low rocks off Cape Morgan (p. 325). The depths in the pass are very irregular, but no hidden dangers were found. Depths less than 10 fathoms (18.3 m) extend about 3/8 mile southward from Triplets Rocks, and the tide rips here are intensified, appearing as breakers. Small craft should avoid them. A narrow crescent-shaped shoal with a least depth of 8 fathoms lies 3½ miles 297° true from Cape Morgan. The shoal can be detected by the swirls and tide rips marking it.

Akutan Pass is wider than Unalga Pass and the **currents** and **tide rips** (p. 305) are not as strong. However, the strength of the current is felt over a much greater distance, so that with an adverse current it was found that better time could be made by using Unalga Pass. On the larger tides, the flood creates such heavy tide rips northward of Unalga Island even in calm weather, that it is advisable to be prepared to takes seas aboard. Tide rips 15 feet in height have been observed. In approaching both Akutan Pass and Baby Pass less rips will be encountered if courses are directed for the area southeastward of the Baby Islands then swinging over to either pass. This area is comparatively quiet on the ebb when both of the passes have heavy tide rips.

Akutan Pass in the day time with clear weather and a fair current furnishes a convenient route for vessels bound to or from Unalaska Bay. From southward it is recommended to make the land in the vicinity of Tigalda Island and Avatanak Island (p. 316) and follow along the south side of these islands until the course is shaped from Rootok Island to Cape Morgan. A midchannel course through the pass is recommended.

Remarks on **currents** in Akutan Pass will be found on page 305.

Baby Islands, a group of six fairly low islands lying in Akutan Pass and northward of the east end of Unalga Island, have numerous rocks among them. The islands are all tundra covered. The four southerly islands are over 100 feet (30 m) high while the two northerly

ones are low and flat. On the westerly island is a large rookery and the ground is very pitted over almost the entire top. The southeastern island has a shack on it and is used as a fox ranch.

When seen detached from Unalga Island, the Baby Islands are fairly prominent although they tend to blend together to appear as one island.

Strong currents sweep among the Baby Islands. The southern end of the passage between the two southeastern islands is blocked by a reef bare at low water, forming a small protected bay, but strong currents make it a rather uncomfortable anchorage for small boats.

***Directions,* Akutan Pass.**—From a position 3 miles southward of Rootok Island a course **280° true** made good for 17 miles will lead 1⅝ miles southward of Battery Point and to a midchannel position in the pass between Cape Morgan (page 325) and Baby Islands. Continue the course 4 miles past Cape Morgan to a position 2 miles off the north side of Unalga Island. When northward of the Baby Islands, it is necessary to guard against a strong set on the ebb into Baby Pass. Then steer **269° true** with Battery Point astern. This course made good for 7 miles will lead to a position 1½ miles northward of Cape Kalekta. The set of the current is across the course and should be guarded against.

Baby Pass (chart 8860), about ¾ mile wide, separates Unalga Island and the Baby Islands. Ledges along the shore restrict the navigable width but depths up to 20 fathoms will be found in midchannel. Less water is found at the north end of the pass.

On the Unalga shore of Baby Pass is a shallow **cove** about 1 mile from the eastern extremity of Unalga Island. Small boats may get fair protection in the cove from southerly and westerly weather; however, a rock awash at low water lies a little southward of the middle of the cove. Shelter inside the Baby Islands is not feasible.

Off the northern point of the cove mentioned in the preceding paragraph is a group of bare rocks extending into Baby Pass. The outer rock is 13 feet (4.0 m) high and distant 300 yards from the point. Foul ground extends 400 yards into Baby Pass from the ¾-mile stretch of shore westward of the cove.

The following ***course*** is recommended in running through the pass toward the northwest: from a point ⅜ mile 225° true from the south point of the south Baby Island, steer **313° true** for 2¼ miles to a position ⅝ mile from the shore of Unalga Island and 1 mile 270° true from the small northerly island of the group. From this position a course of **278° true** clears Priest Rock by one mile. The course through the pass clears two 8 fathom spots, one of which is ½ mile 302° true from the westerly island of the group, the other 1⅛ miles 280° true from the same island.

Very heavy **tide rips** occur to the northwestward of the Baby Islands on a flood tide, and extend a considerable distance to the southeastward on the ebb. See remarks on tide rips in Akutan Pass. The currents are probably stronger in Baby Pass than in Akutan Pass.

UNALGA ISLAND (chart 8860) is separated from Unalaska Island by Unalga Pass. The island is low compared to the neighboring islands, the highest point being a rounded hill 707 feet (215 m) high southwestward of the central point. The eastern end of Unalga Island is a flat topped hill 145 feet (44 m) high.

Malga Bay on the northwest side of Unalga Island is about ⅝ mile in diameter and affords shelter in southerly weather. The eastern shore of the bay is composed of a chain of jagged rocks and islets, the highest one being 106 feet (32 m) high. Temporary anchorage in southerly weather may be found in the center of the bay in 11 fathoms (20.1 m).

On the **north coast of Unalga Island** precipitous bluffs rise 100 to 200 feet (30 to 61 m), blending abruptly at the top into rolling slightly rising tundra-covered table land. There is generally no beach though a flat rock shelf from 10 to 30 feet wide extends from the bluffs at the water's edge. In places a few scattered boulders may be found on the shelf.

The Unalga shore bordering on Baby Pass is described under the paragraph captioned Baby Pass.

South shore of Unalga Island.—A prominent **cylindrical rock** about 120 feet (37 m) high, lies ½ mile southwestward of the eastern extremity of the island and 375 yards offshore. A point terminating in a **rounded knoll** on the southern shore is 1¾ miles westward of the eastern extremity. The knoll is 150 feet (45 m) high.

A large wooden house about 1 mile southwestward of the eastern end of Unalga Island is located on the side of a hill at an elevation of over 100 feet (30 m) and is conspicuous from the southward. Several smaller houses are located in the gully below this house, but can be seen only when close to.

Numerous boulders and rocks border the south shore of Unalga Island. A **dangerous sunken rock** having a depth of about 2¼ fathoms (4 m) lies 1⅞ miles 110° true from the southwestern extremity of the island and 700 yards offshore.

Off the southwestern extremity of Unalga Island a group of rocks extend about 200 yards into **Unalga Pass** and a rock about 4 feet (1.2 m) high near the outer end of the group is conspicuous while entering the Pass. The 4-foot rock should be given a berth of 300 yards.

The western shore of Unalga Island is generally clear.

UNALGA PASS (chart 8860) is the narrowest of the three principally used passes in the eastern Aleutians, connecting the Pacific with the Bering Sea. 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 free from dangers.

The depths in Unalga Pass vary from 12 fathoms (21.9 m) which is found in the middle of the narrowest part of the pass to over 50 fathoms (91 m). Deeper water is found northwestward and southeastward of the pass.

Under normal conditions the pass is not difficult to navigate, especially as the current sets fair with the pass. In thick weather the shore of Unalga Island can be approached close enough to pick up an echo and followed through the pass. The soundings, especially in the southern approaches, furnish numerous characteristic depths to assist a vessel equipped with echo sounding apparatus to determine its position. For these reasons, coupled with the fact that this pass has been thoroughly surveyed, it is believed that it has distinct advantages over Akutan Pass for vessels going north, especially in thick

weather. However, under exceptional circumstances, currents and tide rips of unusual magnitude may be encountered (see p. 305); and treacherous seas, particularly in the narrow part of Unalga Pass, caused by wind opposing the current, often sweep a vessel without warning. These have caused severe damage and men have been washed overboard with resultant loss of life. There are temporary anchorages easy of access at either end of Unalga Pass where better conditions may be awaited.

A belt of **deep water** southward of Unalga Pass leading into Beaver Inlet makes access to the approach of the pass on echo soundings comparatively easy by following the 50-fathom (91 m) curve along the eastern limit and the 100-fathom (30 m) curve or deeper water along the northern limit of the deep. In the lower reaches of Beaver Inlet it has been found invariably possible to catch a glimpse of the shore during the summer fogs. For this reason and because of ease of access, it can be recommended as good practice in thick weather to make the slight detour into the inlet to check the vessel's position before entering Unalga Pass. The currents in the entrance to Beaver Inlet generally do not exceed 2 knots.

For remarks on **currents** in Unalga Pass see page 305.

The Unalga shore bordering Unalga Pass is described under the paragraph captioned Unalga Island.

Brundage Head (Unalaska Island) forming the southwestern entrance point to Unalga Pass, has a knoll 192 feet (59 m) high at its outer end. A pinnacle rock 22 feet (6.7 m) high lies about 300 yards eastward of the point, with deep water outside of it.

Fisherman Point about 1 mile northwestward from Brundage Head is 140 feet (42.5 m) high. A reef with several bare rocks about 15 feet (4.5 m) high and marked by heavy kelp extends over 400 yards northward from the point. The shore between Fisherman Point and Brundage Head is lined with rocks, but none extending over about 300 yards into the pass.

English Bay (chart 9007) indents the Unalska shore bordering on Unalga Pass. It is a secure anchorage for small vessels. The western shore of the bay trends due south for about 2 miles to a low point where it turns sharply westward for about 7/8 mile to the head of an arm about 1/4 mile wide. The head of this arm is shoal, but the most secure anchorage is in this narrow arm, southwestward of the low, flat, grassy point extending from the northern shore, and 2 miles from the entrance. The width of this anchorage between the 5-fathom (9.1 m) curves is about 300 yards. Good anchorage with more swinging room can be found eastward of the low point in 8 to 10 fathoms (14.6 to 18.3 m), but a shoal area extending 400 yards off the northwestern shore northward of the low point must be cleared. A reef extends over 400 yards northward from Fisherman Point, the eastern entrance point of English Bay.

In entering English Bay care must be taken not to be set off the course by the strong currents in Unalga Pass which have an estimated maximum velocity of 9 knots; follow a midchannel course, giving the western shore a berth of at least 1/4 mile and when heading into the arm at the head of the bay favor the south shore slightly. Good holding ground in depths of 12 to 20 fathoms (21.9 to 37 m) will be found nearer the entrance.

From English Bay northward, the western shore of Unalga Pass is much higher and **Erskine Point** (p. 334) about 3 miles northwestward of Fisherman Point is the northern extremity of a ridge about 1,432 feet (436 m) high. The shore from English Bay to Erskine Point has a number of rocks but none extending over about 250 yards.

Lofty Mountain, 2,284 feet (696 m) high, about 2½ miles southwestward from Erskine Point, is a symmetrically shaped conical peak, the highest point in the vicinity. It is easily identified and as it is often clear when surroundings are obscured makes a valuable landmark.

The **Signals, Egg Island** (p. 331), and **Old Man Rocks** are the prominent landmarks for making Unalga Pass from the southeastward.

***Directions,* Unalga Pass.**—Passing 3 miles southward of Rootok Island a course **261° true** made good for about 20 miles will lead to a position 1½ miles off the southern point of Unalga Island. At this position Erskine Point will be seen clear of the western tangent of Unalga Island and the Baby Islands will be closed behind the south tangent of Unalga Island. Then steer **292° true** for about 3½ miles, heading for about the middle of the high land south of Erskine Point, and passing about ⅝ mile off the 4-foot rock off the southwestern end of Unalga Island in the narrowest part of the pass. From a position about ⅝ mile off the southwest end of Unalga Island and with the 4-foot rock bearing 55° true, make good a **329° true** course for about 3 miles to a position with Erskine Point 1 mile on the port beam. Then steer **297° true** for 4 miles and pass 1 mile northward of Cape Kalekta.

The above directions lead slightly to the northward of the middle of the narrowest part of the pass. If the current is running ebb, one can get well out of the strength of the current and the tide rips by keeping closer to the Unalga Island shore. The 4-foot rock off the southwest point of Unalga Island can be safely passed at a distance of 300 yards. When southbound with a fair current, the course from Erskine Point can be followed until well clear of the pass, if desired, or if bound for Beaver Inlet.

If Egg Island is recognized, pass 2 to 3 miles northward of Egg Island, about midway between it and Unalga Island, and steer **292° true** to a position ⅝ mile off the southwestern end of Unalga Island with the 4-foot rock bearing 55° true. Then follow directions as given above.

UNALASKA ISLAND (chart 8860), one of the larger Fox Islands which form the eastern group of the Aleutian chain, is about 67 miles in length along the axis of the chain. **Unalaska** (p. 340), the largest settlement in the Aleutian Islands, is located on Unalaska Island. United States Coast Guard cutters of the Bering Sea Patrol Force base at Unalaska from April to September. A fuel oil station is maintained by the Alaska Commercial Co., at **Dutch Harbor** (p. 339), which is near Unalaska.

Unalaska Island is mountainous, and during the greater part of the year the higher elevations are covered with snow. **Makushin Volcano,** 5,691 feet (1,735 m) high, the highest point on the island, is near the northwestern side and about 25 miles from the eastern

end of the island. In clear weather the volcano is a prominent landmark for vessels bound to Unalaska or Dutch Harbor from Bering Sea.

Sedanka Island, close to the eastern end of Unalaska Island on the Pacific side and separated from the latter island by a narrow, deep strait (Udagak Strait) appears as a part of Unalaska Island. The island is mountainous and covered with tundra. There are numerous peaks separated by deep valleys running northwestward but none of the peaks are conspicuous from the eastward. The highest peak 2,200 feet (670 m) high is in the southwestern part of the island. The outer coast is broken by bays and coves separated by bold, rocky headlands.

CAPE SEDANKA, the eastern point of the island, terminates in a knoll 375 feet (114 m) high. Rocks and islets line the shore, but deep water is found at a distance of 400 yards. The coast on the southeast side of the cape is unusually steep and reaches an elevation of 1,296 feet (387 m).

EGG ISLAND is ⅔ mile in diameter, 541 feet (165 m) high, and lies about 1¼ miles northeastward from Cape Sedanka. It is a grassy island with bluff rocky shore and has numerous rocks and islets lying within 200 yards of its shores, but beyond this distance deep water is found all around the island.

Old Man Rocks, a group of four but only two of which are prominent, lie ⅞ mile westward of Egg Island. The two conspicuous rocks are 100 feet (31 m) and 39 feet (12 m) high respectively. The group is surrounded by deep water at a distance of 200 yards.

Sedanka Pass separates Egg Island and Old Man Rocks from Sedanka Island. It is about 1⅓ miles wide with depths of 30 to 40 fathoms (55 to 73 m). The Sedanka Island shore should be given a berth of ½ mile. Strong currents with rips are experienced occasionally around Cape Sedanka and just south of Old Man Rocks.

THE SIGNALS is the name applied to three rocks lying off the coast of Sedanka Island. **Outer Signal Rock,** 30 feet (9.2 m), lies 3.2 miles south true from Egg Island and a small rock 10 feet (3.1 m) high lies 0.3 mile southeastward of it. Deep water is found close to these rocks. **Inner Signal Rock** lies 3 miles south true from Cape Sedanka, 0.8 mile off the Sedanka Island shore, is 126 feet (49 m) high, and is surrounded by a shoal and reef area ⅜ miles in diameter. A bar from 6 to 10 fathoms in depth reaches from this area to the nearest point of Sedanka Island. The passage between the Inner and Outer Signal Rocks is clear.

About 15 miles southeastward of Egg Island, after gradual shoaling from the 100 fathom curve to about 45 fathoms, the water deepens to depths over 60 fathoms, forming an **underwater basin** about 6 miles wide which leads northwestward into Beaver Inlet, furnishing an excellent pathway for vessels equipped with echo sounding apparatus. A crescent-shaped bank of rocky formation within the basin of deep water and 2 miles eastward of Egg Island has general depths of 12 to 14 fathoms (21.9 to 25.6 m) and a least depth of 9 fathoms (16.5 m) on the western part of the bank. The 50-fathom (91 m) curve surrounding the bank approximates a circle about 1½ miles in diameter. When navigating on soundings in thick weather

this bank and the characteristic deep water afford an opportunity to check a vessel's position. The navigator in finding his way on soundings to the bank must guard against the mischance of nearing Egg Island; the shoaling of the depths in doing so may mislead him in assuming that he is approaching the bank. A definite knowledge from soundings taken regularly along the course from seaward is necessary to avoid this error. Directions for approaching Unalga Pass on soundings are given on page 329.

From Cape Sedanka the shore on the Pacific side trends southwestward for 3 miles, then turns southeastward for 1 mile to a precipitous point, inclosing a small bight where temporary anchorage in westerly weather can be found. The bottom of fine gray sand slopes gradually from the sand beach at the head of the bight to the 20-fathom (37 m) curve distant 1 mile offshore. To enter the bight, pass midway between Outer Signal Rock and Egg Island.

On the **southeast side** of **Sedanka Island**, east of Udagak Strait, are three bays separated by bold headlands; the largest bay is 4 miles northeast of the entrance to Udagak Strait and extends 2 miles inland in a northwesterly direction. Good **anchorage** may be found ½ mile from the head of the bay in 7 fathoms (12.8 m). This bay is protected from all except southeasterly weather. The other two bays, which are nearer Udagak Strait, afford protection from the north and west.

The south end of Sedanka Island is a double point. On the eastern prong is a conspicuous sharp pinnacle rising about 100 feet (30 m) from a flat ledge. The south coast of Unalaska Island westward of Udagak Strait is described on page 354.

Udagak Strait separates Sedanka Island from Unalaska Island. 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 midchannel track, giving the two gravel spits a good berth, particularly the southern spit.

A rock, bare 4 feet (1.2 m) at high water, lies 250 yards from the east shore of Udagak Strait and 1½ miles in from the southeast entrance point; this rock is awash in a heavy southerly swell. A shoal with a least depth of 4 fathoms (7.3 m) extends 200 yards off the eastern shore and lies ¼ mile southeast of the northerly gravel spit. A midchannel course clears this shoal.

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. Depths of 10 to 19 fathoms (18.3 to 35 m) are found within ⅜ mile of the head of the bay.

The **tidal current** in the narrows of Udagak Strait has an estimated maximum velocity of 4 knots. At the south entrance of the strait and through the narrows, the flood sets from the Pacific.

The **south coast of Unalaska Island** westward of Udagak Strait is described on page 354.

BEAVER INLET has its entrance between Brundage Head and Cape Sedanka and extends 17 miles in a 235° true direction into the east end of Unalaska Island. It has an average width of about 3 miles in its lower reaches, narrowing to about 1⅝ miles near its head.

The deep water in the bay extends eastward between Unalga and Egg Island, making access to the inlet comparatively easy for a vessel equipped with echo sounding apparatus. In the lower reaches of the bay it was invariably possible to catch a glimpse of the shore during the summer fogs. See directions for approaching Unalga Pass on soundings, page 329.

Currents in Beaver Inlet are negligible, and in the entrance between Egg and Unalga Islands will not ordinarily exceed 2 knots.

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.

From **Cape Sedanka** (p. 331), the southeastern entrance point of Beaver Inlet, the shore trends northwestward for 1⅝ miles to a point marked by a small natural **arch** and having a chain of rocky islets extending northward about 200 yards. Just westward of this point there is an open **bight** ½ mile wide, ⅜ mile deep, which furnishes a convenient temporary **anchorage** in southerly weather, well out of any swell. Anchor in the middle of the bight about ⅓ mile from shore, with Old Man Rocks showing between the rocky islets off the point to the eastward in about 16 fathoms (29 m). Smaller boats can move farther in to lesser depths near the western end of the bight.

Sisek Cove, about 4 miles southwestward from Old Man Rocks, is too deep for anchorage.

Udamat Bay makes into Sedanka Island from Beaver Inlet 5½ miles southwestward from Old Man Rocks and just west of **Biorka** village, a small native settlement having a conspicuous **church.** The bay is 1 mile wide to a point ¾ mile from its head where it narrows to ⅓ mile. A low valley extends southeastward from the head of the bay to the outer coast. About 1⅜ miles south of the eastern entrance point, a **reef** makes out 200 yards from the eastern shore. If necessary to **anchor** in the bay, the best places are at the head of the bay or just north of the reef mentioned above in a small bight indenting the eastern shore, but there will be scant swinging room. A small rocky patch with depths of 17 to 25 fathoms (31 to 46 m) lies ⅜ mile northwestward from the same reef, which may offer an anchorage with more swinging room.

Udagak Strait, described on page 332, has its northern entrance on the south shore of Beaver Inlet 9¾ miles from Old Man Rocks.

Amugul Bay makes southward from Beaver Inlet about 3 miles southwestward of the entrance to Udagak Strait.

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.** Temporary anchorage only can be found near the heads of these bays for medium-sized craft.

Dushkot Island lies along the north shore of Beaver Inlet near the head.

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. An **anchorage,** practically landlocked, but limited to medium-sized vessels, may be found in 20 fathoms (37 m) muddy bottom, ½ mile

from the head of **Uniktali Bay.** In navigating keep to midbay as far as the narrows, then favor the south shore to avoid a 6¾ fathom (11.3 m) shoal which lies 260 yards south of the north shore.

Ugadaga Bay is an indentation in the north shore of Beaver Inlet 8 miles above the entrance of the inlet. From the head of Ugadaga Bay a **trail** leads to the vollage of Unalaska. Fair **anchorage** may be found 0.4 mile from the head of the bay in 20 fathoms (37 m) even bottom.

Agamgik Bay, indenting the north shore of Beaver Inlet, 5½ miles southwestward of its entrance, offers anchorage in good holding ground with fair shelter, except in severe southeasterly weather.

Eagle Rock, a large, flat-top pinnacle 75 feet (22.9 m) high, lies 125 yards off the rounded point on the east side of the entrance to Agamgik Bay. Off the western point of the entrance, sunken rocks and rocks awash extend from ⅛ to ¼ mile into the entrance. A rock, bare 6 feet at high water, lies outside of this rocky area and 600 yards eastward of the point.

A number of rocks and low islets extend northward from the low point extending from the western shore of Agamgik Bay, with shoal water between them and westward of them. The best **anchorage** is in the middle of the narrow part of the bay, due east of the low point extending from the western shore, in depths of 16 to 20 fathoms (29.3 to 37 m).

The north shore of Beaver Inlet extends eastward from the eastern entrance point of Agamgik Bay for almost 3 miles, to the western entrance point of Deep Bay, where it turns sharply to the northward and northwestward for 1¼ miles forming the western shore of Deep Bay. About halfway between the two bays there is a conspicuous **waterfall,** 350 feet (106 m) high, with a **pinnacle rock** 46 feet (14.0 m) high just to the westward of its base.

Deep Bay is the bight on the north side of the entrance to Beaver Inlet, and is protected at the northeastward by a long ledge and several small islets which make offshore about 0.3 mile and terminate in a kelp marked ¾-fathom (1.8 m) rocky shoal ⅝ mile offshore which breaks in southeasterly weather. A kelp marked 1¼-fathom (2.4 m) rocky shoal spot lies ¼ mile offshore at the southwest entrance point. Temporary anchorage in northwest weather can be found at the entrance to the small cove in the northwestern corner of the bay in depths from 10 to 20 fathoms (18 to 37 m).

From the ledge marking the eastern part of Deep Bay, the shore extends northeastward for 2 miles to **Brundage Head** (p. 329). This stretch of shore has numerous rocks and islets extending as much as ¼ mile offshore and strong currents are noticeable.

English Bay, opening into Unalga Pass, is described on page 329.

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** (p. 330), the eastern point at the entrance, somewhat similar to **Priest Rock** off Cape Kalekta; but the rock off Erskine Point is distinguished by a smaller one between

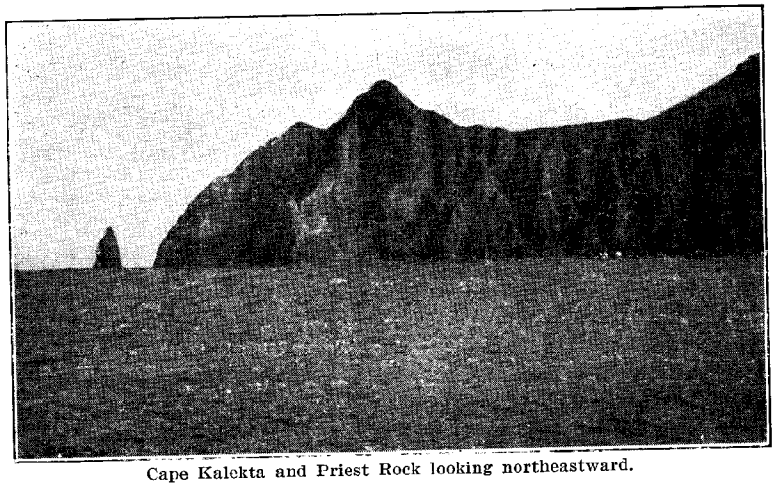
it and the point. Priest Rock is marked by a large whitewash mark at its base. On the west side of Kalekta Bay 1½ miles in from Cape Kalekta is a narrow pinnacle rock 45 feet (13.7 m) high, 100 yards offshore.

