U. S. DEPARTMENT OF COMMERCE
CHARLES SAWYER, SECRETARY
COAST AND GEODETIC SURVEY
ROBERT F. A. STUDDS, *Director*

JUNE 2, 1951 SERIAL NO. 750

UNITED STATES COAST PILOT

Pacific Coast

California, Oregon, and Washington

SEVENTH (1951) EDITION

VK
947
.N3
7th ed.
(1951)

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1951
For sale by the Coast and Geodetic Survey and its sales agents - - - - - $2.50

National Oceanic and Atmospheric Administration

Climate Data Modernization Program

ERRATA NOTICE

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

Discolored pages
Faded or light ink
Binding intrudes into the text

This document has been imaged through the NOAA Climate Data Modernization Program. To view the original document, please contact the NOAA Central Library in Silver Spring, MD at (301) 713-2607 x124 or www.reference@nodc.noaa.gov.

LASON
Imaging Contractor
12200 Kiln Court
Beltsville, MD 20704-1387
October 29, 2003

Blank page retained for pagination

Contents

Number in parentheses immediately following any item in these Contents is number of the largest scale U. S. Coast and Geodetic Survey Chart on which that feature appears.

Page

Important note.....Front end paper

Preface V

Index maps of charts.....Facing VI

Chapter 1.—General Information..... 1
Coast and Geodetic Survey; Corps of Engineers; Hydrographic Office; Weather Bureau; Coast Guard; Customs; Immigration and Naturalization; Quarantine and Health; Bureau of Entomology and Plant Quarantine; Radio.

Chapter 2.—Regional Information..... 41
Tides and Currents; Weather; Local Services.

Chapter 3.—Sailing Directions..... 139

Chapter 4.—San Diego to Santa Monica Bay (5101) 173

Chapter 5.—Santa Monica Bay to Point Arguello (5202) 199

Chapter 6.—Point Arguello to Point Sur (5302)..... 215

Chapter 7.—Point Sur to Point San Pedro (5402) 225

Chapter 8.—Point San Pedro to Point Arena (5502) 235

Chapter 9.—Point Arena to Trinidad Head (5602) 281

Chapter 10.—Trinidad Head to Cape Blanco (5702) 301

Chapter 11.—Cape Blanco to Yaquina Head (5802) 315

Chapter 12.—Yaquina Head to Columbia River (5902) 329

Chapter 13.—Columbia River..... 339

Chapter 14.—Columbia River to Destruction Island (6002) 371

Chapter 15.—Destruction Island to Amphitrite Point (6102) 385

Chapter 16.—Strait of Juan de Fuca and Georgia Strait (6300) 397

Chapter 17.—Puget Sound, Admiralty Inlet to Seattle (6450) 457

Chapter 18.—Puget Sound, Seattle to Olympia (6460) 489

Appendix 515
Addresses of Federal offices in area; Distance Table; Foreign Consuls; Yacht Clubs; Meteorological Tables; Conversion tables; feet and fathoms to meters, nautical to statute miles.

Index 553

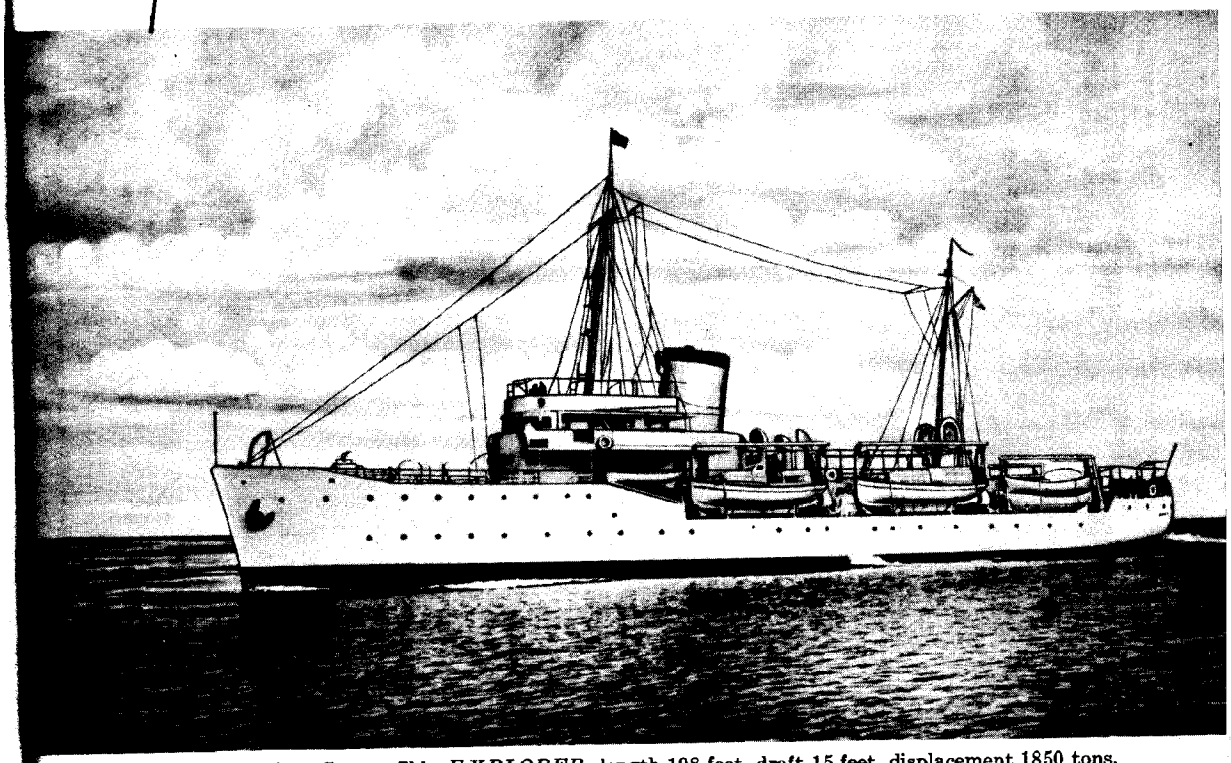
Conversion table points to degrees ..... Back end paper
Distance of visibility of objects at sea ..... Back end paper

SERVICE FLAG
U. S. COAST AND GEODETIC SURVEY

Index Maps

U. S. Coast and Geodetic Survey Charts

Pacific Coast



Coast and Geodetic Survey Ship *EXPLORER*; length 198 feet, draft 15 feet, displacement 1850 tons.

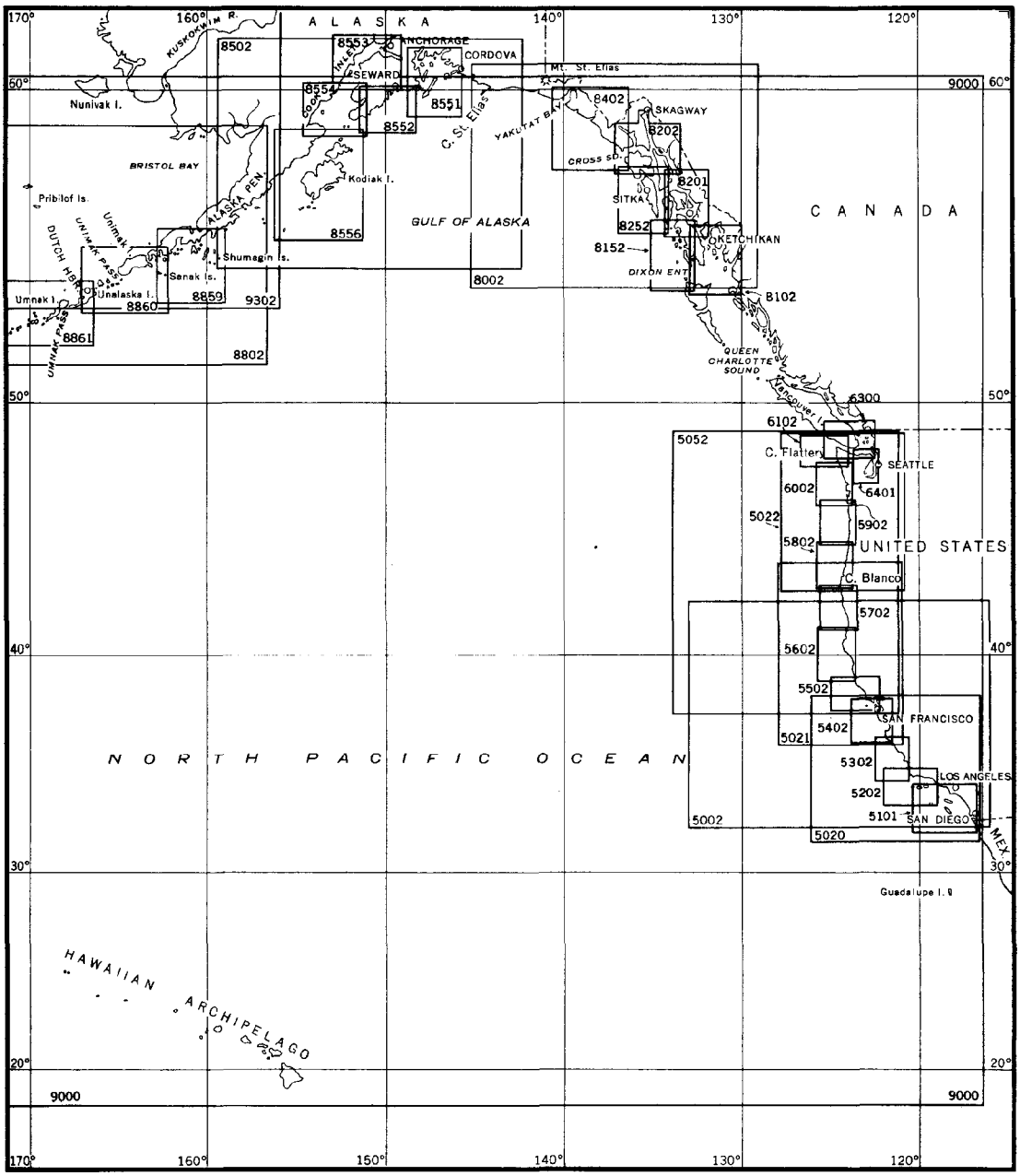
NUMERICAL LIST OF NAUTICAL CHARTS

June 2, 1951

No.	Price	Scale
5001	$0.75	1:40,000
5002	1.00	1:1,412,349
5007	.50	1:40,000
5020	1.00	1:868,003
5021	1.00	1:811,980
5022	1.00	1:736,560
5052	1.00	1:1,200,000
5101	1.00	1:234,270
5105	1.00	1:12,000
5107	.75	1:20,000
5108	.75	1:10,000
5110	.75	1:20,000
5111	1.00	1:40,000
5112	.75	1:40,000
5113	.75	1:40,000
5114	.50	1:40,000
5115	.75	1:40,000
5116	.75	1:40,000
5117	1.00	1:15,000
5118	.75	1:20,000
5128	.50	1:10,000
5142	1.00	1:80,000
5144	.50	1:40,000
5147	1.00	1:12,000
5148	1.00	1:18,000
5202	1.00	1:232,188
5261	.25	1:20,000
5302	1.00	1:216,116
5386	.25	1:20,000
5387	.75	1:40,000
5402	1.00	1:210,668
5403	.75	1:50,000
5476	.75	1:40,000
5502	1.00	1:207,840
5520	.25	1:20,000
5525	.50	1:10,000
5527	1.00	1:40,000
5528	1.00	1:40,000
5531	1.00	1:40,000
5532	1.00	1:40,000
5533	1.00	1:40,000
5534	.75	1:40,000
5535	1.00	1:20,000
5575	1.00	1:10,000
5599	.50	1:40,000
5602	1.00	1:200,000
5603	1.00	1:30,000
5702	1.00	1:196,948
5703	1.00	1:40,000
5711	.75	1:10,000
5773	.25	1:15,000
5795	.75	1:40,000
5802	1.00	1:191,730
5832	.50	1:30,000
5846	.25	1:15,000
5895	.50	1:40,000
5896	1.00	1:40,000
5902	1.00	1:185,238
5951	.75	1:40,000
5952	.50	1:40,000
5971	.50	1:10,000
5984	.75	1:20,000
6002	1.00	1:180,789
6004	.50	1:20,000
6023	.25	1:20,000
6058	.50	1:20,000
6102	1.00	1:176,253
6112	.50	1:20,000
6122	.25	1:20,000
6151	.75	1:40,000
6152	.75	1:40,000
6153	.75	1:40,000
6154	.50	1:40,000
6155	.75	1:20,000
6156	.75	1:40,000
6157	.75	1:40,000
6171	.75	1:15,000
6185	1.00	1:40,000
6195	.75	1:40,000
6265	.75	1:40,000
6266	.50	1:10,000
6300	1.00	1:200,000
6303	.50	1:10,000
6376	1.00	1:25,000
6378	.50	1:40,000
6380	1.00	1:30,000
6381	.75	1:10,000
6382	1.00	1:30,000
6399	.25	1:30,000
6401	.75	1:150,000
6403	.25	1:40,000
6404	.75	1:10,000
6405	.75	1:20,000
6407	.75	1:15,000
6421	.75	1:20,000
6422	.75	1:20,000
6440	.50	1:10,000
6445	.75	1:25,000
6446	1.00	1:25,000
6447	.75	1:10,000
6448	.25	1:40,000
6449	1.00	1:25,000
6450	1.00	1:30,000
6460	.75	1:30,000
6461	.75	1:10,000
6462	.50	1:20,000
8002	.75	1:969,756
8102	1.00	1:229,376
8152	1.00	1:229,376
8201	1.00	1:217,828
8202	1.00	1:209,978
8252	1.00	1:217,828
8402	.75	1:300,000
8502	1.00	1:969,761
8551	1.00	1:200,000
8552	.75	1:200,000
8553	1.00	1:194,154
8554	1.00	1:200,000
8556	1.00	1:350,000
8802	1.00	1:1,023,188
8859	1.00	1:300,000
8860	1.00	1:300,000
8861	1.00	1:300,000
9000	1.00	1:4,860,700
9302	.75	1:1,534,076

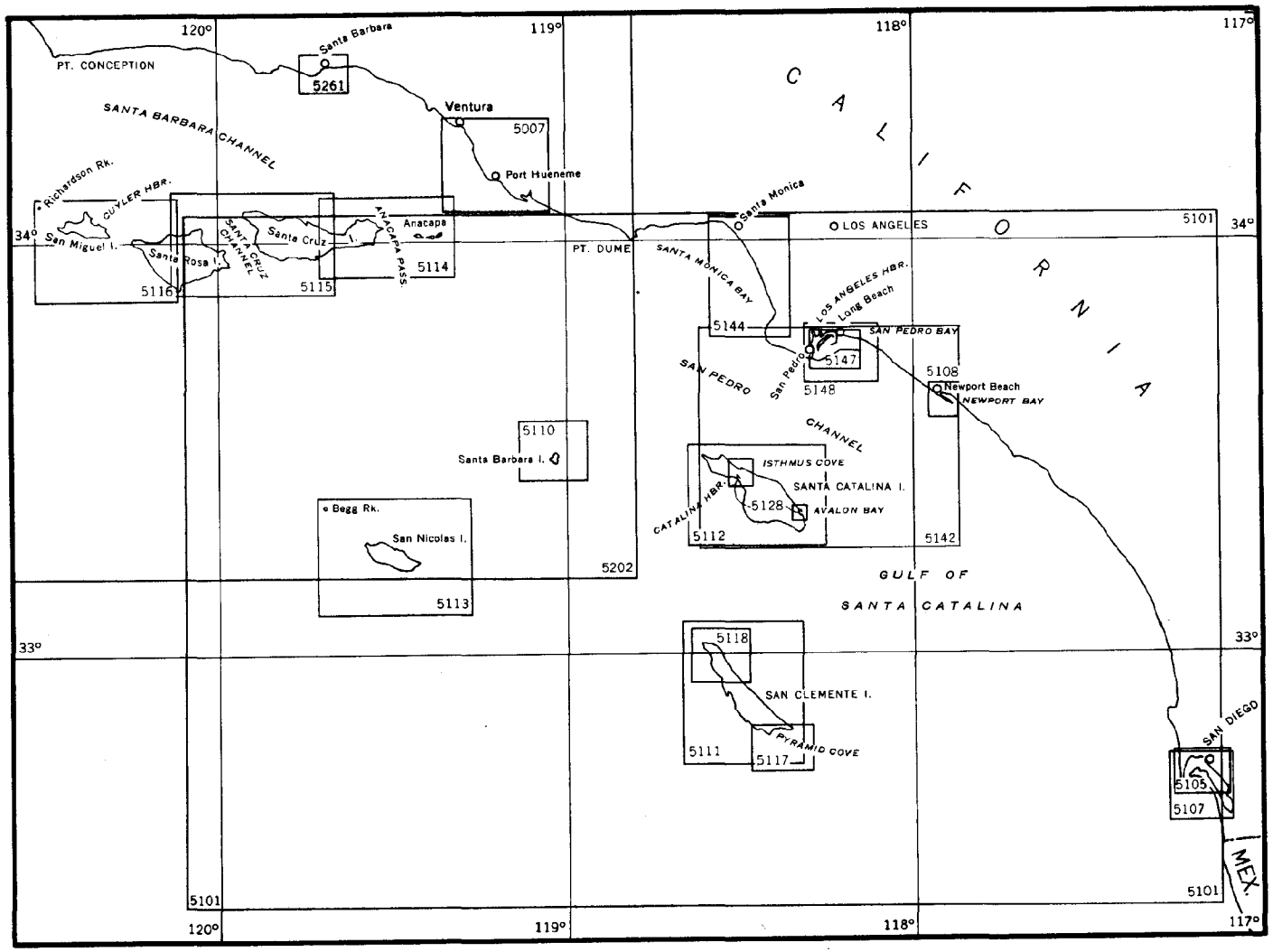
A-316-0 (10)++

SAILING AND GENERAL CHARTS - PACIFIC COAST



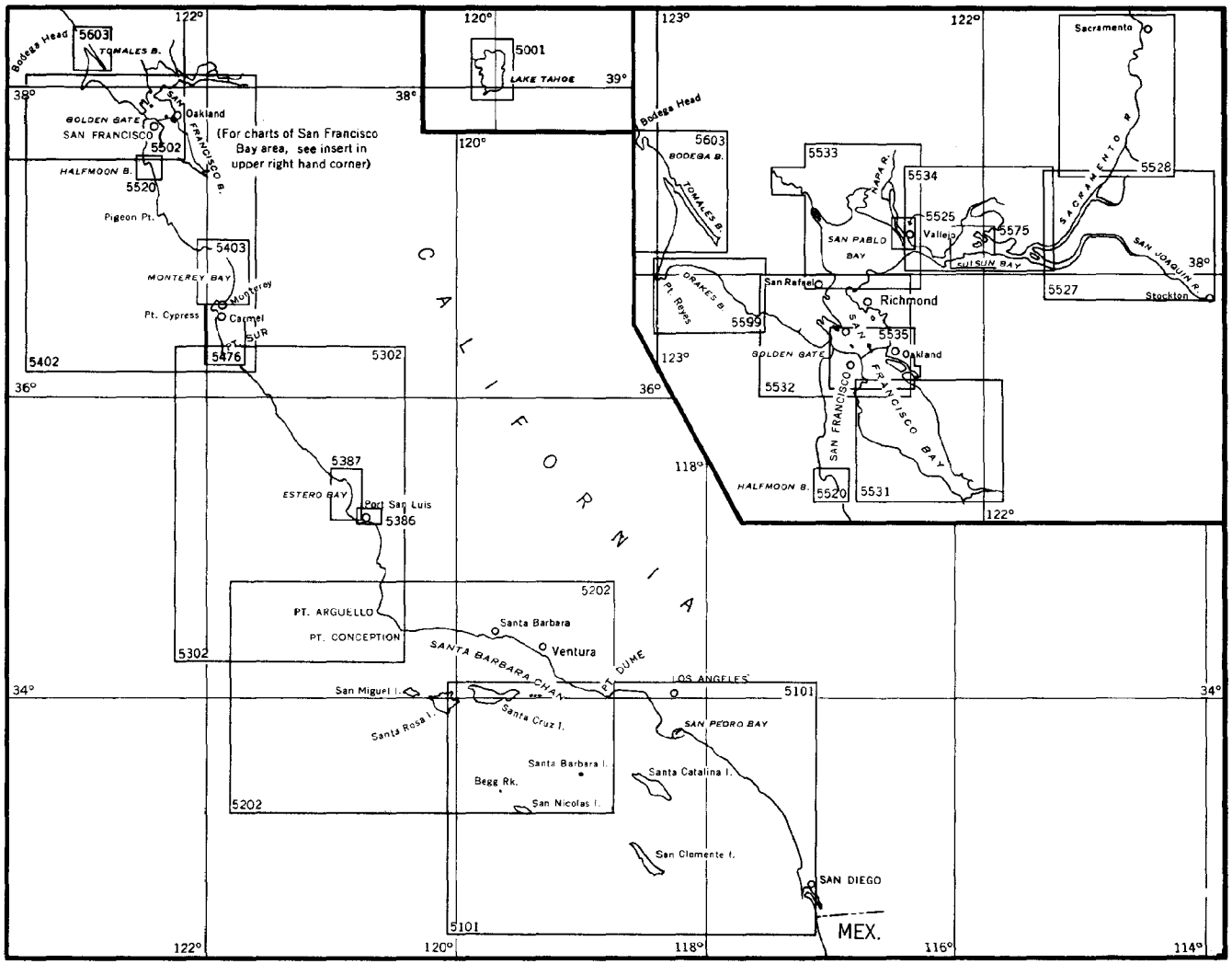
GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

SAN DIEGO TO POINT CONCEPTION, CALIFORNIA



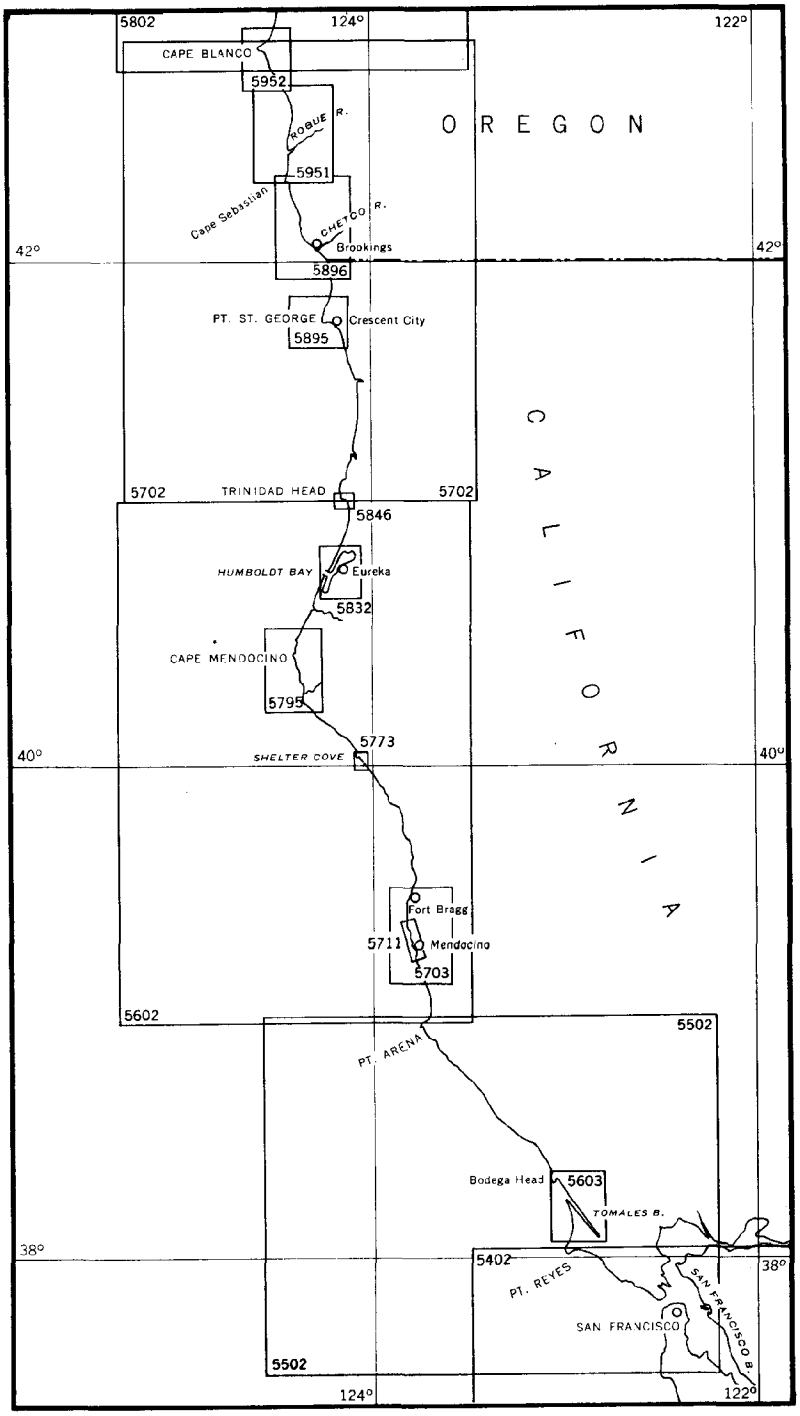
GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

SAN DIEGO TO SAN FRANCISCO BAY, CALIFORNIA



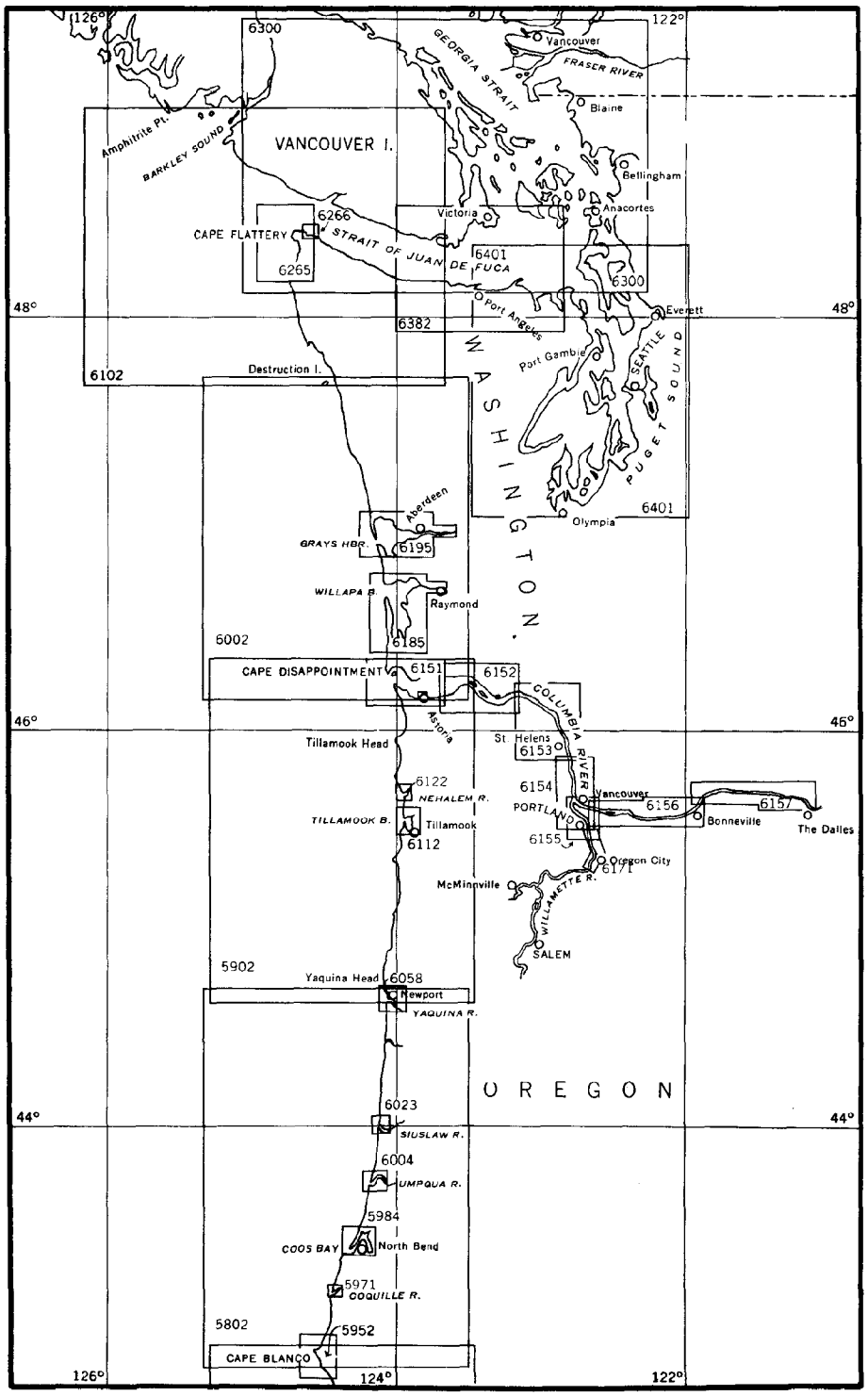
GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

SAN FRANCISCO BAY, CALIFORNIA TO CAPE BLANCO, OREGON



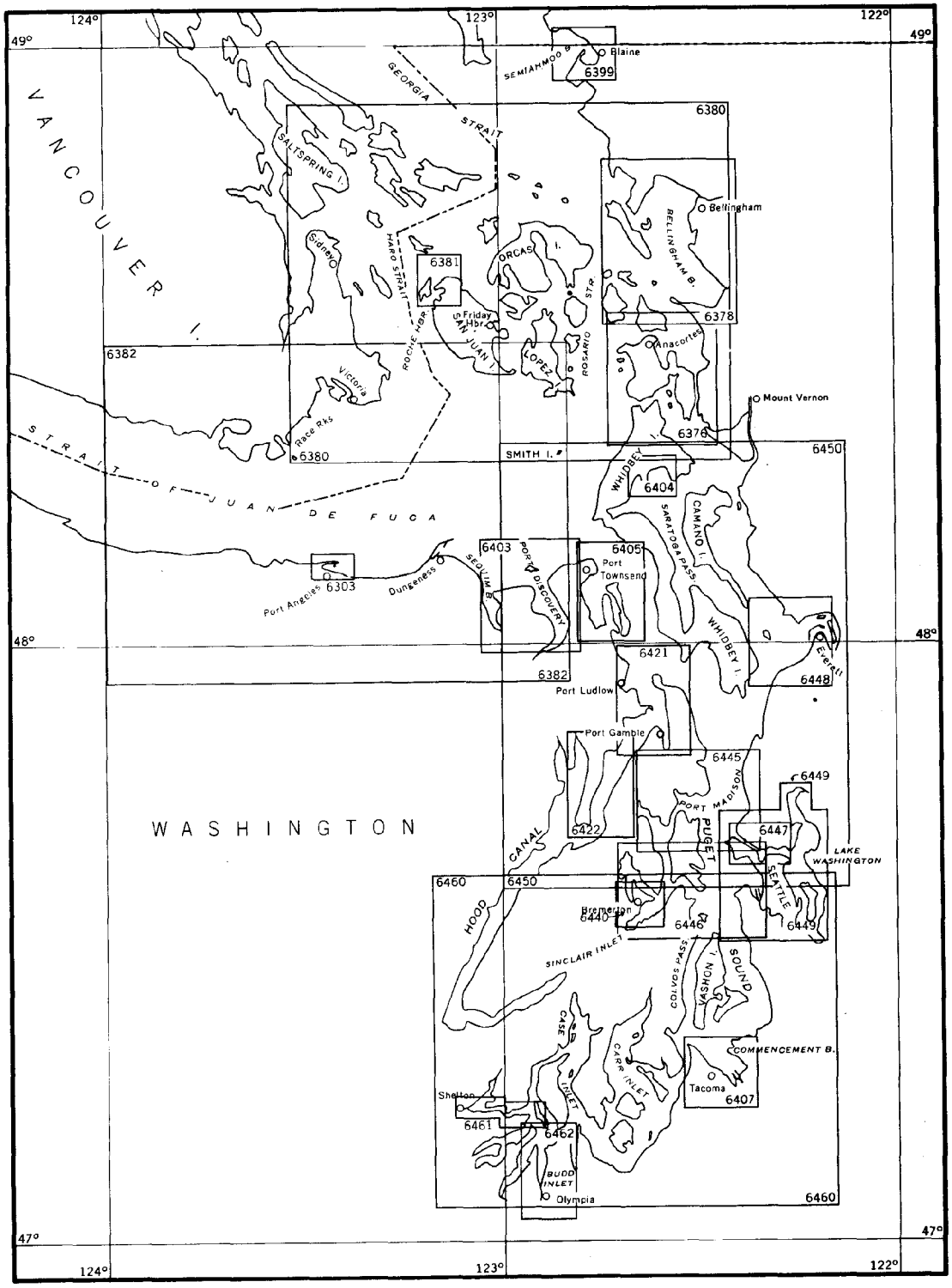
GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

CAPE BLANCO, OREGON TO CAPE FLATTERY, WASH.

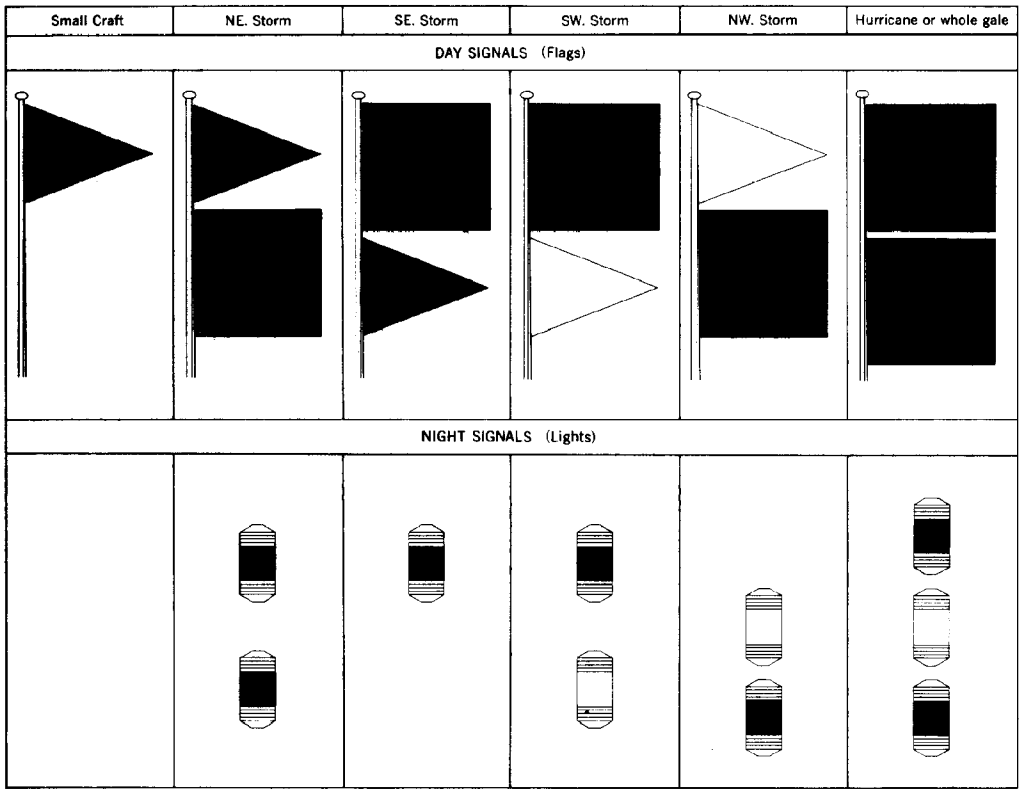


GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

PUGET SOUND AREA



STORM WARNING SIGNALS



EXPLANATION OF SMALL CRAFT, STORM, AND HURRICANE WARNINGS

The small craft warning.—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small craft warnings is made.

The northeast storm warning.—A red pennant *above* a square red flag with black center displayed by day, or two red lanterns, one above the other, displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northeast.*

The southeast storm warning.—A red pennant *below* a square red flag with black center displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southeast.*

The southwest storm warning.—A white pennant *below* a square red flag with black center displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southwest.*

The northwest storm warning.—A white pennant *above* a square red flag with black center displayed by day, or a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northwest.*

Hurricane, or whole gale warning.—Two square flags, red with black centers, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane or of one of the extremely severe and dangerous storms which occasionally move across the Great Lakes.

Code Flags and Single Meanings

** General Signal*

Able (Affirm*) *Speed Trial*	King *Stop Instantly*	Uncle *Standing into danger*	1
Baker *Explosives*	Love *Stop, Something to communicate*	Victor *Require Assistance*	2
Charlie *Yes*	Mike *Doctor on Board*	William *Require Medical Assistance*	3
Dog *Keep Clear*	Nan (Negative*) *No*	Xray *Stop your Intentions*	4
Easy *Altering Course to Starboard*	Oboe (Option*) *Man Overbound*	Yoke *Carrying Mails*	5
Fox *Disabled*	Peter (Prep*) *About to Sail (Lights out)*	Zebra *Shore Stations*	6
George *Want a Pilot*	Queen *Request Pratique*	1st Repeat	7
How *A Pilot is on Board*	Roger *Way is off my ship*	2nd Repeat	8
Item (Interrogatory*) *Altering Course to Port*	Sugar *Going full speed astern*	3rd Repeat	9
Jig *Semaphore*	Tare *Do not pass ahead of me*	*(Decimal Point)* *Code and Answering Pennant:*	0

Preface

THIS is the seventh edition of the United States Coast Pilot, Pacific Coast. It is based on examinations by the United States Coast and Geodetic Survey and includes the results of a special field inspection made in 1950 by Captain Charles K. Green, USC&GS. Weather information was prepared by the United States Weather Bureau. Channel information, data on ports and terminals, and navigation regulations were obtained from the Corps of Engineers. General information and data on navigational aids were furnished by the Coast Guard.

This edition is corrected through Notice to Mariners 22 of June 2, 1951. It cancels the previous edition published in 1942.

Supplements to the Coast Pilot, containing corrections and additions from various sources, are issued each year. Each supplement is complete in itself and cancels all previous issues. The latest supplement, together with Notices to Mariners subsequent to it, will correct the book to date. Supplements may be obtained free upon application to the United States Coast and Geodetic Survey.

Mariners are requested to forward to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot.

ROBERT F. A. STUDDS, *Director.*

2 June 1951.

U. S. Coast Pilot, Pacific Coast

1952 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1952, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1953 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1953, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1954 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1954, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

U. S. Coast Pilot, Pacific Coast

1955 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1955, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1956 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1956, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1957 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1957, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1958 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1958, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1959 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1959, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1960 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1960, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

U. S. Coast Pilot, Pacific Coast

1961 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1961, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1962 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1962, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

.....

U. S. Coast Pilot, Pacific Coast

1963 Supplement

A supplement containing information received in the Coast and Geodetic Survey from the date of publication of this book to January 1, 1963, will be issued in the early part of the year, and will be sent free upon receipt of this coupon at the U. S. Coast and Geodetic Survey, Commerce Building, Washington 25, D. C.

Name.....

Address.....

CHAPTER 1

General Information

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 compilation and publication of **nautical charts, Coast Pilots, tables of predicted tides and currents, and tidal current charts** to meet the needs of the mariner; (3) the determination of geographical positions and elevations in the interior of the country to coordinate the coastal surveys and provide a framework for mapping and other engineering work; (4) the compilation and publication of aeronautical charts for use in air navigation; (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 earthquake data required in designing structures.

District Offices of the Coast and Geodetic Survey are located at some of the principal ports in the United States: see Appendix. Files of charts, Coast Pilots, and other publications are maintained at these offices for the use of mariners, who are invited to avail themselves of the facilities afforded.

Sales agents for Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts of the Coast and Geodetic Survey are located in many ports of the United States and in some foreign ports; see Appendix for agents located within the area covered by this Coast Pilot. The charts and publications can also be purchased from the Washington Office and from most of the District Offices. Orders mailed to Washington, D. C., should be accompanied by check or money order, made payable to the Treasurer of the United States. Postage stamps or Superintendent of Documents coupons cannot be accepted. The catalog of nautical charts and related publications can be obtained free of charge from the Coast and Geodetic Survey or any of its agencies.

Important.—Mariners and others using this Coast Pilot are urgently requested to forward to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., directly or through a District Office, any information affecting it or the charts that may come to their attention, as well as any suggestions they may have for increasing the value of these publications. Reports of an urgent character should be sent by radio or telegraph.

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

949285—52——2

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.

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.

In addition to the signals described, vessels of the Coast and Geodetic Survey when engaged in survey work often hoist one of the following International Code signals:

HD signifying "I am engaged in submarine survey work, you should keep clear of me."

HF signifying "I have a sweep out, you should keep clear of it."

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 this 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.

Nautical charts are published primarily for the use of the mariner, although they serve the public interest in many other ways. They are compiled principally from the basic field surveys of the Coast and Geodetic Survey, supplemented by data from other Government organizations. They include all available information necessary for safe navigation.

Projections.—Nautical charts, with few exceptions, are constructed on the Mercator projection. On this projection meridians and parallels are straight lines intersecting at right angles. On any particular chart the distances between meridians are equal throughout, but distances between parallels increase progressively from the equator toward the poles, so that a straight line between any two points is a rhumb line. This unique property of the Mercator projection is one of the main reasons why it is preferred by the mariner.

Notes, symbols, and abbreviations.—Charts contain various types of notes placed in association with the title or in the proximity of the detail to which they

refer. They may include such matters as scale, projection, date to which chart has been corrected, source of charted data, and explanation of the more important symbols and abbreviations, and index or notation of adjoining charts, controlling depths, caution notes, and the like. These notes are essential for the complete interpretation of the chart and should be thoroughly understood by the chart user.

Accuracy of charts.—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 are 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 entrances 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 and boulders abound it is always possible that soundings, 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, coral heads, or boulders.

Dredged channels.—These are generally shown on 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. The Coast Pilot generally gives the project dimensions of an improved channel.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact station, especially when in exposed localities. It is safer, when possible, to navigate by bearings or angles referred to fixed objects on shore and by the use of soundings.

Plane of reference for soundings on charts.—For the Atlantic coast of the United States and the West Indies, the plane of reference for soundings is the mean of all low waters; for the Pacific coast of the United States, Alaska, and the Hawaiian Islands, it is the mean of the lower low waters. For foreign charts many different planes of reference are in use, but that most frequently adopted is mean low water springs.

The date of a chart is of vital importance to the navigator. When charted information becomes obsolete, further use of the chart for navigation may be dangerous. Natural and artificial changes, many of them critical, are occurring constantly, and it is important that navigators obtain up-to-date charts at regular intervals, or hand-correct their copies for changes listed in *Notice to Mariners*.

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,** *stamped* in the right lower margin and just to the left of the subtitle. Charts are hand-corrected

to show all essential changes for lights, buoys, beacons, recently reported dangers, and other critical information as of date of issue from the Washington, D. C., office. All important corrections subsequent to the date of issue are published in the *Notice to Mariners,* and should be immediately applied by the mariner to charts on hand or purchased from agents.

Scales of charts.—The scales of nautical charts range from 1:2,500 to about 1:5,000,000. Graphic scales are generally shown on charts with scale 1:80,000 or larger and numerical scales are given in the upper right border for smaller scale charts. For convenience of reference, Coast and Geodetic Survey charts are classified according to scale as follows:

Sailing charts.—Scales 1:600,000 and smaller. These are for use in fixing the mariner's position as he approaches the coast from the open ocean, or for sailing between distant coastwise ports. On such charts the shoreline and topography are generalized and only offshore soundings, the principal lights, outer buoys, and landmarks visible at considerable distances are shown.

General charts.—Scale 1:100,000 to 1:600,000. These are for coastwise navigation outside of outlying reefs and shoals.

Coast charts.—Scale 1:50,000 to 1:100,000. These are for inshore navigation leading to bays and harbors of considerable width, and for navigating large inland waterways.

Harbor charts.—Scales larger than 1:50,000. These are for harbors, anchorage areas, and the smaller waterways.

Intracoastal Waterway (inside route) charts.—Scale 1:40,000. This is a special series of charts embracing the inside route in New Jersey, the route from Norfolk, Va., to Key West, Fla., on the Atlantic coast, and from Key West, Fla., to the Mexican boundary on the Gulf coast.

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, the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. For the same reason, near objects should be used for bearings in preference to objects farther off, although the latter may be more prominent, as a small error in a bearing or in laying it down on the chart has greater effect in misplacing the position, the longer the line to be drawn.

Depth curves.—Since the installation of echo-sounding apparatus on most modern ships, the Coast and Geodetic Survey has been giving special prominence to depth curves on nautical charts of areas where modern hydrographic surveys have been made. Deep-water submarine relief has become important to the navigator, and the more faithfully the chart depicts this relief, the closer the navigator can relate his depth readings to the chart and the more certain will be his position. Previously, the charts were distinguished by many soundings and few depth curves; the newer charts are characterized by many depth curves and fewer soundings.

Echo soundings.—Personnel of vessels equipped with echo sounders should understand the limitations of their instruments. Most of the various types of echo

sounder are calibrated for a velocity of sound in water of 800 fathoms per second, whereas the actual velocity may differ from the calibrated value by as much as 5 percent, depending upon the temperature and salinity of the waters in which the vessel is operating; the highest velocities are found in warm, highly saline water, and the lowest in icy, fresh water. Variation in line voltage can also cause errors of 10 percent or more in readings of the echo sounder. It is also possible to obtain echoes from schools of fish.

The largest and commonest error in reading echo sounders is caused by the ability of most installations to record, visually or graphically, echoes from the second, third, or fourth preceding outgoing impulse; such a reading is in error by one or more times the scale range of the instrument. This should be kept in mind when shallow readings are noted where the charts show fairly deep water. Where possible, wide variations from charted depths should be checked by wire.

Compass roses on charts.—The annual change in variation gradually introduces an error in magnetic compass roses on charts, and in some cases, the displacement of position from neglect of this change may be of importance. The compass roses are replotted for every new edition of the chart if the error is appreciable; and the amount and date of the variation and the amount of annual change are stated for each compass rose. On certain of the sailing and general charts the magnetic variation is shown by isogonic lines in addition to the compass roses.