On the west side of Kalekta Bay, 3 miles in from Cape Kalekta, a **gap** cuts through to Constantine Bay in a west-southwesterly direction. This gap is filled by a lagoon not connected with either bay. A **reef** extends 400 yards offshore just south of this gap. **Anchorage** may be found in the south end of the bay ½ mile from shore in 12 to 20 fathoms (22 to 37 m) sandy bottom. Small craft may find anchorage in the center of the small bight ½ mile in diameter on the east side of the bay, 1 mile in from Erskine Point, 5 fathoms (9.1 m) rocky bottom. The holding ground is poor and this bight is not recommended for anchorage except in emergency.

Lofty Mountain, dominating the land eastward of Kalekta Bay is described on page 330.

UNALASKA BAY (chart 9007) opens into the Bering Sea between Cape Kalekta and Cape Cheerful on the north side of Unalaska Island. Commercially it is one of the most important bays in western Alaska. Its shores are generally mountainous, with precipitous sea faces. **Amaknak Island** lies near the southern end of the bay. 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 **harbors** and **anchorages** of Iliuliuk Bay, Dutch Harbor, and Iliuliuk (Unalaska) 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.

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.



Cape Kalekta and Priest Rock looking northeastward.

CAPE KALEKTA is the headland at the eastern side of the entrance to Unalaska Bay. The headland has two summits 785 and 904 feet (239 and 276 m) high, and a ridge which sags to an elevation of about 700 feet connects the headland with the mountains to the southward. The rounded extremity of the cape is the base of slope from the lesser summit. When viewed sidewise, this slope which forms the end of the headland is rounded in outline, rising precipitously at the water's edge and then bending gradually to meet the lesser summit.

The 904-foot (276 m) summit is very close to the western side of the cape. It is predominant, being the highest point on the headland. Viewing the cape from either side this summit has somewhat the shape of a crown. When off the extremity of the cape it appears as a sharp peak and the outline of a spur along the western descent becomes visible. This spur is composed of massive protuberances, the most prominent of which takes the shape of a vertical shaft of rock rising above the level of the top of Priest Rock.

PRIEST ROCK, close-to off the northwest side of Cape Kalekta, is a pinnacle about 204 feet (62 m) high. It is one of the most important landmarks in making Unalaska. It is marked by an unwatched flashing white **light**, approximately 30 feet (9.1 m) high, on a skeleton tower at the base of the rock on its northern side. A 24-foot square on the base of the rock has been **whitewashed** to aid in its identification. Priest Rock should not be confused with the pinnacle rock off Erskine Point, see page 334. There are two low rocky islets of appreciable area lined up northward with Priest Rock.

Cape Kalekta is rugged and precipitous at its extremity and particularly so on its western side. The headland rises almost vertically at the water line with a few detached rocks including Priest Rock, but no beaches. The area about the extremity is foul and marked by kelp, and a **dangerous ledge**, usually marked by breakers and bare 1 foot (0.3 m) at mean lower low water lies nearly 3/8-mile northward from the cape. The ledge is roughly in line with the pinnacle of Priest Rock and the western parts of the low islets northward of Priest Rock. Broken bottom extends about 200 yards farther out. The northern end of the cape should be given a berth of at least 1¼ miles to avoid being carried toward the dangers by strong currents. There are pronounced tide rips.

The **cascade** southward of **Cape Cheerful** (p. 345) is visible off Cape Kalekta.

The **point** on the eastern shore of Unalaska Bay, about 1⅜ miles southward of Priest Rock, presents a smooth rounded profile and is grass covered. The shore on either side of the point has little or no irregularity. The land about the point rises somewhat abruptly at the shore to an elevation of about 150 feet (46 m) then rounds to assume a more or less flat area. This area has a gentle slope toward the steeper slopes leading up to a series of jagged peaks ½-mile inland from the point. The peaks have no particular distinctiveness. The 10-fathom (18.2 m) depth curve is almost ½ mile off the point and broken bottom with a 1½-fathom (2.7 m) spot lies inside of the curve.

Princess Head, on the east side of Unalaska Bay, about 1⅞ miles from Priest Rock, is a wall-like rock formation extending out for a

distance of 200 yards from the shore cliff of that locality. The outer 200-foot length forms the highest part or head of the feature. The head has a fairly level top about 200 feet (61 m) high. The side facing the southwest presents the surface of a rough square, distinguished from the remainder of the rock formation by its lighter shade. Small knobs on the top of the head mark the upper corners of the square. The head is an important and distinctive landmark especially when in close to the east shore of Unalaska Bay in thick weather or when fog closes out the peaks. Two low detached rocks lie off the end of Princess Head.

The rounded shore in the vicinity of Princess Head is the base of a mountain rising to a peak 1,729 feet (527 m) high. The southern slope of this mountain descends gradually to the lagoon in a low gap which bisects the Cape Kalekta Peninsula. The **point** on the rounded shore is a spur from the base of the mountain. The spur parallels Princess Head and is ¼ mile southwestward of it. There is a smaller projection from the shore close northward of the point. A group of bare rocks lies off the point; about 100 yards off the outer one of this group is a **rock** that bares 2 feet (0.6 m) at m. l. l. w.

Constantine Bay, on the east side of Unalaska Bay, has shoal and irregular depths less than 10 fathoms (18.2 m) and its use as an anchorage, except by small craft under favorable conditions, is not recommended. The shore at the head of the bay is sandy. The southwest shore is fringed with rocky ledges. On the east side of the bay is a gap in the land extending eastnortheasterly to Kalekta Bay. This gap is filled with a lagoon which is not connected with either bay.

The **headland** west of Constantine Bay is rugged and precipitous and the area near and around its extremity is foul with rocks and kelp. The **bluffs** along the 1½ mile stretch of shore southward of the extremity, facing Unalaska Bay, are especially high. They are very rugged and have gray, rocky knobs and deep vertical scars giving the appearance of vertical stratification. **Split Top Mountain** marks the south end of this formation; the bluffs reach a maximum elevation of over 1,600 feet (488 m) near the peak of this mountain.

Summer Bay, a wide opening in the eastern shore of Unalaska Bay, opposite Ulakta Head, is composed of several coves, the heads of which are low and sandy. **Morris Cove,** on the east side just northward of a prominent headland has depths less than 4 fathoms (7.3 m), and the bottom is somewhat irregular. In the small cove between the southern cove and the headland, the depths decrease uniformly from 4 fathoms (7.3 m) in mid-entrance to the sand shore at the head. The depths in the southern cove are shallow and irregular.

A **pinnacle,** 75 feet (22.9 m) high, lies close to the north side of the **headland** between Summer and Iliuliuk Bays. The pinnacle stands on the reef bordering the shore of the headland. It has been called **"Second Priest"** in connection with Priest Rock considered as the first. A dangerous **rocky shoal** extends nearly ¼ mile northwestward from the headland. Two rocks, one on the shoal and the other about ⅛ mile northward of the headland, bare 2 feet (0.6 m) at m. l. l. w.

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. 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. From its northwest point a reef extends 1/8 mile, marked by **Needle Rock,** similar in appearance to Priest Rock, but not so large.

Ulakta Head Light, elevation 61 feet (18.6 m), is a gray skeleton tower with concrete pier built on a rock on the reef bordering the shore of Ulakta Head. The light is obscured to the southward of the lines bearing 331° and 122° true to the light. A pinnacle rock, 30 feet (9.1 m) high, adjacent to the shore lies about 200 yards westward of the light. Another rock lies about 300 yards northwestward of the light.

A **yellow cross** is painted on the bluff 3/8 mile southeastward of Ulakta Head Light, at an elevation of 325 feet (99 m), to identify the head during low visibility.

A prominent round **knoll,** 18 feet (5.5 m), marks the shore end of the long **sand spit,** separating Iliuliuk Bay from Dutch Harbor.

ILIULIUK BAY (chart 9008) has its northern entrance eastward of Ulakta Head and extends southward to the village of Unalaska. Northward of Spithead there is an under-water ridge extending across the bay, on which the least depths found are 7 to 8 fathoms (12.8 to 14.6 m) near the middle of the bay; kelp has been seen on this ridge in about mid-channel. South of this ridge the depths increase to 16 to 19 fathoms (28.3 to 34.7 m). There is anchorage almost 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. The Greek **church** and the buildings of the Alaska Commercial Co., at Unalaska, built on low land at the head of the bay, show up prominently in approaching. A conspicuous landmark in entering the bay is the 80-foot steel radio mast of the United States Coast Guard at Unalaska. Two radio towers (each showing a red light) back of Rocky Point are conspicuous as a landmark for entering the bay.

Shore observations indicate that there is a **magnetic variation** ranging from about 15° E. to 17° E. in Iliuliuk Bay and Dutch Harbor (1936). The mariner is cautioned not to place too much dependence on compass deviations determined in this region.

Spithead is the end of the long, low **sand spit** which forms the eastern side of Dutch Harbor. It is marked by an unwatched light at its extremity. Spithead Light is obscured westward of the bearing 215½° true to the light. Shoal water, less than 6 fathoms (11.0 m), marked prominently by kelp, extends 3/8 mile into Iliuliuk Bay from the middle part of the sand spit.

The west shore of Iliuliuk Bay south of the sand spit is fringed with rocks and should not be approached closer than 1/4 mile.

Rocky Point has a kelp-marked **reef** which extends toward Spithead about 400 yards with a depth of ¾ fathom (1.2 m) 250 yards from the point. The northeastern extremity of the reef is marked by a black can **buoy** in 8 fathoms (14.6 m). Along the east side of Rocky Point the reef is extensive; the 10-fathom (18.3 m) curve, which marks the outer limit of broken bottom in this part of Iliuliuk Bay, roughly parallels the side of the point at a distance of nearly 400 yards.

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 22 fathoms (25.6 to 40 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. The southwest gales practically have a clear sweep across the wharf because of the lowland westward.

There is a **T**-shaped wharf with a loading face of 360 feet and a least depth of 32 feet (9.7 m). Near the southeast end depths of 30 feet (9.1 m) are found slightly beyond the line of the face of the wharf and there is abrupt shoaling toward the shore. At the northwest end the 30-foot (9.1 m) depth curve is 30 feet inside the outer corner but meets the line of the face of the wharf 130 feet away.

Large vessels should drop an anchor well offshore and warp in to enable them to get away at once in case of a sudden onshore wind. One of the largest vessels to moor at Dutch Harbor wharf was the U. S. S. *Patoka* in 1933. The tanker is 463 feet long and has an average draft of 26 feet (7.9 m).

Facilities.—Fuel oil storage of 40,000 barrels, and Diesel oil storage of 7,500 barrels, are maintained by the Alaska Commercial Co. Sufficient quantity of gasoline in barrels is available. Coal storage now amounts to about 250 tons. Fresh water is available at the wharf but during a dry season the quantity may be limited. Dry stores in quantity and fresh provisions are kept on hand. Meats can be obtained on short notice. See also facilities for Unalaska.

The numerous buildings of the former Northern Commercial Co. are kept in repair. No machine shop facilities are available.

A naval radio station, call letters NPR, is operated at Dutch Harbor. Broadcasts of local weather conditions are made twice daily. This station handles commercial messages. Night effects in radio bearings on Dutch Harbor have been noted, estimated error being plus or minus 5°. The radio station has a small wharf on Iliuliuk Bay 0.4 mile southward of Rocky Point.

Tides.—Daily tide predictions for Dutch Harbor are given in the tide tables. The mean range of tide is about 2 feet (0.6 m) and the range between mean lower low water and mean higher high water is 3½ feet (1.1 m). The tidal current in Dutch Harbor is inappreciable, and in Iliuliuk Harbor the velocity does not exceed 1 knot.

UNALASKA (chart 9008) is on a low strip of land between the shore at the head of Iliuliuk Bay and a stream which empties into Iliuliuk Harbor. The **wharf** is at the western end of the strip of low land. The north side of the wharf faces the passage connecting the bay and harbor and the west side faces the harbor. The channel approach to the passage is endangered by Tuscarora Rock and Iliuliuk Reef which lie off the village and in Iliuliuk Bay.

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 southward.

Tuscarora Rock, marked on its southern side by a lighted **buoy** (flashing red), 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 45 yards southward of Tuscarora Rock. A rock with 15 feet (4.6 m) 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.

The **channel** in general use, leading to Unalaska wharf or Iliuliuk Harbor, is the one passing southward of Iliuliuk Reef and southeastward of Tuscarora Rock, which is marked by a lighted buoy showing a flashing red light. Southward of the lighted buoy and marking the southern side of the channel is a black can buoy. A black can buoy (No. 1) marks the 5-fathom (9.1 m) depth curve about 225 yards eastward of the lighted buoy. The channel is narrow, 150 feet, and there is a navigable depth of 4½ fathoms (8.2 m). The largest vessel ever to enter Unalaska Harbor was about 10,500 tons, about 450 feet long, and drawing 26 feet (7.9 m). However, large vessels require assistance in being taken in and out, and ordinarily, the channel is suitable for moderate size vessels only.

There is a channel northward of Iliuliuk Reef with a least depth of 17 feet (5 2 m), but it should not be attempted without local knowledge. On the north side of the channel at its eastern end, 200 yards northward of the east end of Iliuliuk Reef, there is a depth of 1¼ fathoms (2.4 m) off the end of a pointed reef extending from the shore. The Coast Guard has established a range on the wharf to mark the axis of the channel northward of Iliuliuk Reef. Front beacon of range is the bollard, painted white, on east corner of wharf. Rear beacon is latticework painted white with black cross. The bearing of the range is about 272° true

The Alaska Commercial Co. maintains the **wharf** (rebuilt 1931) at Unalaska. It has a frontage of 260 feet on each of the north and west sides with depths of 21 and 23 feet (6.4 and 7.0 m), respectively.

A **spit** makes out from the north shore of the **passage** northward of the wharf.

The Coast Guard reports that an eddy has been noted making against the eastern end of the wharf at Unalaska on an ebb tide but is not dangerous. The currents setting in and out of the harbor follow generally the trend of the channels and do not exceed 1 knot in the main entrance channel. See directions for Iliuliuk Harbor.

Facilities, Unalaska (see also Dutch Harbor).—Unalaska (population, 250) is the largest settlement and business center in the Aleutian Islands. It is the center of an extensive herring packing industry. The original Russian settlement was known as **Iliuliuk.** The Alaska Commercial Co. has a well stocked general store and warehouses at Unalaska. There are other stores. Only a limited amount of coal is kept on hand. Some lumber, gasoline, and distillate are usually obtainable. In 1933 about 130 vessels, including trading schooners entered the harbor. Vessels are usually required to go to the wharf at Dutch Harbor for fresh water. There is a post office and a monthly mail from Seward. The Territory of Alaska maintains **radio station** KGC. There is telephone communication with the Naval radio station at Dutch Harbor.

There is direct steamship communication between Seattle and Dutch Harbor (Unalaska).

Unalaska is the headquarters for the United States Coast Guard fleet engaged in the summer patrol of the Bering Sea. There are a United States Commissioner and Deputy Marshal. Unalaska is a customs port of entry. There are a public school, Greek Orthodox Church, Methodist mission, and a United States Bureau of Indian Affairs **hospital** at which native patients receive treatment.

ILIULIUK HARBOR (Unalaska Harbor), the harbor for Unalaska, has its main entrance at the head of Iliuliuk Bay. Unalaska **wharf** (p. 340) is located just inside the entrance. The harbor is small, but landlocked, with good holding ground, and an average depth of 10 fathoms (18.3 m.). There is sufficient room for backing and filling in turning a moderate sized ship. 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. On account of the limited swinging room an anchorage in Dutch Harbor or Unalaska Bay is recommended during severe weather.

Directions for reaching the wharf and the harbor will be found on p. 340.

Expedition Island is in the southern part of Iliuliuk Harbor. On the island is a small grove of evergreens. The trees are from Sitka and were transplanted in 1805 by a Russian Orthodox priest. A similar grove is located near the old Indian village of Amaknak. The trees are 25 feet (7.6 m) in height and their number apparently have not increased.

A **passage** leads from Iliuliuk Harbor to Captains Bay, forming the southern and secondary entrance to the harbor of Unalaska. The narrow part of this passage, southeastward of Expedition Island, is restricted by reefs and shoals extending from the shores on either side, leaving a narrow winding channel having a navigable depth of about 20 feet (6.1 m). A small rocky patch of 3½ fathoms (6.4 m) lies in the middle of the southern approach to this channel. The channel continues northward into Iliuliuk Harbor through a similar area eastward of Expedition Island. The southern entrance to Iliuliuk Harbor is not recommended for vessels over 150 feet in length.

The rocky patch in the southern approach to the channel through the narrows is marked by kelp. Kelp is also found in the channel in

4 to 6 fathoms (7.3 to 11.0 m), whereas depths less than 3 fathoms (5.5 m) in this locality were found free of kelp.

Bailey Ledge, near midchannel at the southern end of the passage leading from Captains Bay to Iliuliuk Harbor, is of small extent, and steep-to. Only a small amount of kelp marks this ledge, which bares 2 feet (0.6 m) at m. l. l. w.

South Amaknak Rocks lie in a foul area extending from the southern extremity of Amaknak Island. A deep water channel is indicated midway between this group of rocks and Bailey Ledge and also about 250 yards eastward of the eastern South Amaknak Rock, thence deep water may be carried to the southern entrance of Iliuliuk Harbor by preferably favoring the eastern shore.

Captains Bay (chart 9007) is the arm at the head of Unalaska Bay. Its entrance from Unalaska Bay direct is westward of Amaknak Island. The bay is also entered, as previously indicated, by passing eastward of Amaknak Island through Iliuliuk (Unalaska) Harbor, but the channel leading southward from the harbor is not recommended for vessels of more than 150 feet in length.

The entrance to Captains Bay westward of Amaknak Island is marked by **Arch Rock** adjacent to the point on the island ¾ mile from its southern extremity. Directly opposite Arch Rock is a **bold point** marking the western side of the entrance. A reef extends 220 yards channelward from the bold point, and from the reef a bar of 5 to 8 fathoms (9.1 to 14.6 m) extends to a point nearly ¾ way across the entrance toward Arch Rock. Large vessels in entering should pass about 100 to 200 yards off Arch Rock as the deep water channel will be found at those distances.

Anchorage may be had in depths of 17 to 20 fathoms (31 to 37 m), even bottom of mud and sand, about ⅜ mile eastward of the northernmost island of the group at the head of Captains Bay. In approaching this anchorage favor the eastern shore to avoid **Swallow Reef** and the shoal to the southward which lies northeastward and eastward of the northernmost island. A reef extends 150 yards from the eastern shore about abreast of Swallow Reef. Small craft may obtain secure shelter in 9 fathoms (16.5 m) sandy bottom, sand and mud bottom, at **Port Levashef,** east of the most southerly of the larger islands.

Hog Island, 302 feet (92 m) high lies off the western side of Amaknak Island in Unalaska Bay. **Foul ground** extends nearly ½ mile northward of Hog Island. The reef extending ¼ mile from the north point, a part of the foul ground, has numerous rock ledges jutting up from the rocky bottom. Clear passage exists between Hog Island and Amaknak Island. Favor Amaknak Island to avoid a 3¼-fathom 6.1 m) shoal, which is 545 yards northeast of the south end of Hog Island. A large thick kelp patch lies southward of Hog Island and should be avoided.

Nateekin Bay, on the southwest side of Unalaska Bay, affords good anchorage, except for northeasterly winds, for small craft in 3 to 4 fathoms (5.5 to 7.3 m) 490 yards east of the head of the middle bight of the northwest shore. A shoal area of 1 fathom (1.8 m) lies southeastward of this anchorage.

Broad Bay, a bight in the western shore of Unalaska Bay 2½ miles southward of Eider Point, affords a fair anchorage in 25 fathoms

(46 m), sandy bottom, ½ mile offshore. The anchorage is exposed to northeasterly weather.

Wide Bay, 1¼ miles westward of Eider Point also affords fair anchorage in 25 fathoms (46 m), mud and sand bottom, ⅜ mile from the west head of the bight.

Makushin Valley, which borders on Broad Bay, is a flat covered with tall grass and about 15 feet (4.6 m) above high water. A sizable stream courses through the valley. The shore along Broad Bay is composed of a very coarse sand. A similar valley and shore are found at Wide Bay. The waterfall just north of Broad Bay can be seen only in the restricted area to the southeast.

EIDER POINT is at the southern end of a rocky bluff formation of great height which characterizes the coast for several miles along the western side of the entrance to Unalaska Bay. In places along this shore there are massive accumulations of loose rock and earth lying at the base of the bluffs, formed by slides. The bluffs are of horizontal strata and those about Cape Cheerful have a distinct reddish hue. The point itself (Eider Point) is a comparatively low projection pointing southward, and from it a narrow **reef** extends in the the same direction for a distance of ¾ mile into Unalaska Bay. The reef bares 2 to 4 feet (0.6 to 1.2 m) at low water and usually breaks at high tide but not generally along its outer limit. Although deep water can be carried from seaward to the vicinity of the end of the reef, Eider Point should be given a berth of at least 1 mile when passing southward of it.

The **CASCADE,** a waterfall 133 feet (41 m) high, on the west coast of Unalaska Bay between Cape Cheerful and Point Eider and distant 1½ miles from the latter, is the most distinguishable feature between the point and the cape. It makes an excellent landmark during a low-ceiling fog when only the lower part of the cascade can be seen. The bluff at the cascade has a remarkably **smooth stratified face** up to the elevation of about 100 feet (30 m) where it forms a distinct horizontal line directly above which the upper strata have very irregular surfaces and appear to overhang in places. The cascade emerges from a slight depression at the top to form a comparatively narrow white waterfall to a sea level bench at the foot of the bluff. On either side of the cascade are rock-and-earth-slide accumulations.

Cape Cheerful and the northwest coast of Unalaska Island are described on page 345.

***Directions,* Unalaska Bay.**—When bound for the 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 to the eastward with the possibility of being carried by currents into the dangerous region of the passes.

Landmarks.—Makushin Volcano, over 5,000 feet (1,500 m) high, is prominent, being the highest point on Unalaska Island. The volcano can generally be seen in clear weather. **Table Top Mountain,** 2,710 feet (826 m) high, back of Cape Cheerful, and the crater of an **extinct volcano** with three points, the highest being 2,293 feet (699 m), west of Eider Point, are distinctive. Either peak may be

used as a leading mark in approaching Cape Cheerful until close enough to distinguish the surrounding features; however, the crater west of Eider Point can be used only when it is not obstructed from view by the higher elevations northwestward of it. 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, **Koriga Point** can be seen at times. The land slopes gently to the point from Makushin Volcano, and ends in a small peaklike formation. From eastward the **cascade** southeastward of Cape Cheerful is also useful as a mark, particularly for low visibility. 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. Further descriptions of the land marks will be found elsewhere in this volume.

Chelan Bank, the extensive 45-fathom (82 m) bank extending about 7 miles 30° true from the vicinity of Cape Cheerful, may be found useful in fixing the position of a vessel by soundings. The bottom on the bank is composed of black sand and gravel; on the shelving areas the bottom is of gray sand and gravel up to about the 80-fathom (146 m) depths. Chelan Bank, at its northeast end, almost makes a junction with a similar bank extending northward and westward from Cape Kalekta, the two banks practically enclosing Unalaska Bay. A light tide rip occurs along the outer edge of Chelan Bank.

Coast Guard cutters moored at Unalaska or Dutch Harbor, or anchored in the vicinity, may be called upon to furnish radio bearings to assist in making the entrance to Unalaska Bay. (See: *Radio bearings from other vessels*, p. 23.) Coast Guard cutters in entering use the Dutch Harbor radio station (NPR) as a radiobeacon. It has been the practice of the *Chelan* to head in on a radio bearing of about 180° on Dutch Harbor radio station, sounding continuously and listening for whistle echoes. On several occasions fog lifted when within 1 mile of Ulakta Head, or else in dead calm weather, whistle echoes from Ulakta Head and the eastern shore were easily heard.

Approaching from the eastward, tabulated courses for Unalaska Bay will be found on page 32.

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. If going alongside the dock, drop an anchor and warp in. This is necessary to enable a vessel to get away in case of a sudden onshore wind.

To enter **Iliuliuk (Unalaska) Harbor,** using the main channel southward of Iliuliuk Reef and Tuscarora Rock, stand southward on a **220° true** course until abreast of buoy 1. Then approach the lighted buoy on a course **285° true** with Coast Guard radio tower at Unalaska ahead and the lighted buoy appearing slightly to the right of the radio tower. Round close aboard the lighted buoy, and then

haul for a position with the wharf slightly on the port bow, favoring the reef on the east side of the channel.