Magnetic disturbance of the compass.—The charts show areas where local magnetic disturbance of the compass, or *local attraction,* is caused by magnetic masses external to the ship. Such disturbances are fairly common in shallow waters; they are never encountered over oceanic depths. Magnetic force diminishes so rapidly with distance that a magnetic center in the visible land would have to be of unprecedented intensity to be capable of affecting the compass of a vessel 0.5 mile from shore.

It is unlikely that all the areas of magnetic disturbance have been located. When such an area is discovered, the position should be fixed and the facts reported as far as they can be ascertained. It is particularly important to note the time at which the disturbance was encountered, so as to rule out the possibility that the effects were caused by a magnetic storm rather than by local irregularity.

Deviation of the compass.—The magnetic effect of the ship itself combines with any instrumental error of the compass to cause the deviation, which 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 soft iron and permanent magnets, suitably placed in or on the binnacle. See U. S. Coast and Geodetic Survey Special Publication No. 96, *Instructions for compensation of the magnetic compass.*

Determination of compass error by the use of navigational ranges.—The azimuths of channel ranges which have been determined with sufficient accuracy for compass error determination are indicated in degrees and minutes in the *Light Lists* and in the *Notice to Mariners.* Azimuths given only in degrees should not be used for this purpose.

Use of electrical equipment affecting magnetic compasses.—Experiments with portable electric megaphones show that such instruments have a definite effect on

magnetic compasses, so that when such instruments are within 6 feet of a compass an error of 2° to 4° will result. Closer proximity increases this greatly. Other equipment, such as emergency lights and portable telephones, will have similar effects. So as not to affect magnetic compasses, such electric equipment should not be stowed within 10 feet of magnetic compasses and care should be taken to see that such instruments are not used in proximity of magnetic compasses for a time greater than necessary. Serious deflection of a ship's compass has been caused by the helmsman wearing an electric suit of the type used by airmen. Masters are advised to prohibit the wearing of such garments in the vicinity of the compass.

Tides and Currents.—Tide Tables are published in advance annually by the Coast and Geodetic Survey. See *Publications* at the end of this chapter. Each volume includes full daily predictions of the times and heights of high and low waters for certain reference stations along the coasts. The use of Table 2 of the Tide Tables should be known to every navigator. By means of this table the predictions given for the reference ports are extended so as to enable one to obtain the predictions for each day for a large number of other stations. Table 3 provides a means for computing the height of tide at any time.

The effect of strong winds, in combination with the regular tidal action, may at times cause the water to fall considerably below the plane of reference of the chart. The water may also rise considerably above mean high water due to similar causes.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, land-locked harbors, or on tidal rivers, the time of slack current may differ by several hours from the time of high or low water. The relation of the times of high or low water to the turning of the current depends upon a number of factors, so that no simple general rule can be given. To obtain the times of slack water, reference should be made to information given in the Coast Pilot for various places, or to the Current Tables.

Current Tables for the Atlantic coast and for the Pacific coast of the United States are published in advance annually by the Coast and Geodetic Survey. Each volume includes the daily predicted times of slack water and the times and velocities of strength of flood and ebb for certain reference stations and a table of current differences and constants by means of which corresponding daily predictions may be readily obtained for numerous other places. Tables for the velocity of current at any time, duration of slack, and rotary tidal currents at certain offshore locations, together with data on the Gulf Stream and wind currents are included. There are also current diagrams for a number of sounds, bays, and harbors which show in a graphical form the velocities of the flood and ebb currents and the times of slack and strength over a considerable stretch of the channel of these waterways. See *Publications* at the end of this chapter.

Tidal Current Charts are published by the Coast and Geodetic Survey for various localities; see *Publications* at the end of this chapter. These current charts are good for any year and show the direction and velocity of the tidal current for

each hour of its cycle. They present a comprehensive view of the tidal current movement of the area as a whole and also supply a means of readily determining the direction and velocity of the current at various localities throughout the area. The Tidal Current Charts are designed for use with the daily current or tide predictions contained in the annual tables.

Destructive and Other Waves.—**Wind waves.**—The most common type of wave is caused by the wind. The size of ocean waves depends on the strength of the wind, its duration, and the extent of open water over which it blows. As they travel across the ocean, their height continually decreases, their length increases, and several days later they roll toward the coast as a long, low **swell** or **ground swell.** This swell may be all but hidden by short irregular wind waves until it enters shallow water. Offshore the swell is almost uniform in character until it is deflected by outlying islands and scattered up and down the coast so that a number of systems of swell approach the shore.

Waves from deep water are modified when they get into shoal water. Where the swell approaches a shoreline at an angle it tends to turn parallel to the shore. It bends into bays and around outlying points. When the depth is reduced to less than one-half the wave length, the waves become higher and shorter, the crest arches forward and finding itself unsupported by sufficient water in front, dashes downward breaking into **surf.** Transformations occur everywhere, and therefore, the character of the surf varies considerably on adjacent beaches although caused by a uniform swell offshore. An individual breaking wave either on a beach, an isolated rock, or a shoal is a **breaker.**

When viewed from a vessel, especially a small boat, the surf or breaker never appears as dangerous as it is, and often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

When large swells encounter the seaward margin of a submarine terrace they break and form smaller waves of translation or rollers. These **rollers** differ from the usual waves found in deep water in that they are entirely above the still-water level. They may cross the shallow water to the shore without change until they break as surf on the beach. Rollers often transport shingle and other material shoreward along the bottom. They do not break and form surf until the depth of water equals the height of the wave.

Seiche and surge.—Seiche is a stationary vertical wave oscillation with a period varying from a few minutes to an hour or more, but somewhat less than the tidal periods. It is usually attributed to an external force such as strong winds, changes in barometric pressure, swells, or seismic sea waves disturbing the equilibrium of the water surface. It is found both in enclosed bodies of water and superimposed upon the tidal waves of the open ocean. When these external forces cause a short-period horizontal oscillation of water, it is called surge.

The combined effect of seiche and surge sometimes makes it difficult to maintain a ship in its position alongside a pier even though the water may appear to the eye to be completely undisturbed; heavy mooring lines have repeatedly been

parted under such conditions. Pilots advise taut lines to reduce the effect of the surge.

Destructive waves.—Unusual sudden changes in height of water level can be caused by seismic sea waves or violent storms. Seismic sea waves sometimes spread out in all directions from places at which severe seismic disturbances occur. They travel long distances and can cause tremendous damage by wrecking ships in harbors or close to shore and inundating coastal regions. Violent storms can produce extreme heights of tide which reflect the piling up of water to high levels or the withdrawal of water with consequent low levels. These two types of destructive waves have become commonly known as **tidal waves,** a name which is technically incorrect as they are not the result of tide-producing forces.

Seismic sea waves.—The destructive effect of great seismic sea waves which occur from time to time should not be minimized. The loss of life and property can be lessened if shipmasters and others acquaint themselves with the behavior of these waves so that intelligent action can be taken when they become imminent.

Tide gage records of the waves of April 1, 1946, in the Pacific and of many others that have occurred in the past show that the recession of the water is usually, though not always, preceded by a smaller but distinct rise of water level. Except for the possible grounding of floating equipment, the rise following the first fall is generally the first destructive part of the series of waves. The waves are so long that they are not visually recognizable as such, but manifest themselves as a rapid rising and falling of the water surface with a period of 12 to 20 minutes.

At Honolulu, which is reasonably well protected from the direct onslaught of the waves, there was on April 1, 1946, first a rise of about ½ foot in 6 minutes followed by a fall of 2¼ feet in the next 7½ minutes. In the 3 succeeding 7½-minute periods there was a rise of 2¾ feet, a fall of about 3½ feet, and then a rise of 4 feet to the third and highest crest of the series. The oscillations continued for many hours. The Honolulu record is probably representative of the pattern, though not the magnitude, of the wave in other parts of the islands where heights of 40 feet or more have been reported. The larger heights occurred on the shores facing the approaching wave, which in this case were the northern shores.

In some harbors there is normally a seiche whose period is determined by the size and depth of the harbor. If seismic sea waves, even though small, should have a period about equal to that of the seiche, a resonance may be set up which would considerably magnify the usual oscillation and make it difficult to hold a ship to her moorings.

Waves travel outward from the epicenter at speeds which depend on depth. Though their speed may exceed 400 knots in the open ocean, they are relatively low, extremely long, and harmless and hence will pass a ship unnoticed. Upon reaching shoaler water the waves decrease in velocity and length, and increase in height. They become dangerous on either nearby or distant coasts where depths and shape of coastline conspire to augment them.

Improvements have been and are being made in the quick determination and reporting of earthquake epicenters, but no method has as yet been perfected for determining whether a sea wave will result from a given earthquake. The prob-

lem of detecting and reporting the existence of sea waves when they do occur is being studied.

The times required for a seismic sea wave to reach Honolulu from various potential epicentral areas have been computed and are as follows: 7½ to 9 hours from the main islands of Japan, 6 to 6½ hours from Kamchatka, 4¼ to 5½ hours from the Aleutian Islands and Alaska Peninsula, 6 to 12 hours, from Mexico and Central America, and 12½ to 15½ hours from South America.

After the receipt of a seaquake warning, safety requires that ships put to sea and that people on shore retreat to high ground away from the water front. If lack of time or other reason makes it necessary for a ship to remain in a harbor, the following account of the experience of a United States naval vessel while lying in the port of Kahului, Maui, on April 1, 1946, may be helpful.

"At or about 0650 this date, the water in this harbor was observed to be receding seaward and the level dropped from 10 to 12 feet in a matter of 15 to 20 minutes. Later the tide surged back into the entrance of the harbor through the jetties with waves washing over the breakwater and, shortly thereafter, over the docks and land on the northeast side. There were officially recorded on the log 20 separate waves from 0650 until 0920. These waves started with great magnitude from 10 to 15 feet in height and lessened as time progressed. Due to the suddenness of the first tidal wave approaching it was impossible to get the vessel safely under way. Later the terrific currents around the harbor entrance made navigation extremely hazardous. In view of these facts, a decision was made to remain alongside the dock and maintain the safety of the ship by the use of mooring lines and wire.

"The vessel was moored starboard side to dock No. 2 and the strong currents within the harbor moved virtually in all directions, causing the ship to alternately move forward, aft, away from the dock, and then toward the dock. During this emergency, the manila lines and two 1⅝ towing hawsers were parted but were replaced immediately. Approximately 30 lines were parted, and all hands were made available at all times to cope with the situation. During the time our lines were being rapidly depleted through breakage, new ones were furnished by the Navy Supply Office and the Marine Corps. In the meantime, the harbor began filling with debris to such an extent that the main generators were shut down, due to the congestion of the sea chest. As a result, the handling of all lines, was accomplished by hand, as all our winches and windlasses are operated electrically. It was feared at one time that in low water the vessel might rest on the bottom with a possibility of capsizing. . . . The damage caused is not sufficiently severe to prevent continued operation of the vessel."

Extreme tides.—A considerable rise or fall in the level of the sea along a particular coast may result from strong winds and a sharp change in barometric pressure. In cases where the water level is raised, higher waves can form with greater depth and the combination can be destructive to low regions, particularly at high stages of tide. Extreme low tides can result in depths which are considerably less than those shown on nautical charts. This storm type of tidal wave occurs especially in coastal regions bordering on shallow waters which are subject to tropical storms.

Use of Oil for Modifying the Effects of Breaking Waves.—Experience has proved the usefulness of oil in modifying the effect of breaking waves and has developed simple and effective methods of using it. The principal facts developed are:

1. The heaviest and thickest oils, notably animal and vegetable oils, are the most effective. Crude petroleum is serviceable and should be used when no better oil is available; it may be improved by mixing with other oils. Refined kerosene is of little value.

2. In cold weather oils thicken and do not spread freely. This tendency to thicken may be reduced by thinning a heavy, sticky oil with petroleum.

3. A small quantity of oil suffices if it can be made to spread to windward.

4. Oil spreads very slowly so a vessel with engines stopped or running slowly before a sea can make a slick to windward but not to leeward, except perhaps close alongside, for the vessel's drift or speed will exceed the rate of spread of the oil.

5. The effect of oil on free waves—that is, on waves in deep water—is greatest.

6. The effect of oil on a surf or waves breaking on a bar where a mass of shallow water is in actual motion is less than on free waves, but oil is of some service under these conditions.

7. A vessel at sea will get the best results by drifting or running slowly before the sea and distributing oil either from canvas bags filled with oakum saturated with oil and slung over the side into the sea or from the waste pipes.

8. In crossing a bar in heavy weather oil in considerable quantities is needed on both sides of the vessel for a short time. A convenient method in this situation is to trail a hose over the bow and pour oil freely through it.

9. In crossing a bar with flood current pour oil overboard and allow the oil to float in ahead of the vessel. To an entering vessel crossing a bar with an ebb current oil is of little use.

10. Oil is useful to vessels and boats when running, lying to, or wearing.

11. A vessel riding to a sea anchor can fasten an oil bag to an endless line rove through a block on the sea anchor. This method distributes the oil ahead and provides a means to haul the bag aboard for refilling.

12. Before boarding a wreck have the wreck use oil freely on both sides, if able to do so. If the wreck cannot use oil, the rescuing vessel should first pass to leeward of the wreck, using oil freely to form a slick into which the wreck will drift. If the wreck is aground, the attending circumstances will indicate the methods to be used.

13. In lowering or hoisting boats in heavy weather, in port or at sea, oil will greatly assist the operation.

14. In towing another vessel in a heavy sea, oil should be distributed from the towing vessel forward and on both sides; if it is only distributed from the after part of the towing vessel, only the tow is benefited.

CORPS OF ENGINEERS.—The improvement of the rivers and harbors of the United States and miscellaneous other civil works are under the charge of the **Corps of Engineers, Department of the Army.** The miscellaneous civil works include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States, the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, and the granting of permits for structures or operations in navigable waters.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the Intracoastal Waterways in the areas under

their jurisdiction may be obtained direct from the District Engineer offices; see Appendix.

Anchorage areas and restricted areas in some places are defined and limited by the Corps of Engineers. They also publish regulations controlling the use of these areas. These are enforced by the United States Coast Guard. The areas are shown on the large-scale charts of the Coast and Geodetic Survey. Copies of the regulations may be obtained at the offices of the Corps of Engineers. The regulations are quoted at length, where applicable, in the Coast Pilots.

The **Port Series,** prepared jointly by the Corps of Engineers and the Maritime Administration, and sold by the Superintendent of Documents, are complete reports covering the principal seaports of the United States. They are primarily of interest to commercial and industrial concerns. The volumes of the series are wide in their scope and treat the subjects of particular interest to the shipping world, such as the physical features of each port (includes list of piers, wharves, and docks, with data), its organization and practices, regulations regarding the movement of ships and goods, port dues and charges, fuel and supplies, water and rail connections, and character and commerce of the hinterlands.

Port and Terminal Charges, a series of four volumes prepared by the Corps of Engineers and sold by the Superintendent of Documents, give detailed information regarding all port services and charges, including dockage, wharfage, storage, and handling charges, at practically all ports of the United States. These publications include the more important governmental regulations affecting the movements of vessels, freight, and passengers. This information includes a digest of the more important regulations of the United States Public Health Service (quarantine and hospital services), the Customs Service, and the Immigration and Naturalization Service.

Protection of navigable waters.—Given below are extracts from the laws of the United States for the protection and preservation of the navigable waters of the United States.

That is shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever, other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable waters; and it shall not be lawful to deposit, or cause, suffer or procure to be deposited material of any kind in any place on the bank of any navigable water, or on the bank of any tributary of any navigable water, where the same shall be liable to be washed into such navigable water, either by ordinary or high tides, or by storms or floods, or otherwise, whereby navigation shall or may be impeded or obstructed.

That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such a manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or aban-

doned, and the neglect or failure of said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

That, except in case of emergency imperiling life or property, or unavoidable accident, collision, or stranding, and except as otherwise permitted by regulations prescribed by the Secretary as hereinafter authorized, it shall be unlawful for any person to discharge, or suffer, or permit the discharge of oil by any method, means, or manner into or upon the coastal navigable waters of the United States from any vessel using oil as fuel for the generation of propulsion power, or any vessel carrying or having oil thereon in excess of that necessary for its lubricating requirements and such as may be required under the laws of the United States and the rules and regulations prescribed thereunder. The Secretary is authorized and empowered to prescribe regulations permitting the discharge of oil from vessels in such quantities, under such conditions, and at such times and places as in his opinion will not be deleterious to health or sea food, or a menace to navigation, or dangerous to persons or property engaged in commerce on such waters, and for the loading, handling, and unloading of oil.

The **HYDROGRAPHIC OFFICE** of the United States Navy exists for the improvement of the means of navigating safely the vessels of the United States Navy and the mercantile marine by providing accurate nautical charts, light lists, and sailing direction (pilots) of foreign navigable waters, navigator's tables and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

Publications issued by Hydrographic Office for the use of mariners are Charts of the high seas and all foreign waters, Sailing Directions for the same areas, Light Lists, Table of Distances Between Ports, Radio Navigational Aids, Radio Weather Aids to Navigation, International Code of Signals, American Practical Navigator (Bowditch), and several books of navigational tables that are described in the American Practical Navigator and in the General Catalog of Hydrographic Office Publications. Periodic publications of the Hydrographic Office are: The Notice to Mariners (weekly), the Hydrographic Bulletin (weekly), the Daily Memorandum, and the Pilot Charts for various oceans (monthly or quarterly); see *Publications* at the end of this chapter.

Notice to Mariners, containing corrections to the charts, Coast Pilots, Sailing Directions, Light Lists, and other publications, is issued weekly and mailed free on application to the Hydrographic Office, Washington 25, D. C., or through any Branch Hydrographic Office, District office of the Coast and Geodetic Survey, or District office of the Coast Guard. The notice is published in two parts. Part I, Western Hemisphere, covers North and South America, Greenland, Aleutian Islands, and Hawaiian Islands. Part II, Eastern Hemisphere, covers the remainder of the world. Each part contains appropriate tables of chart corrections and corrections to Light Lists. Part I carries corrections to H. O. Pub. 205, *Radio Aids to Navigation,* corrections to the *H. O. Chart Catalog,* and other items of world coverage. Part II is needed only by those vessels sailing to ports outside the Western Hemisphere.

WEATHER BUREAU.—Weather forceasts and warnings of the approach of storms over land and ocean areas are among services of the **Weather Bureau** to navigation, commerce, agriculture, and the general public. Other warnings cover a variety of hazards, such as cold waves, frost, forest-fire hazard, floods, and many types of weather conditions affecting the nation's economy.

Meteorological information is collected and transmitted at hourly, 3-hourly and 6-hourly intervals from land stations, ships at sea, and aircraft. These reports form a basis for the forecasting service, for summarization and publication of climatological data having general value and applicability, and for research basic to improvement of the national weather service.

Weather Bureau offices are located in many ports and other places throughout the continental United States and possessions. Stations in the area of concern to this Coast Pilot, at which the public may compare barometers against Weather Bureau barometers and discuss matters of weather service with Weather Bureau officials, are listed in the Appendix. By international agreement, the Weather Bureau also bears a share in the maintenance and operation of certain weather ships on the free oceans.

Marine meteorological service.—The collection of observations from ships at sea is conducted on a purely voluntary and cooperative basis. The Weather Bureau supplies shipmasters with blank forms, printed instructions, and such other material as is essential to the making and recording of observations. In the course of an average peace-time year, more than 100,000 observations are received from vessels representing every maritime nation and reaching every quarter of the globe. Reports based on this cooperative service by seamen are included in various publications. Among these are the *United States Coast Pilots,* which contain sections on weather and climate, storm charts, and meteorological tables. The *Pilot Charts* issued by the Hydrographic Office contain ocean meteorological data prepared in the Weather Bureau. *Sailing Directions, Naval Air Pilots,* and other publications of the Hydrographic Office also contain summaries of weather information prepared by the Weather Bureau for various parts of the world from reports rendered chiefly by officers of merchant ships.

The hurricane and storm warning service.—This service was established primarily to aid marine interests. Storm warnings are prepared at regular district forecast centers and at special hurricane forecast centers. The warnings are distributed to the public through all neighboring Weather Bureau offices by radio, the press, and every other available means. During the West Indian hurricane season, June to November, inclusive, special teletype circuits expedite the exchange of special reports from the Atlantic and Gulf coasts. Special ship reports are described under the heading *Reports from Ships.* Special aircraft reports are obtained during the hurricane season from weather reconnaissance planes which fly near the storms and sometimes into the storm centers. Hurricane warnings, as well as gale and storm warnings, are disseminated also by flag and lantern displays from about 400 storm-warning towers of flagstaffs on the Atlantic, Gulf, and Pacific coasts and on the shores of the Great Lakes.

Weather information service for overseas air transport.—The Weather Bureau provides forecasts for trans-Atlantic flights, and has helped develop weather service required for regularly scheduled air transport operations over the oceans.

Under agreements with foreign governments, the Weather Bureau now provides weather information service for domestic and foreign aircraft. A detailed forecast, based on all available weather information for the ocean and adjacent land areas, is supplied to the aircraft captain just before departure, and any necessary amendments are transmitted by radio to the aircraft during flight. Forecasts cover wind conditions, icing, turbulence, cloud extent and heights, temperatures, and storms or other severe conditions to be expected en route and at the destination airport and alternates at estimated time of arrival.

General public service.—Weather Bureau publications may be obtained on request from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., upon payment of list price. The current *Price List of Weather Bureau Publications* may be requested from the Weather Bureau, Washington 25, D. C. Certain publications, such as *Annual Meteorological Summaries,* may be obtained free of charge, ordinarily from the individual Weather Bureau offices which prepare them.

Other means by which weather information of public concern is disseminated are described under the headings of *Storm Signals, Weather Broadcasts,* and *Reports from Ships (Weather reports, United States)* in this chapter. A table of commercial radio stations which broadcast directly from Weather Bureau microphones is contained in the Appendix. Additional information pertaining to weather radio or teletype services may be requested from the Weather Bureau, Washington 25, D. C.

Storm Signals are displayed by the United States Weather Bureau at numerous places on the coasts of the United States and the shores of the Great Lakes. No visual displays of storm warnings are made at coastal stations in Alaska since distribution of the messages is effected by local radio broadcasts, as a rule. Day and night displays are illustrated in the front of this volume.

These storm signals are used to warn of the approach of a storm of marked violence with the wind beginning to blow from the indicated direction.

The mariner must bear in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

The **COAST GUARD** has among its duties (1) enforcement of the laws of the United States on the high seas, in harbors, bays, sounds, roadsteads, and other like bodies of water along the coasts of the United States, its territories and possessions; (2) enforcement of navigation laws, of neutrality laws and regulations, of rules and regulations in relation to anchorage grounds, and of the Oil Pollution Act; (3) inspection of all vessels to insure safety to passengers and crews; (4) aid to distressed mariners and saving of life and property from shipwreck; (5) issuance of marine licenses and certificates; (6) investigation of circumstances connected with shipwreck or collision at sea; (7) destruction of derelicts; (8) construction, operation, maintenance, and inspection of aids to navigation; and (9) publication of Light Lists and Radiobeacon Charts.

Light Lists.—All aids to navigation, such as lights, radiobeacons, fog signals, buoys, and daymarks, are described in these publications which are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., and by the various sales agencies. Mariners are referred to the above publications for detailed information regarding the characteristics, power, and visibility of lights, as well as descriptions of light structures and daymarks, buoys, and fog signals. Such detailed information is not given in this Coast Pilot; see *Publications* at the end of this chapter.

The Light List is corrected to the date of publication printed on the title page. The mariner is cautioned that the latest list must be used; he should keep his Light Lists as well as his charts corrected from changes announced in the weekly *Notice to Mariners.*

Aids to Navigation.—Lights.—The distances at which lights may be seen in clear weather, given in Light Lists and on charts, are the geographic ranges computed in nautical miles for a height of the observer's eye of 15 feet above sea level; the luminous range is given when the light is not of sufficient power to be seen to the limit of its geographic range. These distances may at times be increased by abnormal atmospheric refraction and, of course, may be greatly lessened by unfavorable weather conditions, such as fog, rain, haze, or smoke. All except the most powerful lights are easily obscured by such conditions.

The navigator who expects to make a light of considerable power should find the geographic range corresponding to his own height of eye by reference to the Visibility Table in the *Light Lists.* For lights of small luminous power it is obvious that the increased geographic range is of no interest.

If, when first sighted, a light can be made to dip below the horizon by at once lowering the eye several feet, it is evident that the vessel is at the limit of the geographic range and that the light is of considerable luminous power. If, under the same circumstances, the light cannot be made to dip, it is evident that the vessel is well within the geographic range and may, in fact, be very close to the light, and that the light is of relatively small power. This same maneuver will also aid in distinguishing the lights of another vessel from the more powerful navigational lights, as a vessel's lights are usually so limited in intensity that they do not carry far enough to be intercepted by the horizon. The distance of a light cannot be estimated by its dimness or brilliance. See inside back cover for *Distance of Visibility of Objects at Sea* table.

Buoys.—For the system of buoyage of the United States—color, shape, numbering, and light characteristics—the mariner is referred to the preface of the *Light Lists.*

Buoys are liable to be carried away, shifted, or capsized; lighted buoys may be extinguished; or audible buoys may not sound as the result of storm, ice conditions, collision, or other accidents. The navigator should, if possible, check his position by bearings on fixed objects on shore and by soundings.

Fog signals that depend upon the transmission of sound through the air have, as aids to navigation, certain inherent defects that should be considered. Sound travels through the air in a variable manner, even in the absence of wind, and its behavior cannot be predicted or guarded against. The distance at which

a fog signal can be heard may vary with the bearing of the signal and may be different on different occasions. The intensity of the sound may be greater at a distance than close-to. There are sometimes areas, perhaps close to the signal, where the sound is entirely inaudible. Mariners must not judge their distance from a fog signal by the intensity of the sound and must not assume that a signal is not sounding because they do not hear it.

All these considerations points to the necessity for the utmost caution when navigating near land in a fog. Audible signals are useful, but the navigator's principal reliance should be on the sounding equipment and on radio bearings, if such are available.

Echoes.—When a vessel is in the vicinity of a high rocky shore the navigator may find it advantageous to time the echo of his own signal and thus obtain a rough estimate of the distance offshore. The velocity of sound in air can be taken as 1,100 feet per second. In some localities **echo boards** have been erected to facilitate this operation. Two general types are in use. The first is specially constructed so that the echo will be heard at a specified distance off. The second is a flat surface which will reflect any sound striking it. See the *Light List* for the construction details of each echo board before using it.

Radiobeacons are operated continuously during fog and low visibility and also at scheduled intervals during clear weather, night and day. The more powerful stations have an effective range far greater than is possible with light and fog signals, and bearings of them will furnish the navigator with a valuable indication of his position long before the land is in sight.

A list and descriptive details of all marine radiobeacons are given in the *Light List* and H. O. Publication No. 205, *Radio Navigational Aids*. Radio aircraft ranges and standard broadcast stations that may be received on marine radio compasses are listed in the Appendix. The correction to be applied to convert a great circle direction to the rhumb line direction for plotting on a Mercator chart can be obtained from *Radio Bearings* in this chapter.

A vessel steering a course for a radiobeacon should observe the same precautions that apply when steering for a light or any other mark. If the radiobeacon is aboard a lightship, particular care should be exercised to avoid the possibility of collision, and sole reliance should never be placed on sighting the lightship or hearing her fog signal. If there are no dependable means by which the vessel's position may be fixed and the course changed well before reaching the lightship, a course should be selected that will insure passing the lightship at a distance, rather than close aboard, and repeated bearings of the radiobeacon should show an increasing change in the same direction.

During a period of radio propagation disturbance, radiobeacon observations may be unreliable. See later discussion under *Time Signals*.

Special operation of radiobeacon stations for calibration of direction finders.—United States radiobeacons will broadcast upon request for the purpose of enabling vessels to calibrate their radio direction finders. If it is not practicable to determine the time of calibration sufficiently in advance to contact the district commander, or if the calibration is desired from a remote station where communication is difficult, request may be made directly to the station by means of

telephone, telegraph, or a whistle signal consisting of three long blasts followed by three short blasts, this whistle signal to be repeated until same is acknowledged by the station through the starting of the transmitter. The same group of signals will be sounded at the termination of calibration.

If attention of station or lightship is not attracted by the whistle signals, hoist the international code signal, **J** over **K**, to indicate request for radio direction-finder calibration.

The work of the station personnel is not confined to standing watch and there may be times when the whistle request for calibration is not immediately heard, due to the noise of the operating station. Usually a repeated signal not too far from the station will attract attention.

Transmission for calibration purposes will be continuous without the 2-minute silent interval unless another station in the same frequency group is in operation at the time, in which case calibration operation will be "1 minute on, 2 minutes off." No continuous transmission for calibration will be undertaken during regular scheduled periods of operation.

In addition to the special operation of regular radiobeacon transmitters for calibration of direction finders, special radio direction finder calibration transmitters of short range are also operated at certain localities to provide continuous service. These stations with information as to position, frequency, and characteristic are given in the *Light Lists*.

Radio bearings.—*Accuracy*—No exact data can be given as to the accuracy to be expected in radio bearings taken by a ship, since the accuracy depends to a large extent upon the skill of the ship's operator, the condition of the ship's equipment, and the accuracy of the ship's calibration curve. Mariners are urged to obtain this information for themselves by taking frequent radio bearings when their ship's position is accurately known, and by recording the results. United States radiobeacons are operated on hourly schedules regardless of weather conditions and at other times upon request (see special operation of radiobeacon stations given in *Light Lists)*, giving mariners opportunity to make such frequent observations, and often to check the results directly with visual bearings.

Skill in the operation of the radio direction-finder can be obtained only by practice and by observing the technical instructions for the set in question. For these reasons the operator should study carefully the instructions issued with the set and should practice taking bearings frequently so that when bearings are needed he can obtain them rapidly and accurately.

As the operator obtains bearings by revolving the direction-finder coil until the signal disappears or becomes a minimum, the operator can tell by the size of the arc of silence or of minimum strength approximately how accurately he has taken the bearing. For instance, if the minimum is broad and the residual signal covers about 10° with equal strength, it is doubtful if the bearing can be accurately estimated within 3° or 4°. Where direction-finder bearings are not taken by the navigating officer, it will frequently be advantageous for the mariner to have his ship's operator report the probable operator's error of the bearing taken.

Radio bearings from other vessels.—Any vessel with a radio direction-finder

can give a bearing to a vsesel equipped with a radio transmitter. 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 service as a radiobeacon for vessels equipped with a radio direction-finder. However, mariners are cautioned that stations established especially for maritime service are more reliable and safer for use by the mariner, for numerous reasons.

Caution, when taking radio bearings from a ship one should be careful to take the bearing when the vessel is on an even keel. Large errors may be introduced if the vessel is listed when the bearing is taken.

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 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.

A table of corrections is given 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 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 radiobeacons in the *Light List* or H. O. Publication No. 205 *Radio Navigational Aids.*

The table is entered with the differences 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.

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 degrees 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 bearings, a retrial should be made, using the new value as the position of the ship.

Example.—A ship in latitude 39°51′ 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.....Latitude.. 39°51′

Middle latitude.....40°14′
Radio station.....Longitude.. 69°37′ W.
Dead reckoning position of ship.....Longitude.. 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°
15°	4	8	12	16	19	23	27	31	35	40	43	47	50	54	58	62	66	70	74	78
16°	4	8	12	17	21	25	29	33	37	41	45	50	54	58	62	66	70	74	79	83
17°	4	9	13	18	22	26	31	35	39	44	48	53	57	61	66	70	75	79	83	88
18°	5	9	13	19	23	28	32	37	42	46	51	56	60	65	70	74	79	83	88	93
19°	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98
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	146	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

949285—52——3

Numbering and recording of undocumented vessels.—Under the act of June 7, 1918, as amended, and the regulations issued thereunder, every undocumented vessel operated in whole or in part by machinery, owned in the United States and found on the navigable waters thereof, except public vessels and vessels not exceeding 16 feet in length, measured from end to end over the deck excluding sheer, temporarily equipped with detachable motors, shall be numbered. The requirements contemplate that machinery-propelled undocumented vessels of less than 5 net tons used for commercial purposes, which are owned in the United States and found on such waters, be numbered under the provisions of the act as such vessels, by reason of tonnage, are exempt from documentation. The Numbering Act, however, is for the purpose of identification only and the certificate of award of number which is issued to any such vessel is solely for such purpose. It is not an authorization, license, or permit for any such vessel to engage in trade.

Vessels of 16 gross tons and over used exclusively for pleasure purposes are entitled to be documented as yachts by the Bureau of Customs. The documentation of such vessels as yachts is not a mandatory requirement, however, and where such vessels are machinery-propelled and found on United States waters, if not documented, they must be numbered under the provisions of the act. There is no restriction as to length, tonnage, or size of such vessels and the provisions of the Numbering Act should not be confused with those of the Motorboat Act of 1940 providing for the equipment of motorboats not exceeding 65 feet in length and with other machinery-propelled vessels. The regulations issued by the Commandant of the Coast Guard under authority of the Numbering Act clarify the language of the statute requiring the following undocumented vessels to be numbered:

(a) All boats equipped with permanently installed motors.

(b) All boats over 16 feet in length equipped with detachable motors.

The following undocumented vessels are not required to be numbered:

(a) Public vessels.

(b) All boats not exceeding 16 feet in length temporarily equipped with detachable motors.

(c) Motor lifeboats carried as lifesaving equipment on inspected vessels.

The words *temporarily equipped with detachable motors* shall be construed to mean outboard motors which are clamped or otherwise temporarily fastened as distinguished from outboard motors bolted or otherwise permanently secured. The controlling principle shall be whether or not the vessel has permanently installed motors rather than the design or construction of the vessel. A boat designed specifically for the use of an outboard motor as the ordinary means of propulsion, if not exceeding 16 feet in length, is nevertheless exempt from the requirements of the act if temporarily equipped with an outboard motor.

Applications and issuance of numbers.—Upon the purchase of an undocumented vessel which has been issued a certificate of award of number under the provisions of the act of June 7, 1918, as amended, and after completion of the bill of sale on the reverse side of the certificate by the vendor or the former owner, the purchaser should execute the application for number for undocumented motor vessel, which is incorporated on the reverse side of the certifi-

cate of award of number (CG 1513) and surrender the certificate, bill of sale, and application for a new number to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, within the statutory period of 10 days. That officer upon receipt of the certificate with the bill of sale and application properly executed, and upon being satisfied with the evidence of ownership, will assign a number to the vessel and forward the certificate and accompanying papers to the District Commander for processing. He will at the same time issue to the new owner a letter authorizing the operation of the vessel for a limited period, without the certificate of award of number on board, pending the issuance of such papers by the District Commander.

In the case of such vessels which are new or which have never been numbered under the provisions of the act of June 7, 1918, as amended, or which are operating under the old form of certificate of award of number, application should be made to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, for a certificate of award of number by presenting proper evidence of ownership such as a bill of sale, or builder's certificate, and by the execution of Form CG 1512, application for number for undocumented motor vessel. Upon the execution of these cards in duplicate and the presentation of evidence of ownership, the Officer in Charge, Marine Inspection, U. S. Coast Guard, will accept the application and accompanying papers, transmitting same to the District Commander for processing and will thereupon assign a number to the vessel, at the same time issuing a letter authorizing the operation of the vessel for a temporary period under the numbers assigned and pending the issuance of a certificate of award of number by the District Commander.

Number required on bows of vessels.—Upon assignment of a number by the Officer in Charge, Marine Inspection, U. S. Coast Guard, or upon receipt of the certificate of award of number, the number awarded shall be painted or attached to each bow of the vessel and shall be in block characters of good proportion and not less than 3 inches in height, reading from left to right and parallel with the waterline, as near the forward end of the bow as legibility of the entire number for surface and aerial identification permits. The number shall also be of a color in contrast with the color of the hull so as to be distinctly visible and legible.

Carrying certificate of award of number.—The certificate of award of number must be kept on board at all times (unless in the custody of the Coast Guard), except in the case of vessels not exceeding 17 feet in length, or vessels whose design or fittings are such that the carrying of such certificate on board would render it imperfect, illegible, or would otherwise tend to destroy its usefulness as a means of ready identification.

Search and rescue operations for surface vessels or aircraft in distress or overdue are coordinated by the Coast Guard. Air-Sea Rescue planes have special markings of chrome yellow on the wing tips and wing-tip floats. The cooperation of vessel operators with the Air-Sea Rescue planes may mean the difference between life and death of some seaman or aviator.

Operators of disabled wooden craft that are, or may consider themselves to be, the object of a search should hoist on a halyard or otherwise place aloft any

metallic object that would assist their detection by radar. All Coast Guard patrol vessels, planes, and some buoy tenders utilize this equipment and thus can continue searches in darkness and during other periods of low visibility if it can be assumed that the object of the search can be detected through the use of this aid.

Actual observations have shown that wooden hulls or other non-metallic objects are suited as radar targets according to the size, orientation, shape, and other radar-reflecting qualities of the object. Their value as radar targets may be enhanced by the use of special radar-reflecting devices properly oriented and placed as high above the waterline as possible. The largest metallic object available should be used.

Distress Signals—Submarine emergency identification signals.—The following smoke bomb or flare signals are made by submarines of the United States in cases of necessity:

Black or green.—Indicates torpedo has been fired. Will be used to simulate torpedo firing on special exercises such as convoy exercises.

Yellow.—Indicates that submarine is about to come to periscope depth from below periscope depth. Surface craft terminate antisubmarine counterattacks and clear vicinity of submarine. Do not stop propellers!

Red.—Indicates an emergency condition within the submarine and she will surface immediately if possible. Surface vessels clear the area and stand by to give assistance after the submarine has surfaced. In case of repeated red signals, or if the submarine fails to surface within a reasonable time, she may be assumed to be disabled. Buoy the location, look for submarine marker buoy, and attempt to establish sonar communications. Advise naval authorities.

The foregoing, all of which mark the submarine's position, are fired from a submerged signal ejector into the air to a height of about 300 feet, then float downward slowly, suspended from a small parachute, and give colored illumination for about 30 seconds.

Submarines are also equipped with marker buoys which are about 3 feet in diameter, painted yellow, and equipped with telephones for communication with the interior of the submarine. A submarine on the bottom in distress and unable to surface, will, if possible, release this buoy. An object of this description which is sighted on the surface of the water should be investigated and naval authorities advised.

Aircraft distress signals.—When an aircraft desires to call upon a surface craft to render assistance to survivors or planes in distress the aircraft will circle the vessel at least once; fly across the bow of the vessel at low altitude, opening and closing the throttle, or changing propeller pitch, when possible; then head in the direction of the distress scene. The aircraft will repeat until the vessel acknowledges by following and will use the Aldis Lamp, radio, or message drop to explain the situation, if possible. The surface craft should follow the aircraft or indicate that it is unable to comply by hoisting the international code flag NEGAT or by other visual or radio means.

Danger signal information.—During the war it came to the attention of the Coast Guard that many American masters and officers, when on the high seas and danger of collision appeared imminent, used the danger signal of four or more short blasts of the whistle as provided by Article 18, Rule 3 of the Inland Pilot Rules. The International Rules for the Prevention of Collision provide no danger signal, and the use of four or more short blasts of the whistle is neither appropriate nor applicable. The International Code of Signals provides a special signal, the letter **U** which may be transmitted visually or by means of Morse

Code (• • —), using a flashing light or a whistle or siren, which signifies *you are standing into danger.* The International Code Signal D which may be transmitted visually or by means of Morse Code (— • •), using a whistle or siren, signifies *keep clear of me—I am maneuvering with difficulty,* and can be used as a warning.

Ship fire signal.—In many ports a standard signal of five prolonged blasts of the whistle or siren has been adopted for use as an alarm in the event of a fire occurring on board the vessel, except vessels underway, or at the dock to which the vessel is moored. Such signal may be used in addition to other means of reporting a fire. The words *prolonged blast* shall mean a blast of from four to six seconds' duration. The signal is not to be used for other purposes. On hearing the 5-blast whistle signal persons on shore should pull a fire alarm box or turn in an alarm to the Fire Department by the most convenient means.

Reports of accidents.—The licensed officer in command of any vessel shall report in writing and in person to the Coast Guard officer nearest the port of first arrival any accident to said vessel involving loss of life, or damage to property, 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.

CUSTOMS.—The functions of the **Bureau of Customs** include the following: Enter and clear vessels; supervise the discharge of cargo; ascertain the quantities of imported merchandise, appraise and classify such merchandise, and assess and collect the duties thereon; control the custom warehousing of imported merchandise; enforce customs and other laws by inspecting international traffic by vessels.

The Bureau of Customs administers the navigation laws pertaining to registry, enrollment, and licensing of vessels, including the issuing of commissions to yachts and the assignment of signal letters; the measurement of vessels, administration of tonnage duties, and the collection of tolls; the regulation of vessels in the coasting and fishing trade and and limitation of the use of foreign vessels in waters under the jurisdiction of the United States; the recording of sales, conveyances, and mortgages of vessels; the protection of steerage passengers; and the remission of fines, penalties, and forfeitures incurred under the laws governing these matters.

Collection districts and ports of entry located within the area covered by this volume are tabulated in the Appendix.

The **IMMIGRATION AND NATURALIZATION SERVICE** is under the jurisdiction of the Department of Justice. The functions of the Service are the administration of the laws relating to the admission, exclusion, and deportation of aliens, the registration and fingerprinting of aliens, and the naturalization of aliens lawfully resident in the United States.

The primary function of the Immigration Border Patrol, which operates as a part of the immigration force, is to detect and prevent the smuggling and surreptitious entry of aliens into the United States in violation of the immigration laws, and to apprehend smugglers of aliens and aliens who have effected unlawful entry.

The immigration laws provide that there shall be paid to the collector of the customs by the master, agent, owner or consignee of a vessel arriving at an American port from a foreign port or place a head tax of $8 for, with certain exceptions, every alien passenger thereon entering the United States.

The designated ports of entry for aliens are divided into three classes. Class A is a designated port of entry for all aliens. Class B is a designated port of entry only for aliens who at the time of applying for admission are lawfully in possession of valid and unexpired resident aliens' border-crossing identification cards or valid nonresident aliens' border-crossing identification cards. Class C is a designated port of entry only for aliens who are arriving in the United States as seamen as that term is defined in the last sentence of section 1 of the Immigration Act of 1917 (39 Stat. 874; 8 U. S. C. 173) [That the term *seaman* as used in this Act shall include every person signed on the ship's articles and employed in any capacity on board any vessel arriving in the United States from any foreign port or place.]. No alien may enter the United States at a designated port of entry until and unless he has been inspected by an immigration officer or officers and found to be entitled under the provisions of the immigration laws and regulations to enter the United States. A list of the ports of entry for aliens is given in the Appendix.

QUARANTINE AND HEALTH.—The **United States Public Health Service** is the governmental guardian of the public health, working to prevent the spread of human contagious and infectious diseases.

In addition to its other duties, this bureau administers hospitalization and out-patient treatment at marine hospitals and many other relief stations to legal beneficiaries of the Government; it administers the foreign and domestic quarantine laws, supervising the medical examination of immigrants and enforcing interstate quarantine laws.

Radio report of disease aboard.—The master of the vessel shall report promptly by radio, to the medical officer in charge at the port of entry, the occurrence or suspected occurrence on board of any of the following communicable diseases: Anthrax, chancroid, chickenpox, cholera, dengue, diphtheria, favus, gonorrhea, granuloma inguinale, impetigo contagiosa, infectious encephalitis, leprosy, lymphogranuloma venereum, measles, meningococcus meningitis, plague, poliomyelitis, psittacosis, ringworm of the scalp, scarlet fever, smallpox, streptococcic sore throat, syphilis, trachoma, tuberculosis, typhoid fever, typhus, yellow fever, or other diseases characterized by fever or skin rash.

Quarantine.—Vessels subject to quarantine inspection include *(a)* all vessels from a port not under the control of the United States, except a vessel which in its current voyage has not touched at any port other than ports under the control of the United States or ports in Canada, Newfoundland, the Islands of St.

Pierre and Miquelon, Iceland, Greenland, the west coast of Lower California, Cuba, the Bahama Islands, the Canal Zone, or the Bermuda Islands; or a vessel which having received pratique at a Canadian port located in the international waters of the Juan de Fuca, Haro, Georgia, and Rosario Straits, and Puget Sound and tributaries and connecting waters on the Pacific coast, travels on the same international waters to a United States port and presents a duplicate copy of the Canadian pratique to the quarantine officer.

(b) A vessel arriving from any port whether or not under the control of the United States, which has aboard a person infected or suspected of being infected with anthrax, chickenpox, cholera, dengue, diphtheria, infectious encephalitis, measles, meningococcus, meningitis, plague, poliomyelitis, psittacosis, scarlet fever, smallpox, streptococcic sore throat, typhoid fever, typhus, or yellow fever, or arrives from a port where at the time of departure there was present or suspected of being present cholera, plague, or yellow fever, or where there was significant increase in the prevalence of smallpox or typhus at the time the vessel touched there.

A vessel shall fly a yellow flag, International Code Flag **Q**—Queen; anchor in the quarantine anchorage; and await inspection.

Only the quarantine officer, quarantine employees, or pilots, shall be permitted to board any vessel subject to quarantine inspection until after it has been inspected by the quarantine officer and granted pratique, except with the permission of the quarantine officer. A person boarding such vessel shall be subject to the same restrictions as those imposed on the persons on the vessel.

Sanitary inspection.—Vessels arriving at a port under the control of the United States from a foreign port shall be subject to sanitary inspection to ascertain whether there exists rodent, vermin, or insect infestation or other unsanitary condition requiring measures for the prevention of the introduction, transmissions, or spread of communicable disease.

Quarantine regulations are given in the text under the names of the ports.

In general, where State quarantine is in force, the minimum requirements of quarantine are in accordance with the regulations of the Public Health Service. National quarantine regulations will be found at the stations of the service and at United States consulates, and will be furnished to vessels upon application, either by officers of the service or by the Bureau in Washington, D. C.

Medical service.—United States merchant seamen are entitled to medical relief obtainable through the Public Health Service at its established hospitals and relief stations.

A United States seaman is one engaged on board in 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 Appendix.