Caution.—In rounding *Tuscarora Reef lighted buoy 2*, care must be taken to avoid striking the steep sand bank on the south side of the channel. Vessels should approach the buoy on a course to make the turn safely. The turn may be made effectively under most conditions by approaching to pass the buoy with little or no headway and then turning with engine full ahead and rudder hard over. The *station position* of the buoy is on the south side of Tuscarora Reef.

If another vessel is lying along the north face of the wharf, it must be passed close aboard in order to avoid the shale spit extending from the north shore. When the stern is even with the northwest corner of the wharf, a swing into the harbor may be made.

If the wharf is clear vessels usually break around the corner to lie along the western face of the wharf. There is clear swinging room for a 250-foot overhang. Vessels lying along the north face of the wharf are subject to a very heavy heave during stormy weather. Mooring lines are in danger of parting and several shots of old anchor chains secured to the wharf are available for use to augment the mooring lines. Heavy moorings are also used on the western face.

Caution.—In leaving Iliuliuk Harbor, avoid too much headway, as the vessel will likely approach Iliuliuk Reef dangerously close before swinging into the channel south of the reef. Tuscarora Reef lighted buoy must be rounded close to.

CAPE CHEERFUL (chart 8860), on the north coast of Unalaska Island just westward of Unalaska Bay, consists of a **main and secondary headland** about 1 mile apart; the two headlands being separated by a low grassy valley emerging on the coast. The valley is flat at the base and resembles an amphitheater; it is called **The Dry Dock.**

The main headland is the western one of the two and is adjacent to the cove which is marked by Wislow Island and a deep valley extending inland. This headland projects farther to seaward and is marked by a peak 1,808 feet (551 m) high. The peak is close to the extremity of the main headland and dominates the end of the cape from most directions of approach. It may, however, appear to merge with the higher elevations back of the secondary headland or is shut out by them when the peak and higher elevations are on range.

Table Top Mountain, with an elevation of 2,710 feet (826 m), is the highest summit back of Cape Cheerful, but there are several peaks to the eastward of it approaching this elevation. The western slope of this mountain descends to the deep valley extending inland from the cove marked by Wislow Island. The mountain has a wide flat top.

The bluffs about Cape Cheerful present a rugged and almost vertical appearance and rise to elevations of 1,000 feet (305 m). They are of horizontal strata and have a distinct reddish hue. Large slides of loose rock at the water line can be seen at places all along the cape. The area outside the base of the bluffs which is at or near the high water line is very rocky and is strewn with boulders. Foul ground extends several hundred yards off the extremity of the secon-

dary headland and its northeastern side. Depths of over 20 fathoms (37 m) are found ½ mile off Cape Cheerful.

The **currents** apparently meet in the vicinity of Cape Cheerful, the flood setting northwestward from Unalga Pass and northeastward from Makushin Cape, creating eddies which set toward the shore. In rough weather the seas are apparently accentuated in the vicinity of the cape and it is therefore advisable to give the cape a wide berth under such conditions.

Along the northeast side of the secondary headland of Cape Cheerful, a half mile length of the bluff is fronted by a comparatively **low, grassy slope** projecting out 350 yards or less to form a rounded but somewhat irregular shore. There is a prominent **cascade** (p. 336) on the coast about 1½ miles southeastward of the grassy slope.

Wislow Island lies in the middle of **Reese Bay,** a cove between Cape Cheerful and Cape Wislow. The pronounced valley or mountain gap extending inland from the coarse sand beach at the head of the cove is a long flat covered with tall grass, partly filled by a lake, and flanked by the side slopes of ridges which terminate at each cape. The island, although rocky, appears regularly rounded in shape. It is 121 feet (37 m) high, and the top is grass covered. Although small Wislow Island stands out prominently against the low background and in this respect is a good landmark during low visibility.

Reese Bay, mentioned above in connection with Wislow Island, is about 1 mile wide at the head which consists of a low narrow strip of sand with some marsh grass. It is about 1 mile deep but appears deeper on account of the low valley that extends inland. **Anchorage** in 14 fathoms (25.6 m) may be found one-half mile northeastward from Wislow Island, with some shelter from southeasterly weather. There are depths of 2 to 3 fathoms (3.7 to 5.5 m) southward of Wislow Island, but there is no shelter in northerly weather, and the shape of the bay apparently concentrates the effect of any northerly swell, so that it breaks well off the shore at the head of the bay.

The channel westward of Wislow Island is blocked by a detached rocky shoal, marked by kelp, with a depth of about 1 fathom (1.8 m) lying 350 yards westsouthwestward from the south end of Wislow Island.

CAPE WISLOW, 2½ miles westward of the main headland of Cape Cheerful, is dominated by **Mount Marshall Reese,** 2,540 feet (774 m) high. This peak is at the northern end of the long ridge which parallels the low valley extending inland from Wislow Bay. The land slopes gradually and evenly from Mount Marshall Reese to the end of Cape Wislow where it terminates in a bluff about 600 feet (183 m) high.

Southwestward of Cape Wislow, about 1 and 3 miles, respectively, there are two remarkable **rocky cliffs** about 2,000 feet (609 m) high. They appear as equilateral triangles from the northwestward. A smaller triangular bluff 820 feet (250 m) high lies between them. Several large **waterfalls** from 200 to 500 feet (61 to 152 m) high emerge from the gullies between these bluffs.

Irishmans Hat, a square tower rock, 85 feet (26 m) high, lies about ¼ mile offshore from the foot of the westerly cliff described above. This rock seldom can be identified from any direction except northeastward where it shows clear of the land.

Wood Bay, just westward of Irishmans Hat, and about 6 miles west-southwestward from Cape Cheerful, is an open bight, having a sand and gravel beach at its head. The **lowland** to the southward separating the mountainous mass of Makushin Volcano from the highland in the vicinity of Mount Marshall Reese often can be recognized from offshore when the mountains are in clouds.

Anchorage with some shelter from southwesterly and southeasterly weather can be found in depths of 11 fathoms (20 m) ½ mile from the westerly shore, with Ridge Point bearing about 275° true. The depths shoal rapidly towards the head of the bay and depths of 3 fathoms (5.5 m) and less are found 600 yards offshore near the southeastern part of the bay.

Point Tebenkof, the western point of Wood Bay, 7½ miles west-southwestward from Cape Cheerful, is probably the most readily identifiable of any of the points along this stretch of coast, especially from the southwestward. The point terminates in a grassy **bluff** 800 to 1,000 feet (244 to 305 m) high which overlooks all the lower points to the southwestward.

From Point Tebenkof the land rises gradually and evenly to a **flat-topped peak** or **ridge** 3,505 feet (1,068 m) high, 2¾ miles inland. From the southwestward this ridge is seen on the sky line as a straight line slightly inclined to the horizon and terminating at the inshore end in a smoothly rounded peak which is a spur from the higher land about Makushin Volcano. The bluff at Point Tebenkof may be seen over and inside of the bluff at Bishop Point and the hill at Point Kadin.

A **red cinder crater,** 1,874 feet (571 m) high, lies 1¼ miles south of Point Tebenkof and to the eastward of the ridge. This crater peak shows over the ridge to the westward as a flat-topped hump appearing as a part of this ridge. It is a useful landmark because it is often clear when all other peaks are obscured. It can be identified readily from northeastward, as here it shows clear over the lower land at the head of Wood Bay, while all other points and landmarks merge with the higher land in the background.

Point Tebenkof should be given a berth of at least ½ mile. A rock awash at high water lies 200 yards offshore about ⅜ mile westward of the point and a 2⅙ fathom (3.9 m) shoal marked by heavy kelp lies 375 yards offshore, outside of the rock awash.

A large **slide** 1¼ miles westward of Point Tebenkof may be identified under certain conditions of light. The bare place has the shape of an enormous key-hole, about 600 feet (183 m) high.

Bishop Point is a level table-like projection, 250 feet (76 m) high, about 3 miles west-southwestward from Point Tebenkof. It terminates in a **pinnacle** 102 feet (31 m) high. A deep **gorge** extends 3½ miles southward from the point. **Cascades** are visible in the summer time high up on the walls of this gorge.

Temporary **anchorage** in southerly weather may be found ⅜ mile from shore in depths of about 16 fathoms (29 m) 1 mile east-northeastward from Bishop Point or ½ mile west-southwestward from it.

Triple Falls, two large waterfalls one of which is divided into two cascades about 100 feet (30 m) high, 1⅝ miles southwestward from Bishop Point, are visible to the northward and northeastward but not to the westward.

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Koriga Point, on the northwest coast of Unalaska Island and about 11 miles west-southwestward of Wislow Island, is about 140 feet (43 m) high and difficult to distinguish except from the southwestward. There are a number of rocky islets close to shore eastward and westward of the point. Deep water (40 fathoms, 73 m) is found within ¼ mile of the point.

A round hill 320 feet (97 m) high lying about ¾ mile southwestward of Koriga Point can be identified from the southwestward when it is clear of Point Tebenkof but is difficult to distinguish when seen against the higher land.

The shore southwestward of Koriga Point is composed of rocky bluffs 100 to 300 feet (30 to 91 m) high. A small cove with a sandy beach 1¾ miles southwestward of the cape has depths of less than 5 fathoms (9 m), and the eastern part of the cove is obstructed by rocks and kelp.

Point Kadin, 14½ miles southwestward of Wislow Island, is an inconspicuous rounding section of the northwest coast of Unalaska Island. There is a group of **rocks** 18 feet (5.5 m) high, 250 yards off the cape. About ⅜ mile southwestward there is another group of rocks 7 feet (2.1 m) high, 350 yards off shore from a waterfall about 170 feet (52 m) high visible only from the northward. Extending northwestward and westward more than ½ mile from these rocks there is a rocky bank with depths from 5½ to 8 fathoms (10 to 14.5 m), while depths of 12 fathoms (22 m) are found about 1 mile westward. Tide rips occur in this vicinity, and in heavy weather the seas are perceptibly heavier. It is recommended that Point Kadin be given a wide berth, especially in bad weather.

Round Top (name applied by survey party), about 1 mile inland at Cape Kovrizhka, is a massive round-topped peak 2,452 feet (747 m) high, separated from the peaks surrounding Makushin Volcano and higher than any of the nearby peaks. It is a useful landmark.

Makushin Volcano, 6,680 feet (2,036 m) high, is a flat-topped, snow-covered mass with several jagged peaks of about the same elevation surrounding it. It can easily be identified when not covered by clouds. The westernmost of these jagged peaks is particularly sharp and distinct and has an elevation of 5,242 feet (1,598 m).

CAPE KOVRIZHKA, also called **Cape Gatton,** 5 miles south-southwestward of Point Kadin, is very prominent and easily distinguished by the dome shaped rocky hill 233 feet (71 m) high which forms its westernmost extremity. Numerous rocks are found around this cape, and it should be given a berth of 1 mile. Under certain combinations of wind and current comparatively heavy tide rips occur in the vicinity of the cape.

On the north side of Cape Kovrizhka is a small open bay which affords a temporary anchorage during moderate southeast weather.

Volcano Bay, immediately south and east of Cape Kovrizhka, is a small bay open to the west and south, forming a fair anchorage for easterly weather. However, strong winds are to be expected, and with winds shifting to the south and west the bay becomes quite rough and dangerous to small craft.

Makushin Bay, indenting the western side of Unalaska Island, is 2½ miles wide at the entrance and extends in an easterly direction for 5 miles to the entrance of Anderson, Cannery, and Portage Bays.

An Aleut village is situated on the north and west side of Makushin Bay. The monthly mail steamer from Seward makes regular calls at Makushin, but there is no post office. Fresh water is obtainable from a stream at the village.

The northern entrance point to Makushin Bay is marked by a rocky islet 104 feet (32 m) high, lying ½ mile southwestward of Makushin Point, with several rocks between it and the point.

***To enter* Makushin Bay** from northward, steer to pass about ½ mile westward of the rocky islet on a course of **135° true**, and when it is abeam, steer **95° true** to head for Cathedral Rocks, a group of prominent pinnacle rocks. Continue on this course until Priest Rock is abeam, then steer **26° true** to head for the left or west edge of the prominent glacial valley, continuing on this course until the village is just abaft the beam, then head in for the village, and anchor in 15 fathoms (27.4 m) mud bottom, with the church bearing 285° true and Priest Rock bearing 230° true and about ¼ mile off the beach. This anchorage is good for westerly and northerly weather, but with southerly weather considerable swell makes in, and in easterly weather it becomes quite rough.

In making Anderson, Cannery, or Portage Bays, steer midchannel courses through Makushin Bay, passing midway between the reef to the westward of the entrance to Anderson Bay and the 8-fathom (14.6 m) shoal lying 1½ miles to the north of this reef.

Anderson Bay is the southern arm of Makushin Bay. It affords several good anchorages of moderate size and at least one anchorage for one or more larger ships. A gravel spit, forming the point on the western side of the entrance is a distinctive feature. The bay extends about 6 miles in a southeasterly direction and is terminated by two arms with a wedge-shaped peninsula between them. Four well-rounded grass covered islands lie in the eastern half of the bay. These islands are well apart from one another; the northern one is near the eastern entrance point of the bay and the southern one is well inside the entrance to the eastern arm.

A reef baring at low water lies 440 yards offshore, 1¼ miles westward of the western entrance point to Anderson Bay.

To enter Anderson Bay, steer 160° true (mid-channel) from a position ¾ mile northeastward of the west entrance point which is a low gravel spit. Pass westward of the islands until the southern tangent of the second island from the north is ⅓ mile on the port beam (course 160° true). Then steer **188° true** (mid-channel) and proceed to anchorage in the western arm in 20 fathoms (37 m) water, mud bottom, northward of the narrow pass formed by two opposing points. The narrow pass is about 1¼ miles from the entrance to the western arm and is obstructed by a dangerous shoal of 1½ fathoms (3.0 m) in mid-channel.

To proceed to anchorage in main bay, pass south of the second island from entrance and midway between the second and third islands and anchor in 20 fathoms (37 m), mud bottom, in bight of main shore opposite the second island.

To proceed to anchorage in eastern arm of Anderson Bay, pass midway between the third island from the north and the point of the peninsula at the entrance to the arm. Then pass to eastward of the fourth island anchor in 22 fathoms (40 m) water, mud bottom, on a

bottom ridge of that depth extending from the middle of the fourth island to the main eastern shore.

Cannery Bay, 1 mile to the eastward of Anderson Bay, extends about 3 miles in a southeast and easterly direction. Near the head and on the south side of the bay is the wharf and cannery of the Pacific American Fisheries, which at present is inoperative. The wharf is in fair condition, with a frontage of about 80 ft. and fresh water can be obtained there. However, the pipe line is deteriorating. A watchman is maintained at the cannery. To enter Cannery Bay, steer mid-channel courses, favoring the eastern side at the entrance. The only anchorage is at the eastern end of the bay, about 0.4 mile northeast of the cannery in from 15 to 17 fathoms (27 to 31 m) of water, soft bottom.

Portage Bay extends about 4 miles in an easterly direction from the entrance to Cannery Bay. Two shoals having a least depth of 6 fathoms (29.3 m) are found in its entrance in almost mid-channel. To enter Portage Bay, pass on either side of these shoals and then steer mid-channel courses until within ¾ mile of the head of the bay, then steer to pass north of the 1⅙ fathoms shoal and rocks found near the head of the bay. An indifferent anchorage for small vessels may be had in 19 fathoms sticky bottom midway between these rocks and the north shore.

A trail to Unalaska begins at the prominent valley about 1 mile from the head and on the north side of Portage Bay. The trip to Unalaska takes about 8 hours.

Cape Starichkoff, forming the southern entrance point to Makushin Bay, is marked by an off-lying rock 27 feet (8.2 m) high. Numerous rocks, sunken and awash, are found along the shore in this vicinity, but are not known to extend beyond ¼ mile off the beach. The mountains rise abruptly from the beach in this vicinity to a height of 1,600 feet (487 m).

Two miles southward of Cape Starichkoff there is a deep narrow valley, trending eastward. Convenient anchorage in southeast weather can be found off this valley ½ mile from shore in depth of about 20 fathoms (36 m) with the center of the valley bearing about 110° true and a conspicuous small rock lying about 150 yards off the shore at the southern edge of the valley, bearing about 150° true. Launches can find more shelter by anchoring closer to shore. A small bank with least depth 6¼ fathoms (11.3 m) lies 450 yards westward of the rock, mentioned above.

Skan Bay, on the west side of Unalaska Island, has its northeastern entrance point at the ledge 2 miles southward of Cape Starichkoff. It is 2 miles wide at the entrance and extends about 4 miles in a southeasterly direction.

A bank, on which a least depth of 3¾ fathoms (7.0 m) was found, lies in the bay entrance, 1⅜ miles 202° true from the entrance point on the northeast side and ¾ mile northward of the southwestern entrance point.

The two arms at the head of Skan Bay are separated by a high headland. The southeastern arm is too deep to furnish any convenient anchorage. The entrance to the southwestern arm is about ⅜ mile wide, choked with rather heavy kelp, but has a least depth of about 5½ fathoms (10 m) in midchannel.

The *Surveyor* used an anchorage just inside the southwestern entrance point of Skan Bay, a little less than ½ mile from shore in a depth of 15 fathoms (27.4 m) where some shelter from westerly weather was found.

Spray Cape, about 3 miles westward of the southwestern entrance point of Skan Bay, is conspicuous from the northward. A small islet about 80 ft. (24.4 m) high lies close to shore off its northwestern side, and rocks covered at high water extend southwestward from this point.

The shore between Skan Bay and Spray Cape is fringed by pinnacle rocks and islets and a bank with least depth of 6¾ fathoms (12.2 m) extends more than ½ mile offshore.

From Spray Cape the shore trends south-southeastward for 3½ miles to the entrance to Pumicestone Bay. It is high and steep, fringed by rocks, but deep water is found at a distance of ⅜ mile. An anchorage with good shelter in southeast weather can be found ⅜ mile from the eastern shore at the entrance to Pumicestone Bay in a depth of 20 fathoms (37 m) off a small indentation in the shore.

Pumicestone Bay, on the northwest side of the long westerly extension of Unalaska Island, is somewhat over 1½ miles wide at the entrance, narrowing rapidly to less than ½ mile. The bay extends about 9 miles in an easterly direction with an abrupt **S** turn to the northward and eastward about 4½ miles from the entrance. The turn is partially blocked by a small flat-topped island about 30 yards in extent and 36 feet (10.8 m) in elevation, leaving a clear channel 300 yards wide.

The north shore of Pumicestone Bay is formed by low, grass-covered hills. The shore is extremely rocky and rugged, the bluffs having a general elevation of 50 feet (15.2 m). The south shore is almost vertical and characterized by many slides. The bay is divided by the turn into an outer and an inner bay.

There are two large streams flowing into the bay, one on the northeast and the other at the southward side of the head of the bay.

At the head, the *inner bay* widens forming a basin ½ mile in diameter where good anchorage may be found, in depths of about 20 fathoms (36 m) or less. The southeastern part of this basin shoals abruptly from 10 fathoms to less than 1.

To enter the inner bay from the northward, passing about 1 mile off Spray Cape, steer 180° true to about 1 mile northward of Kashega Point. Thence 112° true to pass about ¼ mile southward of the rocky grass-topped island. Round the island and keeping a mid-channel course, make the **S** turn and continue in an easterly direction to the anchorage at the head of the bay.

Kashega Point, the southern entrance point of Pumicestone Bay, is 1500 feet (457 m) high and deep water is found close to its northern shore.

About 1½ miles southward of Kashega Point there is a bold rocky island about 80 feet (24 m) high, 600 yards from shore. A bay almost circular in shape and 1 mile in diameter indents the shore eastward of this island locally known as McIver Bight. A good anchorage can be found in the center of the bay in depths of about 10 fathoms with the island bearing East. The bay is exposed to the westward and northwestward, but small boats can find some

shelter from westerly weather by anchoring closer to shore. The southeastern part of the bay has depths of 2 to 4 fathoms (3.6 to 7.2 m).

Kashega Bay is on the northwestern side of the long westerly extension of Unalaska Island and distant about 25 miles from Umnak Pass. At the southwestern side of the entrance is a low grassy island known locally as **Buck Island.** About ¾ mile northwestward of Buck Island, there is a narrow rocky ledge extending northwestward about ⅜ mile on which there are two conspicuous pinnacles. The outer one is about 95 feet (29 m) high, the inner one is about 35 feet (10.6 m) high. These pinnacles are the most conspicuous landmarks in approaching the bay. About ⅜ mile northwestward of the higher pinnacle there is a small rock about 5 feet (1.5 m) high.

The bay has a navigable entrance ½ mile wide and is about 1½ miles long in a southeasterly direction. There is a small **village** at the southeastern end, consisting of a school, church, sheep ranch buildings, and a few houses. The village shows seaward through a small angle and then is not visible until arriving well inside the bay. Mail steamers from Seward make regular calls. There is no post-office and no supplies are available. The anchorage in the bay is exposed to the northwestward and the holding bottom is reported none too good.

To enter **Kashega Bay** from a position 3 miles west of Cape Kovrizhka, steer south for a distance of about 19 miles. The pinnacle (high conical rock) will be seen slightly on the port bow. When about 1¼ miles from the pinnacle and with the middle of the entrance bearing **127° true,** head for it passing about ½ mile northeastward of the pinnacle. When well past the entrance, with the outer tangent of Buck Island bearing 270° true, hold over to **115° true** and proceed to anchorage, favoring the northeastern shore to avoid a kelp patch with a least depth of 2¼ fathoms (3.7 m), 250 yards from the southwestern shore about ½ mile northwestward of the village church. **Anchorage** in 6 fathoms (10.9 m) can be found with the church bearing about 165° true and the pinnacle bearing about 287° true. The mail boat anchors much closer to the village northeastward of the church, in a depth of 4 fathoms (7.3 m).

Just westward of Kashega Bay there is a bight known locally as **Buck Bight.** It is clear, except near the head. The bay is open to the northward.

Seolanka Point, about 175 feet (53 m) high, is the western extremity of the ridge bordering the south side of Kashaga Bay. A conspicuous rocky pinnacle 43 feet (13 m) high lies 1½ miles northwestward of the point of the cape, with a smaller pinnacle 200 yards to the southeastward. A long ledge extends towards the pinnacles from the point and there is a conspicuous flat topped islet ¼ mile off the point. The ledge and islets can be safely approached at a distance of ½ mile.

Kismaliuk Bay (Ulimidugan Bay) is an irregularly shaped bay extending roughly southeastward for 2 miles. It branches into two arms. The northerly arm extends easterly and the southern arm southeasterly. The two arms are separated by a low broad point from which a chain of bare rocky islets extends about ½ mile in a northwesterly direction. The outer islet is the most conspicuous, elevation 20 feet (6 m).

The northern arm is of little importance and affords little protection from northwesterly weather. The depth of water shoals gradually from 17 fathoms (31 m) at the entrance.

The southern arm, protected by the chain of islets, affords excellent protection. The entrance channel is clear and about 500 yards (460 m) wide, with a mid-channel depth of 12 fathoms (22 m). The water shoals gradually to the head of the arm.

To enter Kismaliuk Bay and its southern arm, round the pinnacles off Cape Hague, keeping about ½ mile off them. When the pinnacles bear **90° true,** haul around to course **148° true;** the large rocky islet off the point separating the two arms will be seen a little on the port bow. Continue on this course to a mid-channel point between this islet and a pair of low lying islets off the southern shore. After making the entrance, continue in a mid-channel course about ½ mile to anchorage in 8 fathoms (14.5 m) of water, mud bottom or on bearings as follows: tangent to a western point 304° true, islet 14° true, tangent eastern point 34° true.

Aspid Bay is the first bay east of Cape Aspid. It extends about 2¼ miles in a southerly direction and affords but little protection from northerly and northwesterly weather. The depth at the entrance is about 15 fathoms (27 m); from here the water shoals gradually to the head of the bay. There is good bottom for anchoring in 9 to 10 fathoms (16 to 18 m). Aspid Bay is separated from the bay to the eastward of it by a bold narrow **ridge** having remarkable serrations.

Cape Aspid, on the north side of Unalaska Island about 15 miles from its western extremity at Umnak Pass, has a conical hilltop, 900 feet (274 m) high, near the extremity of the cape. The shape of the hill (terminating in bluffs at the shore) is unlike any other land in the vicinity, as all the adjoining hills are flat topped with comparatively gentle slopes. The cape is a useful landmark from all directions except from the northward, where the hill merges with the higher land to the southward. A ledge extends about 400 yards offshore, terminating in an islet about 24 feet (7.3 m) high.