Free medical advice is furnished to seamen by radio. See H. O. Publication 205, *Radio Navigational Aids.*

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE.—To prevent the entry or spread within the United States and its territories of injurious insects and plant diseases, the **Bureau of Entomolgy and Plant Quarantine** enforce quarantines and restrictive orders, issued under authority provided in various acts of Congress, which prohibit or regulate the importation or interstate movement of injurious insects and of plants and products that may introduce or spread insect pests or plant diseases new to or not widely prevalent within the United States or its territories. In compliance with plant-quarantine regulations it inspects at ports of entry plants and plant products that may be brought into the United States or its territories. A list of the ports within the area covered by the volume at which inspectors of this Bureau are located, is given in the Appendix.

The Bureau inspects plants and plant products offered for export and certifies to shippers and interested parties such products in accordance with the sanitary requirements of the country to which they may be exported.

RADIO.—Radio supervision.—The radio communications in the United States and its possessions, except the Panama Canal Zone, are controlled by the **Federal Communications Commission,** Washington 25, D. C.

Responsibility of shipmasters.—Shipmasters have the responsibility of seeing that the general radio regulations are carried out by the radio operators.

Radio inspectors.—Inspectors of the Federal Communications Commission have authority to board ships at United States ports for the inspection of the radio station to determine whether it complies with international treaties, Federal laws, and such rules and regulations of the Federal Communications Commission which may apply. In general, these inspectors operate at the following ports where field officers of the Commission are located and where information concerning radio regulations and communications may be obtained:

Boston, Mass.	San Juan, P. R.	Los Angeles, Calif.
New York, N. Y.	Tampa, Fla.	San Francisco, Calif.
Philadelphia, Pa.	New Orleans, La.	Portland, Oreg.
Baltimore, Md.	Beaumont, Tex.	Seattle, Wash.
Norfolk, Va.	Galveston, Tex.	Juneau, Alaska.
Savannah, Ga.	Houston, Tex.	Honolulu, T. H.
Miami, Fla.	San Diego, Calif.	

Service documents.—The rules and regulations of the International Telecommunication Convention require that when a radio-transmitting installation is compulsory equipment on board a ship, the latter must be provided with the following service documents:

1. The radio license.
2. The operators' certificates.
3. Register (radio service log) in which shall be noted, 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 ship shall be indicated once a day in the said register.

4. Alphabetical list of call letters.
5. List of coast and ship stations.
6. List of stations performing special services.
7. The general radio regulations and the additional radio regulations as well as the provisions of the convention necessary for the operations of radio-communication service on board ships.
8. The telegraph rates of the countries for which the station (ship) most frequently accepts radio-telegrams.

The rules and regulations of the United States Federal Communications Commission require certain vessels to have additional service documents, a complete list of which may be obtained from the Federal Communications Commission, Washington 25, D. C., or from its suboffices. For further details concerning the above rules and regulations consult the following publications:

Ship Radiotelegraph Safety Rules.
The Communications Act of 1934, with amendments.
Radio Navigational Aids, H. O. 205.

Weather Broadcasts.—Marine Weather Bulletins covering North Atlantic and North Pacific waters are issued by the Weather Bureau for broadcast by commercial and Government radio stations. Bulletins for Western North Atlantic waters are broadcast by U. S. Navy Radio Station NSS, Washington, D. C., while those applicable to Eastern North Pacific waters are transmitted by Stations KPH, Bolinas and KTK, San Francisco, Calif. A separate Marine Bulletin for Central Pacific waters is broadcast by KHK, Kahuku, T. H. The marine bulletins contain Storm Advisories, Weather Summary and Forecasts for the next 24 hours, beginning from the time of broadcast. A selection of ship and coast station reports in abbreviated codes is included in the NSS, KTK and KHK transmissions for use in preparing shipboard weather maps.

For those ships desiring additional surface and upper air data for preparation of weather maps at sea, Synoptic Weather Bulletins are broadcast by the Civil Aeronautics Administration Stations WSY, New York, N. Y. and WEK, New Orleans, La. Similar transmissions which also include ocean area warnings and forecasts are made by U. S. Navy Stations NBA, Balboa, C. Z.; NPG, San Francisco, Calif. and NPM, Honolulu, T. H.

Areas covered by warnings and forecasts in the marine bulletins, together with time schedules of the broadcasts, are as follows:

NSS, Washington, D. C.: North Atlantic north of Latitude 3° N. and West of Longitude 35°W., including Gulf of Mexico and Caribbean Sea—0200, 0800, 1400 and 2000 G. C. T.

NBA, Balboa, C. Z.: North Atlantic south of Latitude 25° N. and west of Longitude 60° W., Pacific waters between Latitudes 10° S. and 30° N. and east of Longitude 110° W.—0530, 1030, 1700 and 2230 G. C. T.

NPG, San Francisco, Calif.: North Pacific south of Latitude 60° N. and from Longitude 150° W. to 105° W.—0100, 0700, 1300 and 1900 G. C. T.

KTK, San Francisco, Calif.: North Pacific waters east of the 180th meridian—0420 and 1620 G. C. T.

KPH, Bolinas, Calif.: North Pacific waters east of the 180th meridian—0500 and 1700 G. C. T.

NPM, Honolulu, T. H.: North Pacific waters from the Equator to Latitude 45° N. and from Longitude 140° W. to 160° E.—0300, 0900, 1500 and 2100 G. C. T.

KHK, Kahuku, T. H.: North Pacific from the Equator to Latitude 45° N. and from Longitude 140° W. to 180°—0830 and 2330 G. C. T.

Local weather bulletins containing containing coastal area forecasts, storm warnings when issued and weather summaries for specified areas are broadcast on schedule twice daily by many government and commercial marine shore radio stations.

Storm warnings, whenever they are issued by the United States Weather Bureau, are the subject of special broadcasts by many Government and commercial radio stations of the mobile service. These special broadcasts are generally preceded by transmission of the Safety Signal (TTT) and the preliminary announcement on 500 kc.

Emergency broadcasts by U. S. Naval Radio Stations.—Storm warnings and notices concerning the safety of navigation at sea of an urgent nature are broadcast by United States Naval Radio stations in accordance with the urgency, as follows:

A. Notices of an urgent nature, such as tidal waves, hurricanes, typhoons, cyclones, etc., so imminent as to warrant immediate broadcasting:

1. One transmission immediately on receipt.
2. One transmission at the end of the first ensuing silent period.
3. One transmission during the first ensuing on-watch period for ships with one operator, in case both previous transmissions were made during the off-watch period.

B. Storm warnings and notices of less urgency than those specified in (A) above and other than those normally included in scheduled hydrographic broadcasts:

1. One transmission at the end of the first ensuing silent period.
2. One transmission during the on-watch period for ships with one operator in case the previous transmission was made during an off-watch period.

These broadcasts are preceded by transmission of the Urgent Signal (XXX) or Safety Signal (TTT) and a preliminary announcement on 500 kc. with subsequent shift to indicated station working frequency for transmission of the message.

Emergency broadcasts by U. S. Coast Guard Radio Stations.—Storm and hurricane warnings, advisories and other urgent marine information are broadcast by Coast Guard radiotelegraph and radiotelephone stations: (1), immediately on receipt of the message at the radio station and (2), at 2-hourly intervals thereafter, on the hour for a period of 6 hours, unless the information is canceled or superseded.

Radiotelegraph transmissions are preceded by announcement on 500 kc. as described for Naval stations (above).

Radiotelephone broadcasts are preceded by a preliminary announcement on 2670 kc., with subsequent shift to indicated station working frequency for transmission of the message. Broadcasts are made once through at a good writing speed.

Radiotelephonic broadcasts of weather information (United States).—Transmission by voice of weather information from the Weather Bureau is made through certain radio stations of the Coast Guard and of the commercial coastal

harbor radiotelephone service. These broadcasts are followed immediately by reports of dangerous obstructions and changes in aids to navigation.

This service gives to yachts, fishing craft, tugboats and other vessels equipped with a radio receiving set having a band covering the frequency range of 2 to 3 megacycles, official weather information from the Weather Bureau in plain language and on regular schedules.

These radiotelephone broadcasts are made twice and, in some cases, four times daily at definite times and include marine forecasts (and storm warnings whenever they are issued) for coastal waters in or adjacent to the areas served by the radio stations.

Small craft warnings of winds likely to interfere with the safe operation of small craft are included in these broadcasts.

Certain local radio stations in the standard broadcast band have microphones installed in nearby Weather Bureau offices. From these stations forecasts, weather summaries and warnings are broadcast on regular schedule. For stations and schedules in the area covered by this volume, see the Appendix.

West Indies.—Coast Guard station NMR, San Juan, P. R. broadcasts twice daily by radiotelephone and radiotelegraph a weather bulletin consisting of marine forecasts and weather summary for the Caribbean Sea area and small craft, storm and hurricane warnings when applicable.

Mexico and Canada.—Scheduled broadcasts of weather information affecting the coasts of Mexico and Canada are made by designated stations of those countries on marine frequencies by both radiotelegraph and radiotelephone.

Alaska.—Weather broadcasts are made by radiotelegraph and radiotelephone by Naval station NHB, Kodiak and Coast Guard station NMJ, Ketchikan. Radiotelephone broadcasts are also made by various stations of the Alaska Communication System operating in the 2-megacycle band.

Circulars giving complete details relating to the broadcasting of weather information, including times and frequencies, are available on request to the Weather Bureau. Similar information is also given in H. O. Publication 206, *Radio Weather Aids,* including decoding tables and station index numbers.

Reports from ships.—The master of every ship of the United States equipped with radio transmitting apparatus, on meeting with a tropical storm, dangerous ice, derelict, 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.

Weather reports (United States).—Weather reports should not be sent regularly except from ships with which specific arrangements have been made by the United States Weather Bureau, but masters of all ships encountering tropical or other severe storms should send special observations by radio.

These reports should be sent in the International Meteorological Code, unsigned and checked PREPAID, UNITED STATES GOVERNMENT. They should be given Safety Message priority and addressed OBSERVER WASHINGTON from Atlantic waters and OBSERVER SAN FRANCISCO from Pacific waters.

If a copy of the code is not available on shipboard, the message may be sent in plain language. Copies of the *International Meteorological Code for Ships* may

be obtained free on application to the United States Weather Bureau, Washington 25, D. C. It may also be found in H. O. Publication 206, *Radio Weather Aids.*

During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea area, Southern North Atlantic Ocean and the Pacific waters west of Central America and Mexico are urged to cooperate with the Weather Bureau in furnishing these special reports in order that warnings to shipping and coastal areas may be issued.

Time Signals.—The United States system of broadcasting time signals begins at 55 minutes 0 seconds of some hour and continues for 5 minutes. Signals are transmitted on every second during that time, except that there is no signal on the twenty-ninth second of any minute, nor on certain seconds at the ends of the minutes, as shown in the following diagram:

Minute	Second										
	50	51	52	53	54	55	56	57	58	59	60
55	—		—	—	—	—					—
56	—	—		—	—	—					—
57	—	—	—		—	—					—
58	—	—	—	—		—					—
59	—										—

The dashes in the above diagram indicate seconds on which signals are transmitted. The seconds marked "60" are the zero seconds of the following minutes. All seconds from 0 to 50, inclusive, are transmitted except the twenty-ninth second. The dash on the beginning of the hour (shown as 59 minutes 60 seconds) is much longer than the others, i. e., 1.3 seconds. In all cases the beginnings of the dashes indicate the beginnings of the seconds, and the ends of the dashes are without significance. It will be noted that the number of dashes sounded in the group at the end of any minute indicates the number of minutes of the signal yet to be sent. In the event of a failure or an error occurring in any of the time signals another time signal will be transmitted 1 hour later on the same frequency.

Standard Frequency Broadcast Service of National Bureau of Standards.— The technical radio services broadcast continuously by the National Bureau of Standards, Central Radio Propagation Laboratory, from its radio station WWV near Washington, D. C., include a total of eight radio frequencies, 2.5, 5, 10, 15, 20, 25, 30, and 35 megacycles, which are on the air at all times, day and night. This insures reliable coverage of the United States and extensive coverage of other parts of the world.

Station WWVH on the island of Maui, Hawaii, broadcasts on three frequencies, 5, 10, and 15 megacycles. Further information about WWVH is given later in this section.

The services are: (1) Standard radio frequencies, (2) time announcements, (3) standard time intervals, (4) standard audio frequencies, (5) standard musical pitch, 440 cycles per second, corresponding to A above middle C, (6) radio propagation disturbance warning notices.

Megacycles	Power, kw.	Modulation	Audio frequencies cycles per second
2.5	0.7	1	400 or 600
5	8.0	1	440 or 600
10	9.0	1	440 or 600
15	9.0	1	440 or 600
20	* 8.5	1	440 or 600
25	0.1	1	440 or 600
30	0.1	1	
35	0.1	1	

* 0.1 kw., for first 4 work days after first Sunday of each month.

Time announcements.—The audio frequencies are interrupted at precisely 1 minute before each hour and each 5 minutes thereafter. They are resumed precisely on the hour and each 5 minutes thereafter.

The beginnings of the periods, when the audio frequencies are resumed, are in agreement with the basic service of the United States Naval Observatory so that they mark accurately the hour and successive 5-minute periods.

Greenwich Civil Time or Greenwich Mean Time is announced in telegraphic code each 5 minutes. This provides a quick reference to correct time where a timepiece may be in error by a few minutes. The 0- to 24-hour system is used starting with 0000 at midnight. The first two figures give the hour and the last two figures the number of minutes past the hour when the tone returns. For example, at 1655 GCT, or 11:55 AM, Eastern Standard Time, four figures (1, 6, 5, and 5) are broadcast in code. The code used, International Morse, is given below. The time announcement refers to the end of the announcement interval, i. e., when the audio frequencies are resumed.

Numerals in International Morse Code

0 — — — — —	2 • • — — —	4 • • • • —	6 — • • • •	8 — — — • •
1 • — — — —	3 • • • — —	5 • • • • •	7 — — • • •	9 — — — — •

A voice announcement of Eastern Standard Time is given following each telegraphic code announcement. For example, at 9:10 EST the voice announcement in English is: "This is radio station WWV; when the tone returns it will be 9:10 a.m. Eastern Standard Time; 9:10 a. m."

Two standard audio frequencies, 440 cycles per second and 600 cycles per second, are broadcast on all radio carrier frequencies except 30 and 35 mc. The audio frequencies are given alternately, starting with 600 cycles every hour on the hour for four minutes, interrupted one minute, followed by 440 cycles for four minutes, and interrupted one minute. Each ten-minute period is the same.

Standard time intervals.—On each carrier frequency is a pulse of 0.005-second duration which occurs at intervals of precisely 1 second. The pulse consists of five cycles, each of 0.001-second duration, and is heard as a faint tick when listening to the broadcast. It may be used as an accurate time signal. On the fifty-ninth second of every minute the pulse is omitted. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the seconds pulses, are marked by the beginning or ending of the periods when the audio frequencies are off.

Radio propagation disturbance warning notice.—A warning of radio propagation conditions is broadcast in code on each of the standard radio carrier frequen-

cies at 19 and 49 minutes past the hour. If a warning is in effect, the letter "W" (in International Morse Code • — —) is repeated 6 times following the time announcement; if unstable conditions are expected, the letter "U" (in International Morse Code • • —) is repeated 6 times; if there is no warning, the letter "N" (in International Morse Code — •) is repeated 8 times.

A warning (W) means that radio propagation disturbance of the ionosphere-storm type in the North Atlantic region is anticipated within 12 hours, or is in progress, with its most severe effects on radio transmission paths for which the control points of transmission lie in or near the northern auroral one. This type of radio propagation disturbance is characterized by low intensities, accompanied by utter or rapid fading on the normal frequencies used at the different times of the day, or by complete blackouts of signals. By shifting to lower than normal frequencies for that time of day it may be possible to obtain communication, although with lower than normal intensity. Owing to increased auroral-zone absorption during the disturbance, however, usable transmission may be impossible on any high frequency. Also, *during a period of radio propagation disturbance, direction-finder observations may be unreliable.* Sudden ionosphere disturbances (SID) characterized by simultaneous fadeouts in the entire high-frequency spectrum, on paths in the daylight side of the world, are not covered by this warning.

The usual daily time for changing the announced warning is 2119 GCT (4:19 p.m., EST). The notice is, however, changed at any hour when disturbance becomes noticeable or anticipated. After a warning (W), the announcement is returned to "U" and later to "N" as conditions return to normal. Thus any time a radio operator questions reception of North Atlantic paths, it would be advisable to check with the WWV announcement to see whether conditions are considered disturbed by the Bureau's Warning Service.

Distance range of reception.—Of the radio frequencies of WWV, the lowest provides service to short distances, and the highest to great distances. Reliable reception is in general possible at all times throughout the United States and North Atlantic Ocean, and at some times throughout the world. One should select the frequency that gives the best reception at any particular place and time. This can usually be done by two methods:

A. By tuning to the different frequencies and selecting the one most suitable at that time. For nighttime conditions over the propagation path, lower frequencies than those used during the day are usually necessary because of the skip. Received intensities on usable frequencies are much greater for nighttime than for daytime conditions.

B. By making use of techniques of prediction of usable frequencies.

Additional information on how to receive and utilize the service is given in the Bureau's Letter Circular, LC974, *Technical Radio Broadcast Services, Radio Station WWV,* obtainable on request. The Bureau welcomes reports on reception, methods of use, or special applications of the service. Correspondence should be addressed to Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

Radio Station WWVH.—Radio Station WWVH, recently established by the National Bureau of Standards on the island of Maui, Territory of Hawaii, broad-

casts on an experimental basis, on 5, 10, and 15 megacycles. Station WWVH extends to the Pacific area the following technical services: Standard radio frequencies, time announcements, standard time intervals, standard audio frequencies and standard musical pitch. Omnidirectional antennas radiate approximately 400 watts of power at each carrier frequency.

The program of broadcasts of WWVH, on its three frequencies, 5, 10, and 15 mc., is the same as that of station WWV for standard time intervals, time announcements in code, standard audio frequencies, and accuracy. Reports received indicate that station WWVH may be usefully received at many locations not served by station WWV and that simultaneous reception of WWV and WWVH does not interfere with ordinary use of the standard frequencies and time signals.

The entire broadcast (modulation and carrier) is interrupted for periods of approximately four minutes immediately after each hour and half hour, and for periods of approximately forty minutes beginning at 0700 and 1900 GCT. These interruptions are made to permit operation of automatic ionospheric sounding equipment at the Hawaiian field station and to compare the local standards at WWVH with broadcasts by station WWV.

NAVIGATIONAL WARNINGS.—Radiotelegraphic navigational warnings affecting the waters of the United States and possessions are compiled by the United States Hydrographic Office; the United States Coast Guard; and the North Atlantic International Ice Patrol, United States Coast Guard vessel. These warnings contain information of importance to the safety of navigation, such as the position of ice and derelicts, and defects and changes in aids to navigation, mine fields, and the like which are later published in the *Notice to Mariners.*

Radiotelephone transmission by voice of navigational warnings is made immediately after the regular radiotelephonic broadcast of weather information by the same stations, following the same schedule and method of procedure.

These radiotelephone warnings contain the latest reports of local changes in aids to navigation such as are later published in the *Notice to Mariners* and the late and more important reports of obstructions to navigation in nearby waters as received from the Hydrographic Office and local sources.

Complete details relative to radiotelephonic or radiotelegraphic navigational warnings are given in H. O. Publication 205, *Radio Navigational Aids.*

Ships in distress.—Radio-equipped vessels requiring assistance may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency 500 kc. to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "COGUARD." Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

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 dispatching 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.

Small craft in distress.—Under the provision of the international regulations, which permit the use of any means available to a vessel or aircraft in distress to draw attention and obtain help, small commercial and private craft equipped with radiotelegraph or radiotelephone 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. and will answer emergency calls thereon, if heard.

Medical advice by radio.—Arrangements are made in various countries whereby mariners of all nationalities may obtain medical advice by radio. In the United States and its possessions free medical advice is obtainable through Government and commercial radio stations of its mobile service. This advice is given in language intelligible to the layman. For further details see H. O. Publication 205, *Radio Navigational Aids.*

LORAN is a system of position finding by reception of radio signals from specially designed transmitting stations of known position. The name is derived by combining the first two letters of "long," the first two letters of "range," and the first letter of "navigation." It is designed to furnish reliable positions to navigators at greater distances from the transmitting stations than is possible by other methods of radio navigation.

The principle of the Loran system is the determination of the difference of the distances of two radio transmitting stations from the observer, though not the actual distance of either station. This is accomplished by determining how much more time a signal or pulse from one station takes to reach him than a signal or pulse from the other. Upon a chart a curve is drawn through all points whose distances from these stations differ by the amount found from the observation. The vessel must be somewhere on this curve, which is the Loran line of position with reference to these stations. Similarly, another line of position is obtained by comparing the signals received from another pair of stations. Since the vessel must be on both lines, the point of their intersection is its position.

Because of the velocity of propagation of radio waves, 162,000 nautical miles per second, the time differences are extremely small being measured in millionths of a second. These small time intervals are determined visually by measuring on the luminous time scale of the receiver aboard ship or aircraft the separation between reference marks made by the reception of the pulses from the transmitting stations. This time scale is formed by the motion of a point of light, which is the tip of a ray of electrons, controlled by electrical circuits in the receiver. The components of this motion take place in a few millionths of a second and are not visually perceptible, but the complete cycle in the formation of the time scale is repeated over and over at the rate of approximately 25 times per

second. Due to persistence of vision, the eye sees a continuous pattern as in motion pictures. It is on this microsecond time scale that the time difference is measured.

The position of the vessel is found from the time difference by the use of Loran charts or tables. For the service area of each pair of transmitting stations the time differences which a vessel would observe are laid down in a pattern of lines. Each line is labeled with the time difference which is common to all points on it. The navigator has only to select the line of position indicated by the reading of the Loran receiver. Loran tables are used to determine positions of greater accuracy than is possible with the average small-scale Loran chart. The tables furnish the data necessary to plot, on any chart, the required segment of the line of position.

Caution.—Loran Position determinations on or near the base line extensions are subject to considerable error and therefore should be avoided whenever possible. For accurate position determinations in the base line extension area, the use of a radio bearing (or other means) along with Loran lines from another rate is recommended.

Loran charts and tables are compiled and distributed by the Hydrographic Office. They are available for all effective Loran service areas, which include the more frequented portions of the North Atlantic, North Pacific, South Pacific, and Indian Oceans.

The Coast and Geodetic Survey is printing Loran lines of positions on various sailing and inshore navigational charts.

The Hydrographic Office distributes H. O. Misc. 15308, *Loran Accuracy Diagram.* The diagram shows, for the regions of the world where Loran is available, the limits of areas within which loran ground wave lines of position have average errors of 1 mile or less, and areas within which sky wave lines of position have average errors of 2 miles or less. In addition, there are outlined all areas where two or more loran lines of position intersect at angles greater than 15 degrees.

Mariners and aviators are requested to notify the Commandant (OAN), Coast Guard Headquarters, Washington 25, D. C., or the nearest Coast Guard District Commander, of any defect observed in the operation of the Loran System (blinking is *not* a defect). The notification should include information as to the Loran rate involved, whether signals observed are groundwaves or skywaves, the nature of the defect, the approximate position of the craft, and the date and time (GCT) of observation of the defective operation.

Suggestions for improvement of Loran service are also requested, addressed to Commandant (OAN), Coast Guard Headquarters, Washington 25, D. C.

RADAR (Radio Detection and Ranging) is one of the most important of recent developments affecting the techniques of navigation. It is an anticollision and piloting device that may be used during darkness and low visibility to detect most objects and to furnish an accurate measurement of range under all conditions. However, it has many limitations as well as advantages. Radar is merely a supplement and a highly valuable adjunct to other navigational methods.

Radar works on the principle of echoes. Instead of sound a radar transmits

a radio signal. The radar equipment is basically an instrument for measuring the distance from the transmitter of an object which will reflect electromagnetic energy of radio frequencies.

The accuracy of a position obtained by radar varies considerably with different types of radar and the skill of the operator. In general, the accuracy of radar fixes compares favorably with, and sometimes exceeds, those obtained by other methods.

Advantages.—For navigational purposes, radar has several advantages over other navigational aids; namely:

1. Radar can be used at night and during periods of low visibility, when most other methods are not available.

2. Radar navigation is often more accurate than other methods of piloting. The limitations of accuracy of each set should be determined.

3. Radar fixes can be obtained rapidly. With the PPI (Plan Position Indicator) scope a continuous position is available.

4. A fix can be obtained from a single object, since both range and bearing are provided.

5. Radar may be available at greater distances from land than most methods of piloting.

6. Radar is a reliable anticollision device, permitting higher speeds (with relative safety) during periods of low visibility.

Failure on the part of a Government vessel to make use of radar while under way in low visibility has been held by a court to be directly contributory to a collision in which the vessel was involved. Article 29 of both International Rules of the Road and Inland Rules of the Road are applicable. This decision places an additional burden on vessels, which are equipped and manned to use radar to do so while under way during periods of reduced visibility without in any way relieving commanding officers of the responsibility of carrying out normal precautionary measures.

7. Radar can be used to locate and track violent tropical storms.

8. Radar reception is not affected by the same factors that cause interference and poor reception in radio communication. Consequently, radar's use is insured when normal radio communication is impossible.

Limitations.—As a navigational aid, radar is subject to certain limitations and disadvantages, as follows:

1. Radar is subject to mechanical failure. Also, as radar sets are sensitive instruments requiring accurate and precise adjustment, any error in the adjustment or synchronization will cause an error in the result.

2. There are both minimum and maximum range limitations. The minimum range is dependent on several factors. Inasmuch as the receiver is disconnected while a pulse is being sent out, any echo returning during transmission of the pulse will not be indicated. Excessive sea return, or echo from nearby water, and other obstruction nearby also affect the minimum effective range. Sea return becomes less with increased range because of the change in the angle of incidence, more of the signal is reflected away from the ship and less is returned in the form of echo. A good practical minimum range is 100 yards.

Maximum range is usually limited by the curvature of the earth to the line-of-sight, or slightly more (about 15 percent), because high frequency radio waves travel in a straight line and do not follow the earth's curvature except under the abnormal atmospheric conditions heretofore mentioned. The approximate maximum range at which any given target will return an echo can be determined by means of the table of *Distance of Visibility of Objects at Sea* in the same manner used for determining the distance at which a light can be expected to be seen at sea. This assumes, of course, that the radar is of sufficient power to extend to such a distance, that the scope is graduated for range to this distance, and that the target is of a nature that it will return a good echo.

3. Interpretation of the information presented on the scope is not always easy, even after considerable training.

4. Radar may be less accurate than other methods of piloting. A visual bearing, for instance, is usually more accurate than the radar bearing.

5. Radar may be unreliable or unavailable during certain atmospheric conditions.

6. Radar requires transmission from the ship.

7. Charts do not always give information necessary for identification of radar echoes.

8. Small boats and buoys may not be detected, especially if a light sea is running, if they are near the shore, or lack sufficient elevation to produce an echo. Most icebergs can be detected at distances equal to that at which a similar land mass could be seen, but *radar is not wholly reliable in the detection of growlers and floe ice large enough to damage or sink ships.*

9. Radar cannot distinguish the *nature* of small targets. One small object capable of returning an echo looks to radar just about the same as another.

The limitation of each radar set should be thoroughly understood by those who are depending upon the information it presents.

PUBLICATIONS.—The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner.

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.

Sales agencies have been established in various ports by the Coast and Geodetic Survey, Hydrographic Office, and Superintendent of Documents. District Offices of the Coast and Geodetic Survey sell all publications of that Bureau. Branch Hydrographic Offices do not sell any of the publications of that Bureau.

The mailing address of the Coast and Geodetic Survey, Hydrographic Office, Superintendent of Documents, Weather Bureau, Coast Guard, and Federal Communications Commission is Washington 25, D. C.

The Catalog of the United States Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts is distributed free by the United States Coast and Geodetic Survey and its agents.

949285—52——4

Nautical Charts.—Coast of the United States, Territories, and Possessions:
Issued by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey and its sales agents.
Mississippi River from the Head of Passes to Cairo:
Issued and for sale by the Mississippi River Commission, Vicksburg, Miss.
Illinois Waterway System:
Issued and for sale by the United States Corps of Engineers, Chicago, Ill.
Ohio River:
Issued and for sale by the United States Corps of 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, Mich.
New York State Canal System:
Issued and for sale by the Superintendent of Public Works, Albany, N. Y.
Foreign Countries:
Issued by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
Coast Pilots.—Coasts of the United States, Territories, and Possessions:
Published by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey and its sales agents.
Foreign Countries:
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
Tide and Current Tables.—Tide Tables, East Coast, North and South America, including Greenland:
Tide Tables, West Coast, North and South America, including Hawaiian Islands:
Tide Tables, Europe and West Coast of Africa, including Mediterranean Sea:
Tide Tables Central and Western Pacific Ocean and Indian Ocean:
Current Tables, Atlantic Coast, North America:
Current Tables, Pacific Coast, North America:
Tide and Current Tables, Philippine Islands:
Tide and Current Tables, Japan and China:
Published by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey and its sales agents.
Tidal Current Charts.—Boston Harbor, Narragansett Bay to Nantucket Sound, Long Island and Block Island Sounds, New York Harbor, Delaware Bay and River, Tampa Bay, San Francisco Bay, Puget Sound Northern Part, Puget Sound Southern Part—Nine Volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey and its sales agents.
Water Temperatures and Densities.—Surface Water Temperatures, Atlantic and Gulf Coasts (TW 1).
Surface Water Temperatures, Pacific Coast (TW 2).
Density of Sea Water, Atlantic and Gulf Coasts (DW 1).
Density of Sea Water, Pacific Ocean (DW 2).
Published by and free on application to the United States Coast and Geodetic Survey.
Notice to Mariners.—Notices to Mariners are published weekly and may be secured free of charge from the United States Hydrographic Office.
Light Lists.—Atlantic and Gulf Coasts, Intracoastal Waterway, Pacific Coast:
Published by the United States Coast Guard.
For sale by the Superintendent of Documents and his sales agents.
Foreign Countries:
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
Radio.—Charts of Radiobeacon System, Atlantic and Gulf Coasts, Pacific Coast, and Great Lakes:

Free on application to the United States Coast Guard.
Radio Circulars giving schedules, frequencies, and data included in weather broadcasts.
Free on application to the Chief, United States Weather Bureau.
Radio Navigational Aids (H. O. Pub. No. 205).
Radio Weather Aids to Navigation (H. O. Pub. No. 206). 5
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
List of radiobeacons:
See Light Lists published by the United States Coast Guard.
Hydrographic Bulletin: 10
Issued weekly by the United States Hydrographic Office.
International Code of Signals [American Edition] Vol. II—Radio (H. O. Pub. No. 88):
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
International Convention for the Safety of Life at Sea, London, 1929 (affecting radio), Extracts From: 15
May be obtained from United States Federal Communications Commission.
Communications Act of 1934:
For sale by Superintendent of Documents.
Ship Radio Telegraph Safety Rules: 20
From the United States Federal Communications Commission or the Superintendent of Documents.
The International Bureau of Telecommunication Union, Berne, Switzerland, publishes and sells the following:
1. List of Frequencies. 25
2. List of Coast Stations and Ship Stations.
3. List of Aircraft and Aeronautical Stations.
4. List of Broadcasting Stations.
5. List of Stations Performing Special Services.
6. List of Call Letters of Fixed Land and Mobile Stations. 30
7. List of Fixed Stations.
8. The Telegraph Rates.
Radio Service Bulletin:
Issued by United States Federal Communications Commission.
Weather.—Manual of Marine Meteorological Observations (W. B. Circular M): 35
Preparation and Use of Weather Maps at Sea (W. B. Circular R):
Manual of Cloud Forms and Codes for States of the Sky (W. B. Circular S):
International Code for Radio Weather Reports from Ships (W. B. 1046, Revised):
Published by the United States Weather Bureau.
For sale by Superintendent of Documents. These publications will also be furnished free of charge on request of ships' officers cooperating with the Weather Bureau. 40
Miscellaneous.—American Practical Navigator [Bowditch] (H. O. Pub. No. 9):
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office, the Superintendent of Documents, and their agents.
The American Nautical Almanac: 45
The American Ephemeris and Nautical Almanac:
Published by the United States Naval Observatory.
For sale by the Superintendent of Documents and his sales agents.
International Code of Signals [American Edition] Vol. I—Visual (H. O. Pub. No. 87):
Published by the United States Hydrographic Office. 50
For sale by the Hydrographic Office and its sales agents.
Pilot Rules for Certain Inland Waters of Atlantic and Pacific Coasts and Coast of Gulf of Mexico:
Published by and free on application to the United States Coast Guard.

Pilot Rules for Rivers whose Waters Flow into the Gulf of Mexico and Their Tributaries and Red River of the North:

Published by and free on application to the United States Coast Guard.

Pilot Rules for Great Lakes and Their Connecting and Tributary Waters:

Published by and free on application to the United States Coast Guard.

Navigation Laws of the United States:

Published by the United States Coast Guard.

For sale by the Superintendent of Documents.

General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes.

Published by and issued free on application to the United States Coast Guard.

Laws Governing Steamboat Inspection:

Published by and issued free on application to the United States Coast Guard.

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.

Port Series—of the United States:

Prepared by the Corps of Engineers, United States Department of the Army, in cooperation with the Maritime Administration, United States Department of Commerce.

For sale by the Superintendent of Documents.

Port and Terminal Charges:

Prepared by the Corps of Engineers, United States Department of the Army.

For sale by the Superintendent of Documents.

CHAPTER 2

Regional Information

THE PACIFIC COAST of the United States, between Mexico on the south and Canada's British Columbia on the north, is mostly rugged and mountainous, with high land rising abruptly from the sea in many places. The entire coast is backed by the Coast Range, 2,000 to 7,000 feet high, which frequently terminates at the shore in high cliffs and jagged off-lying rocks. South of San Francisco Bay the mountains are usually bare or covered with chaparral and underbrush. North of the bay the mountains are mostly well timbered, and in some places, especially northward of the Columbia River, the timber is particularly dense and heavy.

There are few outlying dangers along the coast. Notable are Bishop Rock and the islands off the southern coast of California; Noonday Rock and the Farallon Islands off San Francisco Bay; and Blunts, St. George, Rogue River, Orford, and Umatilla Reefs northward of San Francisco Bay. The southern islands are the largest and most prominent and, except for the Farallons, the farthest offshore of any along the coast.

Approaching the coast depths are too great for a vessel not equipped with an echo sounder to determine them readily until quite close. The slope downward from the 100-fathom curve is very abrupt, as is the case in many places between the 30- and 100-fathom curves. The 100-fathom curve lies at an average distance of less than 10 miles from shore, but this distance increases off San Francisco Bay, in the vicinity of Heceta Bank, off the mouth of the Columbia River, and at the entrance to the Strait of Juan de Fuca. In thick weather the greatest caution should be exercised and soundings should be taken frequently.

Kelp grows on nearly every danger with a rocky bottom and is particularly heavy in Santa Barbara Channel and in the vicinity of San Diego Bay. It will be seen on the surface of the water during the summer and autumn months; during the winter and spring it is not always seen, especially where it is exposed to a heavy sea. Many rocks are not marked by kelp, because a heavy sea will occasionally tear it away and a moderate current will draw it under water. When passing on the side of a patch of kelp from which the stems stream away with the current, care should be taken to give it a good berth. Dead, detached kelp floats on the water curled in masses, while live kelp, attached to rocks, streams away level with the surface. Live kelp is usually an indication of depths less than 10 fathoms.

Anchorage, affording shelter from the severe northwesterly winds of summer, is available at several places along the coast. In southeasterly and southwesterly weather there are few places where shelter may be had. San Diego Bay, Los Angeles Harbor, the lee side of the islands off the southern coast, and Monterey Bay are the only places south of San Francisco Bay. North of San Francisco, Humboldt Bay, Coos Bay, Tillamook Bay, Columbia River, Willapa Bay, and Grays Harbor afford good shelter, but most of these places must be made before the sea rises, as the bars afterwards become impassable. Neah Bay, just inside the entrance to the Stait of Juan de Fuca, is used considerably by vessels in westerly or southerly weather.

Aids in navigation are numerous, and there are few places along the coast where a vessel is not in sight of one or most lights. Lightships are stationed off San Francisco Bay, Blunts Reef near Cape Mendocino, the mouth of the Columbia River, Umatilla Reef, and Swiftsure Bank off the entrance to the Strait of Juan de Fuca. Most of the dangers are buoyed and are generally marked by kelp. All lightships and some light stations are equipped with radiobeacons.

Rules of the Road.—*Rules to Prevent Collision of Vessels and Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and the Coast of the Gulf of Mexico* are applicable. At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described in later chapters, the channel waters inshore of the outermost buoys or other aid to navigation of any system of aids are inland waters. International Rules govern in other cases and in Canadian waters.

TIDES AND CURRENTS.—**Tides.**—A very important characteristic of the western coast of the United States is the large inequality in the heights of the two high waters and of the two low waters of each day. On the outer coast the average difference between the heights of the two high waters of the day is from 1 to 2 feet, and the average difference in the heights of the two low waters from 2 to 3 feet. It was because of this large difference in the low-water heights that the mean of the lower low waters, rather than the mean of all low waters, was adopted as the plane of reference for the charts of this region.

This inequality changes with the declination of the moon. When the moon is near the Equator the inequality is relatively small; but when the moon is near its greatest north or south declination, the difference in the heights of the two high waters or of the two low waters of each day reaches a maximum. The tides at this time are called **tropic tides.**

Off the outer coast the mean rise of the tide above the plane of reference varies from 5 feet off southern California to about 7½ feet off the coast of Washington. Extreme variations from 3 feet below to 10 feet above the datum may reasonably be expected.

At the entrance to San Francisco Bay the mean rise of the tide is about 5 feet above the plane of reference. At the southern end of the bay the tide occurs about 1½ hours later, and the mean rise is about 2½ feet greater than at the entrance to the bay. Passing northward into San Pablo Bay, the tide occurs from 1 to 2 hours later than at the Golden Gate, with a mean rise of about ½

foot greater than at the latter place. In Suisun Bay the time of tide is about 3 hours later than at the Golden Gate, with a mean rise about the same. It requires about four hours for high water to pass from Suisun Bay to Stockton, on the San Joaquin River, and about 5 hours from Suisun Bay to Sacramento, on the Sacramento River. The mean rise of the tide above the plane of reference at Stockton is about 3½ feet, and at Sacramento is about 2½ feet.

In Humboldt Bay the tide is from ½ to 1 hour later than on the outer coast. The mean rise is about 6 feet above the plane of reference.

In Coos Bay the tide is from ½ to 1½ hours later, and the rise of high water about the same as in Humboldt Bay.

In Yaquina Bay the mean rise is about 7 feet above the plane of reference.

At the entrance to the Columbia River the mean rise is about 7 feet above the plane of reference. It requires about 6 hours for high water to pass from the entrance to the Columbia River to the mouth of the Willamette River. In passing up the Columbia River the range of tide decreases until it is only about 1½ feet at the mouth of the Willamette. Above this point the tidal range becomes too small to be of practical importance. There are, however, large fluctuations in the level due to the meteorological conditions. An extreme variation of 24½ feet has been noted at St. Johns on the Willamette River. The river is usually highest during the months of May, June, and July, and lowest during the months of September, October, and November.

In Willapa Bay and in Grays Harbor the mean rise is about 9 feet above the plane of reference.

Passing through the Strait of Juan de Fuca, the tide occurs about 4 hours later at Port Townsend than at Cape Flattery. The mean rise increases from 7 feet above the datum at Cape Flattery to 7½ feet at Port Townsend. There is an increase in the average inequality between the two low waters of each day from 3 feet at Cape Flattery to 5 feet at Port Townsend. The average inequality between the two high waters of each day at both places is about 1½ feet.

In Puget Sound the tide is about ½ to 1 hour later than at Port Townsend. The mean rise increases from 7½ feet above the datum of mean lower low water at Port Townsend to 13½ feet at Olympia. In Puget Sound the average difference between the two low waters of each day is 6 feet. At Seattle an extreme range from 4½ feet below the datum of mean lower low water to 15 feet above the same datum has been observed. At Olympia, in the southern part of the sound, an extreme high water 18 feet above the datum has been noted.

In San Juan Archipelago the mean rise of the tide varies from 6½ to 8 feet above the plane of reference. An extreme range from 4½ feet below the plane of reference to 12 feet above the same datum may reasonably be expected.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually but little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, landlocked harbors, or on tidal rivers the time of slack current may differ by several hours from the time of high or low water stand. The relation of the times of high and low water to the turning of the current depends upon a number of factors, hence no simple nor general rule can

be given. To obtain the times of slack water or strength of current, reference should be made either to figures given for various places in this volume of the Coast Pilot or to the *Pacific Coast Current Tables.*

Currents.—A current, the outer limit of which extends offshore more than 300 miles, flows approximately parallel to the Pacific coast of the United States from 50° to 30° north latitude. The direction of the current is generally southward throughout the year except as noted below. Its velocity, which averages about ¼ knot, is greatly influenced by prevailing winds, northerly winds increasing it and southerly winds diminishing it.

North of latitude 45° the set is usually northward from November through February.

Along the coast during certain periods there is a weak northerly flow known as the **Davidson Inshore Current,** which is evident between San Diego and Point Conception from July through February and between Point Conception and Cape Flattery from November through February.

Along the coast of Vancouver Island there is usually a northwestward flow, which as measured at Swiftsure Bank Lightship has an average velocity of nearly ½ knot at all seasons.

The above statements apply to general or average conditions. The currents, particularly offshore, at a specific time depend largely upon prevailing winds, whereas alongshore and off the entrances to inland waterways they depend also upon tidal and drainage effects.

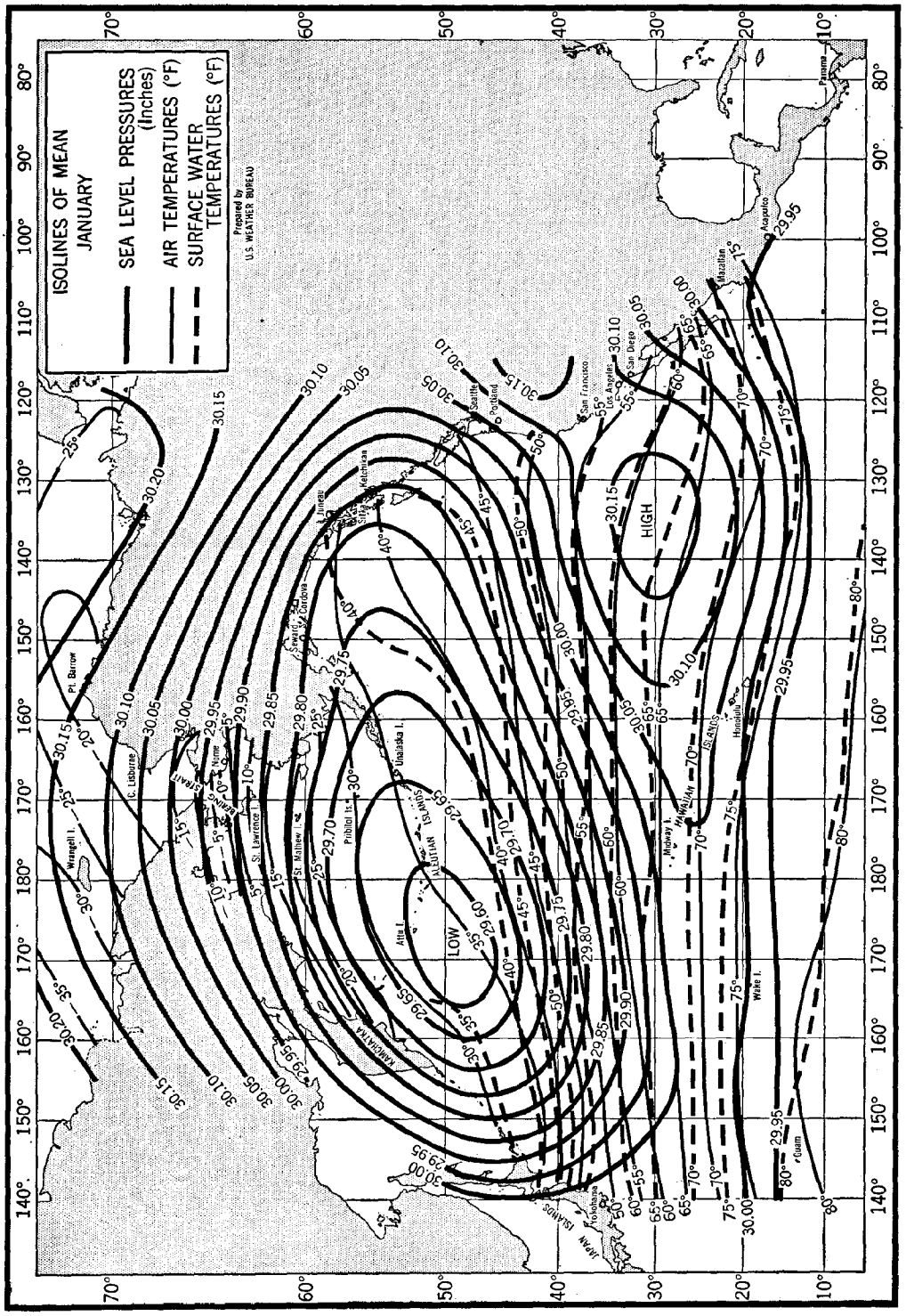
For detailed information, consult H. O. 570, *Atlas of Surface Current, Northeastern Pacific Ocean,* and the *Pacific Coast Current Tables.* The latter publication discusses currents at lightships in detail.