East Point, the eastern entrance point of Chernofski Harbor, is the extremity of a narrow peninsula composed of several hills, the highest being 315 feet (96 m) high. The seaward face of the peninsula is rugged and broken and there are rocks extending seaward on the line of the ridge. There is a deep wide cleft across the middle of this peninsula which may be identified when bearing southward of southeast.

Several small detached banks with depths of 13 fathoms (23.8 m) surrounded by deeper water lie to the northward of East Point.

West Point, the western entrance point to Chernofski Harbor, is rugged and broken with numerous pinnacles off its seaward face.

Chernofski Harbor (chart 9196).—The entrance between East and West Points, through a narrow canal formed by low promontories is about 4 miles southwestward of Cape Aspid. The village and church at one time located here have been abandoned and have disappeared, the only inhabitants are the employes of a sheep ranching company which ships fresh mutton and wool. No other supplies are available. Mail steamers from Seward make regular calls but there is no post office. There is no wharf.

There is an unwatched **light** marking East Point, about 60 feet (18.3 m) high. The light is of low power. The structure supporting the light is difficult to distinguish in the daytime. An unwatched **post light** is located at the outer end of a low point on the south shore about 2¼ miles from the entrance.

***Directions*, Chernofski Harbor.**—The entrance to the harbor is difficult to distinguish as there are no conspicuous landmarks. From the entrance, the north tangent of Umnak Island (Cape Idak) bears 309° true. The wedge shaped rock with low land to the westward of it, about 1 mile eastward of East Point, may help to identify the locality.

From a position 3 miles westward of Point Kadin, a course **205° true** for 34 miles will lead to a position about 1 mile northwestward of the entrance, heading for the tangent to the first point southwestward of West Point. On this course a small bank with a depth of 13 fathoms 1½ miles north-northwestward of East Point may be crossed. When the entrance to the bay has opened out and the entrance light bears about 110° true, enter on a course **123° true,** keeping mid-channel, as there are projecting ledges on both sides.

***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 former village.

The mail boat, on monthly calls from Seward, anchors off the buildings on the south shore about 1½ miles from West Point, where convenient anchorage can be found. In northwest weather, the inner harbor furnishes better shelter. The inner bay offers good shelter from all directions.

Fresh water can be obtained from a stream in the southern part of the Bay. The head of the bay at the southeastern end is shallow and can be used only by small boats.

In ***Umnak Pass,*** a convenient **anchorage** in southerly weather can be found about 1 mile eastnortheastward of Konets Head in depth about 20 fathoms (36.6 m). In approaching this anchorage on the ebb, allow for the strength of the current. The flood is blanked northward of Konets Head.

Lone Peak, about 5 miles northeastward of **Konets Head** (p. 358), is the top of a long narrow ridge, 1,847 feet (563 m) high, running roughly parallel to the coast. From northeastward and southwestward, the peak appears like a sharp cone and forms a useful landmark.

SOUTH COAST of Unalaska Island.—Udagak Strait separates the eastern end of the southern part of Unalaska Island from Sedanka Island (p. 331); but the latter island appears as part of the former, the two being close together and having a continuity of trend along the outside coast. The gap between the mountains on either side of the southern part of **Udagak Strait** (p. 332) stands out in a measure, from a southeasterly direction, against a background of mountains on the west side of the northern end of the strait. The 1½-mile stretch of shore forming the south entrance of the strait on the Unalaska Island side, is at the base of a very steep side of a ridge, the summit of which is 1,920 feet (585 m) high.

The mountains on Unalaska Island just westward of Udagak Strait have jagged peaks and ridges. Cliffs are general along the coast.

The south coast of Unalaska with the exception of Kuliliak Bay is unsurveyed (1937). The bays indenting the coast are incorrectly charted. In general the south coast of Unalaska and Sedanka Islands have foul areas immediately offshore. A wide berth should be given all points, particularly Reef Cape.

Between Udagak Strait and Kayak Cape the coast is rugged in appearance and is indented by small bays extending from 1 to 2 miles inland. **Hive Bay,** about 5 miles west of Udagak Strait, is the largest of these, its two arms (one extending northeast the other northwest) affording good protection from northerly weather. The bay is reported foul and should be avoided.

Staraya Harbor, just east of Kayak Cape, affords good anchorage near the head, but is wide open to the east and south and affords protection only from the north and west.

Kayak Cape is the first prominent point west of Udagak Strait. It is lower than points to the westward, bold at the extremity and its narrow ridge is marked by several prominent humps about 1,200 feet (364 m) in elevation.

From Kayak Cape westward the shoreline trends to the southwest and is deeply indented by several large bays, affording varying degrees of protection. Only two of these, Usof Bay and Blueberry Bay (see below), are considered to give adequate protection from all kinds of weather. Three Island Bay and Raven Bay are landlocked at the head, giving excellent protection for small craft only.

Protection Bay, just west of Kayak Cape, extends about 3 miles inland. There is a slight hook to the westward at the head of the bay, giving some protection for small craft from the south. This bay has the least shelter of any of the bays in the vicinity, but its depth is more convenient for anchoring.

Cape Yanaliuk, about 5 miles southwest of Kayak Cape, is easily identified by the mushroom-shaped rock just off the point. The cape has a markedly jagged appearance. A small bight on the east side of the cape extends ½ mile inland but affords no protection in bad weather.

Three Island Bay, west of Cape Yanaliuk, extends inland for about 5 miles in a north-northwesterly direction and affords good protection for small craft, in any weather, in 8 to 15 fathoms (14.5 to 27 m) at the head of the bay behind three small islands, which give the bay its name. A cove on the east side of the bay, about 3 miles from the entrance, is too deep for good anchorage. A wide cove (Foam Cove) on the west side provides fair temporary anchorage near the mouth of a stream which shows conspicuously from the bay entrance. The general depth of the bay is 40 to 60 fathoms (73 to 110 m).

Blueberry Bay, the next bay west of Three Island Bay, extends inland in a northwesterly direction for about 3 miles. A fairly sharp turn to the northward for about ¾ mile makes the head of the bay landlocked and there is good shelter but the depth, 25 to 30 fathoms (45 to 55 m), is too great for good anchorage.

Whalebone Cape, just west of Blueberry Bay, is marked by a high massive broad top hill about 1,900 feet high (579 m), which is easily identified from either direction along the coast.

Usof Bay just west of Whalebone Cape extends inland about 8 miles in a north-northwesterly direction and affords good anchorage at the head, 20 fathoms (37 m) sand. The width of the bay narrows to ½ mile about 5 miles from the entrance and a slight turn to the northward for about a mile makes the head of the bay landlocked. The general depth of the bay is over 40 fathoms (73 m). A small hanging glacier shows at the head of the bay over the west side of the narrows as seen from the entrance. There is good anchorage for small craft in a small landlocked cove at the mouth of a canyon on the west side about 5 miles in from the entrance, 7 to 10 fathoms (12.8 to 18.3 m) mud. To the north of the canyon is a conspicuous cascade. On the east side of the bay a group of sharp pinnacles marks the first point inside the bay—about ¾ mile from Whalebone Cape. A prospector's cabin is at the head of the second bight from the entrance on the east side. A rock at the entrance to this bight affords some protection inside of it.

Cape Prominence, the west entrance point of Usof Bay described in the previous paragraph, is marked by a tall cylindrical pinnacle connected at its base with the main point. It shows conspicuously from south-southwest. A flat ledge only a few feet high makes off several hundred meters, and may be mistaken for the ledges off Reef Point.

Reef Point, is easily identified by a conspicuous cathedral rock just off the southern extremity. A ledge, just a few feet above high water, extends ½ mile off the point. No dangers were noted outside of this ledge.

Raven Bay, west of Reef Point, has two entrances, one on each side of a large island. From seaward it appears as two bays. The eastern entrance is deep, but the western entrance has depths less than 10 fathoms and should be avoided pending a survey.

The narrows in Raven Bay, about 4 miles from the entrance, extend inland about 1 mile. Beyond the narrows the bay divides into two arms. At the head of the west arm is a small saltery where there is good anchorage for small craft in 3 to 5 fathoms (5.5 to 9.1 m), but no wharf of any kind. Small craft may also anchor at the head of the east arm, south of the small grassy island, 3 fathoms (5.5 m). A rock which is bare at extreme low tides is at the north end of the narrows, slightly to the east of the center of the channel. The best water is to the west of this rock. In entering the narrows from the south, care should be taken to avoid a kelp patch, about 4½ fathoms (8.2 m), on the west side, opposite a small cave on the west shore.

East Cape (chart 9196), on the south coast of Unalaska Island, is the prominent point of land or headland between Eagle and Kuliliak Bays.

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). In southerly weather, short seas almost breaking across the entrance, make it difficult to enter. The bay offers good shelter in 5 to 8 fathoms (9.2 to 14.6 m).

The cove about 1½ miles east of the entrance to Kuliliak Bay is shoal at the head but an anchorage can be found about 1 mile from shore in 16 fathoms (29 m) with some shelter from southeasterly weather.

A wide low valley extends from Kuliliak Bay to Kashega Bay and fog often drifts through this valley from the north side in northerly or westerly weather.

Westward of Kuliliak Bay the country is less rugged, the peaks are lower and are separated by wide valleys. In the spring and early summer the snow disappears from all the peaks to the westward, while in the area east of Kuliliak Bay many peaks remain snow covered throughout the summer.

From Kuliliak Bay the shore trends southwestward for 10½ miles to a point called **Lance Point** by the survey party. Rocky ledges extend some distance off the intervening points. This shore should be given a berth of at least two miles until it has been surveyed.

Lance Point, about 8 miles northeastward of Cape Aiak, is about 200 feet (61 m) high and has the appearance of a low tongue projecting from the higher land northward of it. A small grass covered islet about 75 feet (23 m) high lies about 1 mile westward of Lance Point.

CAPE AIAK, on the south coast of Unalaska Island about 15 miles from Konets Head, is about 1,820 feet (555 m) high, and from the northeastward at a distance appears like a massive flat topped island with a massive horn or pinnacle on the southern slope. Breakers extend 300 yards southward from the southern end of the point.

Between Lance Point and Cape Aiak there is a large indentation forming an open bay which was called **Aiak Bay.** At its head is a smaller bay with sandy beaches partly inclosed by a chain of low rocky islets; the smaller bay is apparently shoal and furnishes little protection. The eastern part of Aiak Bay appears to be foul. Anchorage with shelter from northeast to southwest can be found 1 mile northward of Cape Aiak in depths from 12 to 15 fathoms (21.9 to 27.4 m) ½ mile from shore.

A small bank with a least depth of 11 fathoms (20.1 m) lies 1⅜ miles 284° true from Cape Aiak and about ⅜ mile from shore. Depths of 20 fathoms (36.6 m) are found close to this bank.

About 2 miles northwestward of Cape Aiak and ¼ mile from shore there is a group of islets about 250 feet (76 m) high consisting of fantastically eroded pinnacles called **Gargoyle Islands** by the survey party. A reef awash at high water connects these islets to the shore. A shoal with a least depth of 3 fathoms (5.5 m) which breaks in heavy weather lies about 670 yards 205° true from the southwestern extremity of these islands. Another shoal of the same depth lies 1,220 yards 290° true from the same point and about ½ mile southward from a rocky islet lying close to shore. A sunken rock which breaks in moderate weather lies 1,308 yards 332° true from the southwestern extremity of Gargoyle Islands and about 400 yards from shore.

Anchorage for launches with some shelter from southeastward can be found about 250 yards from shore northwestward from the Gargoyle Islands in depths of about 5 fathoms (9.1 m). This anchorage is not recommended but furnishes the best available shelter along this coast between Umnak Pass and Kuliliak Bay.

About 2 miles southwestward from the Gargoyle Islands there is a low narrow point projecting southeastward called **Serpent Point** by the survey party; and between them is **Surveyor Bay,** about 2½

miles in extent. The northern shore is composed of low sand dunes. There are several rocky ledges extending about 700 yards off the western shore. A rocky patch with depths of 4⅔ fathoms (8.5 m) which breaks in heavy weather lies 1½ miles 23° true from Serpent Point. Anchorage with good shelter except from the south and southeastward can be found ¾ mile north of Serpent Point and ½ mile from shore in depths of 15 fathoms (27.4 m). There is an 8-fathom (14.6 m) spot ½ mile 152° true from Serpent Point.

About 1¾ miles westward of Serpent Point there is a chain of grassy islets projecting southward and terminating in a rocky islet **(South Rock)** about 25 feet (7.6 m) high, forming the southernmost feature off Unalaska Island. This islet lies 8 miles southwestward of Cape Aiak and 9½ miles southeastward of the west end (Konets Head) of Unalaska Island. Depths of 20 fathoms (36.6 m) are found 300 yards off the south side of the islet. This islet is about 3 miles southward of the chartered position.

Southwest End is about 6 miles 305° true from South Rock. The point is marked by a round hill 397 feet (121 m) high. A rocky ledge about 25 feet (7.6 m) high extends ½ mile southward from the point.

Konets Head, the western extremity of Unalaska Island, lies almost 3 miles northwestward of Southwest End and is marked by a conspicuous **knoll** 127 feet (38.7 m) high.

Lone Peak, about 5 miles northeastward of Konets Head, is described on page 354.

The shore between Southwest End and Konets Head is fringed by reefs and ledges extending almost ½ mile offshore. Ledges extend about 300 yards westward from Konets Head but deep water is found about 400 yards westward of these ledges. A bank with a least depth of 8 fathoms (14.6 m) surrounded by much deeper water, lies 1¾ miles 257° true from Konets Head. Heavy tide rips occur on this bank on the ebb.

About 1½ miles south of Konets Head there is a flat topped grassy island about ⅓ mile in diameter and 204 feet (62.2 m) high. The name **Emerald Island** was applied by the survey party; the grass becomes green much earlier than on the main island and on account of the rich soil remains greener throughout the summer. The island is fringed by reefs and a rock lies 700 yards southeastward of it. Another group of rocks about 10 feet (3.0 m) high lies ½ mile to the northward of the island. On the west side of the island rocks extend 350 yards westward.

Irregular bottom with numerous spots with depths of 11 to 14 fathoms (20.1 to 25.6 m) extends 3½ miles southward of Emerald Island. Tide rips which have the appearance of breakers occur on these spots on the ebb; with a strong ebb and an opposing breeze they attain a considerable size. It is advisable to avoid this area.

POLIVNOI ROCK, about 17 feet (5.2 m) high and 100 yards in diameter lies 5 miles 235° true from Konets Head. A breaker lies 300 yards southwestward of it. A large herd of sea lions is found in the vicinity. In heavy weather, seas wash over the rock. This rock is apparently the one charted as a rock awash, as the position relative to Konets Head is somewhat similar and there is no rock awash in the vicinity corresponding to the one shown on the chart.

***Directions,* south side Unalaska Island.**—The following courses are laid about as close to shore as it is considered advisable to go without using extreme precautions. From a point 6 miles south of Emerald Island, a **90° true** course for 7 miles will bring South Rock bearing 0° true distant 2 miles. Thence a course **68° true** for 35½ miles will bring Cylinder Point 2½ miles distant bearing 338° true after passing Cape Aiak and Reef Cape at a distance of 2 miles. From Cylinder Point abeam a course of **51° true** for 25½ miles will bring the eastern entrance point of Udagak Strait abeam bearing 321° true distant 2½ miles. From this point courses can be taken from Chart 8860.

UMNAK PASS, separating Unalaska Island from Umnak Island, is about 3 miles wide and about 10½ miles long in a northeast and southwest direction from the vicinity of Polivnoi Rock to that of Pustoi Rock. For description of the shore see various headings previously described in connection with Unalaska Island and those following in connection with Umnak Island.

Currents, *Umnak Pass.*—The currents attain an estimated maximum velocity of 5 knots and flow northeastward on the flood, and southwestward on the ebb, with marked counter currents along the Unalaska Island shore on the flood. The effect of the current is felt in a diminishing degree as far as Cape Idak and Cape Aspid on the north side and about 10 miles to the southward of Polivnoi Rock.

A strong current sweeps in between Emerald Island and the west end (Konets Head) of Unalaska Island on the flood, and causes a set almost at right angles to the course when navigating Umnak Pass.

On the ebb, very pronounced **tide rips** occur on the south sides of the shoaler banks in Umnak Pass and in the southern approach. These tide rips are different from the tide rips encountered in Akutan Pass and Unalga Pass. In smooth weather they look like a line of breakers and may attain a considerable height. In rough weather, they merge with the seas but accentuate the effect to such an extent that even in moderate weather a small vessel makes very heavy weather of it. Off the points along the Umnak Island shore, tide rips are dangerous for skiffs and small launches, especially between Otter Point and Kettle Cape.

After passing Kettle Cape through the **passage** (p. —) between the shore fringe of rocks and the 1½ fathom (3.0 m) shoal lying 1½ miles off the cape, a vessel bound through Umnak Pass should steer eastward for about 4 miles to a midchannel position about 1 mile northwestward of Polivnoi Rock to avoid the shoal water extending off the shore of Umnak Island northeastward of Kettle Cape, before heading for Ship Rock.

BOGOSLOF ISLAND (Lat. 53°56′ N., Long. 168°02′ W.) lies in the 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. It now consists of one main island and a rocky islet known as Fire Island. Bogoslof Island forms a useful landfall on a course west from **Cape Cheerful** (p. 345).

According to existing records, eruptions have occurred in 1796, 1883, 1906, 1910, and 1923–27, but it is probable that there have been other eruptions of which there are no records.

The 500-fathom (914 m) curve around Bogoslof Island, approximates a circle about 5 miles in diameter.

The main island once known as **Castle Island** because of a castle-shaped rock on it (see Castle Rock below), is approximately 1 mile long and ½ mile wide, extending in a northwesterly and southeasterly direction. The southern end terminates in a low, black-sand spit which is now the haul-out place of a large number of sea lions. This point was found to shift its position during the season of 1935. On the northwest part of the island is located the volcano crater of recent time (141 ft. high) from which steam emits occasionally, and adjoining the crater is a pond which is 4 feet (1.3 m) below high water. The rocky portion of the island is the home of thousands of birds.

Castle Rock on the southwest part of the main island no longer resembles a castle. Its outline is ragged and consists of two main pinnacles 333 feet (101 m) high. The eastern one is in latitude 53° 55′45″ N., longitude 168°02′11″ W.

Fire Island, 225 feet (72 m) high, lies 440 yards northwestward of the main island and is practically connected with it by a rocky ledge which is awash at m. l. l. w. It is a steep rocky island, 220 yards long and 100 yards wide, consisting of three distinct summits, the middle one being square and resembling a castle. This summit is lower than the adjoining ones. A small islet 109 feet (35 m) high adjoins Fire Island.

Anchorage can be had on the northeast side of the island, offshore in 20 fathoms (37 m), sandy bottom. Anchorage can also be found on the northwest side of the island, 800 yards offshore, in 10 fathoms (18.3 m). The above anchorages are fair weather anchorages only.

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 made Point Kadin ahead instead of to starboard. Maximum northwesterly currents of 1.3 knots were found on the northeast side of the island. There were also indications of a stronger easterly current on the northern side of the island.

UMNAK ISLAND (chart 8802), third largest island of the Aleutians, 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-shape, 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.

Another peak of about the same height, with jagged top lies 5½ mile 72° true from Mount Vsevidof and obscures the latter when viewed from the northeastward.

KETTLE CAPE, on the southeast side of Umnak Island and at the south entrance to Umnak Pass, is a jagged rocky ridge about 530 feet (162 m) high which from certain directions resembles a kettle. It is the first prominent point west of Umnak Pass. The point is more conspicuous than its height or the configuration of the shore would indicate, as low land surrounds it.

Kettle Cape is fringed by rocks; the outer ones to the southeastward are about ⅛ mile offshore and are visible only at about m. l. l. w. A large area of shoal water lies 1½ miles 135° true off Kettle Cape on which the least water found was 1½ fathoms (3.0 m). This area breaks heavily in moderate southerly weather. It is marked by kelp but the kelp is difficult to see except in flat calm weather. Depths of 10 to 14 fathoms (18.2 to 25.6 m) are found between this shoal and Kettle Cape. The *Surveyor* used this **passage** frequently as an approach to an **anchorage** east of Kettle Cape where some shelter can be found from westerly and northerly weather.

***To approach* Kettle Cape** from the eastward, the *Surveyor* proceeded as follows: From a point 2 miles 180° true from **South Rock** (p. 358), make good a course 270° true from 15½ miles, heading about for **The Pillars** (p. 365), to a position 5 miles 170° true from Kettle Cape, where a depth of about 20 fathoms (37 m) will be found. This course passes about 5 miles south of Polivnoi Rock and clears a number of patches lying south of Polivnoi Rock having depths of about 10 fathoms (18.2 m). At this position, Polivnoi Rock will be almost on the horizon bearing 45° true and the Pillars will bear about 272° true. Then steer **350° true** for about 4¼ miles, heading for Kettle Cape and passing westward of the 1½-fathom (2.7 m) shoal, the bottom shoaling gradually to about 10 fathoms (18.2 m). When about ½ mile from the fringe of rocks off Kettle Cape, change course to **56° true** heading for Ship Rock, and then round Kettle Cape cautiously at a distance of a little less than ½ mile to the **anchorage** in 8 to 12 fathoms (14.6 to 22.0 m) ½ mile eastward of the point of the cape.

The shore northeastward from Kettle Cape is composed of sections of sand beach backed by low earth bluffs and gulleys, from whence it rises gradually to the rim of the enormous crater of **Tulik Volcano** which occupies the whole northern part of Umnak Island. Outside the high water line there are several shoals and reefs. **Mt. Tulik** is a conical peak 4,103 feet (1,250 m) high on the eastern rim of the Crater. Another very sharp peak of about the same height lies 7 miles west of Mt. Tulik on the western rim of the crater. Dense smoke was being emitted from various parts of the crater intermittently during 1936. The village charted northward of Kettle Cape no longer exists, and nothing is visible.

Two miles northeastward from Kettle Cape and extending several miles northeastward, the shore is fringed by rocks extending 500 yards offshore and comparatively shoal water (less than 10 fathoms) (18.2 m) extends 1¼ miles offshore. Heavy tide rips occur in this area, dangerous for small boats.

Black Rock, a flat rocky ledge about 10 feet (3.0 m) high, lies about 7¾ miles northeastward of Kettle Cape and about ⅝ mile from shore. Depths of 12 to 20 fathoms (22.0 to 36.5 m) are found ½ mile southward and eastward of this rock.

About 10½ miles northeastward from Kettle Cape there is a point with a rocky ledge extending about 350 yards northeastward, where a landing can be made behind the ledge.

Otter Point lies about 12 miles northeastward of Kettle Cape. The intervening shoreline is featureless and Otter Point, when abreast of it, is only recognizable from the change in direction of the shoreline which here turns to the northward. From the northeastward, a knoll about 275 feet (83 m) high rising above a comparatively flat area just westward of Otter Point stands out conspicuously.

Pustoi Island is flat, grassy, about 68 feet (20.7 m) high and about 500 yards in diameter. It lies about ⅞ mile northeastward of Otter Point. The channel between Pustoi Island and Otter Point has a depth of about 8 fathoms (14.6 m). Deep water is found close off the eastern end of the island.

Ship Rock, lying 1 mile southeastward of Otter Point, is one of the most conspicuous landmarks in the vicinity. It is an island about 350 yards long and 200 yards wide with a sharp inaccessible peak 424 feet (129.2 m) high at its southern end. At its northern end there is a lower peak ending in an abrupt bluff giving the island its distinctive shape, but from NE. and SW. only the single higher peak is visible. The channel between Ship Rock and Umnak Island has depths of over 20 fathoms (36.5 m), but on account of strong currents and tide rips it should be avoided without local knowledge. A bank with a depth of 9 fathoms (16.4 m) on which swirls and tide rips occur, extends almost ½ mile eastward of the island, but deep water is found beyond this distance.

From Otter Point, the shore trends northward for 2 miles, then NNW.-ward for 1 mile, then northeastward for 2 miles forming a broad bight, called **Otter Bay** by the survey party. Good anchorage can be found with shelter from south, west, and north, in depths from 8 to 20 fathoms (14.6 to 36 m).

A vessel could remain in Otter Bay in moderate southeast weather but not in severe storms. In approaching the anchorage, the depths shoal rapidly from 20 to 10 fathoms (37 to 18.2 m) about when Pustoi Island comes on range with Ship Rock. Depths of 10 fathoms (18.2 m) are found 1 mile from shore, but depths of not less than about 6 fathoms (10.9 m) will be found at a distance of 600 yards from shore.

A reef extends 350 yards eastward from the shore at a point 1¼ miles southeastward from the southern end of the high land which begins at a point 4 miles northward of Otter Point and extends northward to Cape Idak.

The following bearings are for an anchorage about ⅞ mile from shore in depths of about 16 fathoms (29.2 m). Ship Rock (highest point) just open of west end of Pustoi Island bearing 181° true. Bluff at southern end of high land which extends northward to Cape Idak, 320° true.

The shore northeastward of Otter Bay to Cape Idak is composed of **steep bluffs,** with several rocky islets close to shore. There are no hidden dangers except very close to the land and the shore can be skirted at a distance of ½ mile.

CAPE IDAK, the northeastern point of Umnak Island, is the northern end of a long flat ridge about 1,580 feet (482 m) high, sloping gradually to the northward. From the eastward this point appears as the northern end of the island as the land to the westward is low, but Cape Tanak extends more than 3 miles farther north.

CAPE TANAK, about 8 miles west-northwestward from Cape Idak, is a low rounding point with a number of hummocks about 50 feet (15.2 m) high. Between Cape Idak and Cape Tanak there is a flat bight, which on account of the lowland back of it, gives the appearance of being farther indented than it actually is. Depths of 20 to 30 fathoms (37 to 55 m) were found about 1 mile off this shore shoaling gradually to the shore.

About 3 miles west of Cape Tanak there is another, **low narrow point.**

Nikolski Anchorage is about 14 miles southward of Mount Vsevidof. The Territory of Alaska maintains radio station KKU.

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.

In 1933, the Coast Guard cutter *Chelan* made a hydrographic survey of the outer (Nikolski) anchorage and along an approach to the anchorage. This approach is about ¾ mile southwestward of Ananiuliak Island on a course 139° true heading approximately for the church and white building at the village. The soundings reveal a gently sloping bottom toward the westward, of hard gray sand, and with no pronounced indication of danger.

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. A light has been established on the southwest end of the island.

Soundings taken continuously while approaching and skirting Umnak Island revealed a very uneven bottom in the passage leading from the Bering Sea to the Pacific, westward of Umnak Island. A shoal with 20 fathoms (37 m), found in passing over it, lies approximately 2 miles northwest of Ananiuliak Island.

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 from the village. The entire area southwestward of this reef, and between Umnak and Adugak 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 to close 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 anchorage used by the *Chelan* was in 16 fathoms (29.3 m); Niggerhead, a flat-topped hill, bearing about 45° true, the church (cross) bearing about 132° true, and a high rock bearing 242° true just inside the tangent of the southwestern cliffs. Having had occasion to ride out three moderate gales, the commanding officer considers the anchorage safe for vessels with average ground tackle for all winds except those from WSW. true to NW. true.

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 the inner harbor avoid the rock off the southern entrance point, 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.

A safe approach by small boat to the inner harbor is made by holding the western end of the barrier reef in line with the large white building until within 150 yards. This range clears the sunken rocks off the entrance which break in a moderate swell.

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. There is a herd of reindeer, foxes, and a few head of horses and cattle on the island.

The monthly main steamer from Seward makes regular calls at Nikolski. There is no post office. There is no radio communication with Nikolski.

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 southwestern 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.

The **Southwestern part of Umnak Island** is comparatively low and level and is used for grazing a large number of sheep.

Driftwood Bay is on the southeast coast of Umnak Island opposite Nikolski village; vessels have anchored here, but no detailed information is available.

It is reported that Driftwood Bay appears larger than shown on chart 8802 and that it provides shelter from northerly weather, but is exposed to all southerly weather.

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.

Off the southeast coast of Umnak Island there is a group of islands, rocks, etc.

VSEVIDOF ISLAND, the largest of the group, is roughly triangular in shape, 280 feet (85 m) high and lies about 3 miles off the coast of Umnak Island. The northeast shore of the island is steep-to, making it difficult to find anchorage depths. A narrow bank with depths of 9 to 15 fathoms (16.5 to 27.4 m) extends northward from the north point of the island. A 3-fathom (5.5 m) shoal lies about 600 yards off the southwest corner of the island.

Russian Bay lies 10 miles north-northeastward from Vsevidof Island. It is about one mile wide and 2 miles deep. A rocky ledge about 10 feet (3.0 m) high lies about one mile east of the southern entrance point. A ravine-like valley leads from the head of the bay southwestward to the west coast of Umnak Island.

THE PILLARS are two pinnacle islets about 170 feet and 125 feet (52 and 38 m) high, with a small detached rock about 100 yards northward, lying about 15 miles 34° from Vsevidof Island.

The broad bay between Russian Bay and Kettle Cape (page 361) is fringed by off-lying ledges. It has not been examined. Two broad valleys lead westward and southwestward across Umnak Island from the head of this bay.

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.

On the north coast there is a cove locally known as **Applegate Cove** which is reported to afford good anchorage. Otherwise there are no anchorages reported and it is difficult to find 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. It is reported that the Islands of Four Mountains are out of position on the chart (1933).

YUNASKA, AMUKTA, AND CHAGULAK ISLANDS (chart 8802) 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.

It is reported that shelter for small launches can be obtained in a bight on the northeast shore of Yunaska Island. This bight is marked by a prominent rock which looks like an elephant's head. There is no fresh water near this anchorage.

Anchorage for small vessels is reported in a bay on the southwest shore of Amukta Island. It is marked by a high pinnacle rock which is left on the port hand in entering on a midchannel course. An eruption of a volcano on Yunaska Island was noted November 3, 1937. It appeared most intense in the center of the island, but smaller eruptions were visible at the extreme east and west ends. There is a fox hunter's cabin at the head of the bay. There is no other information available 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 or "Seventy-two 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.

In 1927, the *Algonquin* was boarded by several high breaking seas about 25 miles northeast of Seguam Island. These seas were encountered along a stretch of about 2 miles, where tide rips were about 20 feet (6.1 m) high. Tremendous tide rips also have been reported 50 miles northward of Amukta Pass.

SEGUAM ISLAND (chart 8802), 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 side, 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.

A breaker in heavy weather, marked by kelp at times, is reported 19 miles 0° true from the southwestern end of the island.

It is reported that there is a bight on the northeast side of the island. Anchorage can be had in this bight in 20 fathoms (37 m). Fresh water is available and a fox rancher's cabin is located on the shore of the bight.

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 off-shore dangers.

The Coast Guard Cutter *Haida* passed through Seguam Pass about 3 miles southward of Seguam Island. The sea was found very confused and the fathometer indicated very irregular bottom. Tide rips extend 5 to 7 miles westward from Seguam Island. The sea is extremely rough in these rips, even in 75 fathoms of water. The least depth found was 53 fathoms (97 m). The pass is not recommended.

ANDREANOF ISLANDS (chart 9102) extend in a long chain from Seguam Pass to Amchitka Pass.

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 master of a trading vessel, having local knowledge, recommends a berth of at least 2 miles along the northern shore. 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.

A shoal of about 4 fathoms (7.3 m) is reported 1½ miles northward of the west end of the island, and a breaker about 300 yards northeastward of the northwest point of the island. Heavy tide rips extending several miles northeastward of Amlia Pass have been observed with a moderately heavy swell from the northeast. A breaker is reported 200 to 300 yards northeast of the northwest point of Amlia Island, somewhat to the eastward of a line from the point to Cape Shaw.

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.

Along both shores of the Amlia Pass there are steep rock bluffs rising to low rolling hills. The higher bluffs are on the Amlia Island side. The southeastern point of the pass is marked by a large pinnacle.

Dangerous reefs are reported to extend well into the pass from the ledge that makes out from the western side. The outer limits of these reefs are said to reach a point only 1/8 mile away from the eastern side of Amlia Pass at the western point of Amlia Island.

The current floods to the north and ebbs to the south. The duration of slack water is reported to be 10 to 20 minutes. The flood current sometimes lasts 12 to 14 hours. In general, the tide rips are stronger on the south side of the pass during the flood and on the north side during the ebb.

The pass is considered dangerous for strangers and unnavigable with heavy weather setting in.

Vessels of about 13 feet draft have gone through the pass. The pass has not been surveyed. The following directions are considered good by experienced local navigators, but if followed should be used with caution:

When making **Amlia Pass** from the southward, head for the north point of the small bay on the west end of Amlia Island on an approximate true north (N. by W. mag.) course with Cape Kudugnak just open past the end of Amlia Island, coming onto this course while 2 miles or more off the Amlia shore in order to avoid dangers lying well off the Amlia shore near the southeast entrance to the pass. When up to the north end of the small bay, hold the Amlia shore at a distance of 100 to 150 yards until up to the northeast point of the pass. Then head for Cape Kudugnak until vessel is well in the open.

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 Kanaga and Attu. A low pass crosses the island from Nazan to Korovin Bays. The northeastern portion contains the volcano **Korovin**, 4,852 feet (1,480 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. There is a high conical peak near **Cape Shaw.**

NAZAN BAY (chart 9010) lies on the eastern coast, facing Amlia Island; the west point of Amlia is a conspicuous landmark for making the bay. The bay was surveyed in 1934.

Cape Kudugnak is a northern point of the entrance to Nazan Bay. A 200-foot (61 m), rounded, grassy knoll rises abruptly from the shore of the cape. When viewed from a distant northeasterly direction, the knoll appears as a rounded islet adjacent to a low point. 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. This island has a rounded grass top and rocky bluffs. A **sunken rock** covered by 5 fathoms (9.1 m) lies 5/8 mile eastward of Uyak Island.

Palisades Point is about 1 1/8 miles northward of Uyak Island. It is marked by prominent rocky bluffs. From the top of the point

322 feet (98 m) high, a plateau extends inland to the mountains. A rock 60 feet high (18 m) lies close to the shore just west of the southern extremity of the point.

In foggy weather the harbor in Nazan Bay will often be found clear when there is fog in the entrance. The **outer harbor** is large, but unprotected from the eastward. Vessels have anchored behind the bluffs at Palisades Point in northeast weather. Strong northwest winds draw through the low land between Nazen and Korovin Bays. There is a gradually sloping bottom of sand and volcanic ash with depths of 15 to 20 fathoms (27.4 to 37 m) about 1½ miles across.

The **inner harbor** (Nazan Bay) lies in front of the village and is small and protected, with depths from 6 to 12 fathoms (11 to 21.9 m). It is somewhat exposed to the northeast. In depths greater than 5 fathoms, the swinging *radius* is about 330 yards.

The entrance is between Cone and Bolshoi Islands. There are sunken rocks along the southeast side of the entrance channel; a patch of these having a least depth of 4 feet (1.2 m) lies 330 yards northward of the *north* point of the Bolshoi Islands, and the other with a depth of 10 feet (3.1 m) lies 175 yards northwestward of the high-water rocks at the *northwest* point. Between the latter sunken rock and the southern Cone Island the channel to the inner harbor has a width of 220 yards between the 5-fathom (9.1 m) depth curves and 300 yards between the 3-fathom (5.5 m) depth curves. Foul ground extends 220 yards westward from the westernmost point of the Bolshoi Islands near the head of the inner harbor. The inner harbor provides anchorage in sticky bottom; the holding ground is not particularly good.

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 of small, low, grass-covered islands, 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. It has widths of about 40 to 200 yards between the 3-fathom (5.5 m) depth curves.

The waters off the north shore of the largest of the Bolshoi Islands is clear beyond the 5-fathom (9.1 m) depth curve. Southeastward from this island and from Uyak Island to Amlia Pass there are numerous off-laying reefs.

There is a patch of **sunken rocks** lying 200 yards northward from the north point of the largest Bolshoi Island.

Atka (also known as Nazan) is a small settlement consisting of Aleuts and half-breeds. The Bureau of Indian Affairs has a school in the village. The Kanaga Ranching Co. maintains a trading post. A limited amount of general supplies and gasoline can be obtained. The village is not visible from the bay until after passing the largest Bolshoi Island.

There are no mail facilities; the only contact with the outside being by trading schooners from Unalaska. The Territory of Alaska maintains **radio station** KLF. There is a herd of reindeer on the island which is also farmed for foxes by the natives.

A well-sheltered tide flat behind Bolshoi Islands and ⅜ mile southeast of the village is suitable for beaching boats. Atka is the only village between Umnak and Kanaga Islands.

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.

Trading vessels bound through Amlia Pass use the channel behind the Bolshoi Islands. Southward of Cape Utes, this route remains unsurveyed.

Caution: **Local magnetic attraction** exists in Nazan Bay. Some of the values of magnetic variation as determined in 1934 are as follows: Cape Kudugnak, 12°20′ E.; Flat Point, 8°51′ E.; Palisades Point, 12°47′ E.; Uyak Island 10°27′ E.; Cone Islands, 11°42′ E.; Point 1 mile southwest of Cape Utes, 8°15′ E.; and Rock ⅓ mile North of Cape Utes, 16°05′ E.

Tides.—The tide in ***Nazan Bay*** is chiefly diurnal. The range from mean lower low water to mean higher high water is about 3½ feet.

To enter **Nazan Bay.**—Pass ⅝ mile south of Cape Kudugnak and steer **270° true.** When Uyak Island is on the port beam distant ½ mile, head for anchorage as desired in the outer harbor, or, to enter the inner harbor, steer **250° true** for ⅞ mile with the high pinnacle on the eastern Cone Islet ahead. Then steer **225° true,** passing midway between the highest part of the southern Cone Islet and the high-water rocks at the northwestern point of the largest Bolshoi Island, and anchor as desired.

Korovin Bay (chart 9196) is on the western side of Atka Island. A low pass connects the head of this bay with that of Nazan Bay and the island in this locality is estimated to be about 2½ miles wide. The United States Coast Guard recommend the following directions for entering: Round Cape Korovin and stand in along the beach about 1½ miles offshore. Round the point at the southeastern end of the first bight and haul up for the anchorage off Korovinsky. There are several rocks awash about 0.3 mile southwest of the point. The anchorage selected is in 14 to 20 fathoms (25.6 to 37 m) on the following approximate bearings: Middle of islet, 10° true; the point at the southeastern end of the first bight, 275° true.

Sand Bay is a small bay on the southeast side of Korovin Bay. It is well sheltered from seaward by great rocky cliffs and islets. The bay is apparently clear of dangers, with depths ranging from 20 fathoms (37 m) to 5 fathoms (9.1 m) just off the sand bar at the head of the bay. The stream has a bar at its mouth which prevents boating water. Ducks abound in the marshlands on the eastern side of the bay and ptarmigan in the hills behind the bay.

To enter Sand Bay from the anchorage off Korovinsky, steer a course well clear of dangers until the entrance to Sand Bay bears about 150° true and stand in on that course, entering midway between the entrance points. Anchor about midway between the two bights just inside the entrance, in 20 fathoms, sticky bottom. Standing out, keep a midchannel course out of Korovin Bay. There appears to be deep water on the courses, depths ranging from 30 to 75 fathoms (55 to 137 m), the latter depth being found about half-way out. (Information from United States Coast Guard.)

CAPE KIGUN, the westernmost point of Atka Island, appears as a bald headland.

ADAK ISLAND is large and mountainous; some of the peaks are always snow covered. Fox farming is now being conducted on the island.

It is reported that there is a good anchorage in the bay on the southeast side of Igitkin Island.

Bay of Islands[1] 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 mid-channel 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, then steer **121° true**, 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, steer **149° true** 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 (4.3 m), 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.

[1] The entrance to this bay lies about 1½ miles southwestward from North Anchorage as shown on chart 9196. Bay of Islands is not shown in detail on any existing chart. A copy of the reconnaissance survey can be obtained by application to the Director, Coast and Geodetic Survey, Washington, D. C.

To enter, proceed on a **121° true** 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 two 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). An eruption was reported early in 1933. Local navigators report a landlocked bay more extensive than the one shown on the chart, on the south coast just east of Cape Tusik. It has a narrow entrance. Fox ranchers have stocked the island.

TANAGA ISLAND is westward of Kanaga Island, and has a volcano 6,975 feet (2,126 m) high on its northwest point. The volcano appeared dormant in 1933. **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. Fresh water can be obtained from the streams. The anchorage is not recommended for large vessels, but small craft can find shelter. It is reported that a wharf has been built in Tanaga Bay.

A long **reef** is reported to extend eastward from **Cape Sudak,** the northeastern point of the island, to **Bobrof 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 vesesls 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. The waters between Gareloi Island and the group of islands to the southward of it are known to be foul and should be avoided.

Amatignak Island, 1,921 feet (585 m) high, is the southernmost island of all the Aleutians, and is an important landmark for vessels passing southward of the islands on the trans-Pacific great circle course. The *S. S. Nevada* was lost on the southern shore of this island in 1932. The vessel went ashore in a gale and broke up immediately. Thirty-one lives were lost.

It is reported that the relative positions of the islands extending southward from Gareloi Island to Amatignak Island are incorrectly shown on the chart. There was an eruption on Gareloi Island in 1930 which is reported to have changed its shape somewhat.

AMCHITKA PASS, between Unalga Island and the Rat Island group, has a reef, the existence of which is doubtful, charted in the middle of the northern part of the pass. Soundings in the pass indicate great depths.

The cutter *Tahoma* passed through Adak Strait and stood westward, rounding Cape Sasmik before picking up bottom between this cape and Cape Amagalik, and then continued northwest through Tagana Pass. About midway between Capes Sasmik and Amagalik, there is a small black island, which shows well from a distance. Both of these capes are long and low, with many rocks extending a considerable distance offshore. Near Cape Amagalik, the land is low, rolling, and grassy. Near Cape Sasmik it is bold and rocky. The beach between the two capes is relatively low and grassy with many detached rocks well offshore and with breakers extending out from the rocks.

RAT ISLANDS (chart 9102) form a group in the Aleutian Chain westward of Amchitka Pass.

Semisopochnoi Island, called also *Island of the Seven Mountains*, is 3,112 feet (948 m) high. It is usually made as a landmark by vessels cruising north along the Aleutians. It is important on account of Petrel Bank, which extends 30 miles or more 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.

PETREL BANK and **BOWERS BANK**, which is in latitude 54.5° N., longitude 179.2° E., are connected by an extensive rise of the ocean floor of the Bering Sea. From Bowers Bank the ridge of the rise turns toward the west for about 140 miles. This formation may be that of a submarine mountain range. A depth of 74 fathoms (135 m) was found in the locality of Bowers Bank. Dangerous peaks or pinnacles may exist and shoals encountered should be navigated with caution in this extensive region.

The northeast point of Semisopochnoi Island is reported as a prominent bluff, 200 to 300 feet (61 to 91 m) high. There is a sea-lion rookery on this point.

Anchorage can be had in the bight on the south side of Semisopochnoi Island in 6 to 8 fathoms (11 to 14.6 m). There is a fox rancher's cabin located on the shore of the bight and fresh water is obtainable.

Amchitka Island is long and low. The northwest end is 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.

Breakers have been reported to exist 8 miles south and east of **East Cape,** the eastern extremity of Amchitka Island. Soundings taken along the northern shore, about 4½ miles offshore, gave no indication of bottom at 115 fathoms (210 m). From these soundings,

a course was continued until the *entrance* of the passage between Little Sitkin and Rat Islands was reached. Along the course, 87 fathoms (159 m) was indicated, and midway between Little Sitkin and Rat Islands 38 fathoms (69 m) was obtained. (NOTE.—A small island is reported in this locality, see text below.)

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 (chart 8851) 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.

There is a fox rancher's house on the north side of Little Sitkin Island. It is reported that the best anchorage is 3½ miles west and south of the house. The anchorage is marked by a very prominent slide.

There is also a fox rancher's house on the bight on the west side of Chugul Island off which small launches may anchor.

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 a fox rancher's house on the north coast of Rat Island and anchorage for small launches may be found off the house. There is no further information available.

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, about 95 miles eastward of Attu Island, is an important landmark while cruising in Bering Sea to and from Attu Island. 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. The depth at the anchorage is 15 fathoms, hard sand bottom. In approaching the anchorage avoid the reef on the north shore and stand in on a **163° true** 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, distant 1 mile. Heavy tide rips may be encountered westward of Buldir Island.

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. The United States Coast Guard considers that the waters between Buldir and Kiska Islands are unsafe and should not be entered unnecessarily. Breakers have been reported to exist in many places in this region. Although many believe the water disturbances to be tide rips, there is no information to prove or disprove the existence of shoals. The few soundings shown on the chart indicate that pinnacle rocks and reefs could easily exist.

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, 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 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 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, one of the **Near Islands** which include Attu 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 12° true, and that the range passes through the western end of Alaid Island of the Semichi Islands. 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 off shore. It is reported that the island is surrounded by kelp beds.

McDonald Cove (chart 8851) is an open anchorage on the east coast. ***Approaching*** it from northward, bring **Krugloi Point** (northeast end of Agattu Island) to bear **241° true** distant 3 miles, and then steer **213° true** until it bears abeam. Then steer for Monolith Point at the north point of the cove on a course **255° true,** and when Cone Peak bears 325° true 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 westernmost of the possessions of the United States in the North Pacific.

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 from **Chirikof Point (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 Chirikof

Point (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.

The Territory of Alaska maintains **radio station** KDE.

There are rocks for a distance of about 1 mile eastward of **Khlebnikof Point,** which is the landfall in the approach from Chirikof Point (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 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** 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,** 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,** 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 Khlebnikof and Chirikof Points. The Coast Guard 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 Khlebnikof Point 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** course for Square Point open eastward of a notch in the mountain, until close to Square Point, and then followed the south shore and a **269° true** 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.

Tides.—High and low water in ***Chichagof Harbor*** occur about ¾ hour later than at Dutch Harbor. The mean range of the tide is 2 feet (0.6 m) and the range between mean lower low water and mean higher high water is about 3½ feet (1.1 m).

***Directions,* routes northward of Aleutian Islands.**—On account of lack of surveys, directions are not available for reentering the North Pacific in the region of Attu Island to effect the transpacific route via the Bering Sea.

Coast Guard vessels cruising along the Aleutian Chain in the Bering Sea have proceeded as follows:

From **Atka** to **Attu** the following courses were steered, checked by observations on the entire run: Stood out from Nazan Bay and rounded Cape Shaw 3 miles off. With North Cape bearing 224° true distant 5 miles, set course **275° true** for

Attu. Observations at noon next day, after a 170 mile run, indicated a **current** of 0.5 knot per hour setting 38° true. During the next 250 miles westward, a current was noted setting 0.56 knot per hour, 56° true, which seems to indicate a constant northeasterly set into the Bering Sea.

From **Attu** to **Islands of Four Mountains**, took departure from Chichagof Harbor, stood 15 miles **45° true**, thence **90° true** for 230 miles. Thence **86° true** to a landfall on Carlisle Island bearing 175° true distant 15 miles.

Ocean depths southward and westward of Attu Island.—A bank reported south of Attu by an "old-time sealer" was looked for in 1936. The Coast Guard Cutter *Chelan* failed to find the bank but instead learned that the **Aleutian Trough** or **Deep** was much narrower and deeper and closer to the south side of the Aleutian Chain. The axis of the trough passes about 70 miles southward of Kiska Island and about 60 miles southward of Attu Island. It has depths of over 4,000 fathoms (7,315 m). Southeastward of Unalaska Island, the greatest known depth is about 3,800 fathoms (6,949 m) in the Aleutian Deep.

Westward of Attu the exploratory soundings taken by the *Chelan* reveal a **submarine ridge** extending for at least 100 miles to 170° E. longitude. The ridge was crossed by a line of soundings at only one place about 50 miles from Attu and a depth of 49 fathoms (90 m) was obtained. Eastward of this crossing the ridge is about 15 miles wide between the 1,000-fathom (1,839 m) depth curves. Westward of the crossing there is considerable enlargement of the area within the 1,000-fathom (1,839 m) depth curves; however, no soundings were taken within. It is believed that further soundings will show highly irregular bottom and the existence of submerged **pinnacles** or peaks along the axis of the ridge.

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11. 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 implicitly, 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 cannot 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 closing 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.

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.

In February 1929 the Coast Guard cutter *Chelan* made the voyage from Unalaska to Pribilof Islands and return without encountering ice. While such freedom from ice is certainly unusual, these instances indicate the extreme conditions that may obtain during a mild winter.

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 (5.5 m) 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.

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 404.

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, ***Bering Sea.***—There has been no systematic study of the currents of the Bering Sea, and the almost constant fogs prevent the navigator from adding much to our meager knowledge concerning them.

Most reports indicate that during the open season there is a general drift northward along the Bering Sea coast and thence through ***Bering Strait*** into the Arctic Ocean. But during the winter ice moves from the Arctic into the Bering Sea.