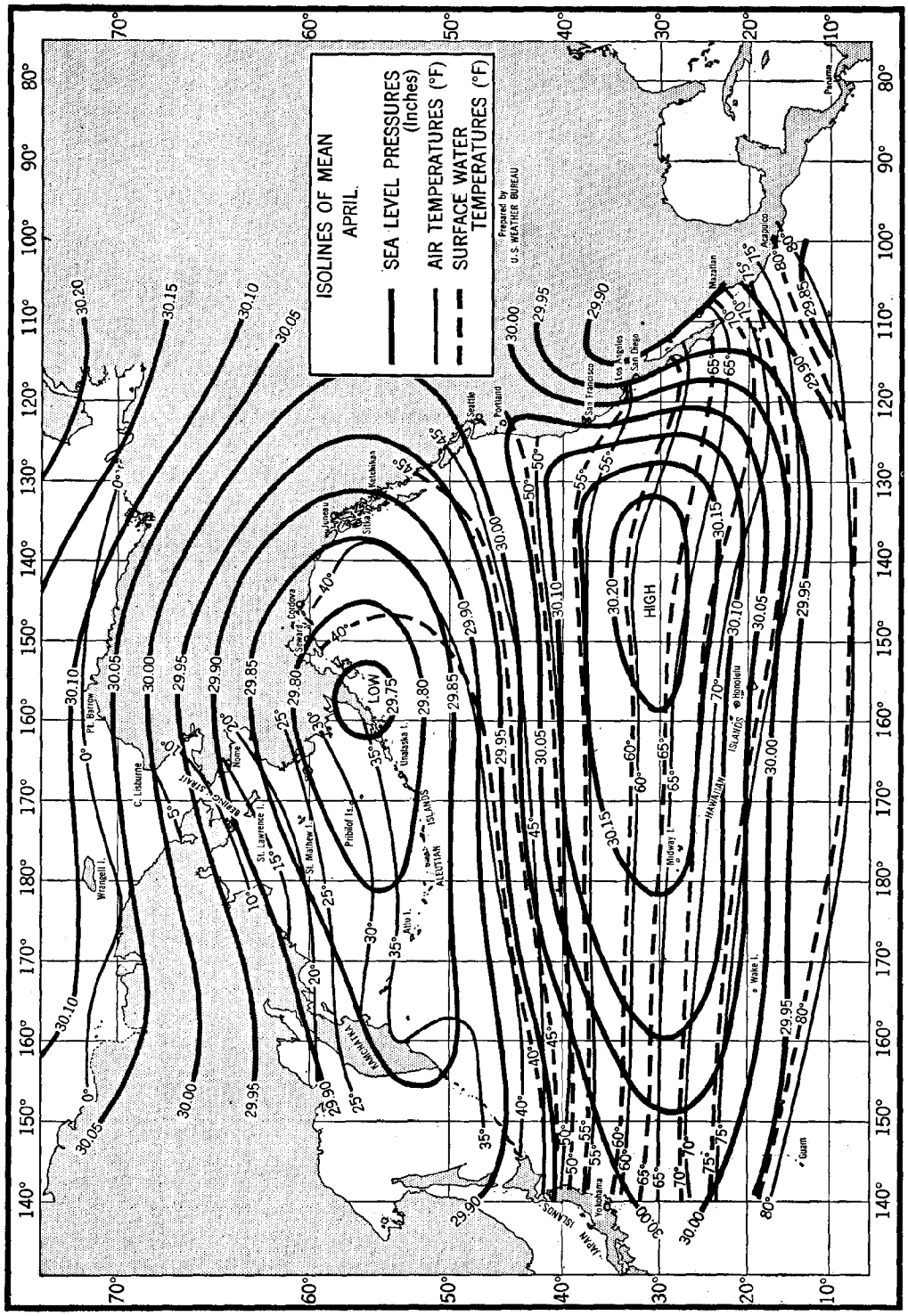
WEATHER AND CLIMATE.—The following material was prepared by the United States Weather Bureau. Temperatures are given in Fahrenheit degrees and barometric pressures in inches of mercury. Meteorological tables and lists of Weather Bureau offices, storm warning displays, and radio stations which transmit weather information direct from Weather Bureau microphones are in the Appendix.

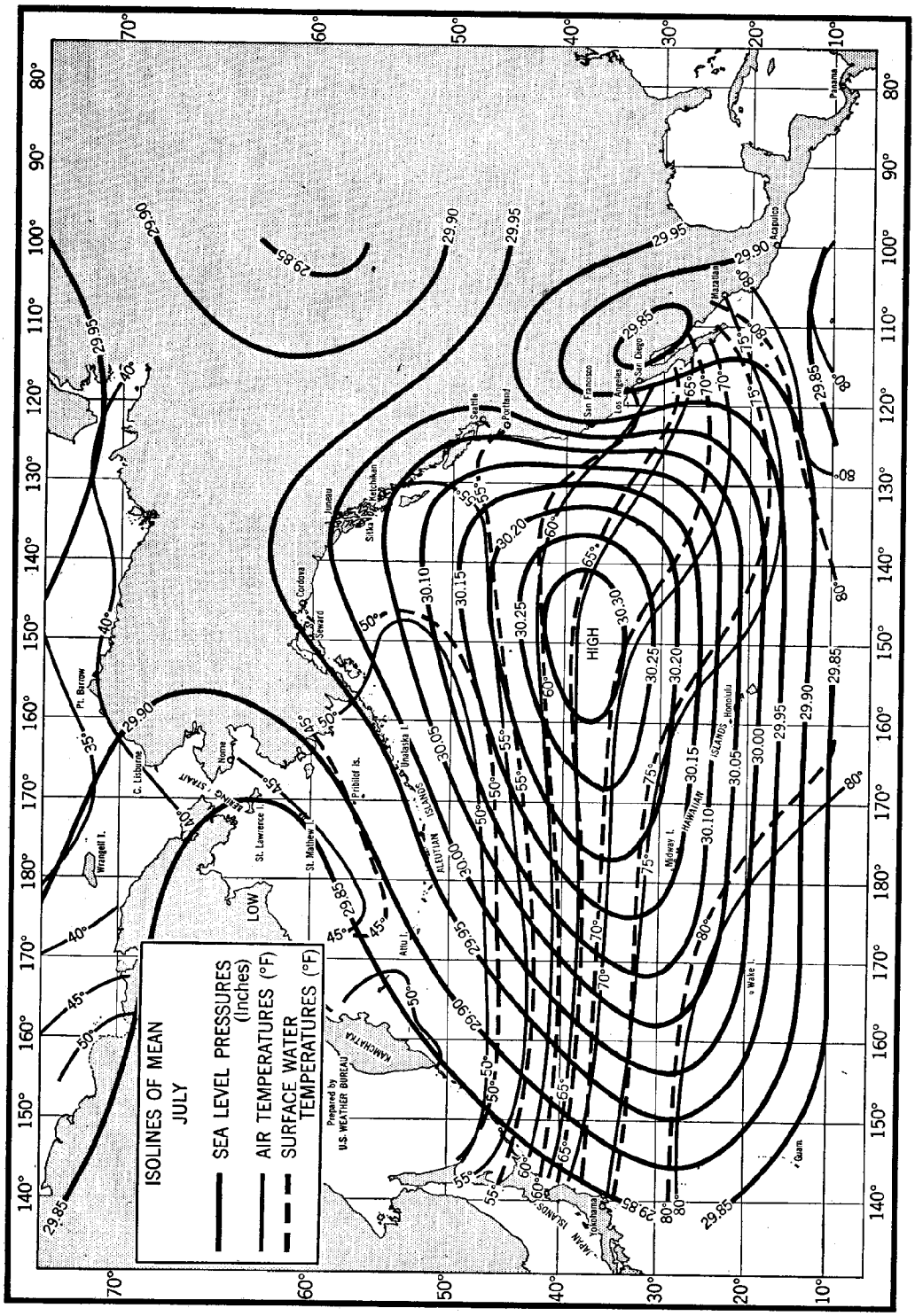
General.—The coastal area from California to Washington and adjacent waters is situated at the eastern extension of the North Pacific high pressure system. When this HIGH is well developed, it is the principal circulation control and forces the LOWS north of this coast. This tends to dampen out weather changes that might otherwise occur so that the weather stays much the same from day to day during such periods. The daily recurrent fogs are an interesting example of this characteristic of west coast weather.

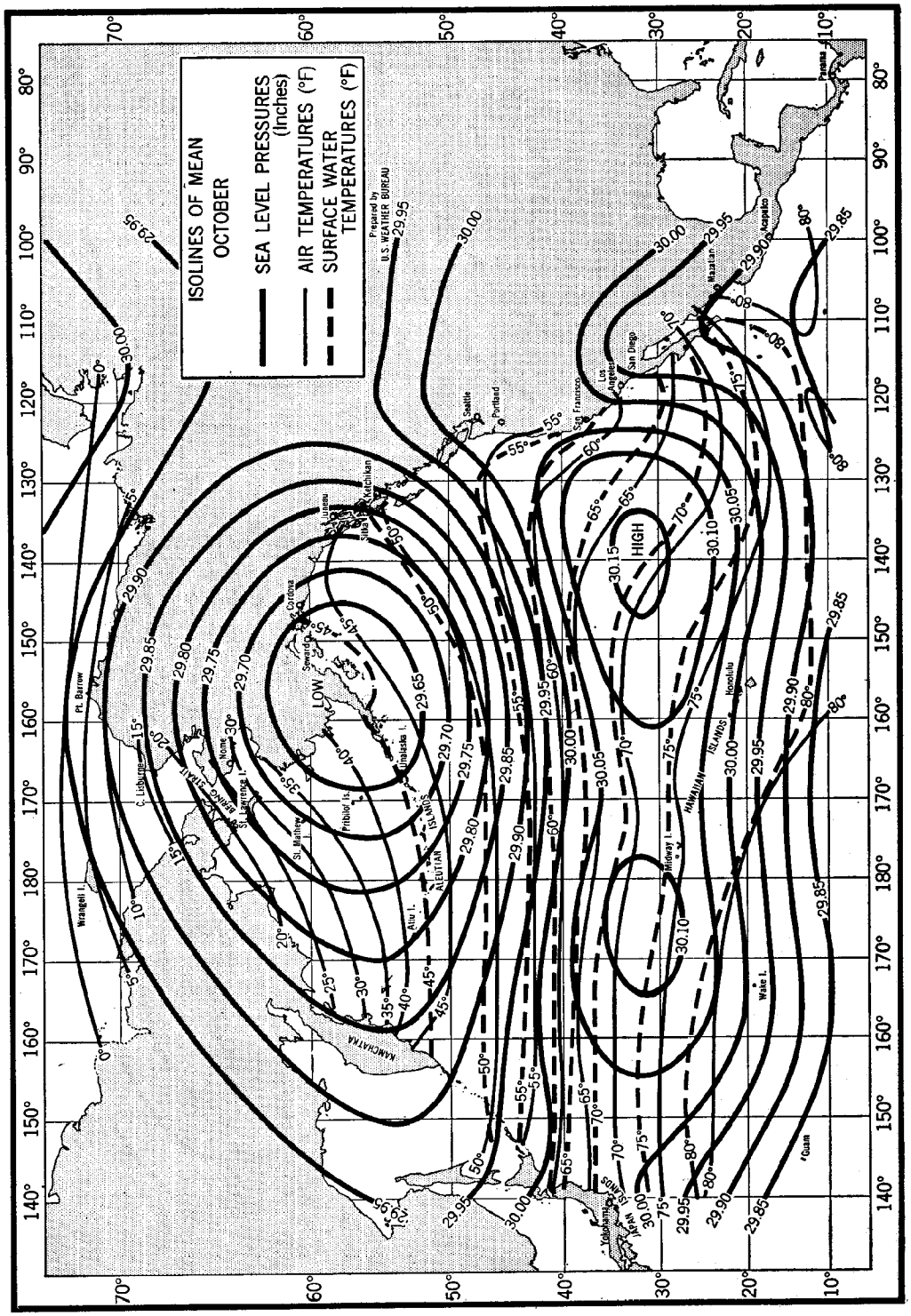
The temperature of the ocean water off the coast is lower than that farther west in most months, the greatest differences occurring in July, August, and September. This cold water keeps the air in contact with it cool and is a factor in the prevalence of summer fogs.

Annual change in pressure pattern and depressions.—In the summer months the North Pacific HIGH reaches its greatest extent. It extends northward to Alaska where it almost, and at times completely, obliterates the Aleutian LOW.


ISOLINES OF MEAN
JANUARY
SEA LEVEL PRESSURES
(Inches)
AIR TEMPERATURES (°F)
SURFACE WATER
TEMPERATURES (°F)
Prepared by
U.S. WEATHER BUREAU
HIGH
LOW
Pt. Barrow
C. Lisburne
Wrangell I.
St. Lawrence I.
St. Matthew I.
Pribilof Is.
Unalaska I.
Attu I.
Ketchikan
Juneau
Cordova
Seattle
Portland
San Francisco
Los Angeles
San Diego
Mazatlan
Acapulco
Panama
Honolulu
Midway I.
Wake I.
Guam
Yokohama
ALEUTIAN ISLANDS
HAWAIIAN ISLANDS
KAMCHATKA
JAPAN ISLANDS


ISOLINES OF MEAN
APRIL
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
SURFACE WATER TEMPERATURES (°F)
Prepared by U.S. WEATHER BUREAU
LOW
HIGH
Seattle
Portland
San Francisco
Los Angeles
San Diego
Mazatlan
Acapulco
Panama
Honolulu
Midway I.
Wake I.
Guam
Yokohama
Pt. Barrow
C. Lisburne
Wrangell I.
Nome
St. Lawrence I.
St. Mathew I.
Pribilof Is.
Unalaska I.
Atlu I.
Cordova
Seward
Juneau
Sitka
Ketchikan
ALEUTIAN ISLANDS
HAWAIIAN ISLANDS
JAPAN ISLANDS
KAMCHATKA
BERING STRAIT

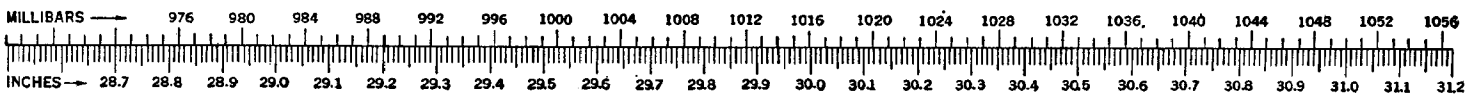

ISOLINES OF MEAN
JULY
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
SURFACE WATER TEMPERATURES (°F)
Prepared by
U.S. WEATHER BUREAU
HIGH
LOW
Pt. Barrow
Wrangell I.
C. Lisburne
Nome
St. Lawrence I.
St. Matthew I.
Pribilof Is.
Attu I.
Unalaska I.
Juneau
Sitka
Ketchikan
Cordova
Seward
Seattle
Portland
San Francisco
Los Angeles
San Diego
Mazatlan
Acapulco
Panama
Midway I.
Honolulu
Wake I.
Guam
Yokohama
KAMCHATKA
BERING STRAIT
ALEUTIAN ISLANDS
HAWAIIAN ISLANDS
JAPAN ISLANDS


ISOLINES OF MEAN
OCTOBER
SEA LEVEL PRESSURES
(Inches)
AIR TEMPERATURES (°F)
SURFACE WATER
TEMPERATURES (°F)
Prepared by
U.S. WEATHER BUREAU
LOW
HIGH
Pt. Barrow
Wrangell I.
C. Lisburne
Nome
St. Lawrence I.
St. Mathew I.
Pribilof Is.
Unalaska I.
Atiu I.
Cordova
Seward
Juneau
Sitka
Ketchikan
Seattle
Portland
San Francisco
Los Angeles
San Diego
Mazatlan
Acapulco
Panama
Honolulu
Midway I.
Wake I.
Guam
Yokohama
KAMCHATKA
ALEUTIAN ISLANDS
HAWAIIAN ISLANDS
JAPAN ISLANDS

Wind Force and State of Sea Surface with Specifications and Equivalents

Beaufort No.	Description of wind	Sea area: State of sea surface	Sea area: Description of sea	Sea area: Scale	Specifications for use on land	Nautical miles per hour	Terms used in U. S. Weather Bureau forecasts
0	Calm	Sea like a mirror—smooth	Glassy-calm	0	Calm; smoke rises vertically	Less than 1	Light.
1	Light air	Ripples with the appearance of scales are formed but without foam crests.	Rippled	1	Direction of wind shown by smoke drift, but not by wind vanes	1 to 3	
2	Light breeze	Small wavelets, still short but more pronounced. Crests have a glassy appearance and do not break.	Smooth	2	Wind felt on face; leaves rustle; ordinary vane moved by wind.	4 to 6	
3	Gentle breeze	Large wavelets; crests begin to break; foam is not white but of glassy appearance, perhaps scattered whitecaps.		3	Leaves and small twigs in constant motion; wind extends light flag.	7 to 10	Gentle.
4	Moderate breeze	Small waves, becoming longer; fairly frequent whitecaps.	Slight	4	Raise dust and loose paper; small branches are moved.	11 to 16	Moderate.
5	Fresh breeze	Moderate waves, taking a more pronounced long form; many whitecaps are formed. (Chance of some spray.)	Moderate	5	Small trees in leaf begin to sway; crested wavelets form on inland waters.	17 to 21	Fresh.
6	Strong breeze	Large waves begin to form; white foam crests are more extensive everywhere. (Probably some spray.)	Rough	6	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	22 to 27	Strong.
7	Moderate gale (high wind)	Sea piles up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	Very rough	7	Whole trees in motion; inconvenience felt in walking against wind.	28 to 33	
8	Fresh gale	Moderately high waves of greater length; edges of crest begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind.	High	8	Breaks twigs off trees; generally impedes progress.	34 to 40	Gale.
9	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Sea begins to "roll." Spray may affect visibility.		9	Slight structural damage occurs (chimney pots and slate removed).	41 to 47	
10	Whole gale (heavy gale).	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes a white appearance. The rolling of the sea becomes heavy and shock-like. Visibility affected.	Very high	10	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	48 to 55	Whole gale.
11	Storm	Exceptionally high waves (small and medium-sized ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.	Phenomenal [1]	11	Very rarely experienced; accompanied by widespread damage.	55 to 65	
12	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.		12		Above 65	Hurricane.

[1] As might exist at the center of a hurricane.



It is centered west of San Francisco at about 145° to 150° W. The average central pressure is about 30.25 inches. By September the HIGH has contracted somewhat but the central pressure still averages about 30.20 inches. The Aleutian LOW is forming in the Bering Sea and migrating LOWs move through this area more frequently.

In November the winter pattern is established. The HIGH has weakened until it is little more than a belt of high pressure between the Aleutian LOW and the equatorial belt of low pressure. The center of the HIGH has moved southward to about 30° N and eastward to 130° to 135° W, and is about 30.15 inches. Moving LOWs form along the polar front and migrate from west to east, tending to make their paths through the area of the Aleutian LOW.

During March the summer pattern begins to emerge. The average pressure at the center of the LOW rises about 0.2 inch after having stayed near 29.60 inches the previous four months. The HIGH begins to spread farther westward although the central pressure is still about 30.15 inches and the center still about 30° N. In April the LOW is further contracted, the HIGH has spread farther and the central pressure increased to 30.20 inches but is still about 30° S. Migratory LOWs become more infrequent and enter the continent farther north. In May and June the center of the HIGH moves farther north and the LOW contracts and weakens until in July the LOW does not appear on the map of average surface pressure and the HIGH shows its maximum central pressure, 30.30 inches, and has reached the northernmost point of its seasonal excursion. The accompanying figures show the average sea level pressure at the mid-months of the four seasons.

Temperature.—Air temperatures along this coast vary, on the average, about 12° to 15° F from midwinter to midsummer, and about the same amount in any season from the extreme north to the extreme south. Thus, Tatoosh Island averages 42° F in January and 56° F in August (difference 14° F), and San Diego 55° F in January and 56° F in August (difference 14° F). Midsummer (August) temperature of 56° F at Tatoosh Island is about the same as midwinter (January) temperature of 55° F at San Diego.

Extremes are seldom met along the coast. The coldest recorded at the stations considered is at Tatoosh Island where 7° F occurred in January 1893. There is an average of only 5 days a year at Tatoosh Island when the minimum temperature goes below freezing. A temperature as high as 90° F has not been recorded here. At the southern end of the coast, San Diego does not have a freezing temperature every year and averages only one day a year with a temperature as high as 90° F.

Surface Water Temperatures.—The surface waters up to 200 to 300 miles off shore, which constitute a current with a south-southeastward set, are generally cooler than the water displaced. In winter this water is warmer than the air over it most of the time but in summer the water is most frequently cooler than the air. This summer temperature condition favors the formation of fog.

Along the Washington coast (latitudes 45° to 50° N) the average water temperature varies from 46° F in February to 56° F in August. The air temperature averages higher than water temperature from May through October,

the difference being on the order of one degree F. The Oregon coast (latitudes 40° to 45° N) has a similar regime, the average water temperature ranging from 50° F in February and March to 55° F in September. The central California coast (latitudes 35° to 40° N) still has a similar regime to the Oregon coast but with water temperature about 4° F higher. However, along the central California coast the difference between air and water average temperatures is only about one-half degree F. The average temperatures of the water along the southern California coast (south of latitude 35° N) does not fall below that of the air in any month. Water temperatures along this stretch average from 58° F in February to 65° F in August and September.

Precipitation.—The season of most precipitation is winter, and of least summer. This applies to the entire length of the coast, although in the northern portion the precipitation is greater and the season longer than in the southern portion.

The following table gives a comparison of precipitation at stations along the coast from north to south.

Seasonal Precipitation Along the Pacific Coast

Station	Total Precipitation (In.)				Days with Precipitation			
	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
Tatoosh Island	6.81	23.72	32.99	17.25	33	50	63	51
North Head	4.31	16.05	24.79	12.52	31	48	63	51
Eureka	1.01	8.52	19.87	10.36	9	26	48	37
San Francisco	0.18	3.66	12.74	5.31	2	13	32	20
Los Angeles	0.12	1.96	9.05	4.11	1	6	18	12
San Diego	0.18	1.45	5.87	2.49	2	8	21	15

This shows summer rain more frequent and greater in amount at Tatoosh Island than winter rain at San Diego, and that for most of the coast summer is usually very dry.

Thunderstorms are relatively infrequent over the coastal areas and adjacent waters. Except over extreme southern California, thunderstorms occur almost entirely in the winter half of the year. Records of the number of days with thunderstorms show Los Angeles having the greatest number with five a year on the average, and San Francisco the least with less than one a year.

Snow has been recorded all along the coast but is of practical significance only along the coasts of Washington and Oregon. Tatoosh Island may have snow from November to March and usually has two to three inches in January and February. North Head has snow over a similar period but usually about an inch a month less than Tatoosh Island in January and February. As much as 30 inches has fallen in a month at Tatoosh Island and 20 inches at North Head.

Fog.—The fogs which lie off the Pacific coast are of two principal types. One has the summer characteristic, in that it forms over the sea and floats shoreward; the other has the winter characteristic, in that it forms over the land and floats seaward. The summer type of fog as a rule condenses over the cool currents that skirt the coast. When the warmer saturated air from the

westward blows over this cooler region, its dew point, already only slightly above the water temperature, is easily attained and fog results. The generally light anticyclonic winds which prevail here during the warm months, at which time the North Pacific HIGH remains particularly stable, are conducive to both the formation and maintenance of summer fog. The winter type of fog is much less prevalent than that of the summer. It is more local in character, although it may extend through a considerable range of latitude, and does not advance far to sea. It is only when the summer type, so called—which may occur likewise in winter, though not to the same extent as in the warmer seasons—unites with the land type, or forms coincidently with it, that a general sheet of fog extends for some distance to sea. Since fog on the Pacific coast comes in greatest measure during the prevalence of anticyclonic conditions, the frequent winter alternation of cyclonic conditions and accompanying greater wind movement over the easternmost reaches of the Pacific result in lessened production.

Advection fog (sea fog or coastal fog) occurs along the Pacific coast wherever cool waters lie immediately off the coast, the maximum occurrence being in summer. *Radiation fog* occurs in sheltered indentations along the coast, with the maximum occurring in the fall or early winter season.

The seaward extent of fog varies considerably. Its distribution over the ocean cannot be accurately stated because of the lack of records. The band of densest and most frequent fog which hugs the surface of the comparatively narrow stream of colder water off the Pacific coast is sometimes limited to a width of 50 miles or less. At other times fog occurs simultaneously for hundreds or even thousands of miles at sea, as is shown by the reports of vessels scattered along the middle and upper steamship routes. There is also undoubtedly a great variation in the location of the point where California's fogs are first formed. However, available records do show an increase in fog frequency from the 135th meridian eastward. Aviators and seamen have observed fog forming but a few miles from shore. Wright, when stationed at Mount Tamalpais, spoke of its origin about 22 miles at sea.

The months of maximum occurrence of fog off the Pacific coast varies somewhat with the different localities, and, of course, with the individual year. Fog is most prevalent over Puget Sound in the late summer and fall months. Over the Strait of Juan de Fuca sea fog predominates and the greatest frequency occurs in August and September. Fog occurs with almost equal frequency over the strait throughout the other months. Along the coast proper, from Tatoosh Island to the lower California coast, the period of most frequent fog is from July to October, and that of least frequency from December to May. On the lower coast of California, that is, from Los Angeles southward, the foggiest months are those from September to February, and the least foggy, from May to August. In the San Francisco Bay region the incidence of low visibility (less than 2 miles) rises sharply in the fall months rather than in the summer because of the occurrence of radiation fog, and reaches a maximum of 13 percent (of hourly observations) in November at Oakland and 17 percent in December at San Francisco Airport.

Over the Puget Sound area radiation fog predominates. During the late summer and fall months there are a great number of nights with clear skies and

very little movement of the air. During the night, as heat is lost from the earth by radiation, it cools the temperature of the air immediately above it. Naturally, there is considerable water vapor present in the air over the Puget Sound region and as the air is cooled to its dewpoint temperature, the water vapor condenses and fog results. In the late summer, the nights are shorter and the opportunity for radiation cooling is not quite so great; therefore, the fog is not so thick and dissipates rather early in the morning. As the nights lengthen during autumn, the fog will form earlier and to a greater depth and will not dissipate so early in the morning; in fact, under very stagnant conditions in October it is not uncommon to have the fog hang over this region all day for several days. Not until a storm approaches the coast which will cause sufficient wind to blow out the fog, is this region free from it. There is not so much fog in November and December due to the fact that the increase in cloudiness prevents the radiation cooling necessary to form fog, and also as a rule, there is too much wind. The less common type of fog in this area, advection fog, usually accompanies frontal system or is a result of the movement of the warm moisture laden air from the southern latitudes of the ocean over the colder water and land to the north.

Outside the Strait of Juan de Fuca thick fog banks sometimes rear themselves almost perpendicularly, facing clear weather inshore, thus allowing a vessel to arrive at destination without difficulty. At other times, the bank will move slowly into the strait, enveloping both shores for some distance, then perhaps leaving the Vancouver shore to the northward and clinging to the Washington shore with further progress. Port Angeles, situated on the strait about half the distance between the Pacific coast and the junction of the strait with Puget Sound, has water on three sides and is subjected to both sea and radiation fog. Sea fog predominates, the maximum frequency of eight days for the month occurring in August.

Off the coasts of Washington and Oregon navigation is sometimes seriously obstructed by dense smoke from forest fires, which are most prevalent from July to September. At other times light smoke will add to the density of fog.

The maximum frequency of fog along the coast of Washington and Oregon is 16 percent at Tatoosh Island, occurring in August. Between Tatoosh Island and Brookings, where 14.5 percent of observations in July record fog, smaller frequencies are encountered. From Brookings to north of the Golden Gate the maximum percentage frequency is reached in the vicinity of Blunts Reef. In the vicinity of Eureka, where coastal plains are found, maximum frequency of fog occurs in the fall months and is of the radiation type. Humboldt Bay, the harbor of Eureka, however, is an area of dense sea fog, and the shoals near there are dangerous to vessels in thick weather. Between Blunts Reef and San Francisco are two of the most foggy spots on the Pacific coast, namely Point Arena and Point Reyes. Point Reyes is often spoken of as being the actual center of heaviest and most frequent fogs on the Pacific coast, and this is true when an average over a long period of record is considered. Owing to the persistency of the fog cover, through which it is said the sun's rays sometimes fail to penetrate for 3 or even 4 weeks at a time, Point Reyes has close to the lowest midsummer temperature of any observing station in the United States.

Golden Gate, the entrance to San Francisco Bay, is a region of frequent fog, and shipwrecks have been numerous there. Often a sheet of fog forms in early forenoon off the bold headlands on either side of the Golden Gate and becomes more formidable in size as the day wears on. As the temperature rises in the warm valleys away from the shore, a steadily increasing indraft takes place. Then a cliff of white vapor, perhaps 1500 or more feet in height, approaches the shore and enshrouds a good portion of all of San Francisco Bay. Under favorable temperature conditions, the fog will overspread the shore and rise up the more than half-mile height of Mt. Tamalpais, overlooking the side of the gateway.

There are several well-marked types of fog in the vicinity of San Francisco. First and most prominent is the summer afternoon sea fog described above which moves inland at an average rate of 16 miles per hour. The second type is the *tule fog*. This is a low-lying, dense land or river fog, which forms during winter mornings and drains slowly seaward at the rate of perhaps a mile an hour. It is essentially a valley fog and is most marked in the lowlands, but sometimes on clear winter nights when the cooling due to radiation is marked, fog forms early over the city and bay, dissipating before noon. As a rule the city hills and even the roofs of the tall office buildings are above the fog. The high parts of the city are generally out of the fog several hours before the low portions. The third type is a non-descript fog, formed by a mixture of city smoke and dust with the condensed vapor. This lies about 650 feet above the city streets. A pall of smoke and fog drifts slowly seaward during the morning hours, especially in the spring and autumn, and returns again about 1 p. m., driven in by the west wind. In such cases it appears as a dark, low cloud and for a period of fifteen minutes or half an hour causes a noticeable darkness.

In summer the afternoon sea fog varies in depth from 100 to 1640 feet, the depth decreasing as the distance inland increases. On summer afternoons the velocity of the wind at San Francisco rises with almost clocklike regularity to about 22 miles per hour, and a solid wall of fog comes through the Golden Gate, causing a fall in temperature.

Between San Francisco and Monterey warm-water eddies are intersposed between the cold waters and the coast and a band of less frequent fog results. At Point Piedras Blancas, about half way between Monterey and Point Arguello, the maximum frequency for the whole coast, 28 percent in July, is reached, Estero Bay, just a few miles south of Point Piedras Blancas, is also one of the foggiest spots along the coast.

Surface fogs are not a common phenomenon over the waters of southern California below Point Arguello, since warm-water eddies lie between the coast and the cool California current. This condition results in a preponderance of low stratus clouds rather than surface fog. The minimum occurrence is at San Diego Bay. Point Arguello is the southernmost point in the band of maximum occurrence of fog. There the cool water lies close inshore and the maximum frequency of 10 percent occurs in July and August. Fogs at Point Arguello are invariably thick and it is recognized among mariners to be one of the most dangerous points on the coast.

While the coast of southern California has a minimum frequency of fog, there are two very foggy spots off the coast of Los Angeles. These are San

Miguel Island and Buffalo Springs on Catalina Island. San Miguel has 43.3 percent frequency in July, and Buffalo Springs 17.5 percent occurring in August.

Along a great length of the coast, fog may be found at any time of the day. At North Head, Washington, fog is often formed when northwest winds of forces 2 to 4 occur; at Tatoosh Island it often comes in with south or southwest winds. When northwest winds approach Humboldt Bay and warm air currrents come from the land, the two frequently mingle, neutralizing each other and at the same time, in the process, laying banks of fog along this dangerous part of the coast. Off southern California night and early morning fogs predominate.

Table 1 in the Appendix gives the average occurrence of low visibilities in percent of for selected stations along the coast, and in islands off the coast. The term low visibilities applies to visibilities of 2 miles or less. The 0-1/2 mile category approximates the international definition of fog. The 0-1/4 mile category includes both dense and thick fog. The occurrence of dense fog alone may be obtained from Table 2.

Table 3 gives the average duration and the maximum duration (in hours) of fog for San Diego, San Francisco, and Seattle. The maximum durations at the three stations occur during the winter months, a condition which reflects the longer hours of darkness. Radiation fog is more common at each of these stations. The maximum durations which can be definitely ascribed to coastal fog did not exceed 24 hours for the period or record available.

Gales.—There is considerable difference in frequency of gales between the northern and southern portions of this coast. Gales are most frequent in the winter months, averaging 5 to 8 percent of observations along the Washington coast and only about one percent of observations along the southern California coast. In summer, the coastal area of Washington averages less than one percent of observations with gales while the coast of Oregon southward to central California averages one to two percent. Gales are very infrequent along the southern California coast in summer.

The direction from which gales blow shows a marked seasonal variation. In winter they may occur from any direction but more blow from the southeast, south or southwest than all other directions combined. Few or none come from the northeast or east. In summer gales are almost exclusively from the northwest and north.

Along the coast of Washington (45° to 50° N) the season of maximum number of gales extends from early October until April. This is the period when differing air masses and fronts address the coast. The fact that most gales during this period are from the southeast, south or southwest indicates that they occur in the warm sector of the LOW. During June, July, and August gales from any direction are rare. From northern Oregon to northern California (40° to 45° N) the season of maximum number of gales along the coast lasts from November through February. During these months most of the gales blow from the southeast and south with a few from the north and northwest. March and October are transition months. From April through September gales are fewer and those that do occur, are usually from the northwest or north.

949285—52——5

Farther south along the California coast (35° to 40° N) northwest gales are more frequent than either farther south or north, and occur at all seasons although they are most frequent from March through July. Northwest gales are as frequent or more frequent than gales from any other direction in all months. There is a secondary maximum of southeast and south gales from November through March.

The coastal waters of southern California (south of 35° N) have gales so infrequently that they are recorded in only one percent of the observations in January and December. No direction stands out as predominant. Near Los Angeles there is an infrequent but violent local wind known as the Santa Ana.

Local Winds.—The mountains along the coast form such an effective barrier to the free exchange of air between the ocean and the interior that when there is a considerable pressure gradient between the continent and the ocean strong winds develop in the passes and valleys. Notable among these surface winds that are caused by topography and that affect navigation are the winds in the Strait of Juan de Fuca and the Santa Ana near Los Angeles.

Winds in the Strait of Juan de Fuca as measured at Tatoosh Island are so modified by topography that it is not always obvious to the non-meteorologist what pressure gradients will produce strong east winds at Tatoosh Island. The frequency of easterly winds increases with the coming of winter until in January about half the time the wind is due east and the average speed about 19 knots. The minimum frequency is in July and August when winds are east only 8 to 10 percent of the time and the average speed has dropped to 7 or 8 knots.

The accompanying table is compiled from automatic record made at Tatoosh Island from 1937 through 1941. Wind speeds from the east, south, southwest and west only are given.

Tatoosh Island 1937-1941

	Percent Frequency									Speed in Knots			
	N	NE	E	SE	S	SW	W	NW	Calm	E	S	SW	W
January	0.9	3.6	51.8	10.0	17.0	8.1	6.3	2.3	0	19.5	15.9	16.2	13.1
February	0.9	2.6	46.4	9.4	17.9	11.5	6.8	4.5	0	15.7	14.4	15.0	10.6
March	2.0	7.4	32.1	7.6	21.0	13.9	10.9	5.0	0.1	15.0	13.1	12.1	10.4
April	1.4	4.0	21.0	6.5	22.4	21.1	21.0	2.6	0	13.9	13.2	10.1	9.6
May	2.1	5.8	15.1	2.9	20.2	22.6	25.9	5.3	0.1	12.2	13.4	9.5	9.1
June	1.4	3.6	11.3	1.4	21.4	32.0	26.0	2.8	0.1	8.9	10.3	7.9	6.3
July	1.4	3.0	7.5	1.3	34.3	37.6	13.5	1.3	0.1	7.5	10.6	8.4	5.5
August	2.0	7.8	10.9	2.5	36.2	29.5	8.8	2.0	0.3	8.3	9.6	7.6	5.0
September	2.3	11.9	21.7	3.3	26.7	21.1	10.1	2.8	0.1	10.1	9.6	7.5	6.4
October	0.8	9.2	39.2	4.7	27.2	10.5	6.7	1.1	0.6	14.1	15.3	10.3	7.9
November	0.7	3.7	45.0	8.7	20.6	11.5	7.7	2.1	0	17.6	16.0	14.2	11.8
December	0.6	2.2	41.5	9.0	24.2	10.4	9.4	2.6	0.1	18.0	19.0	20.6	14.8

The following is adapted from the description of an east wind at Tatoosh Island:

The average wind speed for February 2, 1916, was 46.4 knots, the five minute maximum 59 knots, and the extreme for one minute was at the rate of 73 knots. Much of the force of this easterly wind was confined to the immediate vicinity of the station.

This storm in common with all east-northeast storms, increased slowly in violence, maintained its full strength for several hours and gradually diminshed. The hourly maxima differed from the hourly average by from 2 to 11 knots with an average difference of 3. The average speed from noon to 9 p. m. of February 2 was 53 knots, or 6 knots below the maximum; and between 2 and 5 p. m. the average was 54 knots, or 5 knots below the maximum.

This wind varied about 10° in either direction from east-northeast, veering toward east while under 44 knots and backing toward northeast with an increase in speed.

Under the influence of an anticyclone, the easterly winds may blow out of the Strait of Juan de Fuca at high speeds for several days at a time, with unclouded skies and otherwise pleasant weather. Masters of sailing vessels gladly take advantage of such weather conditions when outbound, and have completed the run from Puget Sound to San Francisco in five days, or less than half the time of an ordinary smart run. Many vessels have passed out of the strait under full sail before winds of more than 40 knots from east-northeast without damage. On the other hand, one vessel, while inbound off Neah Bay, was partially dismasted in a southwest squall of 26 knots. In the latter case the increase in force was too sudden to permit sufficient shortening of sail.

Much of the force of the easterly wind is apparently local and due to the configuration of the strait. The shoreline on the south side for 5 miles eastward extends almost due east and west. A study of the maxima in east-northeast winds almost invariably shows more of the northerly component in the direction about the times of their occurrence, suggesting that the increase in speed is induced by lateral compression. There is no means of determining if these winds are stronger between the station and the nearby cape, but the cape's effect in the strait can frequently be noted. During the time on February 2 when the wind was averaging 54 knots the wind's effect on the water and on four passing steam vessels was observed to be no greater, at distances of 1 mile and more from the station, than that exerted during registered speeds of from 44 to 47 knots from the same direction. Three of the vessels, inbound, made fair time against the wind and apparently were retarded not more than 3 knots.

An important difference between the easterly winds and westerly winds is their respective effect on the waves. The swell is normally propagated from west to east, or onshore. Any westerly wind tends to heighten the waves. An easterly wind, on the contrary, beats the sea down until a speed of about 47 knots is attained after which the wind produces an offshore wave of comparatively slight intensity. (Taken from *Violent easterly winds at Tatoosh Island, Wash.* by Ralph W. Mize. Monthly Weather Review, v. 44, June 1916, p. 352-354.)

The **Santa Ana** is an offshore desert wind usually occurring in or near San Pedro Bay. While infrequent, it may be violent. These winds are most apt to occur in late autumn or winter and at times may reach a speed of 52 knots.

Meteorological conditions are favorable for a desert wind whenever a strong area of high barometric pressure moves in or develops over the Plateau region and the barometric gradient calls for northeast or east winds over southern California. The air moving outward from this Plateau high pressure area streams through Cajon Pass into the Great Valley of southern California. If the pressure

difference between Nevada and southern California is only moderate (0.16 to 0.40 in.) the desert winds are usually confined to rather narrow belts extending from the mouths of the passes to the ocean by the lowest and least obstructed routes.

These air streams from Cajon Pass usually maintain their identity in a remarkable manner. They move out over the valley floor, swing toward the southwest, and either follow the canyon of the Santa Ana River through the Santa Ana Mountains or move directly over the low mountains south of the canyon and then follow a well-defined path over the almost level plains of Orange County and reach the ocean in the vicinity of Newport. The stream may shift its position slightly from time to time, but appears to change but little in width or velocity. Sometimes it spreads out somewhat after passing the Santa Ana Mountains, but usually it follows a well-defined path to the ocean. It often comes over the south foothills at the western entrance to Santa Ana Canyon, appearing in such cases to come down the hillsides in strong gusts directly along the ground.

These winds diminish little if any immediately after passing over water and some reports credit them with blowing considerable distances at sea. However, beyond 50 miles from shore they are usually of no particular concern.

Aside from weather forecasts broadcast by radio the mariner has but short notice of the approach of a Santa Ana. The barometer is well nigh useless when its readings are taken alone, and it maintains its readings with little variation, although a gale may spring up and blow for hours. For some hours before a Santa Ana, there is usually a period of good visibility and unusually low humidity. Shortly before the arrival of the Santa Ana on the coast its presence may be observed by a dark brown dust cloud approaching. This will often give from 10 to 30 minutes warning and is always one of the positive indications.

The Santa Ana may come any time during the 24 hours buts its strength is reinforced or opposed by the ordinary land and sea breezes. The reinforcement by the land breeze tends to produce the greatest velocity between 7 a. m. and 9 a. m., and its force can be expected to lessen after 10 a. m.

Other characteristics than just the force of these winds should be noted. The low humidity and dust combine to irritate the nose and eyes. Dust and sand are deposited in every crevice, and carburetors may become choked. Electrostatic charges, built up on insulated objects, may cause ignition troubles with gasoline engines. The sparks caused by static discharges have caused gasoline explosions.

Tropical storms.—The southern portion of this coast may be affected by tropical storms which originate in or near the Gulf of Tehuantepec in late summer and autumn. They average about six a season although few come far enough north to affect the United States coastal waters. There is evidence that more than this form, but dissipate before reaching an area with meterological observers. Most of these storms are of less than hurricane intensity and most are short lived. These storms may bring unseasonable rains and squally winds to southern California but seldom farther north. The coasts of Baja California, Sonora, and Sinaloa in Mexico are usually the most affected.

COASTWISE NAVIGATION.—Navigation along the coast of California, Oregon, and Washington presents to the mariner a problem of unusual difficulty. The courses in general are long and must be traversed during frequent periods of thick weather, with the vessel subject to the action of currents whose velocity and direction are uncertain.

Most of the strandings along this coast have occurred in foggy but comparatively calm weather. Considering the large number of strandings on record, it is surprising that the loss in lives and property has been so small. Various reasons may be advanced for the strandings, one of them undoubtedly being the failure of the navigator to realize that currents of considerable velocity are frequently encountered when there are no other unfavorable local conditions to warn him of their existence. Current observations at lightships show that a wind-driven current usually sets in a direction somewhat to the right or left of the direction toward which the wind is blowing.

In the majority of the cases where the strandings appear to have been directly due to currents, the currents have been against the vessel. Most of the strandings have happened to deeply laden, southbound vessels to the northward of the projecting points like Capes Blanco, Mendocino, and Arena. The consensus of opinion among the navigators of the coast is that the currents follow the curves of the shore. If this is true, a vessel southbound against a northerly current would tend to set in to the northward of the points and out to the southward of them.

Some believe that there are currents which originate well offshore and flowing in strike the coast and are deflected to the north or south. This theory would explain the fact, already noted, that currents are so frequently encountered in relatively calm weather. It would also explain the fact that vessels have frequently experienced a considerable set directly inshore caused by currents acting so squarely across the track that they had no effect on the speed made good. Sets of this character appear to be particularly frequent between Heceta Bank and Cape Arago, between Trinidad Head and Cape Mendocino, and off Monterey Bay.

Under the conditions described, it is absolutely necessary to take soundings for safe navigation along this coast in thick weather. The continuous chain of soundings obtained by a vessel equipped with an echo sounder will be found most useful in laying down on the chart the track made good by the vessel. Radio bearings greatly reduce the dangers incident to navigation but their use should not lead the navigator to neglect sounding.

The master must assume the possible existence of a current setting his ship into danger and take his precautions accordingly. On vessels not equipped with a reliable echo sounder, the vessel's progress should be verified by an occasional wire sounding on each course where depths permit, and soundings should be taken frequently before and after a change of course, unless a reliable fix has been obtained. The soundings after the change are of the greatest value in revealing any error in the reckoning on which the change of course is based, and it may conservatively be stated that the great majority of the past disasters would have been prevented if such soundings had been taken.

The value of an echo sounder when underway cannot be overemphasized.

If such equipment is not available some up-and-down soundings with the vessel stopped are essential to accuracy.

The radio compass has given the navigator another way of determining his position with a fair degree of accuracy, but sounding should never be neglected. A vessel equipped with an echo sounder may depend largely upon continuous soundings to furnish accurate information as to the vessel's position. Because there are certain conditions under which radio bearings may be subjected to grave error, the additional check of sounding in critical places should be carried out. One of the worst disasters along the Pacific coast was due in part to the erroneous interpretation of a radio bearing.

There are pinnacle rocks along the Pacific coast that extend considerable distances from shore in some places. The ordinary survey cannot be relied on to locate all these rocks. The Coast and Geodetic Survey has swept some of the coast with the wire drag. Vessels navigating close to shore to avoid the northwesterly winds of summer necessarily incur the danger of striking an uncharted pinnacle.

The **Coast Highway** extends close along the shore in numerous places along the entire length of the Pacific coast. The navigator should take care not to confuse headlights of automobiles with aids to navigation.

Fishweirs.—Regulations prescribe that fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation. The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high water line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the Army Department permit authorizing the erection of the structure or appliance. When several structures or appliances are placed on one line with no navigable passage between them, they will be considered, for lighting purposes, as one structure.

LOCAL SERVICES.—Pilots will be found cruising off the port of San Francisco. Pilots are available at most of the other ports, but do not cruise off the entrances. Vessels desiring pilots are urged to radio ahead, and state probable time of arrival off the entrance.

Towboats are available at all the principal ports, but as a rule no longer cruise off the entrances. Arrangements for towboats should be made by radio or telegraph.

Supplies.—Vessels usually obtain their supplies in San Diego, Los Angeles, San Francisco, Columbia River, or Puget Sound. Coal can be obtained at some points. Fuel oil can be obtained at all the principal ports. Ship chandlery can be had at San Diego, San Pedro, San Francisco, Humboldt Bay, Coos Bay, Columbia River, and Puget Sound, and in limited quantities at several other places.

Repairs.—Extensive repairs to large vessels can be made only in Los Angeles Harbor, San Francisco Bay, Portland and Seattle. Small motor boats and yachts

can be hauled out, and ordinary repairs can be made to machinery at several other places.