The northward drift is probably not more than ½ knot in places well northward of the Aleutian Island passes; the flow increases off the Yukon Delta and attains a more or less constant strength of 1 to 2 knots through Bering Strait. The effects of wind and atmospheric pressure are said to materially affect or blot out this condition at times. The current in the locality of a disturbed area will generally set with a strong wind or toward an atmospheric depression, and such current may prove of value as a storm warning.

Strong tidal currents flow alternately in both directions through the eastern Aleutian Island passes (p. 303) and probably through the entire Aleutian chain. Tidal effects on currents are also felt in the bays, sounds, and in the vicinity of islands of Bering Sea, see below.

The following observations apply to the season of navigation in Bering Sea:

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 northward 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 from 1 to 2 knots. 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 on the flood, and southward or southwestward on the ebb. 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.

The **currents** of ***Bristol Bay*** are usually considered as partly tidal. 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. Northward of Unimak Pass it is generally found that there is some current flowing northwestward, which is considered a part of the general northward drift in the Bering Sea.

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, accompanying southeasterly winds, and fog accompanying southwesterly winds, are considered to be worse on the south side of the Aleutian Islands than on the north side in their immediate vicinity. See remarks on weather, Aleutian Islands, page 306.

It is reported that summer fogs in Bering Sea, while sometimes very dense, often extend less than 100 feet (30 m) above the water. It is, therefore, often possible to make a landfall by sending a man aloft where he will be able to look over the fog. It is also often possible to make high islands and capes by working up to them from leeward and taking advantage of a rift in the fog that prevails to leeward of such features. This rift in the fog is called the "Ookah" by the

natives. It does not exist in the lee of lowland, small islands, or during a calm.

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 cannot 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 (chart 8802) 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.

With the exception of Nushagak Bay, Bristol Bay is unsurveyed, and little detailed information is available. The chart is compiled from reports and reconnaissance surveys, some of which were made

many years ago. Extreme caution must be used in approaching these shores.

Currents in Bristol Bay are discussed in connection with those of Bering Sea, page 382.

Cape Sarichef (p. 310), the western end of the **south coast of Bristol Bay,** 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 **Pogromni Volcano** (p. 307) 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.

Note.—It is reported that Cape Mordvinof lies about 1 mile north of its charted position (1937). Navigators are cautioned to make ample allowance when laying courses northward of this cape especially from Bristol Bay.

From **Urilia Bay** to **Isanotski Strait** the coast trends in a northeasterly direction, is very low, and has several rocky patches extending ½ to 1 mile from shore, making navigation unsafe inside the 12-fathom (21.9 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 of 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).—*Chunak Point Beacon* is established on a sand dune about 1⅞ miles westward from Chunak Point. The beacon is useful to small craft making the entrance of the strait from Bering Sea. For *directions*, Isanotski Strait, see page 294.

The strait is shown on chart 8701.

From Isanotski 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 (513 m) in height. It lies 12 miles northwest from Cape Glazenap. The beaches are mostly huge boulders 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 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 **Khudiakof 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.

A depth of 12 fathoms (22 m) was reported 20 miles off the coast, northward of **Black Hill.**

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.**

Nelson Lagoon lies back of **Lagoon Point** and the Kudobin Islands.. The Pacific American Fisheries, Inc., maintain **radio station** KMU.

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 (chart 8833).—The survey of this port is 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.

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 cannot 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 reported a least depth of 8 feet (2.4 m) at low water in this channel, but local knowledge is required for its use, as the ice changes the channel each year.

A 2-fathom (3.7 m) **shoal** of small extent has been reported to exist ½ mile WNW. mag. from Entrance Point.

The **cannery** buildings and wharf of the Pacific American Fisheries are located just inside Entrance Point.

Northwestward from Entrance Point is a large **shoal** with depths of 9 feet (2.7 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 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.

The cannery company maintains a **radio station** (call letters KJW) 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, makes regular calls at Port Moller. There is a trail leading overland from Port Moller to Balboa Bay on the Pacific side of the peninsula.

Anchorage.—A convenient anchorage can be had in the channel abreast the dolphin is 13 fathoms (23.8 m). A more protected anchorage may be found in the channel between Entrance Point and Harbor Point.

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** 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 usualy 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** course until 1¼ to 1½ miles from it. Then steer **188° true,** heading to pass ¼ mile westward of the end of Harbor Point.

Directions, Cape Sarichef to Port Moller are given on page 389.

Tides, *Port Moller.*—High and low water occur about 5 hours earlier than at Nushagak Bay. The mean range of the tide is about 7½ feet (2.3 m) and the range between mean lower low water and mean higher high water 10½ feet (3.2 m).

Herendeen Bay (chart 8833) is on the west side of Port Moller. There is 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 ⅞ mile westward of Crow Point and ½ mile southward of Bluff Point.

Hague Channel is 1 mile wide at its northern entrance, and is contracted to less than ½ 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 northside 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.

There are coal outcrops in Herendeen Bay, and at one time coal was mined here. The mines have long since been abandoned.

There is a frequently used portage from the head of Herendeen Bay to Balboa Bay, on the south side of the Alaska Peninsula.

***Directions,* Cape Sarichef to Port Moller.**—From a position 3½ miles west (true) from Cape Sarichef Lighthouse, steer **40° true** for 29½ miles to a point with Cape Mordvinof abeam, distant 3 miles. Then steer **51° true** for 53 miles to a point with Amak Island on the starboard beam, distant 7½ miles. From this point steer **60° true** to a position 9 miles offshore, with Black Hill, near Cape Lieskof, abeam. Then steer **76° true** 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 sandhill 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 387.

On the courses east from Amak Island a strong inshore set is frequently noted and should be guarded against.

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.

In 1930 the Bureau of Fisheries vessel *Crane* entered Port Heiden twice, using the following courses:

Keep the marker on Chistiakof Island open to the left of the saltery building. Steer E. ½ S. mag. until about 250 yards off the island, then keep that distance off around the north end of the island. The first course is about NE. mag. and the least depth is about 3 fathoms at low water. After entering the harbor, follow the mainland at about 250 yards off and anchor in 6 fathoms off the saltery building.

The bottom is sandy and the holding ground is very poor. The ebb current has a velocity of about 3 knots. A southeast wind seems to increase the velocity of the current.

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.

Caution.—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 Egegik, which empty into Kvichak Bay; and the Ugashik, next southward of the Egegik. 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.

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. **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.

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,** marked by a **light,** is a bluff on the north side at the entrance, about 7 miles southward of Cape Greig. Here the river is about 4 miles wide at high water. The **indentation** between the capes including 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 boulders 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.

A red nun buoy is maintained off the entrance from May 1 to August 1 of each year. Each year the cannery company anchor two floats on the north side of the channel at the entrance. The Alaska Packers Association **cannery** (**radio** call letters KUL) is near the entrance at **Pilot Point** while the Red Salmon Canning Co. cannery (**radio** call letters KKX) is at the village of **Ugashik.**

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 Greig Light is an unwatched light 350 feet (107 m) above the water. The light is maintained from about May 1 to November 1 of each year. The low coast continues from the cape to the Egegik 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. There is a report that the hill is prominent from the northwest.

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 north side of the entrance is marked by a black can buoy maintained from May 1 to August 1 of each year.

The Alaska Packers Association in Egegik River maintain **radio station** KUD. The Pacific American Fisheries, Inc., maintain **radio station** KMX.

Red Bluff, on the north shore at the entrance, is marked by a flashing white light (every 20 seconds) which is also maintained from May 1 to August 31 of each year.

A dangerous obstruction is reported to exist about 4 miles off Cape Chichagof. The shoals off Egegik should be given a wide berth by vessels passing along the coast. Several vessels have grounded in the vicinity and some have been lost.

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 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.

Middle Bluff Light is 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. The light is on a small wooden structure on the top of the bluff at its highest point approximately. It is difficult to distinguish in the daytime unless close to.

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 **Koggiung.** 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 the 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 the 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.

There are several large salmon canneries on Naknek River, and vessels drawing up to 24 feet (7.3 m) anchor off the mouth of the river. Only small craft drawing about 10 feet (3.0 m) go to the upper canneries on the high tides. Except for a "hole" about ½

mile below the Alaska Packers Diamond NN cannery, there is no place where they can remain afloat at low water.

The canneries all have **radio stations.** KHT are the **radio** call letters of the Alaska Packers Association at **Naknek** village. There is a **marine railway,** capacity about 200 tons. Some supplies such as coal, gasoline, and distillate can usually be obtained. In emergencies some fuel oil is usually obtainable either by barge from tanks ashore or from cannery ships anchored off the river.

Pawik is a small village on the north side of the river. There is a United States deputy marshal and a government school here.

KVICHAK BAY is the large arm at the head of Bristol Bay, extending northeast and bounded on the south by a *designated* line from the south entrance point of Egegik River to Etolin Point. 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.

An **obstruction** buoy was formerly moored in 22 feet (6.7 m) of water over the wreck of the *Charles E. Moody*, in latitude 58°40′ N., longitude 157°20′ W. The wreck is sanded in and has formed a shoal extending approximately 80 yards in a northeasterly direction.

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.

During the cannery season six **lights** mark the upper reach of Kvichak Bay, one of these is at the entrance to Naknek River, three are along the east shore of the Bay above Naknek River and two lights are along the west shore of the bay near the head.

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.

The Alaska Packers Association in Kvichak Bay maintain **radio station** KHB. The Bristol Bay Packing Co. in Kvichak River maintain **radio station** KYM. The Nakat Packing Co. maintains **radio station** KJI or KHV. The Pacific American Fisheries, Inc., maintain radio station KKM.

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 Kvi-

chak 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 extreme tides about 28 feet (8.5 m). These figures are approximate only, there being no available data on tides at this point. Daily tide predictions for Nushagak Bay are given in the tide tables, and it is probable that the time of tide in the two bays does not differ materially.

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,** Kvichak Bay and River are 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.

Graveyard Point, lying about 12 miles northward from Naknek River, is marked by a **light** which is maintained from May 1 to August 31 each year.

***Directions,* Kvichak Bay.**—Due to lack of surveys, detailed directions cannot be given. Egegik Flats should be given a berth of 5 miles, and the lead should be kept going all the time. The navigator should try to keep in depths of not less than 6 fathoms (10.9 m). Strangers should arrange by radio with one of the canneries for a pilot.

KVICHAK RIVER, from Koggiung 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 Koggiung, 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. A part of this trail has been improved and can now be used as a wagon road. A few horses are usually available for packing and hauling jobs over the trail. 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 gasoline launches available 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 (chart 9050), on the north side of Bristol Bay near its head 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 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.

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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 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.

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 (79 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, the eastern entrance point to Nushagak Bay, is indefinite and consists of 3 bluffs, the middle and highest one, 90 feet (27.4 m), usually being considered as the point. A rounded hill about 150 feet (46 m) lies 1½ miles northeastward of Etolin Point. This hill is one of the first summits to show when approaching.

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. However, a **shoal of 10 feet** (3.0 m) is reported to lie outside of the 5-fathom (9.1 m) curve, about 13 miles 170° true from Etolin Point. The shoaling is gradual except in the vicinity of the 10-foot (3.0 m) reported shoal, and the lead is a good guide in approaching the eastern shore when just 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. Libby, McNeill and Libby maintain **radio station** KNE. 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 ⅝ mile southward from the point and is the prominent feature from the bay. KHG are the **radio** call letters of the Alaska Packers Association.

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 (Kanakanak P. O.) is a post office with a United States deputy marshal and commissioner. There is also a Government hospital for natives. **Radio Station** WXK is operated by the Signal Corps, United States Army.

Bradford Point is near Dillingham and abreast Williams Island, which is grassy and awash at the highest tides.

Cannery steamers drawing 22 feet (6.7 m) ascend the bay and lay at anchor off Snag Point. There is one cannery above Snag Point and it is reached by launches.

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.** The Alaska Salmon Co. maintain **radio station** KZV.

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 Columbia River Packers Association maintains **radio station** KKY.

The mail steamer from Seward calls at Nushagak monthly from May to August, inclusive, each year. There are no wharves. 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.

There is a store at Nushagak where all ordinary supplies may be had.

The Pacific American Fisheries, Inc., in Nushagak River, maintain **radio station** KHU or KKI.

Prominent features.—Northward of Nushagak 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 Nushagak 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). This crossing is marked by a lighted range, with the radio mast at Ekuk Spit forming the rear mark. (See pp. 401 and 402.) It is reported locally that the depth on this bar has increased to about 21 feet (6.4 m) in recent years. The channel then follows the general trend of the shore to the anchorage off Clark Point.

From Clark Point a channel leads to Nushagak where there is a depth of about 8 feet (2.4 m) off the canneries.

Anchorages.—There is no anchorage in the outer part of Nushagak 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 pro-

tection. 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. 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 stocks of coal are maintained 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 (5.4 m)). 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 latter 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 (4.6 m), and the range between mean lower low water and mean higher high water is about 19½ feet (5.9 m). Daily tide predictions of ***Nushagak Bay*** (Clark Point) for the months of May to October are given in the tide tables.

Currents.—The currents have considerable strength, the ebb being the stronger, on account of the discharge from the rivers. The maximum ebb current observed was about 4 knots, and flood, about 3 knots. The ebb usually begins shortly before high water and continues to run after low water, roughly about 7 hours ebb and 5½ 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 time differences given in the following paragraphs when applied directly to the predicted times of current for San Francisco Entrance, published in the Pacific Coast current tables, give the approximate times of slack or strength in ***150th meridian time.***

Off Protection Point.—The mean velocity of the current at strength is about 2 knots on the flood and 3 knots on the ebb. To obtain the times of the slacks and strengths of current add *20 minutes* to the predicted times for San Francisco Entrance.

Off Etolin Point.—The mean velocity of the current at strength is about 2 knots on the flood and 2½ on the ebb. To obtain the times of the slacks and strengths of current add *50 minutes* to the predicted times for San Francisco Entrance.

Off Clark Point.—The mean velocity of the current at strength is about 2½ knots on the flood and about 3½ on the ebb. To obtain the times of the slacks and strengths of current add *1 hour and 30 minutes* to the predicted times for San Francisco Entrance.

Off Coffee Point.—The mean velocity of the current at strength is about 2½ knots on the flood and 3½ on the ebb. To obtain the times of slacks and strengths of current add *1 hour and 50 minutes* to the predicted times for San Francisco Entrance.

Off Dillingham.—The mean velocity of the current at strength is about 2½ knots on the flood and 3½ knots on the ebb. To obtain the times of slacks and strengths of current add *2 hours and 20 minutes* to the predicted times for San Francisco Entrance.

***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 Nuhagak 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; but the reported shoal of 1½ fathoms (3 m) about 13 miles 170° true from Etolin Point must be avoided. 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.

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**; 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 Nushagak Bay entrance buoy. Care must be taken to avoid the reported shoal of 1½ fathoms about 9 miles southeastward of the buoy.

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 in ascending the bay, and all traffic now uses the eastern channel. During the season of navigation from May 1 to August 31 each year, *Nushagak Bay entrance buoy* is maintained at the entrance of this channel, and a **lighted range**

marks the channel leading up to Ekuk Bluff. The front light is flashing white on a skeleton tower and the rear light is fixed white on a radio mast. The entrance **buoy** is placed each year on or near the Ekuk Spit range line and may vary somewhat from the position as charted. This buoy sometimes drags out of position.

It is reported that the radio mast is not lighted. The radio mast (rear range) is visible from the entrance buoy but the land on which the light structure (front range) stands is below the horizon when at the buoy. The range is visible when about 10 miles from it. The church steeple on **Ekuk Bluff** can easily be mistaken for the light structure. It may be seen before the light structure becomes visible. The light is on the northwest end of the bluff and is the western one of the two objects in question. The channel marked by the range has not changed in the last 9 years (1938).

To enter make the entrance buoy. Then it is necessary to steer a course 342° true on flood tides and 345° true on ebb tides until abeam of Etolin Point. Here, the front light structure of the range described above appears above the horizon and becomes more prominent than the church steeple. From then on favor the starboard side of the range until approaching the bar, *but* when crossing the bar be strictly on the range as the channel is very narrow at this point. As the bar is approached on the range, three cuts in the bank off the starboard side appear. When the easternmost is about ¾ point forward the beam, the ship is on the bar. When the middle cut is abeam, the range is left to steer a course following the general trend of the shore. Give a wide berth to the spit off Ekuk cannery before heading for Nushagak Point on a 27° true course.

Note.—On flood tides, just inside the bar, cross a distinct rip and keep it about 150 feet off the port side.

Reports state that depths on the **bar** mentioned above have increased and that there is probably 21 feet (6.4 m) where 17 feet (5.2 m) is shown on the chart.

The channel to the eastward of the one marked by the range and the channels to the westward thereof have filled in considerably and the chart (1938) can no longer be used as a guide insofar as these channels are concerned.

Clark Point to the upper canneries.—At low water a large mud flat is exposed southeast of Coffee Point near the middle of the river. The shoal water in the middle of the river is extensive and a Coast Guard launch reported difficulty in crossing from the west channel to Clark Point during the time of low water. The west channel below Bradford Point was reported to be filled up in places. The river above Clark Point should not be attempted by a vessel without a local pilot. The following ***directions*** were given by Captain Thomson of the steamship *Arctic:*

From the channel off Clark Point, steer **21°** true for **2¾** miles until the Government hospital at Dillingham bears about **0°** true. Then head for the hospital, bringing it in range with the west notch of a distant mountain peak. This peak has a notch on each side of the summit; the range is on the west notch. If you do not see the mountain, a cut on the bank marked by dried grass with the hospital in range with the south side of the cut, will carry you across the bar. Continue this course for **4½** miles or until about 1 mile after crossing the bar on which there is about 12 feet (3.6 m) at low water.

Then steer **16°** true to Bradford Point abeam, after which follow the trend of the shore line to an anchorage off Snag Point.

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 Peirce, 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.

A reef consisting of sand and smooth boulders is reported to extend over 1¼ miles northwestward from the northwest end of Round Island. It is believed that the reef bares at extreme low water.

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.

Kulukak Bay is reported as having shoal water in the entrance, and 3 fathoms (5.5 m) just inside the entrance. There is a village with a Government school on the west side of the bay.

Togiak Bay lies about midway between Cape Constantine and Cape Newenham. The bay is shoal and there is no detailed information available. The village of Togiak is reported as lying about 4 miles northward of the position as charted on chart 8802. There is a Government school here.

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.

Shoal water has been reported as extending eastward from **Hagemeister Island** in the direction of **High Island**. Ice has been observed grounded here. Foul ground is also reported as extending northward of the north point of the island.

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,** 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.

There is a native village on the northwest shore of the strait.

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** 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 open into the Bering Sea north of the entrance to Bristol Bay. The 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 occured, 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.

Airplane traffic does not extend farther west than the Kuskokwim River, and planes from Anchorage make that trip quite often. Weather in the Bering Sea is not conducive to safe flying because of the long periods of thick weather and sudden changes in weather.

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-toothed 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 (6.4 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 Rocks, in 3½ fathoms (6.4 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, either in the middle of the entrance or up to ¾ mile inside the bay on a line approximately NE by N (Mag) of the south tangent of the north spit. Inside the entrance the strength of the tidal currents reaches a maximum of about 2½ knots, in a direction parallel to the axis of the channel. The holding ground is good. Small craft can select a berth from the chart that affords the best shelter. A restricted anchorage for small vessels exists about 1 mile southward of the south entrance point, but local knowledge is necessary for its use. The sea from the outside is broken by the shoals off the entrance and does not reach the anchorage. With southerly or easterly winds tide rips, dangerous for small craft, 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 and at the village of Platinum, situated in the southwestern end of Goodnews Bay.

The mail is flown at irregular intervals between Platinum and Anchorage; a limited amount of stores and gasoline is available.

There is a platinum mine at the foot of Red Mountain.

The Northland Development Co., in Goodnews Bay, maintains **radio station KHH.**

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.

Shoals extend 2½ miles off the entrance of Goodnews Bay. In 1938 an examination of the critical depths of the shoals to the southward was made, showing a least depth of 11 feet (3.3 m) about 2½ miles southward of the entrance. Two sets of ranges were erected. The following **directions** lead across the bar and through the entrance. From a point about 2½ miles south by west of the entrance stand in on the northeast-southwest range, 37° true until the East-West range, bearing 90½° true closes, then steer 0° true for about ¾ miles or until abeam of west tangent of the spit, then follow the south spit at a distance of ¼ mile, and cross the entrance to the above anchorage.

In entering Goodnews Bay the mariner should bear in mind that the tide tables are for Nushagak Bay; also that the maximum tide is about 9 feet (2.7 m). High tide occurs about 6 hours later than at Nushagak.

To the anchorage in the northern part of the bay, round the north spit at a distance of 300 yards, steer **312° true** 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 mountain 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.

The *United*, drawing 16 feet (4.9 m), was taken into Goodnews Bay. The master reports that there is good anchorage in 7 to 11 fathoms (12.8 to 20.1 m) of water, 2 miles N. by E. from the bay entrance on line to Baluka Hill. This indicates that deep water can be carried farther into the bay in the main channel than indicated on the chart.

Mumtrak is a small village at the head of Goodnews Bay. It can be approached only by small boats and at high tide. There is a Government school at Mumtrak.

CARTER SPIT, on the east side of Kuskokwim Bay, 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 bay 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. The so-called Warehouse Channel which joins the eastern channel just south of Beacon Point has closed up. A middle ground is forming in the channel just south of Apokak (1931). The beacon at Beacon Point has disappeared.

Popokamute was formerly a large native summer village on the west bank of the river opposite Beacon Point. The natives gathered here to catch and dry their winter supply of salmon. The point has washed away considerably since the time of the survey. It is reported that all signs of Popakamute have disappeared.

A line drawn between Beacon Point and Popokamute is considered the dividing line between Kuskokwim Bay and River.

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 considerably 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 river boats operating to points on the upper river.

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** which may be reached through Nome radio station WXY. 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 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.

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.—At Apokak, ***Kuskokwim River,*** the mean range of the tide is about 9½ feet (2.9 m) and the range between mean lower low water and mean higher high water is 12 feet (3.7 m) while at Bethel the corresponding ranges are 2 feet and 3½ feet (1.1 m).

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 Apokak the strongest current observed was 3½ knots. 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.

Note.—The time differences given in the following paragraphs when applied directly to the predicted times of current for San Francisco Entrance, published in the Pacific Coast current tables, give the approximate times of slacks and strengths in ***165th meridian time.***

In Goodnews Bay the currents are strongest at the entrance, the maximum observed being about 2½ knots. To obtain the times of slacks and strengths subtract *5 hours and 45 minutes* from the predicted times for San Francisco entrance. 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.

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.

In the Channel west of Carter Bay.—The mean velocity of the current is about 1½ knots at strength of ebb and flood. To obtain the times of slacks and strengths subtract *4 hours and 10 minutes* from the predicted times for San Francisco Entrance.

In the Channel, southwest of Warehouse Bluff.—The mean velocity of the current at strength of ebb and flood is about 2½ knots. To obtain the times of slacks and strengths subtract *3 hours and 25* minutes from the predicted times for San Francisco Entrance.

In the Channel off Apokak.—The mean velocity of the current at strength of ebb and flood is about 3 knots. To obtain the times of beginning of flood and maximum flood subtract *3 hours and 55 minutes* from the predicted times for San Francisco Entrance. To obtain the beginning of ebb and maximum ebb subtract *2 hours and 20 minutes* from the predicted times for San Francisco Entrance.

***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.

In 1931, a vessel drawing 19 feet (5.8 m) made two trips to Bethel without taking the bottom at any time.

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.

Passing about 2 miles westward of Cape Newenham, make good a **28° true** course for about 6 miles until the cape bears 190° true; then make a good **10° true** course with Cape Newenham directly astern for about 18 miles until Baluka Hill bears 65° true and Red Mountain 121° true. From this position make good a **341° true** course for about 13 miles to a position 4 miles **256° true** from the elbow of Carter Spit, and 4½ miles 270° true 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** course for about 6½ miles until Castle Rock, the southwest headland of Security Cove, bears 177° true. Strong tidal currents occur along the north shore of Cape Newenham. From this position make good a **357° true** course with Castle Rock astern for 14 miles until the summit of Red Mountain is abeam; then make good a **341° true** course for 19½ miles to a position 4 miles 256° true from the elbow of Carter Spit.

From a position 4 miles 256° true from the elbow of Carter Spit make good a **302° true** 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** 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** 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** 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. It is reported that extensive changes have taken place northward of Latitude 59°36′ N. The chart is no longer a sufficient guide with respect to the channels.

In proceeding up the river to Bethel, West Channel and the passage west of Eek Island are used. A **cross-over** from Eek Channel to West Channel is made in an area subject to considerable change. In 1931, the cross-over in Latitude 60°03½′ N., had filled completely; and a new channel with a depth of 18 feet (5.5 m), in Latitude 59°59′ N., connecting the two channels, was then available. It is generally necessary to wait for nearly high water before making a cross-over to West Channel. Navigation in this region is difficult and the pilot

and his launch should be employed. There are no landmarks visible unless the beacons on shore are in place. If buoys are in place the cross-over is much easier.

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 former beacon at Beacon Point was an aid in reaching this 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. In 1931, it was reported that a middle ground was forming in the channel just southward of Apokak.

Passage, west of Eek Island.—Once in West Channel, follow the west bank of the river southwestward of Eek Island 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. ***Note.***—In 1931, the western channel was used from **West Point** (northwestward of Eek Island) to a point just south of the small island in latitude 60°18′ N., where a cross-over was then made to the eastern line of soundings shown on chart 9104.

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 lie in the Bering Sea about 200 miles northwestward from Unimak Pass. 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. A **radiobeacon** is located on St. Paul Island. (Operating details differ from general system. See p. 22.) The Bureau of Fisheries maintains a radio station, call letters KVR, on St. Paul Island, contacted through Dutch Harbor radio station NPR. 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 under way 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 (chart 8996), the southern one of the Pribilof Islands, 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 bearingf 164° true. 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.

Radio telephone communication is had with St. Paul Island radio station KVR.

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 poits is deep, and they can be passed close-to with safety.

Otter Island, off the south side of St. Paul 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 the northeast extremity of Crater Point bearing 185° true, distant ½ mile. This island must be approached with great caution in thick weather, and at all times a vessel should keep out of 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 current.

Walrus Island, off the east side of St. Paul Island, is low, about 39 feet (11.9 m) above the water, level on top, and composed of irregular masses of volcanic rock. It is very hard to pick up in thick weather. 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 is the northern one of the Pribilof Islands, about 235 miles northwestward from Unimak Pass. 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 **Hutchison 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 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.

A sunken rock having a depth of about 3 fathoms (5.5 m) or less has been reported between Hutchinson Hill and North Point, approximately 3,700 yards 353° true from Little Polovina Hill.

In general, the coastal waters on the north side of St. Paul Island have uneven and rocky bottom, and for this reason anchorage is not favorable.

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, 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 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 brakers, 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.

There is no protected harbor nor satisfactory landing facilities. Vessels are often delayed at St. Paul for many days in landing cargo and personnel due to strong winds which build up heavy seas and make boating impossible.

The Bureau of Fisheries vessel *Penguin* (400 tons) makes 5 round trips a year between Seattle, Wash., and St. Paul via Dutch Harbor, carrying passengers and freight. The vessel is used for the administration of sealing activities at St. Paul.

The southern limit of the Bering Sea ice field reaches St. Paul Island.

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 three main radio towers, the radio station on Village Hill, and a tall steel stack at the site of the byproducts plant. The radio towers are 300 feet (91 m) high and are visible 10 miles.

Vessels ***approaching*** the anchorage should steer for the steel byproducts stack on course **82° true** and anchor in 8 fathoms (14.6 m) with the stack distant 1,750 yards and the radio station bearing 124° true, 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 composed of 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.

St. Paul Island **radiobeacon** (57°07.3′ N., 170°16.1′ W.) operates from May 1 to October 31 only on a regular schedule and from November 1 to April 30 on request only. The radiobeacon will be operated at other times and during fog or low visibility, on adequate advance notice. Such requests shall be made through Navy, Dutch Harbor, radio station NPR, as St. Paul radiobeacon station is not equipped to receive messages direct from ships.

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 1930, about 30,000 seals were killed by the Government, and a census showed that the seal herd was increasing satisfactorily.

A **radio station,** call letters KVR, is operated by the Bureau of Fisheries on St. Paul Island. This station has no fixed hour of service, but may be contacted through Dutch Harbor (NPR) on adequate advance notice.

Tides.—The mean rise and fall at ***St. Paul Island*** is about 2 feet (0.6 m), and the range between mean lower low water and mean higher high water is 3½ feet (1.1 m). Around St. Paul Island the flood tidal currents set 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 worse on the ebb. The tides and tidal currents are greatly influenced by the winds.

NUNIVAK ISLAND (chart 9302), in the Bering Sea and near the mainland of Alaska, is about 330 miles northward of Unimak Pass. It 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. A shoal of 3½ fathoms has been reported by the S. S. *A. J. Baldwin*, north of Nunivak Island about 16 miles 332° from Cape Etolin. About 10 miles due south of Cape Corwin, the vessel has seen marked breakers, believed to be a shoal. The island should therefore be approached with caution.

From westward Nunivak Island 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. There are herds of reindeer on the island.

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 Nunivak 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 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 from Cape Mohican.

A shoal with 9 feet (2.7 m) over it is shown on the charts about 12 miles 46° true from Cape Mohican. A line of sounding 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 knots 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 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.

CAPE MENDENHALL, the southern point of Nunivak Island, 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 of Nunivak Island, 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 direction about 20 miles to a point called **CAPE MANNING**, and from the latter cape to Cape Corwin the direction is 176° true 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 of Nunivak Island, 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 reconnaisance of Nunivak Island and found a shoal with 3 fathoms (5.5 m) over it about 10 miles 355° true from Cape Etolin, with deep water between. Keeping Cape Vancouver bearing northward of 86° true, Cape Etolin can be rounded when coming from westward in 10 fathoms (18.3 m) of water. With Cape Vancouver bearing 86° true 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.

The bottom shoals gradually from 10 fathoms (18.3 m) outside in to the beach. The shores are high with the exception of the southern shore, which consists of a sand and gravel beach in front of a bluff about 30 feet (9.1 m) high. The beach along the cliffs is lined with large boulders.

This harbor was surveyed by the Coast Guard cutter *Chelan.* It is roughly half-moon shaped and 1½ miles wide. The bottom is of sand except near the rocky portions of the shore, and there are no indications of dangers over a large 5- to 6-fathom (9.1 to 10.9 m) area in the central part of the harbor. Boat landings are generally made off the schoolhouse, west of the creek; however, boulders lie close to the shore at this landing as well as in the cove on the western shore.

A **creek** in the southwestern part of the bay drains a lake, but the water is brackish, as the level of the lake is affected by the tides. The lake freezes every winter and makes an excellent landing field for aircraft equipped with skids. It is also sufficiently large for a seaplane to use during the summer. A native village is on the west bank of this creek with the schoolhouse high on the hill. The latter is a prominent mark on entering the harbor.

A trader visits the village regularly. There is no food except fish, birds, and reindeer.

The shore line to the westward of Nash Harbor is fairly high and consists of cliffs, while to the northeastward it is low.

Tides.—The mean rise and fall at ***Nunivak Island*** is 3 feet (0.9 m), and the range between mean lower low water and mean higher high water is about 4½ feet (1.4 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.

A current of 3 knots was observed setting alongshore between Cape Etolin and Nash Harbor.

ST. MATTHEW ISLAND and adjoining islands (chart 8851) lie about 135 miles westward from Nunimak Island. They 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. The islands are reported to lie 4½ miles north and 5 miles west of their charted positions.

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. Westward 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.

There is a waterfall on the north side of the island ½ mile southwestward of the west end of the headland which is about 5 miles from Cape Upright.

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, 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., reported 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), and the range between mean lower low water and mean higher high water is about 4 feet (1.2 m). The flood current sets eastward, and the ebb westward, at the rate of about 1 to 2½ knots.

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 of 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 extremity 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 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 from the cape. Along the highland 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 (1.5 m).

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. 435) 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 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 knots. 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 direction for about 108 miles to latitude 63°32′ N., longitude 164°58′ W. At this point it turns to a general 87° true 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 (6.8 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).

Yukon River is navigable for flat bottom boats along its entire course from the mouth to near the head of **Lake Bennet.** The **Porcupine River** is said to be navigable from the Yukon River to the **Bell River.**

ST. LAWRENCE ISLAND is in the northern part of Bering Sea about 120 miles southward of Bering Strait.

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, eastern end of St. Lawrence Island, 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 mile offshore.

From Northeast Cape the east coast of St. Lawrence Island has a general 192° true 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 knots on both flood and ebb; the flood sets northward and ebb southward alongshore.

The east coast of the island then trends 209° true for 4 miles, and then curves westward and northward in a distance of 5 miles until it has a 310° true 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 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 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 from Punuk Islands showed the flood currents setting about 24° true, with a maximum velocity of 1.1 knots.

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 an easterly direction from the highland of the coast. There are breakers about ¾ mile 355° true 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 distace 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 vessel has reported striking a sunken rock about 2 miles offshore at a point about 16 miles northeastward of Southwest Cape. The danger is marked as a PD rock on the chart.

A reef makes off 1 mile in a 220° true 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 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 station, call letters WWP. It is also the headquarters of the Reindeer Commercial Co. which runs about 7,000 deer on the island.

A **bar** extends to the northward from North Cape, and vessels should anchor to the westward of this bar. The 8-fathom (14.6 m) depth curve is about ½ mile from shore.

Tides.—The mean range of the tide at ***St. Lawrence Island*** is about 1½ feet (0.5 m) and the range between mean lower low water and mean higher high water is about 2 feet (0. 6 m).

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. Subtract 1½ hours from the published times of high and low waters at Kodiak to obtain the times of slacks before flood and ebb respectively in 165th meridian time.

NORTON SOUND (chart 9380) is one of the important arms of Bering Sea. A few supplies for the Yukon River by way of St. Michael pass through it. The north shore is 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 383, 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) cannot be depended on and may be several miles in error although the sight seemed a good one.

Pastol Bay region on the south side of Norton Sound is described in connection with the *approach to the Yukon River (Apoon Pass) from St. Michael*, page 434.

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 **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 Mountain,** near the center, 472 feet (144 m) high; and **Stephens Hill,** a sharp, conical hill, overlooking Stephens Pass. **Orizaba Reef** extends 1½ miles off **Rock Point,** the point 51° true from St. Michael Mountain. It is marked by a bell buoy (not maintained during 1932) placed in 28 feet (8.5 m) of water. The buoy is removed during the winter.

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 **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.

Danger.—A boulder with 18 feet (5.5 m) of water over it lies 1,000 yards 64° true from Whale Island Light.

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 (chart 9375), on the east point of St. Michael Island, is the point of transfer from deep-water vessels to the Yukon River boats. The traffic through St. Michael has decreased greatly in recent years, due to the fact that the greater part of the freight from 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.

There is no hospital or physician at St. Michael. A nurse of the Bureau of Education is employed at the public school.

The army post and radio station have been abandoned, and most of the old warehouses of the former trading companies have been removed. There are radio telephone communications with a series of stations along the Yukon River. Further information regarding this service may be obtained from the Northern Commercial Co. in Seattle, Wash., or in St. Michael. The tallest of the remaining radio 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.

River vessels of the Alaska Railroad ply the lower ***Yukon*** as far as Holy Cross Mission, and launches ***from St. Michael*** connect with these boats, thus affording an infrequent service to Fairbanks during the season of navigation. See *approach to the Yukon River* (*Apoon Pass*) *from St. Michael*, page 433.

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 boulder described on this page line 5.

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.

A **light**, maintained August 1 to October 31 each year, has been established on the highest part of Egg Island. It is obscured from view within ¼ mile of the north and northwest shores.

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 ¾ 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. 381.)

The **coast** from St. Michael Bay to Cape Darby 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 channel over the bar leading to the river entrance is marked by a lighted range. Both lights are fixed white and are located on the shore on the north side of the river mouth.

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 northeasterly 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 approaching 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. The cape is marked by a light. Rocky Point is a high, bold promontory with irregular rocky cliffs. The point is marked by a light 175 feet (53 m) above water, on a small white house.

GOLOVNIN BAY (chart 9382), on the north side of Norton Sound, has its entrance between Cape Darby and Rocky Point, with a width of 10 miles. It extends in a general northerly direction for 12 miles to the entrance to Golovnin Lagoon. The east shore is high and bold, with occasional sand and gravel beaches. **Carolyn Island**, marked by a light, 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. The head of the bay on the west side of the entrance to Golovnin Lagoon 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. Good water is generally available on the west side of the bay during the navigable season, and vessels can approach close enough to obtain it expeditiously. The stream is about 200 yards south of a conspicuous white post and white cross on the cliff. Boats may be filled by gravity flow from a chute and hose. In 1932 the Coast Guard cutter *Northland* made an intensive survey of the ship anchorage off this watering stream. According to this survey, the 24-foot (7.3 m) depth curve is about 400 yards offshore, outside of which is a gentle sloping bottom to the charted depths one mile offshore.

There is another stream on the east shore of Golovnin Bay.

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 from the north point of the low sand island on the south side of the entrance to Golovnin Lagoon. The channel leading to the entrance to Golovnin Lagoon 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 months, from about August 1 to November 1, lights are shown as follows: A light on a small white house on the northeasterly shore of the bay, 3¼ miles southeastward from Golovnin. There is a light on the north end of the spit about 1 mile south of Golovnin. The light formerly in the village has been moved to the end of the spit westward of Golovnin.

Carolyn Island is marked by a fixed red light placed on the middle of the island.

Anchorage.—A little westward of the southern sand spit, in the entrance to Golovnin Lagoon, 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 Golovnin Bay good shelter is found from easterly or southwest or westerly winds.

Golovin (post office), on the north spit at the entrance to Golovnin Lagoon, is a distributing point for the mining district of the Fish River country.

Golovnin Lagoon 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.

During the season of navigation about 14 buoys are maintained to mark the channel over the flats in the approach to Fish River.

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 giv-

ing 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 neuessary to keep in the best water.

A fuel oil tank to the westward of the dwelling is a good landmark.

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.

Several radio-pole masts on the western side of the inlet are good landmarks in clear weather.

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. Four buoys mark the entrance during the season of navigation.

***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 from Cape Sarichef Lighthouse, on the eastern side at the northern end of Unimak Pass, a **344° true** course made good for 353 miles should lead to the above latitude and longitude, and Cape Mohican should bear about 95° true and be distant 18 miles.

II. ***Or, from a position*** 3 miles westward from Cape Kalekta a **352° true** course made good for 376 miles should lead to the above position with Cape Mohican bearing 95° true, 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. 416).

III. ***From Cape Mohican*** bearing 95° true, distant 18 miles, a **4° true** 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, 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** 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** 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** 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. 427.)

On the 93° true 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.

V. ***If bound to Golovnin 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** 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** 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 436.

VII. ***If bound to Port Clarence.***—From a position in latitude 63° N. and longitude 167°40′ W. a **0° true** 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** 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. 437.)

***Directions,* Isanotski Strait** (False Pass) to **St. Michael.**—The following remarks are intended to apply only to small craft 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. 416.)

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 9.1 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.

APPROACH TO THE YUKON RIVER (APOON PASS) ***from St. Michael.***—St. Michael (p. 427) 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 launches 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 small craft 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, an 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 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 craft 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 22 stakes so that no detailed directions are necessary for following it. Lights and stakes 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 school. **New Fort Hamilton** is on the **Kwikpak,** 36 miles above Kotlik.

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 reaches above the head of the delta. At the head of the Kwikpak Pass the rise and fall is less than 1 foot (0.3 m).

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.

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 miles 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. There is a lookout at the mouth of the Snake River and a life boat and surf boat are maintained during the summer.

Nome has steamship communication with Unalaska and Seattle.

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 1937, the controlling depths were as follows: bar, 6 feet (1.8 m); channel, 8 to 10 feet (2.4 to 3.0 m); basin, 0 to 9 feet (0 to 2.7 m).

The outer end of the east jetty is marked by light and the outer end of the west jetty is marked by light. The channel through the entrance is marked by range lights, the front range being fixed red and the rear range being fixed white. These lights are maintained from August 1 to November 15 of each year. 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).

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.

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.

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 south-

ward of Cape Rodney and to give the shore between Cape Douglas and Point Spencer a berth of over 5 miles.

Cape Rodney is marked by a **light** maintained from August 1 to November 1 of each year.

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 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 perceptible current southward or eastward; the general set is northward and westward.

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 CLARENCE indents the **Seward Peninsula**, southward of Cape Prince of Wales. It is a good harbor, close to Bering 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.

Point Spencer is marked by a light, and there is also a light on the north spit of the entrance to Grantley Harbor.

It is reported that there are several poles at Point Spencer which are more conspicuous in daytime than the light structure.

The channel through the entrance to Grantley Harbor is marked by buoys maintained from 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.

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.

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 roadhouse, also a good store and an oil station. The mining operations here are now insignificant.

There is a **radio station,** call letters KIE, operated by the Teller Radio Board.

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 *Northland* usually calls on her annual cruise to the Arctic.

Fresh water.—The most dependable water supply is at the Teller Reindeer Station, but it must be pumped into boats which cannot approach close enough to obtain water expeditiously. Water can be obtained more conveniently near Cape Riley except during the drier season of the year, when the stream is not running.

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, 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 set northwestward with a velocity of 1 to 2 knots.

***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 Nome or points south is to make King Island, keeping in depths greater than 10 fathoms (18.3 m) to avoid the foul ground northward from Sledge Island, and obtain a good position before proceeding farther. From King Island, a course may be set a little eastward of Cape York. The northwestward set of the current in this region should be kept in mind. After making Cape York, the coast may be followed eastward to the entrance to Port Clarence, from which a course can be set to the anchorage just inside Point Spencer.

12. ARCTIC OCEAN

The remarks on the navigation of Bering Sea (p. 380) 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 onshore, a safe place can sometimes be found behind the ground ice. A vessel may be made fast to this ice with grapples, 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 cannot 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 made it a rule to be ready to leave there about October 10, and though there were times when they stayed later, these were 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 form 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 Seahorse 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, on the east side of **Bering Strait**, 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 and school), 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.

PRINCE OF WALES SHOAL seems to be a ridge of sand which extends about 8° true 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 vessel *Good Hope* was wrecked on Prince of Wales Shoal, about 10 miles northward of the cape, during a high wind storm.

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 beyond the cape. In passing through Bering Strait and running to Kotzebue Sound, it was the practice of the *Northland* to head north true until East Cape (north tangent) bore 260° true than head 80° true for entrance of sound. 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 of **Seward Peninsula**, especially sailing vessels with northerly or northeasterly winds.

No buoys have been established to mark Prince of Wales Shoal on account of its indefinite limits; moreover, the remoteness of the locality and ice conditions make this impracticable to do so. Navigators are obliged therefore to fix their position by aid of the distant land features.

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 per hour, and care should be taken in making an anchorage here not to be swept by this current upon the shoal. When approaching the cape to anchor, keep south of the line

bearing 90° true to the schoolhouse at Wales. Anchor in 10 fathoms (18.3 m) ⅝ mile westward of the northern end of the sharp rocky bluffs. **Fairway Rock** is a high, square-headed, steep-sided rock. The bottom is steep-to on all sides, and there are no outlying dangers.

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 **(Nunarbuk)** is 1,759 feet (536 m) high, and the smaller **(Ignaluk)** 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 principal village is on Ignaluk, just above the sand spit, which extends from about the center of the western shore of the island. Deep water extends very close to the southern side of this island. Vessels coming from the south and east may run close along the south shore of Ignaluk, keeping the depth greater than 14 fathoms (25.6 m), until the village is sighted. Anchorage can be found to southward of the sand spit, from which a reef and shoal extend an unknown distance toward the south end of Big Diomede. A passage between the islands is reported, but should not be attempted by large vessels. A village on the southwest end of Big Diomede was nearly abandoned in 1926.

The boundary line between the United States and Russia passes between these islands.

East Cape (Siberia) 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 Sarichef Island, narrow and about 7 miles long. A **light** has been establishtd on Sarichef Island, southwest side of entrance to Shishmaref Inlet, about ½ mile from the northeast end of the island. The village of Shishmaref lies about midway the length of the island. It is the most important settlement along this section of the coast. It has about 100 inhabitants, and there is a post office, school, fox farm, and store; of these the schoolhouse is the most conspicuous. About ½ mile northeast of the village a 50-foot watchtower on the fox farm is one of the best landmarks along the beach. It is painted white, and a light is usually displayed from the top at night. Anchorage in 5 fathoms (9.1 m) can be obtained with this tower bearing 115° true, distant about 1¼ miles. The navigable inlet is around the northeast end of the island. A dangerous bar makes out about ½ mile westward of the north entrance point.

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 August 1 to November 1 of each year.

KOTZEBUE SOUND, northward of Seward Peninsula, 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 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, ***Kotzebue Sound,*** is 4 feet (1.2 m), and the range between mean lower low water and mean higher high water is about 5 feet (1.5 m).

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.

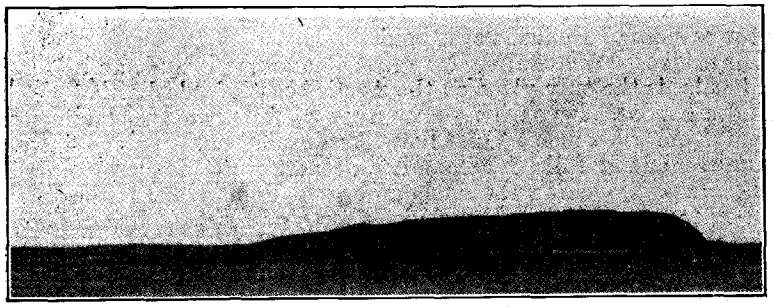
Kiwalik is a small town on the spit at the mouth of Kiwalik River. There is a pilot here by the name of Ben Tipperman, who is familiar with local waters. There is a small store at Kiwalik.

Candle is a town about 10 miles up the Kiwalik River. Freight is lightered up the river from Kiwalik. KIB are the call letters of the Candle Community **Radio** Association.

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 looking E. by N., 3 miles away.

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 until in the vicinity of the anchorage. Anchor in 5 fathoms (9.1 m) with the cape bearing between 90° true and 102° true 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 tidal 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. Observations at this location show a northwestward nontidal flow which at times has sufficient velocity to overcome the flood of the tidal current and produce a continuous northwestward current of varying velocity for days at a time. This northwestward flow attains maximum velocities of 1 to 2 knots at times of ebb strength of the tidal current.

HOTHAM INLET, making in from the north side of Kotzebue Sound, 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 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.

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 with a school about 10 miles southeastward from Cape Seppings. There are several reindeer herds in the vicinity and meat can be obtained.

The red-roofed schoolhouse is conspicuous for a distance of 5 miles. There is a good anchorage about 1 mile offshore in 6 fathoms (11 m), with the schoolhouse bearing 50° true.

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, **Marryatt 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.

Shoal water extends westward from the point and the 6-fathom (10.9 m) curve projects out about 1 mile from the point in a west magnetic direction.

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.

The native village is near the point while the buildings of the mission are a considerable distance to the eastward.

The anchorage most convenient to the village and mission is on the north side of the point, but a better landing can sometimes be made south of the point. The northern anchorage is in 6 fathoms (10.9 m) about ½ mile offshore, with the mission church bearing 175° true. The south anchorage is in 10 fathoms (18.3 m) 2 miles offshore, with the church bearing 325° true.

Because of the shoal off this point, vessels must either round the point close-to or make a wide sweep to the westward and round it many miles off. To pass close-to, haul gradually around the point, keeping about ½ mile offshore; keep the lead going constantly and hold in not less than 6 fathoms (11 m).

There is no communication other than by boat in the summer and by dog team in 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 Marryatt 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 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 Marryatt 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 clips, 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 scatterd 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, owning 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

mountain 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 Wainright 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).

Captain Pederson of the trading vessel *Patterson* reports (1930) that there is a good channel through Blossom Shoals about 2 miles off Icy Cape.

The Coast Guard cutter *Northland* has surveyed and navigated a channel through Blossom Shoals. The channel has depths of 5 to 9 fathoms (9.1 to 16.5 m). It parallels the west side of Icy Cape,

2½ miles off. This is evidently the same channel reported closer in by Captain Pederson. A 3-fathom (5.5 m) spot lies about 2 miles 3° from the point of the cape. A 2½-fathom (4.6 m) spot lies about 1¾ miles 326° true from the point of the cape. These two dangers were located by the survey. They lie inshore of the channel.

This channel is of prime importance to a vessel caught north of the shoals by ice setting in onto the outer edge of them. Blossom Shoals form the approximate southern limits of the inshore ice during the July–September season for navigation in this region. The ice moves inshore and offshore with the winds and as the shoals form a salient at this part of the coast, open water may extend north and south of them, but access from one open-water area to the other may be blocked by ice on the other side of the shoals. (From report of commanding officer, Coast Guard cutter *Northland*.)

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, extending 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 opening 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 a **radio station,** call letters WXB, operated by the United States Army Signal Corps.

A few trading 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.