Standard time.—The standard time zone used within the limits of this volume is the standard time of the meridian 120° west, eight hours slower than Greenwich time.

Daylight saving time.—In California and Oregon the clocks are advanced one hour between 2:00 a. m. of the last Sunday in April and 2:00 a. m. on the last Sunday in September. In many localities of Washington the same daylight saving time is observed.

Legal holidays.—The following are the legal holidays observed in the States of California, Oregon, and Washington:

January 1, New Year's Day.—All.
February 12, Lincoln's Birthday.—All.
February 22, Washington's Birthday.—All.
Good Friday.—California (noon to 3 p.m.)
May 30, Memorial Day.—All.
July 4, Independence Day.—All.
Labor Day.—All.
September 9, Admission Day.—California.
October 12, Columbus Day.—All.
November 11, Armistice Day.—All.
Thanksgiving Day.—All.
December 25, Christmas Day.—All.

§202. **ANCHORAGE REGULATIONS.**—Regulations follow for anchorage areas and anchorage grounds within the limits covered by this Coast Pilot.

§ 202.1 *General.* (a) The areas described in Subpart A of this part are designated as special anchorage areas pursuant to the authority contained in an act amending laws for preventing collisions of vessels approved April 22, 1940 (54 Stat. 150). Section 1 of the act amended Article 11 of the Navigation Rules for Harbors, Rivers, and Inland Waters Generally (33 U. S. C. 180), section 2 amended Rule 9 of the Navigation Rules for Great Lakes and Their Connecting and Tributary Waters (33 U. S. C. 258), and section 3 amended Rule 10 of the Navigation Rules for Red River of the North and Rivers Emptying into Gulf of Mexico and Tributaries (33 U. S. C. 319), vessels not more than 65 feet in length, when at anchor in any special anchorage area, shall not be required to carry or exhibit the white anchor lights required by the Navigation Rules.

(b) The anchorage grounds for vessels described in Subpart B of this part are established, and the rules and regulations in relation thereto adopted, pursuant to the authority contained in section 7 of the River and Harbor Act approved March 4, 1915 (38 Stat. 1053; 33 U. S. C. 471).

(c) All bearings in this part are referred to true meridian.

Subpart A—Special Anchorage Areas

§202.90 *San Diego Harbor, Calif.*—(a) *Area A—1.* The waters shoreward of a line from U. S. Military Reservation Monument No. 11 on the north boundary of the U. S. Military Reservation to a point on the combined pierhead-bulkhead line 500 feet southeast of U. S. Station 493; and the waters bounded by Shelter Island, a line 300 feet southeast of and parallel to the line first described, and lines through both ends of Shelter Island normal to such line.

NOTE: This area is reserved for yachts and other small recreational craft. Fixed fore and aft moorings will be allowed in the area as permitted by the Harbor Master, Port of San Diego.

(b) *Area A—2.* Shoreward of a line between Bulkhead Stations 151 and 154.

NOTE: This area is reserved for yachts and other small recreational craft. Fixed moorings will be allowed in this area as permitted by the Harbor Master, Port of San Diego.

(c) *Area A—3.* Shoreward of a line between U. S. Bulkhead Stations 155 and 161.

NOTE: This area is reserved for yachts and other small recreational craft. Fixed moorings will be allowed in this area as permitted by the Harbor Master, Port of San Diego.

(d) *Area B.* Shoreward of the U. S. Bulkhead Line between Stations 464 and 460 and shoreward of a line connecting U. S. Bulkhead Line Station 460 and U. S. Pierhead Line Station 462, prolonged along the pierhead line south to the intersection of the prolongation of the centerline of Cedar Street.

NOTE: This area is reserved for licensed commercial fishing vessels. Fore and aft moorings will be allowed in this area as permitted by the Harbor Master, Port of San Diego.

§202.95 *Newport Bay Harbor, Calif.*—(a) *Area A—1.* In Lido Channel, northeast of a line parallel to and 195 feet from the pierhead line along the southwest shore of Lido Isle; north of the south U. S. Bulkhead line off Lido Isle extended; southwest of a line parallel to and 120 feet from the pierhead line along the southwest shore of Lido Isle; and southeast of the north side of Via Barcelona, on Lido Isle, extended.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the city of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(b) *Area A—2.* East of the east side of 15th Street extended; north of a line parallel to and 250 feet from the pierhead line between 14th and 15th Streets, this line being the north line of Newport Channel, and extending east in a straight line to an intersection with a line bearing 268° from the flashing red beacon on the southeast end of Lido Isle, this line being the northwest line of the main fairway; west of the east side of 13th Street extended; and south of a line parallel to and 220 feet from the pierhead line off the south shore of Lido Isle.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the city of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(c) *Area A—3.* A rectangular area, 40 feet wide and 885 feet long, on the west side of Upper Bay Channel, 120 feet east of and parallel to the west pierhead line, the south end being 50 feet north from U. S. Bulkhead Station 130.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for recreational and small craft of such size and alignment as permitted by the harbor master.

(d) *Area A—4.* South of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the south line of the main fairway; north of a line parallel to and 200 feet from the pierhead line off 11th to 8th Streets; and west of a line bearing 203° from the flashing red beacon at the south extremity of Bay Shores, passing through the pierhead line at the east end of Lido Isle.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(e) *Area A—5 (Newport Harbor Yacht Club).* East of a line bearing 23° from the center of the north end of 8th Street, being parallel to and 150 feet distant from the east end of Area A—4; north of a line parallel to and 200 feet from the pierhead line off 7th and 8th Streets; northwest of a line parallel to and 200 feet from the northwest pierhead line off Bay Island; and south of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the southerly line of the main fairway.

NOTE: This area is reserved for recreational and other small craft. Single moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for pleasure boats and yachts of such sizes and alignments as permitted by the harbor master.

(f) *Area A—6.* Northwest of Harbor Island, beginning at a point on the Newport City line 107 feet from the angle point northwest of Harbor Island; thence 36°27′, 55 feet; thence 303°18′, 300 feet; thence 216°27′, 72 feet; thence 165°12′, 211 feet; thence 75°11′44″, approximately 216 feet, to the point of beginning.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for recreational and small craft of such size and alignment as permitted by the harbor master.

(g) *Area A—7.* East of a line parallel to and 150 feet from the east pierhead line off Bay Island; north of a line parallel to and 150 feet from the pierhead line off Fernando Street; northwest of the east side of Adams Street extended; and southwest of a line bearing 131° from the flashing green beacon off Bay Island, being parallel to and 100 feet southwest of the southwest line of the main channel.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(h) *Area A—8.* Northeast of a line parallel to and 270 feet from the southwest pierhead line from Collins Isle to Balboa Island; north of a line bearing 311° from the flashing red beacon off the southwest point of Balboa Island and passing through the flashing red beacon off the south point of Bay Shore, this line being the northeast line of the main channel; southwest of a line parallel to and 150 feet from the southwest pierhead line from Collins Isle to Balboa Island; and southeast of a line bearing 238° from U. S. Station 160.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(i) *Area A—9.* In Balboa Island Channel, east of a line bearing due north from U. S. Station 151, being 25 feet west of the end of Emerald Avenue; north of a line parallel to and 75 feet from the north pierhead line off Balboa Island; west of the east side of Amethyst Avenue extended; and south of a line parallel to and 150 feet from the north pierhead line of Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(j) *Area A—10.* Southeast of a line bearing 209° from the flashing red beacon on the southwest point of Balboa Island and passing through the east side of the end of "A" Street; north of an irregular line parallel to and 150 feet from the north pierhead line off Balboa Peninsula from "A" to "K" Streets; south of the south line of the main channel; and south and southeast of an irregular line parallel to and 375 feet from the north pierhead line off Balboa Peninsula.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(k) *Area A—11.* Northeast of a line bearing 108°30′ from the flashing red beacon at the southwest point of Balboa Island, passing through the flashing red channel buoy No. 4, this line being the northeast line of the main channel; north of a line parallel to and 350 feet from the south pierhead line off Balboa Island; west of the west bulkhead line of the Grand Canal extended; and south of a line parallel to and 150 feet from the south pierhead line off Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(l) *Area A—12. (Balboa Yacht Club).* South of a line parallel to and 150 feet from the south pierhead line off Balboa Island; west of the east end pierhead line off Balboa Island extended and bearing 161°; north of a line parallel to and 700 feet from the south pierhead line off Balboa Island; and east of a line parallel to and 1,000 feet from the east boundary, bearing 161° from the point of intersection of the east bulkhead line of Grand Canal and the south bulkhead line off Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Single moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for pleasure boats and yachts of such sizes and alignments as permitted by the harbor master.

(m) *Area A—13.* In Upper Bay Channel, beginning at a point 60 feet north of the north side of the State Highway bridge and 62 feet west of the adjudicated high-tide line; thence 20°, 165 feet; thence 267°17′, 100 feet; thence 200°, 165 feet; thence 87°17′, 100 feet, to the point of beginning.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for recreational and small craft of such size and alignment as permitted by the harbor master.

(n) *Area B—1.* Southeast of a line bearing 227° from the flashing red beacon at the southwest corner of Lido Isle and being parallel to and 200 feet from the pierhead line off the southeast end of Rhine Point; northeast of the southwest bulkhead line off Rhine Point extended; north of a line parallel to and 250 feet from the pierhead line between 15th and 18th Streets, this line being the north line of Newport Channel; west of the west side of 15th Street extended; and south of a line parallel to and 220 feet from the pierhead line off the south shore of Lido Isle.

NOTE: This area is reserved for commercial fishing vessels. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for boats licensed for commercial fishing of such sizes and alignments as permitted by the harbor master.

(o) *Area B—2.* In Upper Bay Channel, beginning at the northeast corner of Area A-13; thence 267°17′, 100 feet; thence 11°, 195 feet; thence 111°, 122 feet; thence 200°, 153 feet, to the point of beginning.

NOTE: This area is reserved for commercial fishing vessels. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for commercial fishing boats of such size and alignments as permitted by the harbor master.

§ 202.100 *Los Angeles and Long Beach Harbors, Calif.*—(a) *Area A—1.* North of a line 200 feet from and parallel to the axis of the San Pedro breakwater; northwest of a line extending from U. S. 207 to U. S. 214; southwest of a line bearing 125° from the tall concrete stack south of Fort MacArthur lower reservation; west of the bulkhead line extending south from U. S. "J"; and bayward of the mean high tide line.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to City Ordinance No. 79895. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(b) *Area A—2.* The outer-basin of Fish Harbor, on the east and west sides of Fish Harbor entrance channel.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to City Ordinance No. 79895. Temporary floats or buoys for marking anchors or moorings in place will be allowed in the east portion of this area. Fixed mooring piles or stakes are prohibited in the entire area.

(c) *Area A—3.* The basin lying inside of the jetty in front of the United States Naval Air Station (Reeves Field).

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to City Ordinance No. 79895. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(d) *Area A—4.* The southeast end of the triangular area in East Basin, located between the dredged channels and described as follows: Beginning at U. S. Station 442; thence 128°, 250 feet; thence 38°, 67.67 feet, to true point of beginning; thence 67°10′40″, 2,000 feet; thence 337°10′40″, 1,116.74 feet; and thence 218°, 2,290.66 feet, to the point of beginning. This area is designated as a special anchorage area subject to the condition that the City of Los Angeles Board of Harbor Commissioners define the area by lights at the three corners.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to City Ordinance No. 79895.

§ 202.105 *Avalon Bay, Santa Catalina Island, Calif.* Shoreward of a line connecting the promontories known as Casino Point and Bathhouse Point; excluding therefrom the fairways as established by the harbor master, City of Avalon.

NOTE: This area is reserved for yachts and other small craft. Moorings will be allowed in this area conforming to the City of Avalon Ordinance No. 264 of such size and alignment as permitted by the harbor master.

§ 202.110 *Santa Monica Harbor, Calif.* The waters inclosed by a line 1,000 feet southwest of and parallel to the axis of the Santa Monica breakwater and extending 2,000 feet northwest and 2,000 feet southeast of the ends of the breakwater, lines extending shoreward from and normal to each end of the said line, and the mean high tide line; excluding therefrom the fairways as established by the harbor master, City of Santa Monica.

NOTE: This area is reserved for small craft. Fore and aft moorings will be allowed in this area conforming to the City of Santa Monica Harbor Ordinances Nos. 541, 705, 706, and 1356 for recreational and other small craft of such size and alignment as permitted by the harbor master. Fixed mooring piles or stakes are prohibited.

§ 202.115 *Santa Barbara Harbor, Calif.* North of the Santa Barbara breakwater; seaward of the line of mean high water; and southwest of a line bearing 46°30′ from the north corner of Bath Street and Cabrillo Boulevard to the end of the Santa Barbara breakwater; excluding a fairway 225 feet wide, 100 feet from each side of and parallel to the Navy pier.

NOTE: Fore and aft moorings will be allowed in this area conforming to the City of Santa Barbara Harbor Ordinance No. 2106 for yachts and small craft of such size and alignment as permitted by the harbor master.

§ 202.120 *San Luis Obispo Bay, Calif.* Eastward of the San Luis Obispo County wharf; northward of a line bearing 116° from the southeast corner of San Luis Obispo County wharf; and westward of a line bearing 210° from the most seaward extremity of Fossil Point.

§ 202.125 *Morro Bay Harbor, Calif.*—(a) *Area A—1.* Opposite the town of Morro, beginning at the intersection of the west channel line and the prolongation of the center line of Seventh Street; thence 270° to the mean high water line on the peninsula; thence generally south along the mean high water line to the prolongation of the axis of the south breakwater; thence northeasterly to the intersection of a line 200 feet westerly of and parallel to the east channel line and the prolongation of the center line of Third Street; thence northerly along the line 200 feet westerly of and parallel to the east channel line about 350 feet to its intersection with the west channel line; and thence northwesterly along the west channel line to the point of beginning.

NOTE: This area is reserved for small craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(b) *Area A—2.* Beginning at a point on the channel line opposite the angle point near the south end of the revetment; thence southeast along the east channel line to the end of the channel; thence 166°30′ to White Point; thence along the mean high tide line north to the angle point near the south end of the revetment; thence southwest to the point of beginning.

NOTE: This area is reserved for small craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

§ 202.126 *Monterey Harbor, Calif.* The waters of Monterey Harbor south of the Monterey Breakwater; and shoreward of a line beginning at Point "A" on the south side of the Monterey Breakwater about 750 feet east of the shore and at the westerly extremity of the U. S. Coast Guard wharf along the southerly side of the breakwater; thence 200°, 175 feet, to Point "B"; thence 110°, 1,300 feet, to Point "C"; thence 120° to Point "D" on the northerly extension of the westerly line of Park Avenue, City of Monterey; and thence 168°30′ along the westerly line of Park Avenue extended to the shore; excluding from this area a fairway 125 feet wide whose centerline begins at Point "C" and extends thence 205°, 610 feet, and thence 246°, 720 feet, and the waters between this fairway and the northerly end of Municipal Wharf No. 2 and between the southwesterly end of the fairway and Municipal Wharf No. 1.

Subpart B—Anchorage Grounds

§ 202.210 *San Diego Harbor, Calif.*—(a) *The anchorage grounds.* The anchorage grounds for general use shall include all the navigable waters of the harbor except the special anchorage areas described in Subpart A of this part, the seaplane restricted area described in § 207.612 of this chapter, and the following:

(1) *Non-anchorage area.* A lane from San Diego to Coronado, the east limit of which extends southward from the intersection of Harbor and Kettner Boulevards to the northwest corner of the Union Oil Company wharf in Coronado, and the west limit of which is the projection of a line 315° from the intersection of Pacific Highway and Harbor Boulevard extended to a point of intersection with a line projected due north from the intersection of First Street and "E" Avenue, Coronado.

(2) *Special anchorage for U. S. Government vessels.* West of a line extending from Ballast Point Light and bearing approximately 351°30′ to the shore end of the Quarantine Dock.

(3) *Temporary naval anchorage.* Beginning at North Tower, Coronado Heights; thence 25°30′, 2,500 yards, to latitude 32°37′16″, longitude 117°07′00″; thence 354°30′ to a point 1,787.8 feet south of U. S. Pierhead Line Station 311; thence 263°24′28″, approximately 1,500 feet, to point "d" on the west boundary line of the seaplane restricted area; thence southerly and southwesterly along the boundary line of the seaplane restricted area through points "e" and "f" to point "g"; thence southerly along the mean high tide line to its intersection with the line bearing 25°30′ from the point of beginning.

(b) *The regulations.* (1) Vessels anchoring in portions of the harbor other than those referred to in paragraph (a) of this section shall leave a free passage for other craft and shall not unreasonably obstruct the approach to the wharves in the harbor.

(2) The non-anchorage area described in paragraph (a) (1) of this section is reserved exclusively for submerged pipe lines, power cables, and communication cables. No vessels shall anchor in this area at any time.

(3) The special anchorage described in paragraph (a) (2) of this section is reserved exclusively for the anchorage of vessels of the United States Government and of authorized harbor pilot boats. No other vessels shall anchor in this area except by special permission obtained in advance from the Commandant, Eleventh Naval District, San Diego, California.

(4) The temporary naval anchorage described in paragraph (a) (3) of this section is reserved as a special anchorage for vessels of the United States and authorized harbor pilot boats. At such periods as the area may not be required for the use of naval craft, navigation by other craft may be permitted provided permission is obtained in advance from the Commandant, Eleventh Naval District, San Diego, California.

§ 202.212 *Newport Bay Harbor, Calif.*—(a) *The anchorage grounds*—(1) *Temporary Anchorage C—1.* Southeast of a line parallel to and 170 feet from the pierhead line at the east end of Lido Isle; north of a line parallel to and 250 feet north of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the north line of the main fairway; northwest of a line 120 feet in length bearing 203° from the point of the pierhead line off the west end of Harbor Island; and southwest of the pierhead line off the northeast shore of Lido Isle extended.

(2) *Temporary Anchorage C—2.* East of the pierhead line off the east end of Balboa Peninsula extended and bearing 345°; northeast of a line parallel to and 200 feet from the pierhead line off the shore of Corona del Mar; west of a line parallel to and 100 feet from the pierhead line off the southwest shore of Corona del Mar; and southwest of a line parallel to and 100 feet from the pierhead line off the shore of Corona del Mar.

(b) *The regulations.* (1) Vessels may anchor temporarily in these areas when necessary and space permits, but shall move promptly when the necessity passes or upon order of the harbor master.

(2) Vessels anchoring in these areas shall comply with all applicable Pilot Rules, including that requiring anchor lights at night.

(3) Floats or buoys for marking anchors or moorings in place and fixed mooring piles or stakes are prohibited.

§ 202.214 *Los Angeles and Long Beach Harbors, Calif.*—(a) *The anchorage grounds*—(1) *Commercial and Naval Anchorage B (Los Angeles Harbor).* North of a line 200 feet from and parallel to the axis of the San Pedro Breakwater; southeast of a line ranging from U. S. 207 toward U. S. 214; southwest of a line bearing 125° from the tall concrete stack south of Fort MacArthur lower reservation; south of a line bearing 75° from U. S. 209 (white cross near the west end of the San Pedro Breakwater); and west of a line bearing 172° from Fish Harbor 2 Light and passing through the east white cross on the San Pedro Breakwater.

(i) In this area the requirements of commercial ships will predominate. In case of Navy requirements, see subparagraph (2) (iv) of this paragraph.

(ii) Vessels requiring examination by quarantine, customs, or immigration authorities for the ports of Los Angeles and Long Beach may anchor in this area when Quarantine Anchorage F is not available for this purpose.

(iii) Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(2) *Commercial Anchorage C (Los Angeles Harbor).* North of a line 200 feet from and parallel to the axis of the Middle Breakwater; north of a line, about 3,000 feet long, bearing 293° from Los Angeles Entrance East Light; east of a line bearing 152° from Fish Harbor 2 light; west of a line bearing 338° from the white cross near the west end of the Middle Breakwater; and bayward of the line of mean high water; excepting therefrom Non-Anchorage Area I.

(i) In this area the requirements of commercial ships will predominate. Vessels requiring examination by quarantine, customs, or immigration authorities for the ports of Los Angeles or Long Beach may anchor in this area when Quarantine Anchorage F is not available for this purpose.

(ii) A portion of this anchorage is reserved for use as an emergency seaplane landing area whenever a necessity arises therefor. See § 207.617 of this chapter.

(iii) Fixed mooring piles or stakes and floats or buoys for marking anchor or moorings in place are prohibited.

(iv) The established anchorages for naval vessels having been found inadequate at times, when an especially large number of naval vessels are gathered in the harbor, a special anchorage chart overlay for naval anchorages superimposed on U. S. Coast and Geodetic Survey Chart No. 5148 (not published in this section) will be prepared showing a numbered series of anchorages in order that a naval vessel may be ordered to proceed to a designated numbered anchorage in the harbor. Those designated anchorages, with the exception of those in naval anchorages D and E, which are primarily for naval vessels, are not set aside for the exclusive use of naval vessels, but permission will be given for naval vessels to use them when available. When the Captain of the Port receives notification from the proper naval authorities that it is desired to utilize the specially-numbered naval anchorages in Anchorages B, C, F, or G, he will authorize the use by naval vessels of the required numbers if they can be made available, the commercial conditions at the time being given proper consideration. If, in the opinion of the Captain of the Port, there are sufficient reasons why the numbers first asked for should not be used, he will confer with the naval officer making the request and if other numbers can be agreed upon he will authorize their use.

(3) *Naval anchorage D.* East of a line bearing 338° from a white cross near the west end of the Middle Breakwater, said line being the easterly boundary line of Commercial Anchorage C; north of a line parallel to and 200 feet from the axis of the Middle Breakwater; southwest of a line bearing 310° from Long Beach Entrance West Light and passing through the east end of the Navy Mole; south and west of a line 200 feet from the bayward side of the Navy Mole; and south of the jetty forming the basin for special anchorage area A–3 described in § 202.100 (c).

(i) In this area the requirements of the naval service will predominate. Vessels other than those of the Navy may anchor temporarily in this area when necessary and space permits. Whenever this area is required for the anchoring of naval vessels, it shall be immediately cleared of commercial vessels by the Captain of the Port upon request of the appropriate naval authority.

(ii) The southeast and southwest portions of this anchorage are reserved for use as explosive anchorages whenever a necessity arises therefor. See subparagraphs (8) (i) and (ii) of this paragraph.

(iii) A portion of this anchorage is reserved for use as an emergency seaplane landing area whenever a necessity arises therefor. See § 207.617 of this chapter.

(iv) Floats or buoys for marking anchors or moorings in place and fixed mooring piles or stakes are prohibited, except those which may be required by the Navy and approved by the Captain of the Port.

(4) *Naval Anchorage E (Long Beach Harbor).* North of a line 200 feet from and parallel to the axis of the Long Beach Breakwater; northeast of a line bearing 309° from the west end of the Long Beach Breakwater and passing through the south end of the Long Beach Mole; south of a line 5,500 feet from and parallel to the axis of the Long Beach Breakwater; east of a line bearing due north from the center of the opening between the Middle and Long Beach Breakwaters; south of a line bearing 101° from the south end of pier D; and west of a line bearing due north from the east end of the Long Beach Breakwater.

(i) In this area the requirements of the naval service will predominate. Vessels other than those of the Navy may anchor temporarily in this area when necessary and space permits. Whenever this area is required for the anchoring of naval vessels it shall be immediately cleared of commercial vessels by the Captain of the Port upon request of the appropriate naval authority.

(ii) Floats or buoys for marking anchors or moorings in place and fixed mooring piles or stakes are prohibited, except those which may be required by the Navy and approved by the Captain of the Port.

(iii) The southwest portion of this anchorage is reserved for use as an explosives anchorage whenever a necessity arises therefor. See subparagraph (8) (iii) of this paragraph.

(5) *Quarantine Anchorage F.* East of a line bearing 172° from Fish Harbor 2 Light and passing through the east white cross on the San Pedro Breakwater; southwest of a line bearing 302° from the Los Angeles Harbor Light Station; and northerly of a line parallel to and 200 feet from the axis of the San Pedro Breakwater.

(i) Vessels arriving at quarantine and awaiting inspection will anchor in this anchorage, except that if space in this anchorage is not available then any available anchorages in Anchorages B and C may be temporarily occupied for examination. In case of Navy requirements, see subparagraph (2) (iv) of this paragraph.

(ii) No vessels, except those awaiting quarantine inspection or clearance, will anchor in the quarantine anchorage except in cases of emergency. All vessels so anchored will vacate this area as soon as the emergency ceases.

(iii) U. S. Public Health Service Quarantine Laws and Regulations of the United States are quoted in part as follows: "Paragraph 34—Every vessel subject to quarantine inspection, entering a port of the United States, its possessions or dependencies, shall be considered in quarantine until given free pratique. Such vessel shall fly a yellow flag at the foremast head and shall observe all the other requirements of vessels actually quarantined."

(6) *Commercial Anchorage G (Long Beach Harbor).* North of a line 5,500 feet from and parallel to the axis of the Long Beach Breakwater; southeast of a line 1,000 feet from and parallel to the outer arm of pier A; southwest of a line bearing 116° from the end of the pier A enrockment; and west of a line bearing due north from the center of the opening between the Middle and Long Beach Breakwaters.

(i) In this area the requirements of commercial ships will predominate. In case of Navy requirements, see subparagraph (2) (iv) of this paragraph.

(ii) Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(7) *Non-Anchorage Area I.* An area extending 1,300 feet south from the north boundary line of Anchorage C, 300 feet wide on each side of the prolongation of the centerline of Ferry Street. This non-anchorage area is established for the protection of a submerged outfall sewer pipeline. The City of Los Angeles Board of Harbor Commissioners will mark this area with signs reading "Do not anchor in this area."

(8) *Explosives anchorages*—(i) *No. 1.* That portion of Anchorage D described as a circular area of 900-foot radius, with center bearing 266°, 4,650 yards, from Long Beach Entrance West Light.

(ii) *No. 2.* That portion of Anchorage D described as a circular area of 900-foot radius, with center bearing 276°, 2,975 yards, from Long Beach Entrance West Light.

(iii) *No. 3.* That portion of Anchorage E described as a circular area of 900-foot radius, with center bearing 69°, 2,260 yards, from Long Beach Entrance West Light.

(iv) Explosives anchorages shall be used by vessels only by notification to and permit by the Captain of the Port.

(v) When an explosives anchorage is occupied by a vessel carrying, loading, or unloading explosives, a circular zone of 600 yards or of 1,000 yards surrounding the explosives anchorage, as the Captain of the Port may determine, may be declared by the Captain of the Port to be a forbidden anchorage in the interest of port security and the commerce of the United States. Vessels within such circular zone, upon being notified by the Captain of the Port to move or shift position, shall get under way at once or signal for a tug and shall change positions, as directed, with reasonable promptness.

(vi) In Explosives Anchorages No. 1 and No. 2 naval vessels have priority and in Explosives Anchorage No. 3 commercial vessels have priority. When vacant, any anchorage may be assigned at the discretion of the Captain of the Port.

(vii) When all explosives anchorages are occupied, the Captain of the Port may assign suitable space in Anchorages D or E if available.

(b) *The regulations.* (1) Except in cases of great emergency, no vessel shall be anchored in the navigable waters of Los Angeles and Long Beach Harbors outside of the anchorages established in this section.

(2) Anchors must not be placed outside the anchorages, nor shall any portion of the hull or rigging at any time extend outside the boundaries of the anchorages.

(3) Any vessel anchoring under circumstances of great emergency outside of the anchorages must be placed near the edge of the channel and in such position as not to interfere with free navigation of the channel nor obstruct the approach to any pier nor impede the move-

ment of any vessel, and shall move away immediately after the emergency ceases, or upon notification by the Captain of the Port.

(4) No vessels, other than those of the United States Government, shall anchor in any of the established anchorages nor in any other areas within the outer Los Angeles and Long Beach Harbors, as defined by the limits of the San Pedro Breakwater, the Middle Breakwater, and the Long Beach Breakwater, nor closer than one mile to any point of said breakwaters in the waters seaward thereof, while carrying, loading, or unloading explosives in quantities in excess of 500 tons. Vessels engaged in the transportation of explosives in quantities of 500 tons or less may occupy that portion of Anchorages D or E designated as explosives anchorages, subject to the conditions stated in paragraph (a) (8) (iv)–(vii) of this section.

(5) The instructions of the Captain of the Port assigning vessels to parts of anchorage grounds suitable to their draft, requiring vessels to anchor bow and stern, or with two bow anchors, requiring shifting the anchorage of any vessel within any anchorage ground for the common safety or convenience, or for otherwise enforcing the regulations in this section, shall be promptly followed by owners, masters, and persons in charge of vessels.

(6) Permission to anchor in the channels within the limits of Los Angeles and Long Beach Harbors may be granted by the Captain of the Port to plant or vessels engaged in recovering sunken property or in laying or repairing pipe or cable lines legally established, when approved by the District Engineer, Corps of Engineers, and to plant or vessels engaged in dredging operations when authorized by the District Engineer. The provisions of this subparagraph shall not apply to plant or vessels engaged under the supervision of the District Engineer upon works for the improvement of the harbor, but the District Engineer will advise the Captain of the Port in all cases where plant is to be employed under his supervision.

(7) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel or plant from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating law.

§ 202.216 *Pacific Ocean at Santa Catalina Island, Calif.*—(a) *The anchorage grounds*—(1) *Descanso Bay.* Shoreward of a line connecting the promontories known as White Rock and Casino Point.

(2) *Isthmus Cove.* All waters shoreward of a line connecting the promontories known as Lion Head and Blue Cavern Point, excluding the following-described non-anchorage area: An area 300 feet wide (170 feet west and 130 feet east of the centerline of the Catalina Island Steamship Line pier), extending 1,600 feet from the root of the pier, and an area 150 feet seaward of the shore line extending approximately 1,500 feet east and 1,500 feet northwest of the centerline of said pier.

(b) *The regulations.* (1) The Descanso Bay anchorage is reserved for yachts and other small craft. Floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(2) The Isthmus Cove anchorage shall be available for anchorage of all types of craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(3) The non-anchorage area described in paragraph (a) (2) of this section shall be used only by commercial vessels. Commercial vessels of 15 feet draft or over may anchor in this area seaward of the Catalina Island Steamship Line pier during hours between sunrise and sunset. The use of this area for anchorage is forbidden to all other craft at all times. Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(4) The instructions of the Captain of the Port requiring vessels to anchor bow and stern, or with two bow anchors, or requiring shifting the anchorage of any vessel within the anchorage grounds for the common safety or convenience, or for otherwise enforcing the regulations in this section, shall be promptly complied with by owners, masters, and persons in charge of vessels.

(5) Nothing in this section shall be construed as relieving the owner or person in charge of any vessels or plant from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating law.

§ 202.218 *Pacific Ocean at San Clemente Island, Calif.; in vicinity of Wilson Cove*—(a) *The anchorage grounds.* Shoreward of a line beginning at a point on the beach bearing 153° true, 1,400 yards, from the flashing green light on the southeast headland at Wilson Cove; thence 62° true, 0.67 nautical mile; thence 332° true, 1.63 nautical miles; thence 241°31′ true to the shore line.

(b) *The regulations.* (1) This area is reserved exclusively for anchorage of United States Government vessels or vessels temporarily operating under Government direction, and no vessel, except in an emergency, shall anchor in the area without first obtaining permission from the Commandant, Eleventh Naval District, or the Senior Naval Officer present who shall in turn notify the Commandant promptly.

(2) No vessel shall anchor in such a manner as to unreasonably obstruct the approach to the wharf.

§ 202.220 *Pacific Ocean at San Nicolas Island, Calif.; restricted anchorage areas*—(a) *The restricted areas*—(1) *East area.* All waters within a circle having a radius of one nautical mile centered at latitude 33°13′45″, longitude 119°25′50″ (the former position of San Nicolas Island East End Light), which point bears approximately 101° 420 yards, from San Nicolas Island East End Light.

(2) *West area.* Shoreward of a line bearing 276° true from San Nicolas Island south side light a distance of six nautical miles; thence to a point bearing 270° true, two nautical miles, from the westernmost point of the island; thence 60° to a point due north of the northernmost point of the island; thence 180° true to the shore.

(b) *The regulations.* Except in an emergency, no vessel shall anchor in these restricted areas without authority of the Commandant, Eleventh Naval District. Cargo vessels destined for San Nicolas Island may anchor in the east area for unloading or loading.

§ 202.222 *Pacific Ocean at Santa Barbara Island, Calif.*—(a) *The anchorage grounds.* Shoreward of a line beginning at the Santa Barbara Island Light on the northeast end of the island and bearing 23° true a distance of 1.515 nautical miles seaward from the beach; thence 140°30′ true, 2.54 nautical miles; thence 212°30′ true, 2.30 nautical miles; thence 296°30′ true, 0.96 nautical mile; and thence 325° true to the beach.

(b) *The regulations.* The anchorage shall be available for anchorage of all types of craft. Temporary floats or buoys for marking anchors in place will be permitted in this area.

§ 202.224 *San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, San Joaquin River, and connecting waters, Calif.*—(a) *San Francisco Bay*—(1) *Anchorage 1 (temporary).* (i) Bounded by the north shore of the City of San Francisco and lines joining points which are the following bearings and distances from Alcatraz Light: 193°30′, 2,170 yards; 234°30′, 1,135 yards; 251°, 2,260 yards; 251°, 4,210 yards; and 234°30′, 4,410 yards.

(ii) Except as otherwise provided in this paragraph, this anchorage is a temporary anchorage reserved for the use of vessels entering port while undergoing examination by quarantine, customs, or immigration authorities. Upon completion of these examinations, vessels shall move out of this anchorage promptly. Yachts may anchor in that portion of this anchorage bounded by the shore and lines joining points which are the following bearings and distances from Alcatraz Light: 215°30′, 2,840 yards; 219°30′, 2,650 yards; 230°, 3,380 yards; 227°, 3,500 yards. No permanent moorings shall be placed in this latter-described area.

(2) *Anchorage 2 (general).* That portion of Richardson Bay north of a line bearing 257° from Peninsula Point to the shore at Sausalito, except so much of this area as is included in Naval Anchorage 11 and the improved channel to, and the turning basin at, Sausalito.

(3) *Anchorage 3 (general).* That portion of Belvedere Cove west of a line bearing 25°30′ from Peninsula Point to the shore at Tiburon.

(4) *Anchorage 4 (general).* Bounded by the westerly shore of San Francisco Bay and the following lines: Beginning at the shore at Bluff Point; thence to a point bearing 286°, 3,630 yards, from Southampton Shoal Light; thence to a point bearing 228°, 4,450 yards, from East Brother Island Light; thence along a line bearing 266° to the shore south of Point San Quentin; except so much of this area as is included in the restricted area, Naval Net Depot, Tiburon (described in § 207.640 (h) of this chapter), Quarantine Anchorage 17 when that anchorage is being used for quarantine purposes, and the outer boundary of the forbidden anchorage zone surrounding Explosives Anchorage 13.

(5) *Anchorage 5 (general).* (i) Bounded by the easterly shore of San Francisco Bay and the following lines: Beginning at the shoreward end of the Standard Oil Wharf at Point Orient; thence along the wharf to the southwest corner thereof; thence to a point bearing 334°30′, 4,050 yards, from Southampton Shoal Light; thence along a line bearing 93° to the shore; except so much of this area as is included in the restricted area, Naval Fuel Annex, Molate Point (described in § 207.640 (i) of this chapter), and the improved channel to Richmond Inner Harbor.

(ii) Vessels may anchor in this anchorage immediately adjacent to the improved channel in Richmond Inner Harbor; *Provided,* That any ship obstructing the channel must move from its position immediately if and when the fairway is required by a vessel navigating the channel.

(6) *Anchorage 6 (general).* Bounded by the easterly shore of San Francisco Bay and the following lines: Beginning at the shore at the southernmost extremity of Point Isabel; thence along the northerly shore of Brooks Island to the training wall extending westerly therefrom; thence westerly along the training wall to its bayward end; thence to a point bearing 104°, 1,035 yards, from Treasure Island North End Light; thence along a line bearing 144°30′ to a point 290 yards northerly of the center of Pier K of the San Francisco-Oakland Bay Bridge; thence along a line bearing 71° to the shore; excluding from this area, however, the cable areas therein.

(7) *Anchorage 7 (general).* That portion of San Francisco Bay bounded by the westerly shore of Treasure Island and the following lines: Beginning at the northwest corner of Treasure Island at a point bearing 89°, 4,135 yards, from Alcatraz Light; thence to points which are the following bearings and distances from Alcatraz Light: 73°30′, 3,100 yards; 111°, 3,070 yards; 123°, 4,335 yards; and 108°, 5,100 yards.

(8) *Anchorage 8 (general).* That portion of San Francisco Bay east of the City of San Francisco the corners of which are the following bearings and distances from the center of the anchor pier (Pier C) of the San Francisco-Oakland Bay Bridge: 118°, 2,635 yards; 175° 30′, 2,420 yards; 172°, 3,470 yards; and 168°, 3,520 yards.

(9) *Anchorage 9 (general).* Bounded on the north by the shore, the breakwater and turning basin at the Naval Air Station, Alameda, and a line from Air Station Channel Lighted Buoy 6 to Air Station Channel Entrance Lighted Buoy 2; bounded on the west by a line beginning at Air Station Channel Entrance Lighted Buoy 2, thence to a point bearing 17°, 4,050 yards, from Hunters Point Light, thence to a point bearing 343°30′, 4,000 yards, from Hunters Point Light, thence to a point bearing 343°30′, 3,330 yards, from Hunters Point Light, and thence 146°; bounded on the south by a line 1,000 yards northerly from and parallel to the Hayward-San Mateo Bridge; and bounded on the east by the shore, including all of San Leandro Bay. The following areas are excluded from this anchorage; The seaplane restricted area, Naval Air Station, Alameda (described in § 207.640 (e) of this chapter); Explosives Anchorage 14, Explosives Storage Anchorages 15 and 16, and the forbidden anchorage zone surrounding each of these three anchorages.

(10) *Anchorage 9-A (general).* Shoreward of the following lines: Beginning at the outer end of the south fender of the former automobile ferry slip at the end of the Alameda Mole; thence 270°, 400 yards; thence 216°, approximately 2,000 yards; thence along a line bearing 127° from Alcatraz Light, 1,200 yards; thence 36° to the shore; excluding the cable area adjacent to the Alameda Mole.

(11) *Anchorage 10 (naval).* (i) The triangular-shaped area immediately east of Sausalito northwest of a line bearing 234° from Point Stuart Light, and southwest of a line bearing 303° from Alcatraz Light.

(ii) This anchorage is for the use of public vessels of the United States, but may be used by yachts when not required for use by public vessels. All yachts making use of this anchorage shall be prepared to move immediately upon notice should the anchorage be required for public vessels. With the permission of the District Commander, permanent yacht moorings may be placed within this anchorage, not more than 900 feet from the shore.

NOTE: The term "District Commander" as used in this section means the Commander, Twelfth Coast Guard District, or his authorized representative.

(12) *Anchorage 11 (naval).* (i) That portion of Richardson Bay the corners of which are the following bearings and distances from Point Stuart Light: 273°, 1,150 yards; 271°, 2,520 yards; 257°30′, 2,580 yards; and 248°30′, 1,530 yards; except so much of this area as is included in the improved channel to Sausalito.

(ii) This anchorage is reserved for the exclusive use of vessels and seaplanes of the United States Navy.

13. *Anchorage 12 (naval).* (i) That portion of San Francisco Bay east of the City of San Francisco the corners of which are the following bearings and distances from the center of the anchor pier (Pier C) of the San Francisco-Oakland Bay Bridge: 95°, 3,035 yards, 110°, 980 yards; 188°, 1,170 yards; 175°30′, 2,420 yards; and 118°, 2,635 yards.

(ii) This anchorage is reserved for the use of vessels of the United States or foreign navies and for other public vessels of the United States. With the permission of the District Commander, this anchorage may be used temporarily by vessels other than public vessels, but vessels availing themselves of this privilege must hold themselves in readiness to shift berth immediately upon receiving notice to do so.

(14) *Anchorage 13 (explosives).* (i) A circular area having a radius of 1,000 feet about a white buoy used to mark its location bearing 38°, 2,000 yards, from the most northerly extremity of California Point.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessel. This provision is not intended to prohibit lighters and barges from tying up alongside ships for transfer of cargo.

(iii) A circular zone 2,000 feet wide partially surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels. The additional area included by a 2,000-yard radius is a danger area to be vacated by all vessels when so directed by the District Commander.

(15) *Anchorage 14 (exposives.)* (i) A circular area having a radius of 1,500 feet about a white buoy used to mark its location bearing 100°30′, 2,950 yards, from Hunters Point Light.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessel. This provision is not intended to prohibit lighters and barges from tying up alongside ships for transfer of cargo.

(iii) A circular zone 1,500 feet wide surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

(iv) This anchorage and the surrounding forbidden anchorage zone may be temporarily discontinued by the District Engineer, Corps of Engineers, San Francisco, California, when the area is required for general anchorage purposes.

(16) *Anchorage 15 (explosives storage).* (i) An area 3,000 feet square whose center is marked by a white buoy bearing 124°30′, 9,835 yards, from Hunters Point Light, and whose sides are due north-south and east-west.

(ii) This anchorage is for the purpose of storage of explosives. Barges and vessels shall be anchored so as not to approach within 500 feet of one another. All barges using this anchorage for storage purposes shall anchor with two or more anchors. The District Commander may authorize the placing of moorings within this anchorage, provided these moorings are so placed that barges at one mooring shall at all times be not less than 500 feet from barges at an adjacent mooring.

(iii) A square zone 1,500 feet wide surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

949285—52——6

(17) *Anchorage 16 (explosives storage).* (i) An area 3,000 feet square the northeast corner of which is marked by a white pile dolphin bearing 270°, 2,900 yards, from Roberts Landing, and whose sides are due north-south and east-west.

(ii) This anchorage is for the purpose of storage of explosives. Barges and vessels shall be anchored so as not to approach within 500 feet of one another. All barges using this anchorage for storage purposes shall anchor with two or more anchors. The District Commander may authorize the placing of moorings within this anchorage, provided these moorings are so placed that barges at one mooring shall at all times be not less than 500 feet from barges at an adjacent mooring.

(iii) A square zone 1,500 feet wide surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

(18) *Anchorage 17 (quarantine).* An area 3,000 feet square, the easterly side of which is coincident with the easterly boundary of General Anchorage 4 and the northeasterly corner of which is on the said easterly boundary 97°30′, 2,250 yards, from the northerly extremity of California Point.

NOTE: This anchorage is under the jurisdiction of the Medical Officer in charge of the Port of San Francisco and is included in this section for information only.

(b) *San Pablo Bay*—(1) *Anchorage 18 (general).* Bounded by the westerly shore of San Pablo Bay and the following lines: Beginning at the shore at Point San Pedro; thence 90° to the easterly of the Sisters Islands; thence to points which are the following bearings and distances from Petaluma Creek Light and Echo Board 2 at the entrance to the dredged channel to Petaluma Creek: 185°30′, 1,570 yards and 284°30′, 5,435 yards; excluding from this area, however, the channel to Hamilton Field and extension of this channel easterly to the boundary of the anchorage, and the pipe line area therein.

(2) *Anchorage 19 (general).* Bounded by the northeasterly shore of San Pablo Bay and the following lines: Beginning at the shore at a point bearing 06°30′, 6,400 yards, from Petaluma Creek Light and Echo Board 2 at the entrance to the dredged channel to Petaluma Creek; thence to points which are the following bearings and distances from Petaluma Creek Light and Echo Board 2: 175°30′, 9,070 yards; 132°, 7,530 yards; 105°30′, 9,870 yards; 97° 30′, 13,740 yards; 95°30′, 13,740 yards, and thence along the long dike extending southwesterly from Mare Island to the shore at Mare Island.

NOTE: See § 204.215 establishing a target area in San Pablo Bay adjacent to the westerly shore of Mare Island for use of the Mare Island Navy Yard.

(3) *Anchorage 20 (general).* Bounded by the southeasterly shore of San Pablo Bay and the following lines: Beginning at the northeast corner of Parr Terminal No. 4 at Point San Pablo; thence to a point bearing 14°, 1,135 yards, from the northeast corner of the wharf at Pinole point; thence to the northwest corner of the wharf of the Union Oil Company at Oleum; and thence along this wharf to the shore; excluding from this area Explosives Anchorages 22 and 23.

(4) *Anchorage 21 (naval).* A rectangular area south of Mare Island the corners of which are the following bearings and distances from the tall stack at the Selby Smelting Works: 331°30′, 1,285 yards; 300°30′, 1,830 yards; 286°30′, 1,530 yards; and 321°, 800 yards.

(5) *Anchorage 22 (explosives).* (i) A circular area having a radius of 1,500 feet whose center is at the northwest corner of the wharf of the Giant Powder Company at Pinole Point.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessel.

(6) *Anchorage 23 (explosives).* (i) A circular area having a radius of 1,500 feet whose center is at the northwest corner of the wharf of the Hercules Powder Company at Refugio Landing.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessel.

(c) *Carquinez Strait*—(1) *Anchorage 24 (general).* Bounded by the northerly shore of Carquinez Strait and lines joining points which are the following bearings and distances from Port Costa Light: 332°30′, 1,820 yards, 347°, 1,330 yards; 347°, 710 yards; and 109°30′, 1,800 yards; excluding from this rea, however, the cable area therein.

(2) *Anchorage 25 (general).* Bounded by the south shore of Carquinez Strait and lines joining points which are the following bearings and distances from Benicia Wharf Light: 145°30′, 2,970 yards; 141°, 1,970 yards; and 234°, 1,300 yards.

(d) *Suisun Bay*—(1) *Anchorage 26 (general).* (i) On the west side of Suisun Bay adjacent east and northeast of the City of Benicia within the following boundaries: the northeast edge of the Southern Pacific Bridge from the north shore to the first siren; thence 77° 30′, 550 yards; thence 35°, 6,650 yards; thence 44°, 2,100 yards; thence 314° to the shore; and thence along the shore to the point of beginning.

NOTE: A portion of Anchorage 26 is occupied by the Suisun Bay Reserve Fleet of the Maritime Administration, and section 207.900 establishes a restricted area in the vicinity of this Reserve Fleet.

(2) *Anchorage 27 (general).* An area in the northeast portion of Suisun Bay lying east of a line due north through the tripod on Roe Island at Preston Point; north of a line bearing 84° from the fixed range light located 1,187 yards to the southwest of said tripod to the old lighthouse at the most southerly point of Roe Island; thence bearing 101° to Middle Ground Light; thence 88° to Chipps Island.

(e) *San Joaquin River*—(1) *Anchorage 28 (general).* The waters adjacent to Lower Sherman Island southeasterly of a line 1,350 feet long bearing 238° from Sherman Island North End Light; easterly of a line bearing 163°30′ from the west end of said 1,350-foot line; and northerly of a line bearing 27° from New York Slough East End Light and Echo Board.

(2) *Anchorage 29 (general).* The entire water area southerly of West Island between West Island and the mainland lying between lines bearing 150° from the easterly extremity of West Island and 211° from the westerly extremity of West Island.

(3) *Anchorage 30 (explosives).* (i) That portion of the Old San Joaquin River channel bounded on the west by Mandeville Point and on the north, east, and south by lines joining points which are the following bearings and distances from Stockton Channel 3 Light: 341°, 1,400 yards; 348°30′, 1,520 yards; 355°20′, 1,340 yards; 08°30′, 835 yards; and 341°, 870 yards.

(ii) This anchorage is for the use of vessels, lighters, and barges loaded with, loading, or unloading explosives or explosive materials, and shall not be used by any other vessel or craft while such operations are in progress. At all other times the area will be open to fishing and navigation without restriction.

(iii) Notice of loading and unloading operations will be given by notice published by the United States Coast Guard in "Notice to Mariners," and by notice given by the Port of Stockton to local radio stations and newspapers, and by telephonic means to any organization that may request that such advice be given. In all cases the notice will state how long the operations will be in progress and on what days.

(f) *Mayberry Slough, Sherman Island; restricted anchorage for vessels of the United States Government*—(1) *The anchorage ground.* All of the upper portion of Mayberry Slough, upstream from a point 1.65 nautical miles above its mouth.

(2) *The regulations.* No vessel or other craft, except those belonging to the United States Government, property owners of Sherman Island, or public utilities serving the area, shall navigate or anchor in the anchorage without special permission from the Commanding General, San Francisco Port of Embarkation, Fort Mason, California, or his authorized representative.

(g) *General regulations.* (1) Except in cases of distress, great emergency, or heavy fog, no vessel shall be anchored in the navigable waters of San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, New York Slough, San Joaquin River Deep Water Channel, and the Stockton Turning Basin outside of the anchorages defined and established in this section; or be anchored within an improved channel or a cable or pipeline area shown on a Government chart; or be moored, anchored, or made fast to any pier, wharf, bulkhead, or vessel in such manner as to impede or endanger the passage of any vessel in transit by, or to or from, adjacent wharves, piers, slips, or navigation channels.

(2) The District Commander, whenever in his opinion such action is necessary, may require any or all vessels in any designated anchorage to moor with two or more anchors.

(Vessels using Anchorages 15 and 16 for the purpose of storage of explosives will be required to anchor with two or more anchors at all times.)

(3) Every vessel whose crew may be reduced to such number that it will not have sufficient men on board to weigh anchor at any time shall be anchored with two anchors, with mooring swivel put on before the crew is reduced or released.

(4) Anchors shall not be placed outside the anchorages, nor shall any vessel be so anchored that any portion of the hull or rigging extends outside the boundaries of the anchorage.

(5) Vessels anchoring outside of the designated anchorages or in the San Joaquin River Deep Water Channel or the Stockton Turning Basin because of distress or heavy fog shall be placed as near the edge of the channels or turning basin as possible, and in such position as not to interfere with the free navigation thereof or obstruct the approach to any pier, wharf, slip, or boat harbor. They shall move from such position as soon as the emergency ceases or when so ordered by the District Commander. No vessel shall be permanently moored in areas adjacent to the San Joaquin River Deep Water Channel or in any stream tributary thereto within one-half mile of its junction with the Channel, except on permission in writing from the District Commander.

(6) The anchorages shall be used only for the purposes stated for each and under the special limitations applicable thereto.

(7) The District Commander will assign berths in the anchorages to all vessels applying for such permission. He may grant permits to those vessels habitually maintaining and using the same mooring place in an anchorage, and no vessel shall occupy a permanent berth in an anchorage except under authority of such permit which may be revoked at any time.

(8) A vessel, upon being notified to move into the anchorage limits or to shift its position in the anchorage grounds, shall get under way at once or obtain a tug and change its position with reasonable promptness, as directed.

(9) Whenever required by maritime or commercial interests of the United States, the District Commander is empowered to shift the position of any vessel anchored within or outside an anchorage, of any vessel which is so moored or anchored that its position impedes or obstructs vessel movements in any channel or obstructs or interferes with range lights, and of any vessel which, lying at the exterior end of a pier or alongside a wharf or bulkhead, obstructs or endangers the passage of vessels to or from adjacent wharf property or impedes the movement of vessels entering or leaving slips and boat harbors.

(10) Permits to anchor in channels within the limits of the waterways covered by the regulations in this section may be granted by the District Commander to wrecking plants or other vessels legally engaged in recovering sunken property or in laying or repairing pipe or cable lines legally established when the application for such anchorage is approved by the District Engineer, Corps of Engineers, and to plant engaged in dredging operations when authorized by the District Engineer. The provisions of this subparagraph will not apply to plant engaged under the supervision of the District Engineer upon works for the improvement of rivers and harbors, but the District Engineer will advise the District Commander in advance of the proposed work for such improvement in all cases where the plant is to be employed under his supervision.

(11) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, for signals, or for otherwise violating the law.

(12) Except as provided in subparagraph (15) of this paragraph, vessels carrying explosives or other dangerous articles, including inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, compressed gases, and poisonous substances, shall be anchored within Anchorages 13, 14, 15, 16, 22, 23, and 30 only. Any vessel carrying explosives and desiring to proceed to one of the anchorages provided therefor shall first obtain a written permit from the District Commander, and no vessel shall occupy a berth in such anchorage except by authority of such permit, which may be revoked at any time. All other vessels, especially tugs and stevedore boats, engaged or used in connection with loading ex-

plosives on vessels shall carry written permits from the District Commander, and shall show these permits whenever required by him.

(13) Whenever any watercraft not fitted with mechanical power anchors in Anchorages 13, 14, 15, 16, or 30 while carrying explosives, the District Commander may require the attendance of a tug upon such watercraft when, in his judgment, such action is necessary.

(14) When vessels are conducting loading operations from barges at any of the established explosives anchorages, as indicated by the display of a red flag (International Code Flag "B") at the masthead, passing vessels of over 100 tons displacement shall reduce their speed to six knots over the ground.

(15) The District Engineer, Corps of Engineers, is empowered to authorize, in writing, the anchoring of a single barge carrying explosives in or near the vicinity of work being done directly under his supervision, or under a Department of the Army permit, but only in quantities considered by him as safe and necessary. The District Engineer will prescribe the conditions under which this explosive shall be stored and handled and in each case will furnish the District Commander with a copy of the written permit to anchor explosives on the work and a copy of the conditions for storing and handling.

(16) Vessels other than those under Federal supervision shall not go alongside or in any manner moor to any Government-owned vessel, mooring buoy, or pontoon boom, their anchor cables, or any of their appendages. Vessels other than those under Federal supervision shall not obstruct or interfere in any manner with the mooring, unmooring, or servicing of vessels owned by the United States.

§ 202.228 *Columbia River, Oreg. and Wash.*—(a) *The anchorage grounds*—(1) *Lower Tongue Point Anchorage.* A rectangular area bounded as follows: Beginning at a point bearing 253°30′, 675 yards, from Tongue Point Light; thence to a point bearing 247°30′, 2,015 yards, from Tongue Point Light; thence to a point bearing 261°, 2,125 yards, from Tongue Point Light; thence to a point bearing 284°, 950 yards from Tongue Point Light; and thence to the point of beginning.

(2) *Upper Tongue Point Anchorage.* Northwesterly of a line running from a point bearing 42°, 1,200 yards, from Tongue Point Light, to a point bearing 253°30′, 675 yards, from Tongue Point Light; northeasterly of the northeast boundary of Lower Tongue Point Anchorage; southeasterly of a line ranging from a point bearing 284°, 950 yards, from Tongue Point Light, toward a point bearing 24°, 1,425 yards, from Tongue Point Light; southerly of a line 50 yards south of and parallel to the south side of the main ship channel; and southwesterly of a line ranging from a point bearing 42°, 1,200 yards, from Tongue Point Light, toward a point bearing 24°, 1,425 yards, from Tongue Point Light.

(b) *The regulations.* (1) No vessel shall anchor in anchorages described in paragraph (a) (1) and (2) of this section without prior permission from the Captain of the Port, or his authorized representative. No vessel shall occupy either anchorage for a period longer than 30 days unless a permit is obtained from the Captain of the Port for that purpose. No vessel in a condition such that it is likely to sink or otherwise become a menace or obstruction to the navigation or anchorage of other vessels shall occupy an anchorage except in an emergency and then only for such period as may be permitted by the Captain of the Port. A berth in an anchorage, if available, shall be assigned to any vessel by the Captain of the Port upon application and he may grant revocable permits for the continuous use of the same berth.

§ 202.230 *Puget Sound area, Wash.*—(a) *The anchorage grounds*—(1) *Freshwater Bay emergency explosives anchorage, Strait of Juan de Fuca.* All of Freshwater Bay and adjacent waters shoreward of a line beginning at Observatory Point, latitude 48°09′03″, longitude 123°38′12″, thence due north approximately 1,150 yards to latitude 48°09′36″, longitude 123°38′12″; thence 90°, approximately 6,450 yards, to latitude 48°09′36″, longitude 123°33′27″; thence 180° to the shore line.

(i) This area does not constitute an explosives anchorage for loading or discharging explosives, but is established exclusively for use by explosives laden vessels enroute to the ammu-

nition dumping area which encounter adverse weather and sea conditions and are forced to await more favorable conditions before proceeding to sea.

(2) *Port Townsend explosives anchorages*—(i) *Fair weather anchorage area.* A circular area having a radius of 300 yards, whose center is at latitude 48°06′26″, longitude 122° 43′46″.

(ii) *Foul weather anchorage area.* A circular area having a radius of 300 yards, whose center is at latitude 48°04′05″, longitude 122°44′52″.

(3) *Holmes Harbor general anchorage.* All of Holmes Harbor lying southerly of a line ranging 310° through Hackney Island, between the shores of Whidbey Island.

(4) *Port Gardner general anchorage, Possession Sound.* Beginning at a point bearing 211°, 560 yards from Everett Jetty Light; thence 180°, 675 yards; thence 216°, 250 yards; thence 254°, 800 yards; thence 302°, 1,700 yards; thence 49°, 1,280 yards; thence approximately 115°, 1,525 yards, to the point of beginning.

(5) *Kingston explosives anchorage, Puget Sound.* The waters within the segment of a circle struck from a point bearing 144°, 2,300 yards from Apple Cove Point Light, with a radius of 1,500 yards and extending from 217° to 324°.

(6) *Thorndike Bay emergency explosives anchorage, Hood Canal.* Beginning at a point bearing 267°, 3,500 yards, from Hood Canal 5 Light; thence 180°, 1,000 yards, to a point approximately 251°, 3,725 yards, from Hood Canal 5 Light; thence 270°, 1,350 yards to a point approximately 256°, 5,000 yards, from Hood Canal 5 Light; thence due north 1,000 yards, to a point approximately 268°, 4,900 yards, from Hood Canal 5 Light; thence approximately 90°, 1,350 yards, to the point of beginning.

(7) *Smith Cove general anchorage (west), Elliott Bay.* Shoreward to a line beginning at Fourmile Rock Light; thence to a point bearing 207°, 1,100 yards, from Fourmile Rock Light; thence southeasterly to point bearing 6°30′, 2,075 yards, from Duwamish Head Light; thence due north to the shore of Smith Cove.

(8) *Smith Cove general anchorage (east), Elliott Bay.* Beginning at the intersection of the Federal pierhead line and a line drawn along the north side of Denny Way; thence westerly on said line 2,000 feet; thence northwesterly along a line paralleling the Federal pierhead line to its intersection with a straight line drawn along the east side of Pier 88; thence due north to the intersection with the Federal pierhead line; thence along said pierhead line to the point of beginning.

(9) *Elliott Bay general anchorage (east).* Shoreward of a line beginning at the northeast corner of Harbor Island; thence northerly and in a straight line to its intersection with a line drawn along the south side of King Street; thence west on said line to its intersection with the east line of West Waterway; thence along said line to the northwest corner of Harbor Island.

(10) *Elliott Bay general anchorage (west).* Shoreward of a line beginning at a point of intersection of the Federal pierhead line with a straight line drawn along the west line of West Waterway; thence north to a point intersecting a straight line drawn along the south side of Dearborn Street; thence in a westerly direction to the foot of West Fairmount Avenue.

(11) *Orchard Point general anchorage, Puget Sound.* Beginning at Orchard Point Light; thence 106°, two miles; thence 180° to the northern shore of Blake Island; thence west and south along the shoreline to the southern end of Blake Island at approximate longitude 122° 29′16″; thence 250° to the dock at Harper; thence westerly and northerly along the shoreline to the point of beginning.

(12) *Blake Island explosives anchorage, Puget Sound.* Shoreward of a line bearing 90° from the south tangent of Blake Island, 2,000 yards; thence due north, 1,400 yards; thence 270°, 1,300 yards, to the east point of Blake Island.

(b) *The regulations.* (1) No vessel shall anchor in any general anchorage described in paragraph (a) of this section without permission from the Captain of the Port, or his authorized representative. No vessel shall occupy any general anchorage for a period longer than 30 days unless a permit is obtained from the Captain of the Port for that purpose. No vessel in a condition such that it is likely to sink or otherwise become a menace or obstruction to the navigation or anchorage of other vessels shall occupy a general anchorage except in an emergency and then only for such period as may be permitted by the Captain of the

Port. A berth in a general anchorage, if available, may be assigned to any vessel by the Captain of the Port upon application and he may grant revocable permits for the continuous use of the same berth.

(2) Explosives anchorages described in paragraph (a) of this section are reserved for vessels carrying explosives as cargo. Such areas shall not be used by vessels which do not carry explosives as cargo except in cases of great emergency or by special permit from the Captain of the Port. All vessels carrying explosives as cargo shall be within explosives anchorage when anchored.

(3) A vessel carrying bulk inflammable liquid cargo such as petroleum products shall, when anchored, be at least 1,000 yards away from a vessel carrying explosives. The Captain of the Port may issue a permit to a vessel carrying inflammable or combustible liquids in bulk or other dangerous cargo to anchor in an explosives anchorage whenever such explosives anchorage is not in use by a vessel carrying explosives as cargo.

(4) No vessel carrying explosives as cargo or on which explosives as cargo are to be loaded may proceed to an explosives anchorage without first notifying the Captain of the Port. Upon such notification, the Captain of the Port, if he finds it to be in the interests of port security and the commerce of the United States, shall issue a revocable permit, without which no vessel may anchor in the explosives anchorage, and shall assign to the vessel a berth in the explosives anchorage, if one is available.

(5) All vessels, including tugs and stevedore boats, used in connection with loading or unloading explosives on vessels shall apply to the Captain of the Port for a permit to engage in such loading or unloading, which permit shall be granted by the Captain of the Port if he finds that such action will not be inimical to the interests of port security and the commerce of the United States. No such vessel shall enter any explosives anchorage or engage in loading or unloading explosives without first having obtained a permit.

§203. BRIDGE REGULATIONS.—Regulations follow for operation of drawbridges within the limits covered by this Coast Pilot.

§ 203.710 *Navigable waters of the United States within the State of California; bridges generally*—(a) *Operation requirements.* The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels.

(b) *Signals*—(1) *Sound signals.* To be used if weather conditions are such that sound signals can be heard.

(i) *Call signal for opening of draw.* Three long blasts, sounded within reasonable hearing distance of the bridge, repeated if necessary, and in time to give due notice to the draw tender.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, or loud and distinct strokes of a bell.

(ii) *Acknowledging signals—(a) When draw can be opened immediately.* Same as call signal.

(b) When draw cannot be opened immediately, or when it is open and must be closed immediately. Two long blasts, repeated at regular intervals until acknowledged by the vessel. The vessel shall acknowledge by the same signal. Thereafter, as soon as the draw can be opened, the draw tender shall repeat the call signal.

(2) *Visual signals.* To be used if weather conditions are such that sound signals may not be heard:

(i) *Call signal for opening of draw.* A white flag by day or a white lighted lantern by night, swung in vertical circles at arm's length in full sight of the bridge and facing the draw.

(ii) *Acknowledging signals—(a) When draw can be opened immediately.* Same as call signal, to be given in full sight of the vessel.

(b) When draw cannot be opened immediately, or when it is open and must be closed immediately. A red flag by day or red lighted lantern by night, swung in vertical circles at arm's length in full sight of the vessel, repeated until acknowledged by the vessel. The vessel shall acknowledge by the same signal, given in full sight of the bridge and facing the draw. Thereafter, as soon as the draw can be opened, the draw tender shall repeat the call signal, given in full sight of the vessel.

(3) *Fog signal.* When fog prevails by day or by night the draw tender, after repeating the call signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) *Prompt opening required except when delayed by train.* The draw shall be opened with the least possible delay on receiving the prescribed signal: *Provided,* That the draw shall not be opened when a train is approaching so closely that it cannot be stopped safely before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) *Interference with operation of bridge prohibited.* Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) *Vessels for which openings not required.* A drawbridge shall not be required to open for any vessels carrying appurtenances unessential for navigation which extend above the normal superstructure, if the height of the normal superstructure would permit the vessel to pass under the closed bridge. Military masts shall be considered as part of the normal superstructure.

NOTE: On request, the District Engineer, Corps of Engineers, in charge of a waterway will cause an inspection to be made of the superstructure and appurtenances of a vessel habitually frequenting that waterway with a view to adjusting any differences of opinion in this matter between the vessel owner and a bridge owner.

(f) *Bridges requiring advance notice for prompt opening.* (1) The owners of or agencies controlling bridges for the prompt opening of which advance notice is required by special regulations (§§ 203.712 to 203.718, inclusive) need not keep draw tenders in constant attendance at such bridges.

(2) Whenever a vessel, unable to pass under a closed bridge, desires to pass through the draw, advance notice, as specified in the special regulations, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required. Unless otherwise provided in the special regulations, such advance notice may be given at any regular office of the owner of or agency controlling the bridge. Such notice may also be given to the draw tender or to the person named in the notice posted on the bridge in accordance with subparagraph (4) of this paragraph.

(3) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(4) The owners of or agencies controlling the bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be read easily at any time, a copy of the special regulations pertaining to the respective bridges together with information as to whom notice should be given when it is desired that a bridge be opened and directions for communicating with such person by telephone or otherwise.

(5) Vessels desiring to pass through these bridges without having given advance notice as specified in the special regulations may be delayed, but the owners of or agencies controlling the bridges shall, under such circumstances, use every reasonable means to expedite openings.

(6) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

NOTE: The following special regulations (§§ 203.711 to 203.718, inclusive), modifying and supplementing the foregoing general regulations (§ 203.710), are prescribed for certain bridges where local conditions warrant.

§ 203.711 *Los Angeles and Long Beach Harbors, Calif.*—(a) *Entrance Channel to Long Beach Inner Harbor; pontoon bridge.* (1) The call signal for opening the draw shall be one long blast followed by two short blasts. This signal shall be acknowledged by two long blasts followed by one short blast when the draw can be opened immediately, and by two long blasts when the draw cannot be opened immediately.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

(2) The owner of or agency controlling this bridge shall keep conspicuously posted on the south and north sides thereof, in such manner that they can be easily read from approaching vessels, signs showing the call and acknowledging signals prescribed in subparagraph (1) of this paragraph.

(b) *Cerritos Channel; Commodore Schuyler F. Heim highway bridge, and Henry Ford (Badger) Avenue railroad and highway bridge approximately 130 feet westerly thereof.* (1) From 7:30 a. m. to 8:00 a. m. and from 4:30 p. m. to 5:00 p. m. daily, except Saturdays, Sundays and holidays, the draw of the Commodore Schuyler F. Heim bridge shall not be opened for the passage of vessels except in case of emergency. The draw of the Henry Ford Avenue bridge shall be opened with the least possible delay at any time on receiving the prescribed signal.

(2) The call signal for opening draws of both bridges at once shall be three long blasts. This signal shall be acknowledged by two long blasts followed by one short blast when the draws of both bridges can be opened immediately, and by two long blasts when the draw of either bridge cannot be opened immediately.

NOTE: The bridges are connected electrically to insure that the call signal of three long blasts will not be acknowledged by the opening signal unless both bridges can be opened.

(3) The call signal for opening the draw of the Henry Ford Avenue bridge only shall be two short blasts followed by one long blast. This signal shall be acknowledged by two long blasts followed by one short blast when the draw can be opened immediately, and by two long blasts when the draw cannot be opened immediately.

(4) The owners of or agencies controlling these bridges shall keep conspicuously posted on the east side of the Commodore Schuyler F. Heim bridge and the west side of the Henry Ford Avenue bridge, in such manner that they can be easily read from approaching vessels, signs showing the call and acknowledging signals prescribed in subparagraphs (2) and (3) of this paragraph.

§ 203.712 *Tributaries of San Francisco Bay and San Pablo Bay, Calif.*—(a) *Mud Slough; Southern Pacific Company railroad bridge near Alviso.* At least 24 hours' advance notice required.

(b) *Newark Slough; Southern Pacific Company railroad bridge near Newark.* At least 24 hours' advance notice required. To be given to the Superintendent, Southern Pacific Company, Oakland Pier, Oakland, California.

(c) *San Leandro Bay; State of California highway bridge between Alameda and Bay Farm Island.* From 9:00 p. m. to 5:00 a. m., the draw need not be opened for the passage of vessels. From 5:00 a. m. to 8:00 a. m. and from 5:00 p. m. to 9:00 p. m., at least 12 hours' advance notice required. To be given to the operator of the Bay Farm Island Bridge (telephone Lakehurst 2–2969) between 8:00 a. m. and 5:00 p. m. and to the operator of the Park Street Bridge, Alameda (telephone Lakehurst 2–7272), at all other times.

(d) *Oakland Tidal Canal; Department of the Army highway and railroad bridge at Fruitvale Avenue.* All vessels, except motorboats without tow, are forbidden to approach within 300 feet of this bridge for the purpose of eventual passage through the draw except during slack water or when opposing the tidal flow. Vessels and barges shall not attempt passage through the draw while running with the tide, and the bridge will not be opened for vessels under such conditions.

(e) *Corte Madera Creek; Northwestern Pacific Railroad Company bridge and State of California highway bridge near Corte Madera.* At least 24 hours' advance notice required.

(f) *Novato Creek; State of California highway bridge near Ignacio.* At least 24 hours' advance notice required.

(g) *Petaluma Creek*—(1) *Northwestern Pacific Railroad Company bridge at Black Point.* The owner of or agency controlling this bridge need not keep a draw tender in constant attendance except when the draw is closed for the passage of railroad traffic. At all other times the draw may remain in full open position and unattended. During foggy weather a bell shall be tolled continuously when the draw is in open position.

(2) *City of Petaluma highway bridge at Washington Street, Petaluma.* At least six hours' advance notice required. To be given to the operator of the "D" Street Bridge, telephone Petaluma 191–R.

(h) *Sonoma Creek*—(1) *State of California highway bridge (Sears Point Cutoff Bridge).* At least four hours' advance notice required. To be given to the operator of the State of California highway bridge (Sears Point Cutoff Bridge) across Napa River at Vallejo.

(2) *Northwestern Pacific Railroad Company bridge at Wingo.* At least 24 hours' advance notice required.

(i) *Mare Island Strait, Napa River, and their tributaries*—(1) *Department of the Navy bridge (Mare Island Causeway) and State of California highway bridge (Sears Point Cutoff Bridge) at Vallejo.* From 7:00 a. m. to 8:00 a. m. and from 4:00 p. m. to 5:00 p. m. daily, except Saturdays, Sundays, and holidays, the draws need not be opened for the passage of vessels other than vessels owned, operated, or controlled by the United States.

(2) *Southern Pacific Company railroad bridge at Brazos.* The owner of or agency controlling this bridge need not keep a draw tender in constant attendance except when the draw is closed for the passage of railroad traffic. At all other times the draw may remain in full open position and unattended. During foggy weather a bell shall be tolled continuously when the draw is in open position.

(3) *Napa County highway bridge near Imola.* At least one, and not more than 24 hours' advance notice required. To be given to the operator of the Napa Sewage Disposal Plant, telephone Napa 4–0593.

(4) *Dutchman Slough; James Irvine Bridge.* At least 24 hours' advance notice required.

(5) *Devil Slough; Russ Investment Company highway bridge.* At least 24 hours' advance notice required.

§ 203.713 *Minor tributaries of Suisun Bay, Calif.*—(a) *Pacheco Creek; Contra Costa County highway bridge and Southern Pacific Company railroad bridge near Martinez.* At least 24 hours' advance notice required.

(b) *Cordelia Slough; a tributary of Suisun Slough; Southern Pacific Company railroad bridge.* At least 24 hours' advance notice required.

§ 203.714 *San Joaquin River and its tributaries, Calif.*—(a) *San Joaquin River*—(1) *Stockton Port District railroad bridge between Rough and Ready Island and Stockton.* At least 12 hours' advance notice required. To be given to the Director of the Port, Stockton Port District, Stockton, California.

(2) *San Joaquin County highway bridge between Rough and Ready Island and Stockton.* At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Department or to the County Surveyor at Stockton, California.

(3) *Atchison, Topeka and Santa Fe Railway Company bridge near Stockton.* At least 12 hours' advance notice required. To be given to the bridge owner's agent at Stockton, California.

(4) *State of California highway bridge (Garwood Bridge).* At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, 1200 Wilson Way, Stockton, California.

(5) *San Joaquin County highway bridge (Brandt Bridge).* At least 12 hour's advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(6) *Southern Pacific Company railroad bridge, State of California highway bridges (Mossdale Bridges), and Western Pacific Railroad Company bridge, near Lathrop.* (i) The

signal for opening at once all four of these bridges shall be the call signal described in § 203.710 (b) (1). The signal for opening certain of these bridges, and those bridges only, shall be as follows: For the Southern Pacific Company railroad bridge, two long blasts followed by one short blast; for the highway bridges, two short blasts followed by one long blast; and for the Western Pacific Railroad Company bridge, one long blast followed by one short blast and one long blast.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

(ii) For upstream passages through these bridges, except as provided in subparagraph (iii), at least 24 hours' advance notice required. To be given to the Chief Dispatcher of the Southern Pacific Company at Stockton, California, to the Highway Maintenance Superintendent of the Division of Highways, State of California, at Stockton, California, and to the Chief Dispatcher of the Western Pacific Railroad Company at Sacramento, California. For downstream passages through these bridges, the vessel operators shall notify the individual draw tenders at the time the upstream passages are being made.

(iii) During sand dredging seasons, when, in the opinion of the District Engineer, Corps of Engineers, the attendance of draw tenders is required between 8:30 a. m. and 4:30 p. m. from Monday to Saturday, inclusive, these bridges shall, on proper signal, be opened promptly for the passage of all vessels unable to pass under the closed bridges. Prompt opening between 8:30 a. m. and 4:30 p. m. without advance notice from Monday to Saturday, inclusive, will be directed by the District Engineer provided the operators of sand dredging barges give 15 days' written notice to him and at the same time furnish sufficient evidence that such openings without advance notice are necessary to take care of contemplated traffic.

(7) *Drawbridges above Paradise Dam.* At least seven days' advance notice required.

(b) *Burns Cutoff; San Joaquin County highway bridges (Jacobs Road and Upper Highway Bridges) between Roberts Island and Rough and Ready Island.* At least two days' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(c) *Middle River*—(1) *The Atchison, Topeka, and Santa Fe Railway Company bridge near Middle River Station.* (i) The signal for opening this bridge shall be two long blasts followed by one short blast.

(ii) On Sundays and national holidays, and between 5:00 p. m. and 8:00 a. m. on all other days, at least 12 hours' advance notice required, to be given to the railway company's agent at Stockton: *Provided,* That any advance notice shall be sufficient if given verbally to the draw tender while he is on duty, or by telephone to the railway company's agent at Stockton before 4:00 p. m. on any day except Sunday or national holiday.

(2) *State of California highway bridge between Victoria Island and Drexler Tract.* At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, 1200 Wilson Way, Stockton, California.

(3) *San Joaquin County highway bridge between Union Island and Drexler Tract, at Fish Camp Landing.* At least 24 hours' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(4) *San Joaquin County highway bridge (Williams Bridge) between Union Island and Roberts Island.* At least two days' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(d) *Mormon Channel; City of Stockton highway bridge (Washington Street Bridge), Atchison, Topeka and Santa Fe Railway Company bridge (Edison Street Bridge), and City of Stockton (Lincoln Street Bridge).* (1) The signal for opening at once all three of these bridges shall be the call signal described in § 203.710 (b) (1). The signal for opening any one of these bridges, and that bridge only, shall be as follows: For the Washington Street Bridge, two long blasts followed by one short blast; for the Edison Street Bridge, two short blasts followed by one long blast; and for the Lincoln Street Bridge, one long blast followed by one short blast and one long blast.

(2) At least 12 hours' advance notice required. To be given to the representative of the City of Stockton and to the railway company's agent at Stockton, California.

(e) *King Island Cut; San Joaquin County highway bridge between King Island and Bishop Tract.* At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Department or to the County Surveyor at Stockton, California.

(f) *Honker Cut; San Joaquin County highway bridge between Empire Tract and King Island.* The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from September to November, inclusive, during such other periods as crop movements may justify, and during periods when, in the opinion of the District Engineer, an emergency exists. In the event that the crop moving season is started earlier than September 1 or is extended later than November 30, the period for prompt opening of the bridge on proper signal shall be adjusted accordingly, provided the operators of vessels navigating this waterway give 15 days' written notice to the San Joaquin County Highway Department or to the County Surveyor at Stockton, Caifornia, that such an adjustment is necessary to take care of contempated traffic. At all other times, at least 12 hours' advance notice required. To be given to the San Joaquin County Highway Department or to the County Surveyor at Stockton, California.

(g) *Little Potato Slough; State of California highway bridge at Terminous.* (1) The owner of or agency controlling this bridge shall keep a draw tender in constant attendance: (i) From 8:00 a. m. to 5:00 p. m. during the months of July to September, inclusive.

(ii) During periods when, in the opinion of the District Engineer, Corps of Engineers, an emergency exists; or during crop moving seasons when, in the opinion of the District Engineer, the attendance of a draw tender is required, provided the operators of vessels engaged in the crop moving operations give 15 days' written notice to the District Engineer and at the same time furnish sufficient evidence that such service is necessary to take care of the contemplated traffic. In the event that special periods are established by the District Engineer for the constant attendance of a draw tender during an emergency or a crop moving season, information concerning the hours and lengths of such periods will be published in local newspapers and in the "Notice to Mariners" issued by the United States Coast Guard.

(2) From 5:00 p.m. to 8:00 a.m. during the months of July to September, inclusive, when a draw tender is not in attendance, advance notice required; to be given to the draw tender verbally, or by telephone through the Lodi Exchange, before 4:00 p.m. At all other times, at least 12 hours' advance notice required; to be given to the Division of Highways Maintenance Superintendent, 1200 South Wilson Way, Stockton, California.

(h) *Mokelumne River, including North and South Forks*—(1) *Mokelumne River*—(i) *State of California highway bridge near East Isleton.* The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from 9:00 a.m. to 5:00 p. m. throughout the year; and during periods when, in the opinion of the District Engineer, Corps of Engineers, an emergency exists, or during crop moving seasons when, in the opinion of the District Engineer, the attendance of a draw tender is required provided the operators of vessels engaged in the crop moving operations give 15 days' written notice to the District Engineer and at the same time furnish sufficient evidence that such service is necessary to take care of the contemplated traffic. In the event that special periods are established by the District Engineer for the constant attendance of a draw tender during an emergency or a crop moving season, information concerning the hours and lengths of such periods will be published in local newspapers and in the "Notice to Mariners" issued by the United States Coast Guard. When a draw tender is not in attendance, advance notice required; to be given to the draw tender verbally, or by telephone through the Isleton Exchange, before 4:00 p. m.

(ii) *Drawbridges above New Hope Landing.* At least two days' advance notice required.

(2) *North Fork; Sacramento and San Joaquin Counties Highway bridge (Millers Ferry Bridge).* At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Superintendent or to the County Surveyor at Stockton, California.

(3) *South Fork; San Joaquin County highway bridge (New Hope Landing Bridge).* (i) The signal for opening this bridge shall be two long blasts followed by one short blast.

(ii) At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Superintendent or to the County Surveyor at Stockton, California.

(i) *Snodgrass Slough; Southern Pacific Company railroad bridge and Sacramento County* highway bridge. From 8:00 a. m. to 5:00 p. m., daily, at least 24 hours' advance notice required. From 5:00 p. m. to 8:00 a. m., the draws need not be opened for the passage of vessels except in cases of extreme emergency.

§ 203.715 *Georgiana Slough, Calif.*—(a) *Sacramento County highway bridge near Isleton.* (1) The signal for opening this bridge shall be four long blasts.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration.

(2) The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from 8:00 a. m. to 5:00 p. m. throughout the year, and from 5:00 p. m. to 8:00 a.m. from June to September, inclusive, during such other periods as regular crop movements may justify, and during periods when, in the opinion of the District Engineer, Corps of Engineers, an emergency exists. In the event that the crop moving season is started earlier than June 1 or is extended later than September 30, the period for prompt opening of the bridge on proper signal from 5:00 p. m. to 8:00 a. m. shall be adjusted accordingly, provided the operators of vessels navigating this waterway give 15 days' written notice to the County Engineer of Sacramento County that such an adjustment is necessary to take care of contemplated traffic. At all other times, at least 12 hours' advance notice required. To be given to the operator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

(b) *Southern Pacific railroad bridge near Isleton.* The signal for opening this bridge shall be four long blasts.

(c) *Sacramento County highway bridge near Walnut Grove.* (1) The signal for opening this bridge shall be four long blasts.

(2) The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from 8:00 a. m. to 5:00 p. m. throughout the year, and from 5:00 p. m. to 8:00 a. m. from June to September, inclusive, during such other periods as regular crop movements may justify, and during periods when, in the opinion of the District Engineer, an emergency exists. In the event that the crop moving season is started earlier than June 1 or is extended later than September 30, the period for prompt opening of the bridge on proper signal from 5:00 to 8:00 a. m. shall be adjusted accordingly: *Provided,* The operators of vessels navigating this waterway give 15 days' written notice to the County Engineer of Sacramento County that such an adjustment is necessary to take care of contemplated traffic. At all other times, at least 12 hours' advance notice required. To be given to the operator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

§ 203.716 *Sacramento River and its tributaries, Calif.*—(a) *Sacramento River*—(1) *Sacramento County highway bridge at Walnut Grove and State of California highway bridge at Paintersville.* (i) For signaling vessels proceeding downstream, the owner of or agency controlling the Sacramento County highway bridge at Walnut Grove shall provide lights which shall be operated simultaneously with the sound signals. The lights shall be located on the east side of the river approximately 3,500 feet upstream from the bridge and shall be visible to approaching vessels. When the draw of the bridge can be opened immediately a flashing green light shall be operated. When the draw of the bridge cannot be opened immediately a flashing red light shall be operated.

(ii) When weather conditions prevent hearing sound signals and obstructions prevent seeing lantern signals, a vessel proceeding downstream may signal for opening of the draw of each of these bridges by swinging the beam of its searchlight from side to side in a vertical arc of about 60 degrees. If the draw can be opened immediately the draw tender shall so signal by projecting a steady beam of his searchlight vertically into the air and holding it steadily in that position until the vessel passes through the draw. If the draw tender finds, after giving the opening signal, that the bridge cannot be opened, he shall extinguish his searchlight immediately, but shall relight it when he is able to open the bridge.

(2) *Southern Pacific Company railroad bridge at Sacramento.* The signal for opening this bridge shall be four long blasts.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

(3) *Southern Pacific Company railroad bridge and State of California highway bridge at Knights Landing.* (i) The signal for opening at once both of these bridges shall be the call signal described in § 203.710 (b) (1). The signal for opening either of these bridges, and that bridge only, shall be as follows: For the railroad bridge, two long blasts followed by one short blast; and for the highway bridge, two short blasts followed by one long blast.

(ii) When weather conditions prevent hearing sound signals and obstructions prevent seeing lantern signals, a vessel proceeding downstream may signal for opening of the draw of each of these bridges by swinging the beam of its searchlight from side to side in a vertical arc of about 60 degrees. If the draw can be opened immediately the draw tender shall so signal by projecting a steady beam of his searchlight vertically into the air and holding it steadily in that position until the vessel passes through the draw. If the draw tender finds, after giving the opening signal, that the bridge cannot be opened, he shall extinguish his searchlight immediately, but shall relight it when he is able to open the bridge.

(iii) The owner of or agency controlling each bridge shall keep a draw tender in constant attendance from 8:00 a. m. to 5:00 p. m., and at all times during periods when, in the opinion of the District Engineer, an emergency exists, or during a hauling season which requires 20 or more passages through the bridge in any 30-day period provided 15 days' written notice of the contemplated traffic is given by the operators of the hauling vessels to the Southern Pacific Company's Division Engineer at Sacramento and to the Division of Highways Maintenance Superintendent at Woodland, respectively. At all other times, advance notice required. To be given to the Southern Pacific Company's Chief Dispatcher at Sacramento and to the Division of Highways Maintenance Superintendent, respectively, before 4:00 p. m.

(4) *Sacramento Northern Railway bridge at Meridian.* The owner of or agency controlling this bridge shall keep a draw tender in constant attendance during periods of flood stage. At all other times, at least six hours' advance notice required. To be given to the bridge owner or to its representative in the vicinity.

(5) *State of California highway bridge at Butte City.* At least 24 hours' advance notice required. To be given to the California State Highway Commission or to its representative in the vicinity.

(6) *Drawbridges above Chico Landing.* At least seven days' advance notice required.

(b) *Steamboat Slough; State of California highway bridge at head of Grand Island.* The signal for opening this bridge shall be two long blasts followed by one short blast.

(c) *Miner Slough*—(1) *Prospect Farms pontoon bridge between Ryer Island and Prospect Island.* At least 12 hours' advance notice required. To be given to the Superintendent of Prospect Farms through the Courtland Exchange, or to the main office of Prospect Farms in San Francisco, Calif.

(2) *State of California highway bridge between northerly end of Ryer Island and Holland Tract.* At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, Rio Vista, Calif.

(3) *Continuous attendance of the draws when Prospect Slough is impassable.* In the event that Prospect Slough is impassable for any reason, the owners of or agencies controlling these bridges shall, on notification of that fact, provide continuous attendance of the draws during the period of such blocking and consequent hauling season on Miner Slough. Vessel owners shall notify the owners of or agencies controlling these bridges promptly, under such conditions, of the removal of obstruction from Prospect Slough or the termination of their shipping movements through Miner Slough.

(d) *Sutter Slough; Sacramento County highway bridge near Courtland.* (1) The signal for opening this bridge shall be four long blasts.

(2) At least eight hours' advance notice required. To be given to the Sacramento County Engineer or to the operator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

§ 203.718 *Eureka Slough near Eureka, Calif.* At least 24 hours' advance notice required.

§ 203.720 *Coos Bay, Oreg.*—(a) *Bridge (highway) across South Inlet.* (1) The county highway drawbridge across South Inlet shall open for the passage of vessels or other watercraft of any description upon verbal request to the person in charge of said drawbridge. The bridge tender is J. J. Burns, who lives at the west end of the bridge. In his absence R. G. De Merrit, who resides at the west end of the bridge, is in charge.

(2) Notice shall be placed on said bridge stating where said tenders may be found in case it is necessary for the draw to be opened.

(b) *Bridge of the Willamette-Pacific Railroad Co.* (1) The drawspan of the railroad bridge below North Bend shall be kept open at all times except while actually required for the necessary passage of trains over the drawspan.

(2) During foggy weather a fog bell installed in the center of the drawspan shall be rung continuously, striking every 10 seconds.

(3) At any time during foggy weather, when the draw is closed and the passage is not clear for boats, there shall be sounded continuously a siren which may be heard at a distance of 1 mile from the drawspan. When the bridge is again opened the siren shall be stopped, indicating that the way is clear for the passage of boats.

(c) *Highway and railroad bridges across Coal Bank Inlet.* (1) The railroad drawbridge and the county highway drawbridge across Coal Bank Inlet shall open for the passage of vessels or other watercraft of any description upon verbal request to the persons in charge of said drawbridges. The bridge tender for the raliroad drawbridge is located in the Coos Bay depot of the Southern Pacific Co. The bridge tender for the county drawbridge is the county road supervisor, F. P. Morton, of Coos Bay, Oreg.

(2) Notice shall be posted on each of the bridges described in subparagraph (1) of this paragraph stating where said tenders may be found in case it is necessary for draws to be opened.

§ 203.725 *Umpqua River, Oreg.*—(a) *Bridge of Williamette-Pacific Railroad Co. at Reedsport, Oreg.* (1) The drawspan of the bridge across the Umpqua River at the mouth of Smith River shall be promptly opened for the passage of steam boats or other watercraft upon the following signals: One long blast of the whistle followed quickly by one short blast and one long blast.

(2) Vessels or other watercraft without power shall hail the bridge by horn or megaphone, or the bridge tender shall be notified by verbal communication of the desire to pass through the drawspan.

(3) During foggy weather an answering signal of one long blast from the whistle on the bridge will indicate that everything is clear and the draw open for the passage of boats. An answering signal from the whistle on the bridge of a succession of short blasts will indicate that there is some difficulty in immediately opening the draw, due to a passing train or some other cause.

(b) *Bridge (highway) at Reedsport, Oreg.* (1) The owner of, or agency controlling, the bridge shall provide the appliances and the personnel necessary for the safe, prompt, and efficient opening of the draw at any time during the day or night for the passage of any vessel or other watercraft, which cannot pass under the closed draw, when the following signal is received:

(i) One long blast followed immediately by one short blast of a whistle, siren, trumpet, horn or megaphone, or one loud and distinct stroke of a bell.

(ii) When the draw of the bridge can be opened immediately the draw tender shall reply by one long blast of a whistle, horn, siren, trumpet or megaphone, or one loud and distinct stroke of a bell.

(iii) If the draw of the bridge cannot be opened immediately, the draw tender shall reply by a succession of short blasts of a whistle, horn, siren, trumpet, or megaphone or loud and distinct ringing of a bell.

(2) A copy of the regulations in this section shall be conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can be easily read at any time.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at least once every 4 months to make certain that the machinery is in proper order for satisfactory operation.

(4) This section shall take effect and be in force on and after September 28, 1937.

§ 203.730 *Siuslaw River, Oreg.*—(a) *Oregon State Highway Commission bridge at Florence.* (1) The owner of or agency controlling this bridge shall provide the appliances and personnel necessary for the safe, prompt, and efficient opening of the draw at any time during the day or night for the passage of any vessel or other watercraft which cannot pass under the closed draw when the call signal is received.

(2) The call signal for opening the draw shall be one long blast of a whistle, siren, trumpet, horn, or megaphone followed immediately by one short blast, or one loud and distinct stroke of a bell. When the draw of the bridge can be opened immediately the draw tender shall reply by one long blast of a whistle, horn, siren, trumpet, or megaphone, or one loud and distinct stroke of a bell. If the draw of the bridge cannot be opened immediately, the draw tender shall reply by a succession of short blasts of a whistle, horn, siren, trumpet, or megaphone, or loud and distinct strokes of a bell.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(4) A copy of the regulations in this paragraph shall be conspicuously posted on both sides of the bridge in such manner that it can be easily read at any time.

(b) *Southern Pacific Company railroad bridge at Cushman.* (1) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 24 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(2) Upon receipt of such advance notice, the authorized representative shall, in compliance therewith, arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(4) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be read easily at any time, a copy of the regulations in this paragraph together with a notice stating exactly how the authorized representative may be reached.

§ 203.735 *Tillamook River, Oreg.; bridge (highway).* The county highway drawbridge across the Tillamook River shall open for the passage of vessels or other watercraft of any description upon verbal request to the person in charge of said drawbridge. E. W. Stanley has been appointed by the county court of Tillamook County as bridge tender for the drawbridge across Tillamook River, and has caused notice to be posted on said bridge stating where said tender may be found in case it is necessary for draw to be opened.

§ 203.740 *Youngs Bay, Walluski River, Lewis and Clark River, Skipanon River, John Day River, Blind Slough, and Clatskanie River, Oreg.; bridges.* (a) The drawbridges across Youngs Bay, Walluski River, Lewis and Clark River, Skipanon River, John Day River, and Blind Slough, all in Clatsop County, Oreg., and the bridge across Clatskanie River, in Columbia County, Oreg., shall be promptly opened for the passage of vessels or other watercraft upon the following signals:

(1) Spokane, Portland & Seattle Ry. bridge across Youngs Bay at Smith Point, one long blast followed quickly by one short blast.

(2) Youngs Bay highway bridge at foot of Fifth Street, Astoria, Oreg., two long blasts followed quickly by one short blast.

(3) Walluski River highway bridge, one long blast followed quickly by three short blasts.

(4) Lewis and Clark River highway bridge, near the mouth, one long blast followed quickly by four short blasts.

(5) Skipanon River railroad and highway bridges at Warrenton, Oreg. (both to be opened on one signal), one long blast followed quickly by one short blast.

(6) John Day River, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(7) John Day River highway bridge. (See special regulations in § 203.745.)

(8) Blind Slough, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(9) Clatskanie River, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(b) The bridges listed in paragraph (a) of this section shall be opened for the passage of vessels or watercraft of any kind upon prescribed signals being given on any form of whistle, horn, siren or trumpet, or upon verbal request of the person in charge of such vessel or water craft.

(c) This section shall take effect and be in force on and after December 15, 1929, and shall supersede the regulations approved November 7, 1899, governing the operation of the above-mentioned bridges.