During the winter the only travel is by dog team or by airplane. Mail goes in by dog team about twice each winter.

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 at 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.

The **coast** eastward of Point Barrow is shown on chart 9400.

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°, "Thetis Island." Professional Paper No. 109, issued by the United States Geological Survey, based on surveys made by Leffingwell, was valuable 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 Artic 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.

Trading posts.—Captain Pederson of the trading vessel *Patterson*, reports that trading posts are located at the following points eastward from Point Barrow: **Cape Halkett, Beechey Point, Barter Island, Demarcation Point,** and **Herschel Island.**

Tangent Point is low, flat, and indented by a number of shallow lagoons.

Cape Simpson, at the western 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 2 months.

There is a Canadian Government radio station, call letter VEE, which is operated during the summer months only, usually from the latter part of July to the latter part of September.

13. APPENDIX

COAST PILOTS OF THE COAST AND GEODETIC SURVEY

	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, Puerto Rico, and Virgin Islands	.75
Inside Route Pilot, New York to Key West	.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, Yakutat 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*
Distances Between United States Ports	.10

*The price of these publications will be $1.00 per copy as new editions are issued.

FIELD STATIONS

Boston, Mass., 10th floor, Customhouse.
New York, N. Y., 620 Federal Office Bldg., 90 Church Street.
New Orleans, La., room 314, Customhouse.
San Francisco, Calif., room 307, Customhouse.
Seattle, Wash., room 601, Federal Office Building.
Manila, P. I., Engineer Island.

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 and Notices to Mariners are kept on hand. The field stations are also sales agencies for the Coast and Geodetic Survey publications and Light Lists published by the United States Lighthouse Service. A chart catalogue or extracts thereof, 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 quarterly in the Notice to Mariners.

NAVIGATIONAL AIDS AND THE USE OF CHARTS

The **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 issues the following publications relating to these waters as guides to navigation: Charts, Coast Pilots, Tide Tables, Current Tables, a catalog of these publications, and Notices to Mariners, the last-named published weekly by the Lighthouse Service and Coast and Geodetic Survey.

Nautical charts bear three dates, which are important to persons using them: (1) The *edition date* (month and year) of the publication note, *printed* on most charts centrally in the lower margin; (2) the *print date* (year, month, and day), the latest date *printed* in the lower left-hand corner below the border, which is the date of correction to the printing plate; (3) the *date of issue*,

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stamped in the right lower margin and just to the left of the subtitle. Charts contain all necessary corrections for aids to navigation, dredged channels, and dangers, which have been received to the date of issue, being corrected by hand for data received after the latest print date. All changes in aids to navigation and new dangers are published in Notices to Mariners, published by the Department of Commerce, and charts should be corrected by hand for all notices subsequent to the date of issue of the chart. The edition date of the chart remains unchanged until an extensive correction is made to it; the date is then changed and the issue is known as a new edition. A new edition renders all previous issues of that chart obsolete, and they should be replaced by copies of the new edition. When any correction, no matter how insignificant, but not of sufficient importance to require a new edition, is made to the printing plate, a new print date (year, month, and day) is added in the lower left-hand corner. All the notes on a chart are important and should be read carefully, since in some cases they refer to the aids to navigation or to dangers that cannot be clearly charted. The charts are various in character, and are constructed on different scales, to adapt them to varied navigational purposes. The most important distinctions are the following:

1. Sailing charts, on scales from 1:600,000 to 1:4,500,000, which exhibit the approaches to a large extent of coast, contain the offshore soundings, and enable the navigator to fix his position as he approaches the coast from the open ocean, or when sailing between distant coast ports.
2. General charts of the coast, on scales from 1:180,000 to 1:400,000, intended especially for coastwise navigation, when a vessel's course is offshore but mostly within the sight of land or aids to navigation.
3. Coast charts, on scales from 1:80,000 to 1:100,000, intended for coastwise navigation, close to shore; and for entering and navigating the larger bays and harbors.
4. Harbor charts, on scales from 1:5,000 to 1:40,000, intended for navigation of harbors and constricted waterways.

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 waters of the United States, Puerto Rico, Virgin Islands, Alaska, Hawaiian Islands, and the Philippine Islands, contain descriptions of the coasts, 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. A table of tidal differences is given by means of which the tides at about 4,200 intermediate ports may be obtained. These tables are published in two volumes under the titles: Tide Tables, Atlantic Ocean, and Tide Tables, Pacific Ocean and Indian Ocean.

Current tables are also issued annually in advance. They include daily predictions of the times of slack water and the times and velocities of strength of flood and ebb for a number of harbors, together with differences for obtaining predictions for numerous other places, as well as other useful information on currents. The current tables appear in two volumes, one for the Atlantic coast of the United States and the other for the 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 ports of the United States and in some foreign ports. The charts and publications can also be purchased at 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 money order, express order, or check, payable to the U. S. Coast and Geodetic Survey. Postage stamps cannot be accepted. The sending of money is unsafe except by registered letter. Only catalog numbers of charts need be mentioned. The catalog of charts and other publications of the Survey may be obtained free of charge on application at any of the sales agencies or to the Coast and Geodetic Survey, Washington, D. C. A list of

the sales agencies of the Coast and Geodetic Survey is in the catalog and is repeated quarterly in the Notice to Mariners.

Other publications.—Lists of Lights, including buoys and other daymarks of the United States, including Alaska, Hawaii, Puerto Rico, and Virgin Islands (U. S.), and the Great Lakes, are published by the Lighthouse Service and may be purchased from its sales agencies or from the Superintendent of Documents, Washington, D. C. Notice to Mariners, relating to the same waters, is published weekly by the Lighthouse Service and Coast and Geodetic Survey; this publication can be obtained free of charge on application to the superintendents of lighthouses of the various districts. The Corps of Engineers, United States Army, in cooperation with the United States Maritime Commission, publish the Port Series in 25 volumes and Port and Terminal Charges at United States Ports. These volumes contain much useful information concerning port conditions which is of interest to the navigator. They may be purchased from the Superintendent of Documents, Washington, D. C.

PUBLICATIONS

The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner:

The Catalog of United States Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, Tidal Current Charts, and Aeronautical Charts, or extracts of the catalog, are distributed free by the United States Coast and Geodetic Survey and its authorized agents.

The List of Publications of the Department of Commerce lists the publications of the United States Coast and Geodetic Survey and may be secured free on application from the offices of the Department of Commerce and its field agencies, or from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Certain libraries have been designated by the Congress of the United States to receive prints, as issued, of all publications printed by the Government for public distribution. These publications may be consulted by anyone during business hours.

NAUTICAL CHARTS

Coasts of the United States, Territories, and Possessions:
- Issued by the United States Coast and Geodetic Survey.
- For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Mississippi River from the Head of Passes to Cairo:
- Issued and for sale by the Mississippi River Commission, Vicksburg, Mississippi.

Illinois Waterway System:
- Issued and for sale by the United States Engineers, Chicago, Illinois.

Ohio River:
- Issued and for sale by the United States Engineers, Cincinnati, Ohio.

Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwall, Canada:
- Issued and for sale by the United States Lake Survey, Detroit, Michigan.

New York State Canal System:
- Issued and for sale by the Superintendent of Public Works, Albany, New York.

Foreign countries:
- Issued by the Hydrographic Office, United States Navy Department.
- For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

COAST PILOTS

Coasts of the United States, Territories, and Possessions:
- Published by the United States Coast and Geodetic Survey.
- For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Foreign countries:
- Published by the Hydrographic Office, United States Navy Department.
- For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

TIDE TABLES

Atlantic Ocean, and Pacific and Indian Oceans—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in various ports.

CURRENT TABLES

Atlantic Coast, North America, and Pacific Coast, North America, and Philippine Islands—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

TIDAL CURRENT CHARTS

Boston Harbor, Long Island and Block Island Sounds, New York Harbor, San Francisco Bay—Four volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

NOTICE TO MARINERS

Issued by the United States Department of Commerce and by the Hydrographic Office, United States Navy Department.
Notices to Mariners are published weekly and may be secured free of charge from the United States Lighthouse Service and from the Hydrographic Office.
A limited number of Philippine Island Notices to Mariners (isued quarterly) are available for free distribution at the Coast and Geodetic Survey field stations at Seattle, Wash., and San Francisco, Calif.

LIGHT LISTS

United States, Territories, and Possessions:
Published by the United States Lighthouse Service.
For sale by the Superintendent of Documents, Washington, D. C., and by authorized sales agents in the various ports.
Philippine Islands:
Published by the Department of Finance, Bureau of Customs, Manila, Philippine Islands.
A copy of the List of Lights, Buoys, Beacons and Daymarks of the Philippine Islands will be sent free of charge to any shipmaster on application to the Insular Collector of Customs, Manila, P. I.
A limited number of Philippine Notice to Mariners and List of Lights, etc., are available for free distribution at the Coast and Geodetic Survey Field stations at Seattle, Wash., San Francisco, Calif., and Honolulu, T. H.
Foreign Countries:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

RADIO

Charts of Radiobeacon System, Atlantic and Gulf Coasts, Pacific Coast, and Great Lakes:
Free on application to the various superintendents of lighthouses.
The Communication Act of 1934, as amended:
For sale by the Superintendent of Documents, Washington, D. C.
Extracts from the International Convention for the Safety of Life at Sea, London 1929:
Issued by the Federal Communications Commission, Washington, D. C.
International Code of Signals (American Edition), Vol. II.—Radio:
Published and sold by the United States Hydrographic Office, Washington, D. C.

International Radio Telegraph Conference, Madrid, 1932:
For sale by the Superintendent of Documents, Washington, D. C.
Radio Aids to Navigation (H. O. Publ. No. 205), in two volumes:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C.
Radiobeacons and Radiobeacon Navigation:
Published by the United States Lighthouse Service.
For sale by the Superintendent of Documents, Washington, D. C.
List of Radiobeacons:
See Light Lists published by the United States Lighthouse Service.
Radio Circular No. 1, Distribution of Weather Information, Forecasts, and Warnings by Radio for the Benefit of Marine, Aviation, and Commercial Interests:
Free on application to the Weather Bureau, United States Department of Agriculture, Washington, D. C.
Radio Service Bulletins:
Issued twice monthly by the Federal Communications Commission, Washington, D. C.
Ship Radiotelegraph Safety Rules:
Issued by the Federal Communications Commission, Washington, D. C.
Publications of the International Telecommunication Union, Berne, Switzerland, are listed on page 26.

MISCELLANEOUS

American Practical Navigator (Bowditch):
Published by the Hydrographic Office, United States Navy Department.
For sale by the Superintendent of Documents, Washington, D. C.
Annual Report of the Chief of Engineers, United States Army:
Part 1.—Report upon river and harbor improvement work, including flood-control operations.
Part 2.—Commercial Statistics, Water-borne Commerce of the United States.
These volumes may be consulted at the libraries which are public depositories.
General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes:
Published by and issued free on application to the Bureau of Marine Inspection and Navigation, United States Department of Commerce, Washington, D. C.
International Code of Signals (American Edition), Vol. 1—Visual:
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List of Bridges Over the Navigable Waters of the United States:
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For sale by the Superintendent of Documents, Washington, D. C.
The American Ephemeris and Nautical Almanac:
Published by the United States Naval Observatory.
For sale by the Superintendent of Documents, Washington, D. C.
Rules and Regulations: The Navigable Waters of the United States:
Prepared by the United States Engineers.
For sale by the Superintendent of Documents, 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 indicate clearly 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 current 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 upon the chart by two broken lines to represent the side limits of the improvement together with the depth and date. The depth is the controlling depth through the channel on the date charted and does not mean that this depth obtains over the full width of the channel, nor that the depth has not subsequently changed due to either shoaling or dredging. These changes are often of frequent occurrence; therefore, when

vessels' drafts approximate the charted depth of a dredged channel local information as to conditions should be obtained before entering.

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 cannot 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 amounts 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.—All Coast and Geodetic Survey charts are printed by photo-lithography and have little, if any, distortion.

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.

Lighted buoys and other unwatched lights cannot be implicity relied on; the light may be altogether extinguished, or if flashing or occulting, the apparatus may get out of order.

Lights.—The distances 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 of visibility. 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.

Light sectors.—Where lights have various colored sectors it should be borne in mind that the bearings of the edges of the sectors as given in the light lists and Coast Pilots are in degrees true, reading clockwise from 0° at N. as observed from a vessel.

In some conditions of the atmosphere white lights may have a reddish hue; the mariner, therefore, should not trust solely to color where there are sectors, but should verify the position by taking a bearing on the light. On either side of the line of demarcation between white and red there is always a small sector of uncertain color, as the edges of a sector cannot be cut off sharply.

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 or an echo-sounding instrument is often the only safe guide and should be faithfully used. The establishment of radio-beacons and radio direction-finder stations combined with the use of radio direction-finder apparatus aboard ship has greatly facilitated the fixing of position in fog.

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.

An echo may sometimes be heard from the boarded side of a beacon (echo board) or from a flat surface of any structure. A megaphone is said to be helpful for detecting sound and for determining the direction to the source.

Submarine signals, installed on some lightships, 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, and when the sound signals (air or submarine) are synchronized with the radio-beacon the distance from the lightship may be determined. See page 22. 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 cannot 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 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.

The Tide tables published annually by the Coast and Geodetic Survey give the predicted times and heights of high and low waters for numerous places in the United States and throughout the world.

Plane of reference for soundings on charts.—For the Atlantic coast of the United States and Puerto 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 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 where the tidal range is considerable, special caution is necessary. It should be remembered that along the coast 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 crosscurrent 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 the 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 plunging effects of the propeller and rudder.

The current tables published annually by the Coast and Geodetic Survey give the predicted times of slack water, times and velocities of strengths of currents, and other current data for a number of places on the Pacific and Atlantic coasts of North America and in the Philippines.

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 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 this method. 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 bearings 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 three-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 are a good number, as the four angles thus obtained usually establish a position free of any doubt. 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 afterward 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 continually 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.

Range finders.—Vessels equipped with range-finding apparatus have a ready means for determining the distance from an object and, combined with a bearing, can fix their position at any time when objects are visible.

Soundings.—In thick weather, when near or approaching the land or danger, soundings should be taken continually 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.

Echo sounding.—This modern method of obtaining soundings is coming into extensive use. Its advantages lie in the fact that rapid and almost instantaneous soundings can be had while the vessel is running at full speed, and the navigator thereby knows at all times the depth of water under his keel. The method of determining the ship's position as described in the preceding paragraph is eminently applicable when echo soundings are obtained. Two types of instruments have been brought out. In one type, the returning echo is flashed on a revolving plate and the depth read by an adjacent scale, while with the other type the depths are recorded on a graph.

By means of echo soundings, a vessel can follow a safe depth curve with ease, and dangerous points and capes can be rounded in thick weather with utmost safety.

Echo sounding has been developed to such an extent that it is now used by the surveying vessels of the Coast and Geodetic Survey and has practically replaced the use of the pressure tube.

Use of sounding tubes.—Although of undoubted value as a navigational instrument, the sounding tube is subject to certain defects which, operating singly or in combinations, may give results so misleading as to seriously en-

danger the vessel, whose safety is entirely dependent upon an accurate knowledge of the depths. There are various types of tubes in common use which are too well known to require a detailed description here. They are all based on the principle that the column of air in the tube will be compressed in proportion to the depth to which the tube is lowered in the water. The principle is sound theoretically, but in practice there are several sources of mechanical errors which affect the result in proportion to the depth of water determined. The most important sources of errors are as follows:

(*a*) *Inherent:* Those which occur as a result of permanent defects in the tube, such as the variation of the bore from a true cylinder, variation in the thickness of the cap, etc.

(*b*) *External:* Those which occur as a result of the conditions under which the sounding was taken, variations of temperature or barometric pressure from the normal, etc.

(*c*) *Accidental:* Those which affect a single sounding, due to the failure of the tube to register properly, leakage of air, loss of water from leaky valve, errors due to the presence of salt in the tube, etc.

Before undertaking the sounding necessary to make any particular landfall the vessel should be stopped for an up-and-down cast of the lead in order to test the accuracy under the prevailing conditions of the tubes which are to be used. For this purpose it is not necessary to get bottom; simply run out 60 to 80 fathoms of wire and then see how closely the tubes register that amount. A number of tubes can be sent down at one time, and it is then possible to select one or two which register most nearly correct. The accidental errors are probably the most serious of the three types, both because they are apt to be larger in amount and because it is impossible to foresee when they will occur. It should be kept in mind that tubes which have been working properly for a number of soundings may suddenly develop errors, and for this reason the mariner must beware of overconfidence in the tubes.

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 afterward or before may be combined; also two observations of the sun with sufficient interval to admit of a consderable 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, but they are not recommended for use within an hour of the meridian, when the Marc St. Hilaire Method of Ex-Meridian Tables should be substituted.

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 principle 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.

Radio direction-finder 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 waves 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 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. 23); 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 the shore station are a long distance apart. The bearings may be corrected for this distortion as explained on page 24.

Radio bearings may be combined with position lines obtained from astronomic observations and used in ways very similar to the well-known Sumner line when avoiding dangerous shoals or when making the coast.

Radiobeacons.—The United States Lighthouse Service now maintains and operates radiobeacons at a large number of lighthouses and lightships. In fog or thick weather these radiobeacons send distinctive signals and ships equipped with radio direction finders may readily obtain bearings on these beacons. For a detailed description, see page 21.

Radiobeacon stations that are equipped for **distance finding**, transmit a special radio signal and sound a corresponding air or submarine signal at the same period of time. The reception of the sound signal by a vessel will be delayed depending upon the distance the sound has to travel, whereas the radio signal will be received practically instantaneously.

When the sound signal travels through water, the number of seconds intervening between the reception of the radio signal and sound signal divided by 1.25 gives the distance of the vessel in miles from the station. Where the sound signal travels through air the distance in miles is obtained by dividing the number of seconds by 5 (or more exactly 5.5).

For details as to the signal characteristics see the Light Lists published by the United States Lighthouse Service.

Compass, change in variation of.—The gradual change in the variation must not be forgotten in laying down positions by bearings on charts. The magnetic compass roses placed on the charts for the purpose of facilitating plotting become in time slightly in error due to this change, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of the change may be of importance. The compass roses are replotted for every new edition of the chart if the error is appreciable. Means for determining the amount of this error are provided by printing near the edge of the compass rose the date of its construction and the annual change in variation.

At the present time the rate of change is quite uncertain over a large portion of the coastal waters of the United States and especially of the outlying possessions, as a result of the lack of recent observations. In some cases this uncertainty, coupled with the inadequacy of the original observatioons, has introduced uncertainties in the values of variation shown on the charts, which may be as much as one degree.

The change in the magnetic variation in passing along 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.

On certain small scale charts the magnetic variation is shown by (isogonic) lines in addition to the compass roses. They give a picture of the distribution of the magnetic variation over the entire area of the chart.

Local attraction.—Local attraction or local magnetic disturbance refers only to the effects on the compass of isolated magnetic masses external to the ship. These magnetic masses are either paramagnetic rocks or polarized ferromagnetic substances, such as the mineral magnetite. They may be on the land or under

the ocean bed, and vary in size. Their effects on the compass needle may diminish rapidly with increasing distance, as it takes a large mass to affect the compass at a distance of one-half mile. Local attraction may either diminish or increse the normal variation.

All localities at which there may be local attraction are not known. Whenever such an area is noted, the position should be fixed and the facts reported as far as they can be ascertained.

Deviation.—The magnetic field of the earth is also modified by the presence of the ship itself. The difference between the value of the variation and what its value would be if the ship were absent is known as the "deviation." The deviation varies with the heading of the ship and with the magnetic latitude. It is customary to counteract the deviation as far as is conveniently possible by suitably placed soft iron and permanent magnets. See Special Publication 96 of the United States Coast and Geodetic Survey entitled "Instructions for Compensation of the Magnetic Compass."

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 the 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 kerosene 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 suffices, 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 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 kind 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 position 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 cannot 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	18.8	−20	50	4.48	64.2	NE.
February	21.1	−24	59	4.27	57.7	NE.
March	25.1	−11	52	4.19	44.9	NE
April	33.9	4	63	3.03	19.6	NE.
May	42.2	18	78	2.71	1.5	SW.
June	49.8	30	78	1.93	0	SW.
July	53.4	36	84	3.59	0	SW.
August	51.9	29	84	6.14	0	SW.
September	45.8	23	82	8.79	0.2	NE.
October	37.5	5	69	8.29	9.1	NE.
November	26.8	−9	56	6.03	38.7	NE.
December	20.3	−18	48	5.77	56.3	NE.
For year	35.6	−24	84	59.22	292.2	NE

SEWARD

January	21.5	−20	48	4.39	17.4	N.
February	27.1	−14	55	4.96	19.1	N.
March	30.7	−7	52	3.41	9.9	N.
April	37.2	9	72	3.98	8.2	S.
May	44.5	22	77	3.31	T.	S.
June	51.1	32	84	2.17	0	S.
July	55.4	37	88	2.87	0	S.
August	54.1	33	85	6.07	0	S.
September	48.6	27	84	9.49	T.	N.
October	39.8	9	65	11.19	1.5	N.
November	31.2	3	58	7.38	5.4	N.
December	24.7	−12	53	6.76	16.2	N.
For year	38.8	−20	88	65.98	77.7	N.

ANCHORAGE

January	10.5	−33	56	0.89	13.5	N.
February	18.3	−31	55	.73	9.9	N.
March	22.1	−19	56	.57	7.6	N.
April	34.6	−15	60	.35	2.7	N.
May	44.8	20	71	.48	.3	NW.
June	52.7	29	84	.53	0	W.
July	57.0	34	81	1.76	0	W.
August	55.5	31	82	2.74	0	W.
September	47.7	19	73	2.55	T.	N.
October	35.9	−6	63	2.03	4.5	N.
November	22.6	−18	62	1.02	10.3	N.
December	12.0	−36	53	.95	10.8	N.
For year	34.5	−36	84	14.60	59.6	N.

KODIAK

January	29.9	−9	53	4.68	9.3	NW.
February	31.5	−3	58	4.73	10.6	NW.
March	33.3	2	65	3.84	9.0	NW.
April	36.7	5	62	3.83	5.4	NW.
May	43.0	20	74	5.90	.4	SE.
June	50.0	30	82	4.72	T.	NE.
July	54.5	35	82	3.43	0	SE.
August	53.0	34	85	5.07	0	SE.
September	50.0	26	80	5.28	T.	SE.
October	42.2	7	74	7.23	1.0	NW.
November	35.4	−3	63	5.81	3.3	NW.
December	30.8	−12	62	5.95	7.2	NW.
For year	40.9	−12	85	60.47	46.2	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	32.4	5	56	5.78	18.6	SE.
February	32.2	6	60	6.72	23.6	SE.
March	33.7	5	69	5.32	10.4	SE.
April	35.6	13	61	3.83	8.7	SE.
May	40.9	20	66	4.72	.2	SE.
June	46.1	30	73	2.78	0	SE.
July	51.4	36	80	2.13	0	SE.
August	52.3	28	80	2.77	0	SE.
September	47.9	28	78	5.54	0	SE.
October	41.1	24	65	8.28	.2	NW.
November	3o.1	14	58	6.36	6.7	NW.
December	32.9	10	56	6.92	10.6	SE.
For year	40.2	5	80	61.15	79.0	SE.

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	3.0	−47	39	1.07	10.2	NE.
February	5.1	−41	45	.83	9.2	NE.
March	8.9	−38	40	.89	10.7	NE.
April	18.4	−30	48	.63	4.9	NE.
May	34.0	−6	66	.66	.9	NE.
June	45.3	20	79	1.23	.2	W
July	49.7	28	84	2.64	T.	W
August	49.5	23	80	3.27	T.	SW
September	41.4	16	66	2.71	.5	NE
October	29.0	−4	55	1.65	3.6	NE
November	15.3	−26	50	.94	8.7	NE
December	7.1	−42	40	1.18	11.5	NE.
For year	25.6	−47	84	17.70	60.4	NE.

POINT BARROW

January	−17.5	−52	33	0.12	2.4	NE.
February	−16.9	−56	35	.22	3.5	NE.
March	−14.6	−52	33	.15	2.3	NE.
April	−0.7	−42	40	.14	3.2	NE.
May	19.3	−18	45	.16	2.0	NE.
June	34.8	8	65	.28	.4	NE.
July	40.2	22	78	.94	1.2	SW.
August	38.5	20	73	.74	.7	NE.
September	30.6	4	59	.44	3.2	NE.
October	15.8	−25	43	.58	8.6	NE.
November	−0.6	−37	35	.30	4.7	NE.
December	−13.0	−55	34	.26	4.1	NE.
For year	9.7	−56	78	4.33	36.3	NE.

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