§ 203.745 *John Day River, Oreg.; bridge (highway).* (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance at this bridge.

(b) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon the receipt of such notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can easily be read at any time a copy of the regulations in this section, together with a notice stating exactly how the representative specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at least once each quarter to make certain that the machinery is in proper order for satisfactory operation.

(f) This section shall take effect and be in force on and after April 12, 1933, and all regulations or parts of regulations applying to the bridge in conflict therewith are hereby revoked, to take effect on that date.

§ 203.750 *Willamette River at Portland, Oreg., Columbia River at Vancouver, Wash., and North Portland Harbor (Oregon Slough), Oreg.; bridges (highway and railroad): Signals—(a) Call signals for opening of draw.* These signals shall be as prescribed for each bridge in paragraph (b) of this section. It is given by vessels as notice to bridge operators to open the draw, or in case the draw is already open, that they intend to pass through. A call signal given twice in rapid succession indicates that vessel has authority to pass bridges during closed periods (see paragraph (f) (1) of this section).

(b) *Answering signals*—(1) *Acknowledging signal.* Shall be the same as the call signal for each bridge. Its purpose is to acknowledge the call signal of a vessel and to indicate that the operator intends to open the draw as soon as practicable, or that he will hold it open.

(2) *Danger signal.* Shall consist of a series of short blasts, at least four, given in rapid succession, and repeated if necessary. Its purpose is to answer the call signal of a vessel, but to indicate that the draw cannot or will not be opened at once, or, when vessels are waiting in

the vicinity, that the draw, if open, is about to be closed. It is also to be used in emergency to revoke an acknowledging signal.

(3) *Rescinding signal.* Shall be the reverse of the call signal for each bridge. It is given by a vessel to cancel a previous call signal, to indicate that the vessel does not intend to pass through and that the draw need not be opened, or may be closed.

(4) *Answer to rescinding signal.* (i) Answer by the bridge operator to a rescinding signal shall be the danger signal (see subparagraph (2) of this paragraph).

(5) *Call signals.* The following call signals are prescribed for vessels wishing to have the drawspans opened or held open.

(i) Spokane, Portland & Seattle Ry. bridge, at Vancouver, Wash., one long followed by one short blast.

(ii) Interstate Highway Bridge, at Vancouver, Wash., two long followed by one short blast.

(iii) Spokane, Portland & Seattle Ry. bridge, at North Portland Harbor (Oregon Slough), one long followed by three short blasts.

(iv) Spokane, Portland & Seattle Ry. bridge, at St. Johns, Oreg., one long followed by one short blast.

(v) Broadway Bridge, two long followed by one short blast.

(vi) Oregon-Washington Railroad & Navigation Co. bridge, one long followed by one short blast.

(vii) Burnside Bridge, one long followed by two short blasts.

(viii) Morrison Bridge, one long followed by three short blasts.

(ix) Hawthorne Bridge, one long followed by four short blasts.

Call signals may be given on any form of whistle, horn, siren, or trumpet with sufficient range or volume to be heard by bridge operators.

(c) *To bridge owners.* All bridges to which this section applies shall be equipped with suitable air whistles of sufficient size and range that signals sounded on same shall be distinctly audible up and down stream under adverse wind and weather conditions for a distance of 2,500 feet, except for the Spokane, Portland & Seattle Ry. Co. bridges over Columbia and Willamette Rivers, which shall have a range of at least 5,000 feet under the same conditions.

(d) *To navigators.* (1) A vessel, desiring at any time (except during closed periods, see paragraph (f) (1) of this section) to pass through any of the above-mentioned bridges, under which it cannot pass with the draw closed, shall sound the call signal for such bridge as prescribed in paragraph (b) of this section, and shall repeat such signal at intervals until it is answered by the operator of the bridge (see paragrahs (a) and (e) of this section). In case two vessels approaching from opposite directions would meet at or near the bridge, the vessel bound downstream shall be considered as having the right of way. When either vessel waits for passage of the other, it shall again give the call signal for the bridge and receive acknowledgment before proceeding. It is incumbent upon navigators to make sure that their signals are understood before proceeding through a drawspan, and when approaching bridges, vessels should be kept under control, with a view to stopping, if necessary, before reaching the bridge.

(2) Vessels authorized to pass through bridges during closed periods, as provided in paragraph (f) (1) of this section, shall sound the call signal twice in rapid succession. Signals to open shall be given by vessels at a distance of at least 1,000 feet from the bridge, except in case of a vessel leaving a wharf or anchorage or when waiting less than 1,000 feet from the bridge. In such cases the signal shall be given early enough to allow the operator of the bridge sufficient time in which to clear and open the draw before arrival of the vessel.

(3) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the harbor of Portland, and all towboats engaged in handling other craft or in towing logs through any of the bridges shall be of sufficient power to handle the tow without unduly delaying the closing of the drawspan.

(4) Vessels with hinged or adjustable masts or booms projecting above their fixed structures shall lower same and pass under the bridge, if practicable, without signaling for the draw to open.

(e) *To bridge operators.* (1) If the bridge can be opened, or is already open, when a call signal is given, the operator shall promptly answer the vessel calling by giving the acknowleeding signal and promptly open the draw (except during closed periods, (see paragraph (f) (1) of this section) or hold it open, as the case may be.

(2) In case the draw cannot be opened at once when the call signal is given, the operator shall promptly answer the vessel calling by giving the danger signal and shall repeat same, if necessary. As soon as the exigency which prevented opening has been removed the bridge operator shall promptly sound the regular acknowledging signal for that bridge to advise vessels that the draw can be opened at once, and he shall thereupon proceed to open same if there is a vessel waiting to pass through.

(3) When two vessels arrive at a bridge at or near the same time and blow the call signal, lift spans, when opening, shall be raised high enough to clear the taller vessel. If either vessel at any drawbridge waits for passage of the other and again gives the call signal, the bridge operator shall promptly answer with the acknowedging signal and shall hold the span open. In case the intentions of a waiting vessel are not understood by a bridge operator, when the draw is open he shall sound the danger signal as a warning to vessels that he is about to close the draw.

(4) If a rescinding signal is given by a vessel to cancel a previously given call signal, and it is evident the vessel does not intend to pass through, the bridge operator shall answer with the danger signal (four or more short blasts) and may then close the draw, or need not open it.

(f) Closed periods. (1) The periods from 7:30 a. m. to 9 a. m. and 4:45 p. m. to 6:15 p. m. are hereby designated closed periods during which the drawspans of bridges carrying street traffic over Willamette River at Portland shall not be opened to navigation except as below provided, or when necessary to prevent accident.

(2) Closed periods above defined shall not be effective on Sundays, New Year's Day, Washington's Birthday, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day, or days observed in lieu of these under State law: *Provided,* That closed periods shall not apply against harbor patrol or fireboats answering calls, nor ocean-going vessels of 750 gross tons or over which are entering the harbor from points outside Willamette River: *And provided further,* That upon securing the approval and permission of the harbor master, but not otherwise, other ocean-going vessels of 750 gross tons or over may signal for and pass through these bridges at any hour. Vessels desiring and authorized to pass through bridges during closed periods as provided in subparagraph (1) of this paragraph, or in case of emergency when opening of the draw is necessary to prevent accident, shall sound the call signal twice in rapid succession, i.e., with an interval of not over 5 seconds between signals. Drawspans shall be opened, however, for ocean-going vessels of 750 gross tons or over under the rule in paragraph (e) of this section whether the vessel gives a single or double call signal.

(g) This section shall be in force on and after March 1, 1930, and shall supersede all previous Federal regulations for the bridges to which they are applicable.

§ 203.755 *Willamette River, Oreg.; bridges above Oregon City, Oreg.*—(a) *Southern Pacific Company's bridge at Salem.* (1) Except as provided in subparagraph (2) of this paragraph, the drawspan shall be opened promptly for the passage of river craft unable to pass under the closed bridge upon the following signal: One long blast, followed quickly by one short blast; or upon verbal request of the operator of any watercraft of his desire to have the drawspan opened.

(2) When river stages are below 20 feet, Corps of Engineers gauge, and a vessel unable to pass under the bridge desires to pass through the draw, at least 24 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner or agency controlling the bridge. Such advance notice may be given to the dispatchers of the Southern Pacific Company at Portland or to the Southern Pacific Company Agent at Salem.

(3) Upon receipt of such advance notice, arrangements shall be made for the prompt opening of the drawspan at the time given in the notice for passage of the vessel, and the draw shall be so opened.

949285—52——7

(4) The owner or agency controlling the bridge shall keep a copy of the regulations in this paragraph conspicuously posted on both the upstream and downstream sides of the bridge, in such place and manner than it can be easily read from the river at any time.

(b) *Southern Pacific Company's bridge at Albany, Oreg., and Benton County highway bridge at Corvallis, Oreg.* (1) Whenever a vessel unable to pass under the Southern Pacific Company's railroad bridge at Albany, or the Benton County highway bridge at Corvallis, desires to pass through the draw of either bridge, at least 6 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner or agency controlling the bridge through which passage is desired.

(2) Upon receipt of such advance notice, arrangements shall be made for the prompt opening of the draw at the time given in the notice for passage of the vessel, and the draw shall be so opened.

(3) The owner or agency controlling the bridge shall keep a copy of the regulations in this paragraph conspicuously posted on both the upstream and downstream sides of the bridge, in such place and manner that it can be easily read from the river at any time, together with a notice stating exactly how the representative specified in paragraph (b) (1) of this section may be reached.

(4) The operating machinery of the draws of these bridges shall be maintained in a serviceble condition, and the draw opened and closed at least once each three months, to insure that the machinery is in proper order for satisfactory operation.

§ 203.759 *Columbia River; Oregon-Washington Bridge Company highway bridge between Hood River, Oreg., and White Salmon, Wash.* (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance.

(b) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required, and the vertical clearance required for the vessel, shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw upon signal at the time specified in the notice for the passage of the vessel.

(d) The call signal for opening of the draw shall be one long blast followed by two short blasts and one long blast. When the draw has been opened sufficiently to pass the vessel, the draw tender shall reply by waving conspicuously a green flag by day or a green light by night. When the draw cannot be opened immediately or when it is open and due to an emergency must be closed immediately, the draw tender shall reply by waving conspicuously a red flag by day or a red light by night.

(e) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such manner that it can be easily read at any time, a copy of the regulations in this section, together with a notice stating exactly how the authorized representative may be reached.

(f) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

CROSS REFERENCE: Dalles-Celilo Canal, Columbia River, see § 207.710.

§ 203.760 *Columbia River above Celilo Falls; bridges.* (a) The drawspans of the Northern Pacific Railway bridge across the Columbia River between Kennewick and Pasco, and of the Union Pacific Railroad Company bridge across Columbia River below the mouth of the Snake River, shall be opened promptly for the passage of steamboats of other watercraft upon the following signal, which shall be sounded 10 minutes in advance of the time of the desired passage through the drawspan: one long blast of a whistle or horn, followed quickly by one short and one long blast. *Provided,* That the drawbridges may be held closed for the passage of any train which, before the opening signal has been given by the watercraft, has passed a block signal located not more than one-half mile from the end of the railroad bridge. After the passage of the train, the bridge shall immediately be opened for the passage of the

boat. Trains shall in no event stand in such location as to prevent operation of the draw.

(b) In case the draw is being held closed for a train or cannot immediately be opened when the signal from an approaching vessel is given, the tender of the draw shall so indicate by sounding four short blasts in quick succession upon a whistle or horn immediately after receiving the boat signal, and shall repeat such signal several times at short intervals.

§ 203.762 *Snake River, Wash., and Idaho, bridges.* (a) The owner of or agency controlling any drawbridge will not be required to keep a draw tender in constant attendance.

(b) Whenever a vessel unable to pass under any closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owner of or agency controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in a manner that it can be easily read at any time, a copy of the regulations in this section, together with a notice stating exactly how the representative stated in paragraph (b) of this section may be reached. A list giving the name and address of the representative now in charge of the operation of each existing drawbridge follows:

(1) Drawbridge across Snake River at Ainsworth: Notify A. M. Partch, Assistant Supervisor, Northern Pacific Railway, Pasco, Washington.

(2) Drawbridge across Snake River at Riparia: Notify the Agent, Union Pacific Railroad Company, Kennewick, Washington.

(3) Drawbridge across Snake River at Lewiston: Notify City Engineer, or Fire Department, City of Lewiston, Idaho.

(e) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(f) In pursuance of the provisions of paragraph (c) of this section, the drawbridges across the Snake River at Ainsworth and Riparia, Washington, and Lewiston, Idaho, shall open for the passage of vessels or other watercraft upon the following signal, which signal shall be sounded when 20 minutes run from the bridge: One long, one short, and three long blasts: *Provided, however,* That railroad drawbridges may be held closed for the passage of any mail or passenger train which is expected to arrive within 30 minutes after giving the signal for opening and then shall be immediately opened for the passage of the boat.

(g) In case the draw is being held closed for a train or cannot be immediately opened when the signal from an approaching vessel is given, a red flag by day shall be conspicuously displayed above the superstructure, and a red light shall be conspicuously waved at night.

§ 203.765 *Cowlitz and Lewis Rivers, Wash.; bridges*—(a) *General regulations.* (1) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and sound signals can be heard, when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessels desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, three long distinct blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

NOTE: As used in this section the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration and a short blast shall mean one of 1 second duration.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(iii) When the draw of the bridge cannot be opened immediately the draw tender shall reply by two long distinct blasts of a whistle, horn, or megaphone, or two distinct strokes of a bell. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (2) (iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (2) (iii) of this paragraph, viz, two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3) (iii) of this paragraph the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (3) (iii) of this paragraph viz, raising and lowering a lighted lantern or flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraphs (2) (ii), (2) (iv), (3) (ii), and (3) (iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of a vessel.

(5) The draw shall be opened with the least possible delay upon receiving the prescribed signal: *Provided,* That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for intermittent attendance of bridge tenders on bridges across streams where water traffic is minor, or at times nonexistent, the special regulations and exceptions in paragraph (b) of this section are prescribed.

(b) *Special regulations*—(1) *Lewis River; Northern Pacific Railway Bridge.* Owners of vessels operating on this part of the river are requested to notify those in charge of this bridge of the beginning and ending of the season of navigation for their vessels, or of any contemplated trip of a vessel through this bridge, in which latter case notice will be given not less than 6 hours before the arrival of the vessel at the bridge. When such notice has been given prompt operation of the bridge upon proper signal will be insisted upon. Vessels making trips over this section of the river without first notifying the bridge owners of contemplated trips may expect delays at the bridge; but bridge owners shall use every reasonable means to expedite openings at all times. The owners of this bridge will post in a conspicuous place on each side of the bridge a notice giving instructions as to where and how the bridge operator can be reached at times when an operator is not in constant attendance.

(c) *Effective date.* This section shall take effect on and after April 15, 1927, and shall supersede all regulations heretofore prescribed for the opening of bridges over the waterways to which this section applies.

§ 203.770 *Willapa River and navigable tributaries, Wash.; bridges.* (a) When at any time during the day or night a vessel unable to pass under the closed drawspan of any of

these bridges approaches it from a distance of over 1,000 feet, the person in command of such vessel shall cause to be sounded, when the vessel is at a distance of not less than 1,000 feet, the prescribed signal and shall repeat this signal until it is understood at the bridge.

(b) When such vessel is about to leave a landing 1,000 feet or less from the drawbridge, with the intention of passing through the draw, the person in command shall cause the prescribed signal to be sounded at such interval before leaving the landing that the draw may be opened in time for the vessel to pass.

(c) Wagons, vehicles, and trains shall not be stopped on said drawbridges or on a drawspan for the purpose of delaying the operations of drawbridge, nor shall water craft or vessels be so manipulated as to hinder or delay the operations of a drawspan, but all passage upon, through, or under said drawbridge shall be prompt, to prevent delay to either land or water communication.

(d) Whenever possible, vessels with tows shall not so approach a bridge as to attempt to pass the draw in succession without interval. They must endeavor to so arrange their approach as to cause no delay in closing the draw promptly for the relief of land traffic.

(e) The following signals are prescribed for vessels wishing to have the draws opened: For the State highway bridge over Willapa River (North Fork) at Raymond, one long blast of a whistle followed quickly by one short blast and one long blast; for the Northern Pacific Railway Company bridge over Willapa River (South Fork) at Raymond, two long blasts of a whistle followed quickly by one short blast; for the State highway bridge over Willapa River (South Fork) at Raymond, two long blasts of a whistle followed quickly by two short blasts. These bridges shall also be opened for the passage of vessels or watercraft of any description propelled by other than steam power upon like signals given by whistle or trumpet or upon verbal request of the person or persons in charge of the vessels.

(f) In case the drawspan cannot be immediately operated when the prescribed signal is given, a red flag or ball by day and a red light by night shall be displayed, or on bridges where a suitable whistle has been installed five short blasts shall be immediately given, and repeated until the approaching vessel answers.

§ 203.775 *Grays Harbor and tributaries, Wash.; bridges*—(a) *General regulations.* (1) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, three long distinct blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

NOTE: As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration, and a short blast shall mean one of 1 second duration.

(ii) When the draw of the bridge can be opened immediately the draw tender shall reply by two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by two long distinct blasts of a whistle, horn, or megaphone, or two distinct strokes of a bell. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay as in subparagraph (2) (iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (2) (ii) of this paragraph, viz, two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day; the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3) (iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (3) (ii) of this paragraph, viz, raising or lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraphs (2) (ii), (2) (iv), (3) (ii), or (3) (iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessel.

(5) The draw shall be opened with the least possible delay upon receiving the prescribed signal: *Provided*, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, the special regulations and exceptions in paragraph (b) are prescribed.

(b) *Special regulations.*

(1) State bridge over Hoquiam River at Simpson Avenue: two long blasts of whistle followed quickly by one short blast of whistle.

(2) City bridge over Hoquiam River, Eighth Street, Hoquiam: two long blasts of whistle followed quickly by two short blasts.

(3) Northern Pacific Railway bridge over Hoquiam River near forks of river: one long blast of whistle followed quickly by one short and one long blast.

(4) Northern Pacific Railway bridge over Wishkah River at Aberdeen: one long blast of whistle followed quickly by one short blast.

(5) City bridge over Wishkah River at Heron Street, Aberdeen: one long blast of whistle followed quickly by two short blasts.

(6) City bridge over Wishkah River at Wishkah Street: one long blast of whistle followed quickly by three short blasts.

(7) City bridge over Wishkah River at Second Street, Aberdeen: one long blast of whistle followed quickly by four short blasts.

NOTE: For other special regulations governing operation of this bridge, see § 203.810.

(8) State bridge (West's) over Chehalis River at Aberdeen: two short blasts of whistle followed quickly by one long blast.

(9) Northern Pacific Railway bridge over Chehalis River, Junction City: one long blast of whistle followed quickly by one short and one long blast.

(10) This section shall take effect on and after March 10, 1928, and will supersede the regulations approved September 28, 1926, for drawbridges over these waterways.

§ 203.785 *City Waterway, Tacoma Harbor, Wash.; bridges*—(a) *Draw tenders and operating machinery.* The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels in accordance with the regulations in this section. The operating machinery of the draws shall be maintained in a serviceable condition,

and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(b) *Signals*—(1) *Sound signals.* To be used if weather conditions are such that sound signals can be heard.

(i) *Call signal for opening of draw.* For the City of Tacoma bridge at South Eleventh Street, three long blasts followed by one short blast, for the Northern Pacific Railway Company bridge at South Fifteenth Street, one long blast followed by one short blast and one long blast, of a whistle, horn, or megaphone, sounded within reasonable hearing distance of the bridge in each case, repeated if necessary, and in time to give due notice to the draw tender.

NOTE: As used in this section, the term "long blast" means a distinct blast of four seconds' duration, and the term "short blast" means a distinct blast of one second's duration.

(ii) *Acknowledging signals.*

(iii) *When draw can be opened immediately (opening signal).* Two long blasts followed by one short blast of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(iv) *When draw cannot be opened immediately, or when it is open and must be closed immediately.* Two long blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall sound the opening signal.

(2) *Visual signals.* To be used if weather conditions are such that sound signals may not be heard.

(i) *Call signal for opening of draw.* A white flag by day and a white lighted lantern by night, swung in vertical circles at arm's length in full sight of the bridge and facing the draw.

(ii) *Acknowledging signals.*

(iii) *When draw can be opened immediately (opening signal).* Same as call signal, to be given in full sight of the vessel.

(iv) *When draw cannot be opened immediately, or when it is open and must be closed immediately.* A red flag by day or a red lighted lantern by night, swung in vertical circles at arm's length in full sight of the vessel. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall give the opening signal.

(3) *Fog signal.* When fog prevails by day or by night the draw tender, after giving the opening signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) *Prompt opening required except when delayed by train.* Except as otherwise provided in paragraph (e) of this section, the draw shall be opened with the least possible delay on receiving the prescribed signal: *Provided,* That the draw shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) *Interference with operation of bridge prohibited.* Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) *Special regulations*—(1) *City of Tacoma bridge at South Eleventh Street.* (i) The owner of or agency controlling this bridge need not keep a draw tender in constant attendance.

(ii) Whenever a vessel, unable to pass under the closed bridge, desires to pass through the draw, at least two hours' advance notice of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(iii) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice: *Provided,* That the draw need not be opened between

6:45 a. m. and 7:45 a. m. and between 3:30 p. m. and 5:30 p. m. except when necessary to prevent disaster to shipping.

(iv) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(2) *Union Pacific Railroad Company bridge near South Fifteenth Street.* The draw of this bridge need not be opened between 7:15 a. m. and 8:00 a. m. and between 4:15 and 5:00 p. m. except when necessary to prevent disaster to shipping.

§ 203.790 *Duwamish waterway at Seattle, Wash.; bridges*—(a) *General regulations.* (1) The corporation or persons owning or controlling a drawbridge shall provide the same with necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the opening signal prescribed in paragraph (b) of this section for the particular bridge.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by the signal prescribed under special regulations in paragraph (b) of this section. As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration, and a short blast shall mean one of 1 second duration.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by the signal prescribed under special regulations in paragraph (b) of this section.

(iv) When, after a delay, as in subparagraph (2) (iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed under special regulations in paragraph (b) of this section.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3) (iii) of this paragraph the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in subparagraph (3) (ii) of this paragraph, viz, raising and lowering a lighted lantern or flag.

(4) When fog prevails by day or by night the draw tender, on giving signal (subparagraphs (2) (ii), (2) (iv), (3) (ii) or (3) (iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and the passage of the vessel.

(5) The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided,* That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft or vessels be so manipulated as to hinder

or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(b) *Special regulations.* (1) The general regulations in paragraph (a) of this section shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, and to provide for closed or open periods when land or water traffic predominates, the special regulations and exceptions in this paragraph are prescribed.

(2) The following signals are prescribed for vessels wishing to have the draws opened:

(i) *Northern Pacific Ry. and West Spokane Street Bridges*—(a) *Opening signal.* For the Northern Pacific Ry. bridge only: One long blast of whistle, followed quickly by one short blast. For both the Northern Pacific Ry. and West Spokane Street bridges: one long blast of whistle, followed quickly by three short blasts.

NOTE: Northern Pacific Ry. bridge, clearance 18 feet at mean lower low water; West Spokane Street Bridge, clearance 53 feet at mean lower low water.

(b) *Closed periods.* Between the hours of 6:45 a. m. and 8:45 a. m. and 4:30 p. m. and 6:30 p. m. the draw of the West Spokane Street Bridge need not be opened for the passage of vessels of less than 250 gross tons, unless such vessel has in tow a vessel of 250 gross tons or over.

(ii) *City bridge at First Avenue South.* Clearance 33 feet at mean lower low water.

(a) *Opening signal.* The signal for opening this bridge shall be three long blasts of the whistle.

(b) *Closed periods.* Between the hours of 7 a. m. and 7:30 a. m. and 4 p. m. and 4:30 p. m. the draw need not be opened for the passage of any vessel of less than 40 gross tons, unless said vessel has in tow barge or other floating object that will exceed the height of clearance at that time.

(iii) *City bridge at Eighth Avenue South.* Clearance 31 feet at mean lower low water.

(a) *Opening signal.* The signal for opening this bridge shall be two long blasts followed quickly by one short blast of the whistle.

(b) *Closed periods.* Between the hours 7 a. m. and 7:30 a. m. and 4 p. m. and 4:30 p. m. the draw need not be opened for the passage of any vessel of less than 40 gross tons, unless said vessel has in tow barge or other floating object that will exceed the height of clearance at that time.

(iv) *County bridge at Fourteenth Avenue South.* Clearance 45 feet at mean lower low water.

(a) *Opening signal.* The signal for opening this bridge shall be one long blast followed quickly by one short blast and one long blast of the whistle.

The bridges described in this subparagraph shall also be opened for the passage of vessels or watercraft of any description propelled by other than steam power, upon like signals given by whistle or trumpet, or upon verbal request of the person or persons in charge of same. If the draw of any of the bridges is ready to be opened immediately when the prescribed signal is given from the vessel, the signal shall be answered immediately by the same prescribed signal from a whistle or horn on the bridge; but if the draw is not ready to be opened immediately upon the prescribed signal being given on the vessel, the signal shall be answered immediately from the bridge by four or more short blasts of a whistle, horn, or megaphone, or four or more distinct strokes of a bell.

(3) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the Duwamish Waterway.

(4) All vessels, crafts, or rafts, not self-propelled, navigating the Duwamish Waterway, for which the opening of any bridge may be necessary, shall while passing such bridge, be towed by a suitable self-propelled boat.

(5) When the draw of any of the bridges listed in this subparagraph shall have been opened for 10 minutes, or for such shorter period as may have been necessary for the passage of vessels or other watercraft desiring to pass, it shall be closed for the crossing of trains, cars, vehicles, or individuals, if any be waiting to cross, and after being so closed for 10 minutes, or for such shorter time as may be necessary for the said trains, cars, vehicles, or indi-

viduals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring, and authorized hereinabove, to pass at such time.

(6) This section, other than the giving of the prescribed signals, shall not apply to vessels owned and operated by the United States. Such vessels shall be passed without delay through the draws of any or all bridges at any hour of the day or night upon giving the prescribed signal.

(7) This section shall take effect on and after April 15, 1929, and shall supersede all regulations heretofore prescribed for the opening of bridges over this waterway.

§ 203.795 *Lake Washington Ship Canal, Wash.; bridge*—(a) *General regulations.* (1) The corporations or persons owning or controlling a drawbridge shall provide same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the opening signal prescribed under paragraph (b) (1) of this section for the particular bridge.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by the signal prescribed under paragraph (b) (1) of this section.

As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration, and a short blast shall mean one of 1 second duration.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by the signal prescribed under paragraph (b) (1) of this section.

(iv) When, after a delay, as in subdivision (iii) of this subparagraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed under paragraph (b) (1) of this section.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day, the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day, the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3) (iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in subparagraph (3) (ii) of this paragraph viz, raising and lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraph (2) (ii), (2) (iv), (3) (ii), or (3) (iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessel.

(5) The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided,* That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, and to provide for closed or open periods when land or water traffic predominates, the special regulations and exceptions in paragraph (b) of this section are prescribed.

(b) *Special regulations.* (1) The following signals are prescribed for vessels wishing to have the draws opened:

(i) *Great Northern Railway bridge, clearance 42 feet at high tide.* One long blast of whistle, followed quickly by one short blast.

(ii) *Ballard Bridge, clearance 45 feet.* One long blast of whistle, followed quickly by one short blast.

(iii) *Northern Pacific Railway bridge, clearance 16 feet.* One long blast of whistle, followed quickly by three short blasts.

(iv) *Fremont Avenue Bridge, clearance 30 feet.* One long blast of whistle, followed quickly by one short blast.

(v) *University Bridge, clearance 44 feet.* One long blast of whistle, folowed quickly by three short blasts.

(vi) *Montlake Bridge, clearance 46 feet.* One long blast of whistle, followed quickly by one short blast.

The bridges listed in subparagraph (1) of this paragraph shall also be opened for the passage of vessels or watercraft of any description propelled by other than steam power, upon like signals given by whistle or trumpet, or upon verbal request of the person or persons in charge of same. If the draw of any of the bridges listed in this subparagraph is ready to be opened immediately when the prescribed signal is given from the vessel, the signal shall be answered immediately by the same prescribed signal from a whistle or horn on the bridge; but if the draw is not ready to be opened immediately upon the prescribed signal being given on the vessel, the signal shall be answered immediately from the bridge by four or more short blasts of a whistle, horn, or megaphone or four or more distinct strokes of a bell.

(2) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the Lake Washington Ship Canal.

(3) All vessels, crafts, or rafts, not self-propelled, navigating the Lake Washington Ship Canal, for which the opening of any bridge may be necessary, shall, while passing such bridge, be towed by a suitable self-propelled boat.

(4) The draws in each and every bridge shall, upon the signal prescribed above being given, be opened promptly for the passage of any vessel, or vessels, or other watercraft not able to pass underneath it;

(i) *Provided,* That the Ballard Bridge, Fremont Avenue Bridge, University Bridge, and Montlake Bridge will not be required to open, on any day of the week except Sunday, New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day, between the hours of 7 a. m. and 8:30 a. m. and 4:30 p. m. and 6:15 p. m. for vessels or other watercraft of less than 300 gross tons, unless such vessel has in tow a vessel of 300 gross tons, or over; and

(ii) *Provided further,* That the draw in any of the above four city bridges need not be opened at any time for the passage of any vessel of less than 300 gross tons equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the closed draw, unless it has in tow a vessel which is unable to pass under the closed draw. Any vessel of less than 300 gross tons regularly navigating the canal shall be subject to inspection and measurement by the district engineer, United States Engineer Department at Large, in charge of the locality, and said district engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or movable stacks, masts and flagpoles which can be lowered to enable the vessel to pass under the closed draw of any or all the bridges. If the district engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the closed draw; and

(iii) *Provided further,* That when the draw in any of the above bridges shall have been

opened for 10 minutes, or for such shorter period as may have been necessary for the passage of vessels, or other watercraft, desiring to pass, it shall be closed for the crossing of trains, cars, vehicles, or individuals, if any be waiting to cross, and after being so closed for 10 minutes, or for such shorter time as may be necessary for the said trains, cars, vehicles, or individuals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring and authorized hereinabove, to pass at such time.

(5) This section, other than the giving of the prescribed signals, shall not apply to vessels owned and operated by the United States. Such vessels shall be passed without delay through the draw of any bridge at any hour of the day or night upon giving the prescribed signal.

(6) This section shall take effect and be in force on and after April 15, 1929, and shall supersede all regulations heretofore prescribed for the opening of bridges over this waterway.

§ 203.800 *Lake Washington, Wash.; pontoon bridge between Seattle and Mercer Island, Wash.* (a) The owners of or agencies controlling the drawbridges shall provide the appliances and personnel necessary for the safe, prompt, and efficient operation of the draw.

(b) *Signals.* (1) *Call signals for opening of draw*—(i) *Sound signal.* One long blast followed by one short blast of whistle, horn, or megaphone, sounded within a reasonable distance of the bridge. As used in the regulations in this section long blast shall mean a blast of four seconds duraton, short blast shall mean one of one second duration.

(ii) *Visual signal.* To be used in conjunction with sound signals when conditions prevent sound signals being heard. A white flag by day, a white light by night, swung in full vertical circles at arm's length in full sight of the bridge and facing the draw.

(2) *Acknowledging signals*—(i) *By bridge operator*—(a) *Sound signals.* Draw to be opened immediately; Same as call signal. Draw cannot be opened immediately, or, if open, must be closed immediately: Four or more short blasts of a whistle, horn or megaphone or four or more loud and distinct strokes of a bell, to be repeated at regular intervals until acknowledged by the vessel.

(b) *Visual signals.* To be used in conjunction with sound signals when conditions prevent sound signals being heard. Draw to be opened immediately: A white flag by day, a white light by night swung up and down vertically a number of times in full sight of the vessel. Draw cannot be opened immediately: A red flag by day, a red light by night swung in full vertical circles at arm's length facing the vessel.

(ii) *By the vessel.* Vessels or other watercraft having signaled for opening of the draw and having received a signal that the draw cannot be opened immediately, shall acknowledge said signal by four or more short blasts or by swinging in full vertical circles at arm's length a red flag by day or a red light by night.

(c) Automobile, trucks, or other vehicles shall not be stopped on the draw of the bridge, except in cases of urgent necessity, nor shall vessels or other watercraft be manipulated in a manner hindering or delaying the operation of the draw. All passage over the draw or through the draw opening shall be prompt, in order to prevent delay to either land or water traffic.

(d) All vessels, craft, or rafts, not self-propelled, navigating Lake Washington, for which the opening of the bridge may be necessary, shall, while passing the bridge, be towed by a suitable self-propelled boat.

(e) Upon the signal prescribed in paragraph (b) of this section being given, the draw shall be opened promptly for the passage of any vessel, or vessels, or other water craft not able to pass through the openings under the fixed spans of the pontoon bridge near each shore, or under the spans of the fixed bridge on the east side of Mercer Island:

(1) *Provided,* That the bridge will not be required to open on any day of the week between the hours of 7:00 a. m. and 9:00 a. m. and 4:45 p. m. and 6:30 p. m. for any vessel or other watercraft of less than 2,000 gross tons, unless such vessel has in tow a vessel of 2,000 gross tons or over, or a pile-driver that is unable to pass under the fixed spans, and

(2) *Provided further,* That the bridge need not be opened at any time for the passage of any vessel of less than 300 gross tons equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the fixed spans unless it has in tow a vessel

which is unable to pass under the fixed spans. Any vessel of less than 300 gross tons regularly navigating the lake shall be subject to inspection and measurement by the District Engineer, United States Engineer Department at Large, in charge of the locality, and said District Engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or movable stacks, masts and flagpoles which can be lowered to enable the vessel to pass under the fixed spans. If the District Engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified, the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the fixed spans; and

(3) *Provided further*, That the bridge will not be required to be opened at any time for any craft towing logs or scows, after the owners of the bridge shall have provided fenders, approved by the Department of the Army, at the openings under the approach span of the pontoon bridge, adjacent to Mercer Island, and under the main span of the fixed bridge between Mercer Island and the mainland east of Lake Washington, unless such craft cannot pass under those spans; and

(4) *Provided further*, That when the draw shall have been opened for ten minutes, or for such shorter period as may have been necessary for the passage of vessels, or other watercraft, desiring to pass, it shall be closed for the crossing of vehicles or individuals, if any be waiting to cross, and after being so closed for ten minutes, or for such shorter time as may be necessary for the said vehicles or individuals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring, and authorized herein, to pass at such time; and

(5) *Provided further*, That, at night, between the hours of 9 p. m. and 5 a. m., the draw shall be opened for the passage of all vessels that cannot pass under the fixed spans upon notice given by telephone or otherwise to the bridge operator at least 30 minutes in advance of the time that the vessel desires to pass through the draw.

(f) The regulations in this section, other than the giving of the prescribed signals, shall not apply to vessels owned, operated, or leased by the United States. Such vessels shall be passed without delay through the draw upon giving the prescribed signal, except that notice provided in paragraph (e) of this section for the period between 9 p. m. and 5 a. m. shall be given.

(g) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such a manner that it can be easily read at any time, a copy of the regulations in this section, together with a notice stating exactly how the bridge operator specified in paragraph (e) of this section may be reached.

§ 203.805 *Snohomish River, Steamboat Slough, and Ebey Slough, Wash.; bridges*—(a) *Draw tenders and operating machinery.* The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels in accordance with the regulations in this section. The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(b) *Signals*—(1) *Sound signals.* To be used if weather conditions are such that sound signals can be heard.

(1) *Call signal for opening of draw.* Three long blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell, sounded within reasonable hearing distance of the bridge, repeated if necessary, and in time to give due notice to the draw tender: *Provided*, That distinctive call signals are prescribed for certain bridges as follows:

Snohomish River: State of Washington Department of Highways bridge near the mouth. Three long blasts followed by one short blast.

Steamboat Slough: Great Northern Railway Company bridge near the mouth. One long blast followed by one short blast and one long blast.

Steamboat Slough: State of Washington Department of Highways bridge near the mouth. Two long blasts followed by one short blast.

Ebey Slough: State of Washington Department of Highways bridge near the mouth. Three long blasts followed by one short blast.

NOTE: As used in this section, the term "long blast" means a distinct blast of four seconds' duration, and the term "short blast" means a distinct blast of one second's duration.

(ii) *Acknowledging signals.*

(iii) *When draw can be opened immediately (opening signal).* Two long blasts followed by one short blast of a whistle, horn, or megaphone, or three loud distinct strokes of a bell.

(iv) *When draw cannot be opened immediately, or when it is open and must be closed immediately.* Two long blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall sound the opening signal.

(2) *Visual signals.* To be used if weather conditions are such that sound signals may not be heard.

(i) *Call signal for opening of draw.* A white flag by day or a white lighted lantern by night, swung in vertical circles at arm's length in full sight of the bridge and facing the draw.

(ii) *Acknowledging signals.*

(iii) *When draw can be opened immediately (opening signal).* Same as call signal, to be given in full sight of the vessel.

(iv) *When draw cannot be opened immediately, or when it is open and must be closed immediately.* A red flag by day or a red lighted lantern by night, swung in vertical circles at arm's length in full sight of the vessel. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall give the opening signal.

(3) *Fog signal.* When fog prevails by day or by night the draw tender, after giving the opening signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) *Prompt opening required except when delayed by train.* Except as otherwise provided in paragraph (e) of this section, the draw shall be opened with the least possible delay on receiving the prescribed signal: *Provided,* That the draw shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) *Interference with operation of bridge prohibited.* Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) *Bridges where constant attendance of draw tenders is not required.* (1) The owners of or agencies controlling the bridges listed in subparagraph (5) of this paragraph need not keep draw tenders in constant attendance.

(2) Whenever a vessel, unable to pass a closed bridge, desires to pass through the draw, advance notice, as specified, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(3) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(4) The owners of or agencies controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(5) The bridges to which this paragraph applies, and the special regulations applicable in each case, are as follows:

Snohomish River; State of Washington Department of Highways bridge at the foot of Hewitt Avenue, Everett. At least 12 hours' advance notice required: *Provided,* That during freshets a draw tender shall be kept in constant attendance upon order of the District Engineer, Corps of Engineers.

Snohomish River; bridges of State of Washington Department of Highways, Northern Pacific Railway Company, and Great Northern Railway Company, at Snohomish. At least 24 hours' advance notice required.

Steamboat Slough; bridges of Great Northern Railway Company and State of Washington Department of Highways near Marysville. At least four hours' advance notice required.

§ 203.810 *Navigable waters in the State of Washington; bridges where constant attendance of draw tenders is not required.* (a) The owners of or agencies controlling the bridges listed in paragraph (f) of this section will not be required to keep draw tenders in constant attendance.

(b) Whenever a vessel unable to pass under a closed bridge desires to pass through the draw, advance notice, as specified, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(c) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(d) The owner of or agency controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides thereof in such manner that it can easily be read at any time, a copy of the regulation in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(e) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(f) The bridges to which this section applies, and the regulations applicable in each case, are as follows:

Puyallup Waterway and River, Tacoma Harbor; City of Tacoma highway and street railway bridge at East Eleventh Street, and Chicago, Milwaukee, St. Paul and Pacific Railroad Company bridge near East Eleventh Street. At least four hours' advance notice required.

South Fork, Skagit River; Skagit County highway bridge at Fir. At least 24 hours' advance notice required.

Skagit River; State of Washington Department of Highways bridge and Great Northern Railway Company bridge near Mount Vernon. At least 24 hours' advance notice required.

Wishkah River; City of Aberdeen highway bridge at East Second and Young Streets, Aberdeen. Between sunrise and sunset, at least 24 hours' advance notice required. Between sunset and sunrise the draw need not be opened for the passage of vessels.

§ 203.815 *Clark Fork (Pend Oreille) River, Idaho; bridge of Spokane International Railway Co. near Sandpoint, Idaho.* (a) When at any time during the day a vessel, unable to pass under the closed draw of the bridge, approaches it from a distance of over half a mile, the person in command of such vessel shall cause to be sounded, when said vessel shall be at a distance of not less than half a mile of the bridge, but within signal distance thereof, four blasts of the steam whistle, or horn, or megaphone.

(b) When a vessel is about to leave a landing one-half mile or less from the drawbridge, with the intention of passing through the draw, the person in command of such vessel shall cause the required signal to be sounded at such interval before leaving the landing that the draw may be opened in time for the boat to pass.

(c) Upon hearing or perceiving the signals prescribed in paragraphs (a) and (b) of this section, the tender of the drawbridge, or the foreman of the section gang of the Spokane International Railway Co. having the bridge in charge, shall immediately take the necessary steps to have the draw opened: *Provided,* That the draw shall not be opened when there is a train crossing the bridge, but that in no event shall the opening of the draw be delayed more than 6 hours: *And provided further,* That if 6 hours' previous notice, in writing or otherwise, shall have been given to the agent of the Spokane International Railway Co. at Sandpoint, Idaho, or to any other agent convenient to the bridge, of such desire, there shall be no delay

in opening the draw: *And provided further*, That the draw need not be opened for passage of a tug or other craft equipped with a movable stack or mast which can readily be so lowered as to permit its passage under the closed draw unless such craft has in tow a vessel which is unable to pass under the closed draw.

(d) Trains shall not be stopped on the draw of the bridge except in cases of urgent necessity, nor shall vessels be so manipulated as unnecessarily to hinder or delay the closing of the draw.

§204. DANGER ZONE REGULATIONS.—Regulations follow for danger areas within the limits covered by this Coast Pilot.

§ 204.190 *Pacific Ocean, between La Jolla and Solana Beach, Calif.; firing range, Coast Artillery Replacement Training Center, Camp Callan, San Diego*—(a) *The danger zone.* An area in the Pacific Ocean approximately 10 nautical miles square, bounded on the north by latitude 33°00′ (through Solana Beach), on the east by the shore, on the south by latitude 32°52′ (through Scripp's Pier), and on the west by longitude 117°26′.

(b) *The regulations.* (1) Any vessel propelled by mechanical power at a speed greater than five miles per hour may proceed through the danger zone to and from points beyond (but not from one point to another in the danger zone) without restriction, except when notified to the contrary.

(2) Fishermen desiring to fish in the danger zone will be required to have written permits which will be issued by the enforcing agency upon application thereto.

(3) On days and nights when firing is in progress, no vessel shall enter or remain in the danger zone except vessels of the United States or vessels proceeding through the danger zone as provided in subparagraph (1) of this paragraph.

(4) Except under unusual circumstances, announcement of which will be made to the surrounding communities, the danger zone will be open throughout the year to the public for fishing and traffic without restriction from 12:00 noon, Saturday, to 8:00 a. m., Monday, and on national holidays from 5:00 p. m. of the day preceding to 8:00 a. m. of the day following the holiday. The area will also be open to the public for fishing and traffic without restriction on other days when firing is not to be conducted.

(5) Notice of target practice within the firing range will be given by the enforcing agency by one or more of the following methods:

(i) On days when firing is to be held in all or part of the danger zone, large red flags will be displayed from elevated masts in the immediate vicinity of each firing point (near S. W. Range Tower, U. S. Navy) from which fire is to be conducted. These flags will be hoisted not later than 8:00 a. m. of the day on which firing is to be held and will be lowered when firing ceases for the day.

(ii) Notice published in San Diego daily newspapers.

(iii) Telephone advice to such fishermen's organizations as may request, in writing, that such advice be given.

(iv) Telephone advice to such civil aircraft communication stations and naval air bases as may request, in writing, that such advice be given.

(v) Notice to individual craft by a visit of a United States vessel.

(6) During periods when antiaircraft firing is in progress, safety observers will be maintained for the protection of civil and naval aircraft.

(7) This section shall be enforced by the Commanding General, Coast Artillery Replacement Training Center, Camp Callan, California.

§ 204.195 *Anaheim Bay Harbor, Calif.; Naval Ammunition and Net Depot, Seal Beach*—(a) *The danger zone.* The waters of Anaheim Bay Harbor between the east and west jetties at the United States Naval Ammunition and Net Depot, Seal Beach, California, and the contiguous tidal channel and basin as far east as the Pacific Electric Railway bridge.

(b) *The regulations.* (1) Transit shall be prohibited to all but regularly documented vessels and power boats having a certificate of award of number. Sailing vessels shall use aux-

iliary power in Anaheim Bay proper. Rowboats, canoes, kayaks, etc., are specifically prohibited.

(2) All boats shall proceed as expeditiously as possible by the shortest practicable route through the danger zone. Fishing, landing, and stopping except in actual emergency are specifically prohibited.

(3) The name and address of the owner, and the number, description, color, and size of the craft shall be registered with the enforcing agency.

(4) Passage shall be made only upon the express permission of the enforcing agency (through the Depot Duty Officer) in each instance, date and time of expected return to be given. This permission shall be obtained by telephone or otherwise not less than one hour before seaward transit in order that security personnel may be properly notified and to avoid interference with scheduled operations.

(5) To permit identification all passages, except such as are necessitated by stress of weather, shall be made between the beginning of morning twilight and the end of evening twilight. If after evening twilight the boat shall stop at the dock and clear with the Duty Officer (through sentry).

(6) Both entrances to the bay will be suitably posted.

(7) All craft of whatever category shall have the right at any time to seek shelter in these waters because of stress of weather.

(8) This section shall be enforced by the Commanding Officer of the Naval Ammunition and Net Depot, Seal Beach, California, and such agencies as he may designate.

(9) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel or plant from the penalties of the law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights or signals, or for otherwise violating law.

§ 204.197 *Pacific Ocean in vicinity of San Pedro, Calif.; Practice firing ranges for United States Army Reserve, National Guard, and Coast Guard units*—(a) *The danger zones*—(1) *Zone A.* An area extending south, and west from Point Fermin, described as follows: Beginning at Point Fermin Light, latitude 33°42′18″, longitude 118°17′36″; thence 180° true to latitude 33°41′12″; thence northwesterly to latitude 33°42′48″, longitude 118°19′00″; thence northeasterly to the shore at Whites Point, latitude 33°42′48″, longitude 118°19′00″; and thence southeasterly along the shore to the point of beginning.

(2) *Zone B.* An area extending south and west from Whites Point, described as follows: Beginning at the shore at Whites Point, latitude 33°42′48″, longitude 118°19′00″; thence southwesterly to latitude 33°41′54″, longitude 118°19′24″; thence northwesterly to latitude 33°42′42″, longitude 118°21′24″; thence northeasterly to latitude 33°43′12″, longitude 118° 21′06″; thence 90° true to a point on the shore at longitude 118°19′36″; and thence southeasterly along the shore to the point of beginning.

(3) *Zone C.* An area extending southwest and northwest from Point Vicente, described as follows: Beginning at Point Vicente Light, latitude 33°44′30″, longitude 118°24′36″; thence southwesterly to latitude 33°43′42″, longitude 118°25′24″; thence northwesterly to latitude 33°46′30″, longitude 118°27′06″; thence southeasterly to the shore, latitude 33°44′54″, longitude 118°24′42″; and thence southerly along the shore to the point of beginning.

(b) *The regulations.* (1) Intermittent firing will take place in Zone A and Zone C between 12:30 and 5:30 p. m. on Saturdays and between 8:00 a. m. and 12:30 p. m. on Sundays, and in Zone B between 12:30 and 5:30 p. m. on Saturdays and between 8:00 a. m. and 5.30 p. m. on Sundays.

(2) Except as otherwise provided in this paragraph, the danger zones will be open to fishing and general navigation. When firing is not scheduled the danger zones may be occupied without restriction. When firing is in progress safety observers will be maintained to warn all vessels. Notice to vacate the area, or to stop at the boundaries, will be given by siren, patrol vessel, or other effective means, and such notice shall be promptly obeyed. All vessels permitted to enter a danger zone during a firing period, other than those owned by and operated by or under the direction of the United States Government, shall proceed across the area by the most direct route and clear the area with the greatest possible dispatch. No ves-

sel, fishing boat, or recreational craft shall anchor in any danger zone during an actual firing period.

(3) Nothing in this section shall be construed as relieving the owner or person in charge of a vessel from any penalties for obstructing navigation, or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights and fog signals, or for otherwise violating any law or regulations.

(4) The regulations in this section shall be enforced by the Commander, Southern Subarea, Sixth Army, Fort MacArthur, California, and such agencies as he may designate.

§ 204.200 *Pacific Ocean at San Clemente Island, Calif.; Navy shore bombardment area in vicinity of Pyramid Cove*—(a) *The danger zone.* Shoreward of a line beginning at White Washed Rock on the beach bearing 199° true, 540 yards, from Pyramid Head Light; thence 160° 30′ true, 1.17 nautical miles; thence 243°30′ true, 2.35 nautical miles; and thence 307° true to the beach.

(b) *The regulations.* (1) This area is used for shore bombardment by the United States Navy and all vessels shall promptly vacate the area when ordered to do so by the Navy or Coast Guard. Vessels shall not enter the area during periods scheduled for firing as published in local Notice to Mariners.

(2) Except in an emergency, no vessel shall anchor in the area without first obtaining permission from the Commandant, Eleventh Naval District, or from the Senior Officer present in the anchorage who may grant permission to anchor not exceeding the period he himself is authorized to remain there. The Senior Officer present shall advise the Commandant, Eleventh Naval District, when and to whom he assigns a berth.

§ 204.205 *Monterey Bay, Calif.*—(a) *Firing range, Fort Ord, Calif.*—(1) *The danger zone.* (i) A sector in Monterey Bay, the southerly limit of which is a line bearing 265°20′ true, 14,000 yards, from the shore line at Indian Harbor Beach, 5.1 miles south of the mouth of the Salinas River, and the northeasterly limit of which is a line bearing 327°20′ true, 14,000 yards, from the shore line opposite Marina, 3.75 miles south of the mouth of the Salinas River.

(ii) The danger zone is divided into a short-range area, extending from the shore line seaward for a distance of 7,500 yards, and a long-range area, embracing the entire danger zone.

(2) *The regulations.* (i) Except when notified to the contrary as prescribed in subdivision (iv) of this subparagraph, any vessel may proceed through the danger zone without restriction.

(ii) Fishermen desiring to fish in the danger zone will be required to have written permits which will be issued by the enforcing agency upon application thereto.

(iii) When firing over the water is in progress, no vessel, except vessels of the United States or vessels authorized by the enforcing agency, will enter or remain in the danger zone.

(iv) In all cases where firing will extend over the water, notice of such firing will be given by the enforcing agency by one or more of the following means. The notice will state whether the firing will be over the short-range or long-range area.

(a) Notice published in the Monterey daily newspapers.

(b) Display of red flags at Indian Beach Harbor for firing over the short-range area and red flags near Point Pinos Lighthouse and at Indian Beach Harbor for firing over the long-range area.

(c) Radio broadcast.

(d) Telephone advice to such fishermen's organizations as may request, in writing, that such advice be given.

(e) Notice to individual craft by a visit of a United States vessel.

(v) This paragraph will be enforced by the Commanding General, Fort Ord, California.

(b) *Navy mining operations area*—(1) *The danger zone.* Shoreward of a line beginning at the stack at about latitude 36°58′06″, longitude 121°54′06″; thence 230° true, 6.0 miles; thence 140° true, 7.5 miles; thence 50° true to the shore.

(2) *The regulations.* The danger zone will be used for training in various phases of mine warfare operations. During the period from August 1 to February 15, inclusive, each year, no operations will be carried on which will involve placing any obstructions in the water nor will any operations be carried on at night. During the period from February 16 to July 31, inclusive, each year, operations may be carried on which will involve laying exercise mines and other moored or bottom obstructions. In each case when moored or bottom obstructions are laid a notice to mariners will be issued giving notice of their approximate location within the danger zone, and vessels shall keep clear.

§ 204.210 *Pacific Ocean adjacent to San Francisco, Calif.; firing ranges, U. S. Military Reservations, Harbor Defenses of San Francisco*—(a) *The danger zone.* An area of the Pacific Ocean, bounded on the north by a line bearing 90° true from Point Reyes, on the east by the shore, by the peninsula across Bolinas Bay, and by a line across the Golden Gate between Point Bonita and Point Lobos, on the south by a line bearing 270° true from Pillar Point, and on the west by a line bearing due north and passing through Farallon Light (on Southeast Farallon). The danger zone is divided into four firing ranges, as follows:

(1) *North long range.* That part of the danger zone north of the center line of the main ship channel across the San Francisco bar prolonged.

(2) *North short range.* That part of the north long range east of a line bearing 180° true from Double Point.

(3) *South long range.* That part of the danger zone south of the center line of the main ship channel prolonged.

(4) *South short range.* That part of the south long range east of a line bearing 180° true from Double Point and north of a line bearing 270° true from Point San Pedro.

(b) *The regulations.* (1) Any vessel propelled by mechanical power at a speed greater than five knots may proceed through the danger zone to and from points beyond (but not from one point to another in the danger zone) without restriction, except when notified to the contrary.

(2) Fishermen desiring to fish in the danger zone will be required to have written permits which will be issued by the enforcing agency. Applications for permits may be made direct to the Commanding Officer, Fort Winfield Scott, San Francisco, or may be made to the office of the California State Fish and Game Commission, Ferry Building, San Francisco.

(3) On days and nights when firing is in progress, no vessel shall enter or remain in the danger zone, except vessels of the United States, or vessels proceeding across the zone as provided in subparagraph (1) of this paragraph.

(4) Notice of target practice within any of the firing ranges will be given by the enforcing agency by one or more of the following methods:

(i) Notice published in a San Francisco daily newspaper.

(ii) A display of a red flag at Point Cavallo from daylight of the day of firing until the firing for that day is over.

(iii) Radio broadcast.

(iv) Telephone advice to such fishermen's organizations as may request, in writing, that such advice be given.

(v) Notice to individual craft by a visit of a United States vessel.

(5) This section shall be enforced by the Commanding Officer, Harbor Defenses of San Francisco, and such other agencies as he may designate.

§ 204.215 *San Pablo Bay, Calif.; target practice area, Mare Island Navy Yard, Mare Island*—(a) *The danger zone.* A sector in San Pablo Bay adjacent to the westerly shore of Mare Island with a radius of 3,900 yards, centered at a point bearing 316° true, 3,605 yards, from Mare Island Dike No. 14 Light, with limiting true bearings from that center of 266°30′ and 222°.

(b) *The regulations.* The Commanding Officer, Mare Island Navy Yard, will conduct target practice in the area at intervals of which the public will be duly notified. At such times vessels shall stay clear.

949285—52——8

§ 204.218 *Pacific Ocean off Point Reyes, Calif., northwest of Farallon Islands; bombing target area Naval Air Station, Alameda, Calif.*—(a) *The danger zone.* The waters of the Pacific Ocean included within a circle having a radius of 2.5 nautical miles with its center on Fanny Shoal at latitude 37°49′15″, longitude 123°12′45″, approximately 2.9 nautical miles northwesterly of Noonday Rock, 12.4 nautical miles northwesterly of Farallon Light, and 13.9 nautical miles southwesterly of Point Reyes Light.

(b) *The regulations.* (1) No vessel other than vessels owned or operated by the United States Government shall enter or remain in the danger zone.

(2) The regulations in this section shall be enforced by the Commandant, Twelfth Naval District, and such agencies as he may designate.

§ 204.220 *Tomales Bay, Calif.; naval aircraft bombing target area*—(a) *The danger zone.* A circular area having a radius of 750 yards, the center of which bears 129° true, 2,000 yards, from the southwesterly extremity of Tom Point.

(b) *The regulations.* (1) No vessel shall enter or remain in the danger zone except vessels of the United States.

(2) This section shall be enforced by the Commandant, Twelfth Naval District, Naval Operating Base, San Francisco, and such agencies as he may designate.

§ 204.221 *Strait of Juan de Fuca, Wash.; naval operations area for nonexplosive air-to-surface target practice*—(a) *The danger zone.* (1) Beginning at a point at latitude 48°16′30″, longitude 123°03′00″; thence east to latitude 48°16′30″, longitude 122°55′00″; thence northwesterly to latitude 48°21′00″, longitude 122°57′00″; thence to latitude 48°21′00″, longitude 123°05′00″; thence southeasterly to the point of beginning.

(2) The area will be used for air to surface target practice using non-explosive projectiles.

(3) All runs will be made under weather conditions which will insure that the pilot can determine from the air that the area is clear, and firing will be in a direction from any vessels near the area in order to eliminate all possibility of danger to property or life.

(4) No firing shall take place until the area is clear of all watercraft except those taking part in the practice.

(b) *The regulations.* (1) Between 8:00 a. m., and 4:00 p. m., Pacific standard time, no vessel or other craft shall enter or remain within the designated area except as authorized by the enforcing agency.

(2) Prior to the conducting of each practice the area will be patrolled by Naval vessels flying a "Baker" (red) flag, and unauthorized vessels found therein will be contacted and warned to immediately leave the area.

(3) Upon application, the Navy will grant special permission to others to pass through or otherwise use the area if no interference to the Navy's use of the area is evident.

(4) The regulations in this area shall be enforced by the Commandant of the Thirteenth Naval District or his authorized representative.

§ 204.222 *Hood Canal and Dabob Bay, Wash.; Naval operations areas for deepwater aircraft non-explosive torpedo drops*—(a) *The areas.* (1) All waters of Hood Canal between latitude 47°46′00″ and latitude 47°42′00″, exclusive of navigation lanes one-fourth nautical mile wide along the west shore and along the east shore south from the town of Bangor (latitude 47°43′28″).

(2) All waters of Dabob Bay between latitude 47°47′00″ and latitude 47°42′00″ west of the line of 10-fathom depth along the west shore of the Toandos Peninsula, and east of a line projected in a southwesterly direction from a point one-fourth nautical mile off the southeast shore of Bolton Peninsula at latitude 47°47′00″, passing Pulali Point approximately one-fourth nautical mile off-shore, to latitude 47°42′00″, longtitude 122°51′48″.

(b) *The regulations.* (1) The areas will be used intermittently by the U. S. Navy for non-explosive torpedo ranging. Launching will be conducted only between the hours of 8:00 a. m. and 2:00 p. m. on days other than Saturdays, Sundays, and holidays. Not more than one of the areas will be used at one time. At no time will the navigation lanes generally paralleling the shore be closed to navigation.

(2) Navigation will be permitted within the areas at all times except when naval exercises are in progress. No vessel shall enter or remain in either area when such exercises are in progress in that area. Prior to commencement of an exercise, the Navy will make an aerial or surface reconnaissance of the area it intends to use. Vessels under way and laying a course through the area will not be interfered with, but they shall not delay their progress. Vessels anchored or cruising in the area and vessels unobserved by the Navy reconnaissance which enter or are about to enter the area while a torpedo is in the water will be contacted by a Navy patrol boat and advised to steer clear. Torpedoes will be tested only when all vessels or other craft have cleared the area.

(3) When operations are in progress, use of the area will be indicated by the presence of Naval vessels flying a "Baker" (red) flag.

(4) Notices of temporary suspension and revival of operations will be published in local newspapers and in Notice to Mariners published by the United States Coast Guard.

(5) The regulations in this section shall be enforced by the Commandant, Thirteenth Naval District, and such agencies as he may designate.

§206. FISHING AND HUNTING REGULATIONS.—Regulations follow for fishing and hunting in certain areas covered by this Coast Pilot.

§ 206.85 *San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, New York Slough, San Joaquin River, Sacramento River, and their navigable tributaries and connecting waterways, Calif.; floating or drifting fish nets.* (a) Fishing with nets is prohibited:

(1) In the fairways of ferryboats plying between the following points:

(i) Sausalito, Belvedere, and Tiburon.

(ii) Richmond and Point San Quentin.

(iii) Benicia and Martinez.

(iv) Mallard Slough and Chipps Island.

(2) Within 1,000 feet of bridges, wharves, docks, and steamboat landings.

(3) Within 1,000 feet of vessels moored or anchored in established anchorage grounds (described in § 202.220 of this chapter).

(4) Within 1,000 feet of the junctions of interconnecting sloughs, cuts and canals.

(5) In San Francisco Bay north of a line from the white tank at the Great Western Power Company north of Hunter Point to the western extremity of Alameda Mole.

(6) In the southern part of the San Pablo Bay in an area bounded as follows: Beginning at Point San Pedro; thence northeasterly to and through the buoys marking the north side of the dredged channel across Pinole Shoal; thence to the western extremity of Dike No. 12 and along this dike to Mare Island; thence along the southerly shore of Mare Island and Dike No. 14 to the southern extremity of this dike; thence to the western extremity of Dike No. 9; thence to the northeast corner of the wharf at Selby; thence southwesterly along the 18-foot contour to Point San Pablo; thence to the point of beginning.

(7) In the western part of San Pablo Bay in the channel between Point San Pedro and Beacon No. 2 marking the dredged channel to the mouth of Petaluma Creek, and in the channel to the mouth of Petaluma Creek.

(8) In Mare Island Strait and Napa River downstream from the Sears Point Toll Bridge.

(9) In Carquinez Strait west of the highway bridge at Valona.

(10) In Carquinez Strait southerly of a line extending from the intersection of the east side of the highway bridge at Valona and the north shore to a point bearing 347° true, 710 yards, from Port Costa Light; thence to a point bearing 176°30′ true, 700 yards, from Benicia Light; thence to the northerly pier of the lift span of the railroad bridge between Suisun Point and Army Point; excluding from this prohibited area, however, Anchorage No. 25 (described in § 202.220 (a) (25) of this chapter).

(11) In the southern part of Suisun Bay between the northerly and southerly lines of the channel extending from the railroad bridge between Suisun Point and Army Point to the mouth of New York Slough as marked by buoys.

(12) Within the outer limits of the 30-foot channel through New York Slough and the San Joaquin River to Stockton.

(13) In the Sacramento River as follows:

(i) The right half of the river from one-half mile below to one-eighth mile above Tolands Landing, and the left half of the river from Tolands Landing to Emmaton.

(ii) From one mile below the Rio Vista Bridge to one-half mile above the Grand Island Light.

(iii) From one-half mile below to one-half mile above the bridge at Walnut Grove.

(b) All nets floating or drifting with the tide or current, or attached to any craft, must be laid out from the bank toward the channel.

(c) No nets shall be placed or allowed to move so as to cross more than one-half of the width of the navigable channel where it is 1,000 feet or less in width, nor more than two-thirds of the channel where it is over 1,000 feet in width.

(d) While any net is in position, no other net shall be laid out within 1,000 feet of it from either shore.

(e) Any net shall, upon the approach of any vessel desiring to pass, be so moved, or be so picked up and removed, as to permit the passage of the vessel without hindrance or delay.

(f) Where vessels coming from opposite directions are about to meet in the vicinity of any net, or nets, every such net shall be so picked up and removed from the channel as to permit the passage of the vessels without hindrance or delay.

(g) The person operating a net shall securely attach to the corks at each end of such net and to the cork nearest the center thereof, copper tags showing in figures or letters not less than 1 inch in height, the number or name of his vessel.

(h) A boat, with at least one man in it capable of controlling the net, shall be in constant attendance upon each net while it is laid out. Said attendant shall remain at all times in such position as will enable a ready removal of the net to permit the safe passage of vessels without inconvenience or delay.

(i) The end or ends of the net, not attached to a boat, shall be securely attached to a float, painted in red and white vertical stripes about 4 inches wide. The float shall be large enough to display and shall display signals thereon in an upright position and 3 feet in the clear above the surface of the water, and described as follows:

(1) At night a white light visible all around the horizon.

(2) During daylight hours, a flag 18 inches wide by 24 inches long, the color to be solid red above a diagonal line extending from the lower corner on the staff to the upper outer corner, and solid white below that line.

(j) Every vessel attending a net shall display on each side of the bow its registration number, in figures or letters not less than 9 inches high and 5 inches wide in lines 1¼ inches wide, with a clear interval of 2½ inches between each letter and figure. These shall consist of white letters and figures on a black ground, or black letters and figures on a white ground. In case of a documented vessel, its name shall be similarly displayed.

(k) Each boat attending a net shall display by day, in a position at least 4 feet in the clear above the highest portion of the boat, a flag 18 inches wide by 24 inches long as follows: A black flag when the net is between the vessel and the right-hand bank of the waterway looking downstream or seaward; a red flag when the net is between the vessel and the left-hand bank looking downstream or seaward; and a red flag in any case where, on account of interconnecting sloughs or ditches, uncertainty exists as to which is the right and which the left bank.

(l) During the hours for the display of lights, each boat attending a net shall carry concealed from general view a red light and a green light. Upon the approach of any vessel, the boat shall promptly take its position at the end of the net, headed toward the net and in the general direction of its length, and shall display to the approaching vessel in sufficient time to prevent collision with the boat or running into the net, the light or lights which should be shown in the direction of the vessel under the United States rules for running lights on vessels (30 Stat. 96; 33 U. S. C. 172). The lights shall be shown in such manner as to make them visible, and so that the green light shall not be seen on the port side or the red light on the starboard side of the boat.

(m) During fog or thick weather, the person in charge of a fishing boat shall, upon the approach of any vessel, give four short blasts of a fish horn, repeated at intervals, until the approaching vessel is in sight, after which the flag or light signals shall be given from the fishing boat to indicate on which side the approaching vessel should pass.

(n) When fishing in an established anchorage ground, all nets shall be promptly picked up and removed upon the approach of any vessel desiring to moor or anchor therein.

§ 206.90 *Coastal waters of Oregon and Washington and the navigable waters tributary thereto, including Columbia River, Oreg., Wash. and Idaho, and all its navigable tributaries; fishing.* Until further notice all weir, trap and pound fishermen who desire to operate in the coastal waters of the States of Oregon and Washington (In the State of Washington the operation of fish traps for the capture of salmon became illegal by law on and after December 3, 1934. Federal permits will not be issued in violation of State laws, and in the navigable waters tributary thereto, including the Columbia River, Oregon, Washington, and Idaho, and all its navigable tributaries, and under conditions stated as follows, but not otherwise, whose written applications may receive the approval of the Engineer Officer of the United States Army in charge of the locality, are hereby authorized by the Secretary of the Army to construct and maintain weirs, traps, and pounds erected in the usual manner as heretofore, subject to the following conditions:

(a) All persons desiring to erect and maintain weirs, traps, or pounds, under this authority, shall make application to the Engineer Officer of the United States Army in charge of the locality, giving their names, addresses, and locations for weirs, traps or pounds, and evidence that proper licenses have been granted by State authorities. They shall also report to him all changes of ownership or abandonment of any location. Blueprints of sections of these waterways upon which to indicate desired locations for weirs, traps, and pounds may be purchased at the office of the Engineer Officer in charge of the locality.

(b) That all the apparatus to be used and the work authorized to be done in this section shall be subject to the supervision and approval of the local Engineer Officer.

(c) That no weir, trap, or pound shall be located or built in such place or manner as to obstruct or interfere with navigation or to be injurious to the regimen of the river.

(d) The weir, trap, or pound shall be lighted between sunset and sunrise, by and at the expense of the permittee, for the safety of navigation. A light shall be placed at each end of the structure, excepting where the inner end terminates in such a manner that there is no practicable navigation between it and the high-water line of the adjacent shore, in which case no inner light shall be displayed. The outer light shall be white, and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the Department of the Army permit authorizing the erection of the structure of appliance.

There shall also be installed and maintained on the weir, trap, or pound, by and at the expense of the permittee, such additional lights and signals, as may be prescribed in § 209.130 (q) of this chapter, and provision shall be made for proper attendance of all lights and signals, by watchman, or otherwise, so that they shall at all times be in effective condition.

(e) That on the outer end of the weir, trap, or pound, the permittee or owner shall maintain a sign inscribed "U. S. (No. —)", with letters and numerals not less than 2 inches in height, capable of being readily read from a boat or vessel, and failure to keep such sign conspicuously displayed shall be sufficient reason for the cancellation of this authority and for prosecution, as provided in paragraph (f) of this section.

(f) That upon ceasing to use any weir, trap, or pound as hereby authorized, the structure, including all stakes, shall be at once removed by the owner, and failure to so remove the same shall be considered good ground for prosecution of the owner under the provisions of Section 12 of the River and Harbor Act of March 3, 1899 (30 Stat. 1151; 33 U. S. C. 406). Any weir, trap, or pound allowed to go into a condition of disrepair so that it cannot be readily seen and on which the permit number is not conspicuously displayed will be regarded as abandoned, and if not promptly removed or rebuilt will subject the owner to prosecution.

(g) That if future operations by the United States require an alteration in the position of the weir, trap, or pound, or if, in the opinion of the Secretary of the Army, said weir, trap,

or pound shall cause unreasonable obstruction to the free navigation of the said waters, the permittee will be required, upon due notice from the Secretary of the Army and within 30 days thereafter, to remove or alter said weir, trap, or pound, or obstructions caused thereby, without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed. No claim shall be made against the United States on account of such removals or alterations.

(h) That the United States shall in no case be liable for any damage or injury to the structure or work authorized in this section which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

(i) This authority is revocable at will by the Secretary of the Army and shall expire on (as may be specified by the Engineer Officer not exceeding a period of 5 years).

(j) That it is to be understood that this authority does not give any property rights or any exclusive privilege, and that it does not authorize any injury to private property or invasion of private rights, or any infringement of State laws or regulations, nor does it obviate the necessity of obtaining State assent to the work authorized as it merely expresses the assent of the Federal Government so far as concerns the public rights of navigation. (See *Cummings* v. *Chicago*, 188 U. S. 410.)

(k) This section shall take effect and be in force on and after June 7, 1938.

§ 206.93 *Everett Harbor, Wash., and vicinity; gill nets*—(a) *Restricted fishing area northeast, east, and southeast of Gedney Island.* (1) The regulations in this paragraph shall govern fishing with gill nets, within all tidal waters of Possession Sound, Tulalip Bay, Steamboat Slough, Snohomish River, Everett Harbor, and Port Gardner, easterly of a line extending from the most southerly point of the mainland north of the entrance to Tulalip Bay southwesterly to the most northerly point of Gedney (Hat) Island, and of a line extending from the most southerly point of Gedney Island southeasterly to the Great Northern Railway Company's oil dock (approximately latitude 47°57′30″, longitude 122°15′00″); exclusive of waters lying within the Tulalip Indian Reservation.

(2) A tug with tow, whose intended course will take it through waters occupied by gill net gear, shall sound one long blast, followed by two short blasts, of a whistle or horn, and during darkness or fog shall, in addition, indicate its intended course by directing a searchlight beam on such course. Gill net fishermen operating within the indicated course of the tug shall draw in their gear or otherwise maneuver to permit passage of the tug and its tow without hindrance or unreasonable delay.

(3) A tug without tow, if unable to determine the lay of the nets and doubt exists aboard the tug as to the best course to take, may request assistance of the nearest gill net boat which shall, without delay, drop its net and pilot the tug through. If assistance of a pilot boat is not obtainable, or if nets are so concentrated as to make it impracticable to lay a course through the nets, the tug shall proceed as indicated in subparagraph (2) of this paragraph for a tug with tow, and nets shall be lifted or maneuvered out of the way to permit passage of the tug without hindrance or unreasonable delay.

(4) A boat with at least one man in it capable of controlling the net shall be in constant attendance upon each net while it is laid out, except when providing pilot service as provided in subparagraph (3) of this paragraph.

(b) *Prohibited fishing area in Possession Sound between Mukilteo and Columbia Beach.* Fishing with gill nets is prohibited within 440 yards on each side of a straight line connecting the ferry landings at Mukilteo and Columbia Beach.

§207. NAVIGATION REGULATIONS.—Regulations follow for navigation in special areas within the limits covered by this Coast Pilot.

§ 207.612 *San Diego Harbor, Calif.; seaplane restricted area*—(a) *The area.* (1) That portion of the central part of San Diego Bay, opposite National City, inclosed by lines connect-

ing the following points, which are rectangular coordinates and are referred to the U. S. Coast and Geodetic Survey Station "Old Town" as their origin:

"a"—S. 25,015.85, E. 12,419.60.
"b"—S. 27,720.44, E. 16,258.02.
"c"—S. 30,489.60, E. 18,072.88.
"d"—S. 31,932.83, E. 18,239.47.
"e"—S. 34,403.93, E. 19,132.03.
"f"—S. 39,271.04, E. 19,556.43.
"g"—S. 41,814.54, E. 14,009.32.
"h"—S. 41,454.18, E. 13,835.53.
"i"—S. 40,893.33, E. 14,862.42.
"j"—S. 35,648.50, E. 12,581.33.
"k"—S. 36,228.63, E. 11,316.10.
"l"—S. 33,132.35, E. 9,649.61.
"m"—S. 32,481.78, E. 9,250.19.
"n"—S. 32,378.63, E. 9,274.87.
"o"—S. 31,654.25, E. 8,830.15.
"p"—S. 31,629.57, E. 8,726.99.
"q"—S. 30,966.36, E. 8,319.81.
"r"—S. 30,897.59, E. 8,336.26.
"s"—S. 30,812.37, E. 8,283.94.
"t"—S. 30,795.92, E. 8,215.17.
"u"—S. 30,135.58, E. 7,809.77.

(2) The area will be marked by the United States Navy by marine contact seadrome lights flashing amber.

(b) *The regulations.* (1) The area is hereby set aside for the use of seaplanes and their attendant plant and, except as provided in subparagraph (2) of this paragraph, navigation within the area is restricted to seaplanes, their attendant plant, and vessels under the control of the United States.

(2) At such periods as the area may not be required for the use of seaplanes and their attendant plant, navigation by other craft may be permitted, provided permission is obtained in advance from the Commandant, Eleventh Naval District, San Diego, Calif.

§ 207.613 *Pacific Ocean; U. S. Navy restricted area in vicinity of Scripps Institution of Oceanography Pier, La Jolla, Calif.*—(a) *The restricted area.* An area in the Pacific Ocean at La Jolla, California, bounded as follows: Beginning at the seaward end of the Scripps Institution of Oceanography Pier, about 1.5 miles northeast of Point La Jolla Light; thence 205°07′ true, 1,000 feet; thence 270°00′ true, 4,009 feet; thence 00°00′ true, 2,628 feet; thence 78°34′ true, 3,568 feet; thence 138°00′ true, 2,040 feet; thence 205°07′ true, 1,009 feet, to the point of beginning. The corners of the restricted area will be plainly marked with lighted marker buoys by the United States Navy.

(b) *The regulations.* (1) No vessels, other than vessels operated by or for the United States or the Scripps Institution of Oceanography, shall anchor within the restricted area at any time.

(2) Dredging, dragging, seining, other fishing operations, and other activities not under the direction of the United States or the Scripps Institution of Oceanography, which might foul underwater installations within the restricted area, are prohibited.

(3) All vessels entering the restricted area, other than vessels operated by or for the United States or the Scripps Institution of Oceanography, shall proceed across the area by the most direct route and without unnecessary delay.

(4) This section shall be enforced by the Commandant, Eleventh Naval District, San Diego, California, and such agencies as he may designate.

§ 207.617 *Los Angeles and Long Beach Harbors, Calif.; naval restricted areas*—(a) *Seaplane restricted area*—(1) *The area.* That portion of Anchorages C and D (described in § 202.214 (a) (2) and (3) of this chapter), 525 yards wide and approximately 5,250 yards

long, extending 275 yards northwest and 250 yards southeast of a line bearing 68°30′ true from the tank near the center of Reservation Point, Terminal Island, these boundaries passing through the north and south diamond-shaped markers on the stone seawall forming the east side of Reservation Point. The east end of the area is the southwest boundary of the 45-foot Long Beach Harbor entrance channel and the west end is the east boundary of the dredged channel to Fish Harbor.

(2) *The regulations.* (i) Seaplane landings may be made in this area on two hours' notice. All vessels, naval or commercial, anchoring in the area will be required to move within two hours' notice at any time, day or night.

(ii) The area will be patrolled by small craft on the approach of seaplanes intending to land. During the hours of darkness, whenever seaplanes are approaching the area for landing, the east 2,000 yards of the area will be marked by five accurately spaced flat-type rubber buoys showing fixed green lights. Seaplanes will ordinarily approach the area from the east, landing in the east-to-west direction. Prevailing wind at the time of the intended landings will determine the direction of approach.

(b) *Restricted area at Fleet Operating Base.* (1) *The area.* All the waters between the Navy Mole and Terminal Island to the westward of longitude 118°13′10″.

(2) *The regulations.* This area is reserved exclusively for use by naval vessels. Permission to enter the area must be obtained from the enforcing agency.

(c) *Enforcing agency.* The regulations in this section shall be enforced by the Commanding Officer, U. S. Fleet Operating Base, Terminal Island, and such agencies as he may designate.

§ 207.620 *Pacific Ocean in vicinity of Santa Catalina Island, Calif., seaplane restricted area near Avalon.*—(a) *The area.* Beginning at White Rock; thence 55° true, 5,000 feet; thence 325° true, 5,000 feet; thence 235° true, 5,400 feet; thence southeasterly along the shore line to the point of beginning.

(b) *The regulations.* This area is reserved for the use of seaplane landings and take-offs. Floats or buoys are prohibited, except those authorized by the Department of the Army. Anchoring of vessels is prohibited. Vessels are not prohibited from passing through this area provided they proceed as expeditiously as practicable by the most direct route, and give seaplanes the right-of-way at all times.

§ 207.640 *San Francisco, San Pablo Bay, Carquinez Strait, Suisun Bay, San Joaquin River, and connecting waters, Calif.*—(a) *San Francisco Bay north of Alcatraz Island; submarine operating area*—(1) *The area.* Bounded as follows: North boundary, latitude 37°50′38″; east boundary, longitude 122°25′00″; south boundary, latitude 37°50′00″; west boundary, longitude 122°26′10″.

(2) *The regulations.* Prior notification of the dates and times of all operations will be made by local notice to mariners. A patrol boat will direct the movement of vessels passing in the vicinity of the operating area by means of signal light and loud hailer. Vessels traversing this area shall be alert and comply with the orders of the patrol boat. The regulations in this paragraph shall be enforced by the Commandant, Twelfth Naval District, and such agencies as he may designate.

(b) *San Francisco Bay in the vicinity of Alcatraz Island, restricted area*—(1) *The area.* All waters within 200 yards of the shore of Alcatraz Island.

(2) *The regulations.* The use or navigation of the waters within this area by any vessel or craft other than vessels controlled and operated by the United States Government is prohibited unless authorized by an officer of the Department of Justice empowered by the Attorney General of the United States to grant such authority.

(c) *San Francisco Bay in vicinity of Hunters Point; Naval restricted area*—(1) *The area.* Bounded by the shore of the San Francisco Naval Shipyard and the following lines: Beginning at a point on the northerly shore of the Shipyard bearing 292°40′, 950 yards, from Hunters Point Light; thence 35°27′, 730 yards, to the U. S. Pierhead Line; thence 142°55′, 1,300 yards, along the Pierhead Line; thence 180°, 2,450 yards, to the San Francisco-San Mateo County Line; thence 270°, 430 yards, along the County Line; thence 305°27′, 1,313 yards, to and

along the southwesterly side of South Basin; and thence due north, 413 yards, to the southwesterly shore of the Shipyard.

NOTE: All bearings in this section are referred to true meridian.

(2) *The regulations.* No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commander, San Francisco Naval Shipyard, shall navigate, anchor, or moor in this area.

(d) *San Francisco Bay at South San Francisco; seaplane restricted area*—(1) *The area.* Bounded by the westerly shore of South San Francisco Bay and the following lines: Beginning at a point on shore bearing 147°30′, 2,930 yards, from Aviation Beacon "Aero" at San Francisco Airport; thence to points which are the following bearings and distances from Aviation Beacon "Aero": 104°, 10,100 yards: 90°, 7,290 yards; 53°, 6,120 yards; and 03°, 2,420 yards.

(2) *The regulations.* No surface watercraft shall be operated or anchored in this area except by specific permission of the Commanding Officer, Coast Guard Air Station, South San Francisco. Persons desiring to navigate vessels across the area shall give advice of their intention to do so and make request to the Commanding Officer not less than four hours in advance of the time they desire to take the vessel across the area.

(e) *San Francisco Bay; seaplane restricted area, Naval Air Station, Alameda*—(1) *The seaplane restricted area.* The waters of San Francisco Bay south of the Naval Air Station, Alameda, bounded on the north by the breakwater and turning basin at the Naval Air Station, and lines from Air Station Channel Lighted Buoy 6 to Air Station Channel Entrance Lighted Buoy 2; bounded on the west, south, and east by lines connecting Air Station Channel Entrance Lighted Buoy 2 and points which are the following bearings and distances from Hunters Point Light: 17°, 4,050 yards; 85°, 5,300 yards; 86°, 7,075 yards; 73°, 9,160 yards; and 70°30′, 9,300 yards; and bounded on the northeast by a line running from the last-described point 299° to the breakwater.

(2) *The take-off zone.* The area in San Francisco Bay southeast of the southeast boundary of General Anchorage 8 (described in § 202.224 (a) of this chapter); north of the north boundary of General Anchorage 9 (described in § 202.224 (a) of this chapter); northwest of the seaplane restricted area described in subparagraph (1) of this paragraph; and southwest of the southwest boundary of General Anchorage 9-A (described in § 202.224 (a) of this chapter).

(3) *The regulations.* (i) Except as provided in subdivision (ii) of this subparagraph, no surface watercraft shall be operated or anchored in the seaplane restricted area except those attendant upon seaplane operations of the United States Navy or such other watercraft as have been given specific permission by the enforcing agency.

(ii) Surface watercraft may pass through the northerly part of the seaplane restricted area in a channel-way 800 feet wide adjacent to the southerly side of the breakwater protecting the turning basin at the Naval Air Station, turning at the western end of the breakwater, in a northwesterly direction, and connecting with the channel to the turning basin. Craft navigating this channel-way shall pass directly through and shall obey such verbal instructions regarding passage as may be given from the control tower on the breakwater.

(iii) Vessels entering the take-off zone shall proceed through as necessary without delay. This area shall not be used for such purposes as drills, swinging ship, or other operations which would delay the vessel beyond the time required for normal transit. The enforcing agency may make exceptions to the provisions of this subparagraph if seaplane operations permit.

(iv) The regulations in this paragraph shall be enforced by the Commander, Naval Air Station, Alameda, and such agencies as he may designate.

(f) *San Francisco Bay and Oakland Inner Harbor; restricted areas in vicinity of Naval Air Station, Alameda*—(1) *The areas.*

(i) The waters of San Francisco Bay within 100 yards of the Naval Air Station, Alameda.

(ii) The waters of the entrance channel to Oakland Inner Harbor (San Antonio Estuary) between the westerly end of the rock wall on the south side of the channel and the easterly boundary of the Naval Air Station.

(2) *The regulations.* (i) No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commandant, United States Naval Air Station,

Alameda, shall navigate, anchor, or moor in the area described in subparagraph (1) (i) of this paragraph.

(ii) No vessel without special authority from the Commander, Twelfth Coast Guard District, shall lie, anchor, or moor in the area described in subparagraph (1) (ii) of this paragraph. Vessels may proceed through the entrance channel in process of ordinary navigation or may moor alongside wharves on the Oakland side of the channel.

(g) *Oakland Harbor in vicinity of Naval Supply Center, Oakland; navigation.* All vessels over 1,000 tons when bound for the Naval Supply Center, Oakland, shall heave to well outside the channel, and wait to be boarded by a Naval Supply Center pilot in order to safeguard outbound vessels. The Naval Supply Center pilot will advise and assist the regular master. Whistle signal for the Naval Supply Center pilot is one long blast and one short blast followed by a pause and three short blasts.

(h) *San Francisco Bay in vicinity of Naval Net Depot, Tiburon; restricted area*—(1) *The area.* Beginning at Bluff Point; thence approximately 53°, 1,300 yards, to California City Lighted Horn Buoy 1; thence approximately 323°, 1,800 yards, to California City Lighted Horn Buoy 3; thence 270°, approximately 3,000 yards, to the shore: and thence southeasterly along the shore to the point of beginning.

(2) *The regulations.* No vessels except those engaged in naval operations shall navigate or anchor in this area without the permission of the Commander, Twelfth Coast Guard District.

(i) *San Francisco Bay in vicinity of Naval Fuel Annex, Molate Point; restricted area*—(1) *The area.* Bounded by the easterly shore of upper San Francisco Bay and the following lines: Beginning at a point on shore bearing 17°, 800 yards, from "Tree" at Molate Point; thence 270°, 870 yards; thence 180°, 1,100 yards; and thence 123° to the shore.

(2) *The regulations.* Vessels not operating under supervision of the local military or naval authority or public vessels of the United States shall not enter this area except by specific permission of the Commander, Twelfth Coast Guard District.

(j) *Pinole Shoal Channel, San Pablo Bay; use, administration, and navigation.* (1) The use of Pinole Shoal Channel is reserved for navigation of vessels of greater draft than 20 feet or by tow-boats with tows drawing more than 20 feet. Vessels operated by either sail or power and tows drawing less than 20 feet are not permitted to use this channel or to cross it at any point between San Pablo Bay Lighted Buoy 5 and San Pablo Bay Lighted Bell Buoy 13.

(2) Vessels permitted to use Pinole Shoal Channel under subparagraph (1) of this paragraph shall proceed through the channel at a reasonable speed so as not to endanger other vessels or interfere with any work which may become necessary in maintaining, surveying, or buoying the channel, and they shall not anchor in the channel, except in cases of emergency such as fog or accident which would render progress unsafe or impossible.

(3) This paragraph shall not be construed as prohibiting any necessary use of the channel by any Government boats while on Government duty, or in emergencies by pilot boats, whether steam or sail, or by police boats, or by the vessels of passenger steamship lines operated on regular schedules.

(k) *San Pablo Bay, Carquinez Strait, and Mare Island Strait in vicinity of U. S. Naval Shipyards, Mare Island; restricted area*—(1) *The area.* The waters of San Pablo Bay, Carquinez Strait, and Mare Island Strait, within 100 yards of the shore of that part of the Navy Yard, Mare Island, south of the causeway between the City of Vallejo and Mare Island and extending continuously therefrom southeasterly, southwesterly, and northwesterly around the Navy Yard to its northwesterly limit on the waters of San Pablo Bay, and the waters within 50 yards of any part of the berthing piers at the Navy Yard.

(2) *The regulations.* No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commandant, U. S. Navy Yard, Mare Island, shall navigate, anchor, or moor in this area.

(1) *Carquinez Strait in vicinity of Benicia Arsenal, Benicia; restricted area*—(1) *The area.* Within 100 yards of the shore or of the wharf at the Benicia Arsenal.

(2) *The regulations.* No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commander, Twelfth Coast Guard District, shall enter this area.

(m) *Suisun Bay at Port Chicago; naval magazine restricted area*—(1) *The area.* Beginning at a point on the shore and on the easterly side of the mouth of a small slough bearing 98° 30′, 2,133 yards, from Point Edith Light; thence 340° 30′, 400 yards, to the high water shore line of the most southerly of Seal Islands; thence 69° 30′, 2,050 yards; thence 83° 30′, 866 yards; thence 102° 30′ 2,000 yards; thence 98°, 1,365 yards; thence 180°, 400 yards, to the high water shore line; thence following the high water shore line in a general southwesterly direction to the point of beginning.

(2) *The regulations.* Vessels not operating under the supervision of the local military or naval authority shall not enter this area except by specific permission of the Commander, Twelfth Coast Guard District.

(n) *San Joaquin River Deep Water Channel between Suisun Bay and the easterly end of the channel at Stockton; use, administration, and navigation*—(1) *Maximum speed.* The maximum speed for all ocean-going craft shall not exceed 10 miles per hour above the lower end of New York Slough, seven miles per hour above Criminal Point, or five miles per hour while passing any wharf, dock, or moored craft. As used in this subparagraph, the speed of a vessel when navigating with the current shall be its rate of movement in excess of the velocity of the current.

(2) *Passing.* All craft passing other boats, barges, scows, etc., in motion, moored or anchored, shall slow down and take every necessary precaution to avoid damage.

(3) *Right-of-way.* (i) United States dredges, tugs, launches, derrick boats, and similar plant of contractors executing river and harbor improvement work for the United States, and displaying the signals prescribed by the regulations contained in Part 201 of this chapter shall have the right of way and other craft shall exercise special caution to avoid interference with the work on which the plant is engaged. Dredges, whether Federal or contractors' plant, working the channel must, however, take special care to give ocean-going vessels sufficient room for passing, and must lift both spuds and the ladder, and pull clear, if an adequate width of clear channel cannot otherwise be provided. Ocean-going vessels may show at the masthead a black ball not more than 20 inches in diameter as a signal to the dredge, and may also blow five long blasts of the whistle when within reasonable hearing distance of the dredge, such signal to be followed at the proper time by the passing signal described in the local pilot rules. The dredge shall promptly acknowledge both signals in the usual manner.

(ii) Light-draft vessels when meeting or being overtaken by ocean-going vessels, shall give the right of way to such vessels by making use of the shallow portions of the waterway.

(iii) Rafts and tows must promptly give the channel side demanded upon proper signal by a vessel, and must be handled in such a manner as not to obstruct or interfere with the free use of the waterway by other craft.

(4) *Collisions.* (i) Ocean-going vessels in collision in the channel or turning basin must, if still afloat and in a condition making anchorage necessary, be immediately removed to an approved anchorage ground, or if in such condition that beaching is necessary, they shall be temporarily beached on the northwest side of Mandeville Island or in the Old River.

(ii) Light-draft vessels suffering collision shall be disposed of as directed by the District Engineer, Corps of Engineers, or his authorized representative.

(5) *Wrecks.* In no case following accidents of fire or collision will a vessel be allowed to remain either anchored or grounded in the channel, or beached at any place where it endangers other vessels, while settlement is pending with the underwriters.

(6) *Other laws and regulations.* In all other respects, the existing Federal laws and rules and regulations affecting navigable waters of the United States will govern in this channel.

(7) *Enforcement.* Except as otherwise provided in this paragraph, the Commander, Twelfth Coast Guard District, shall have immediate supervision over the enforcement of the regulations in this paragraph in Suisun Bay, New York Slough, and the San Joaquin River Deep Water Channel.

§ 207.645 *Pacific Ocean and Arena Cove; U. S. Navy restricted areas in vicinity of Point Arena, Calif.*—(a) *The restricted areas.* (1) The waters of Arena Cove bounded by the northerly shore of Arena Cove and by a line beginning at the shoreward end of the Coast

Guard Pier and Marine Ways; thence along the northerly side of the said ways to the northwest corner thereof; thence to points the following true bearings and distances from the outer end of the Arena Cove Fish Company pier: 265°, 700 yards; 241°, 1,200 yards; 244°, 1,500 yards; and 289°, 1,600 yards.

(2) A rectangular area in the Pacific Ocean 1,200 yards wide and three miles long, the centerline of which bears 262° true from the outer end of the Arena Cove Fish Company wharf, and the easterly boundary of which is the westerly boundary of the area described in subparagraph (1) of this paragraph extended to the south.

(b) *The regulations.* (1) No vessel shall cast or drag anchor, drag grapnels, or use heavy fishing drags in these areas.

(2) Permanent mooring buoys may be installed within the areas subject to Department of the Army permits being obtained for such installation.

(3) This section shall be enforced by the Captain of the Port, U. S. Coast Guard, San Francisco, and such agencies as he may designate.

§ 207.660 *Coquille River, Oreg.; logging on North Fork between its mouth and Gravel Ford, at the junction of the North and East Forks.* During the 144 hours extending from midnight of each Wednesday to midnight of the following Tuesday loose timber and logs, and sack rafts (so called) of timber and logs, may be run, and parties engaged in this business may use the waterway in such reasonable manner as may be necessary for the proper transaction of such business: *Provided,* That during any other period than that designated above said parties shall so arrange their work as to leave the channel of said section of the river free from floating logs and other timber and shall not obstruct or delay any other navigation interest.

§ 207.663 *South Fork of Coos River, Oreg.; logging in tidal section.* (a) During the months of August, September, and October loose timber and logs and sack rafts of timber and logs, hereinafter referred to as logs, may be floated in the tidal section of the South Fork of Coos River above the mouth of Bessie Creek, at the times and under the conditions hereinafter prescribed, on Monday only of each week: *Provided,* That if it is impracticable because of insufficient stream flow above the tidal section to float logs into the tidal section on any Monday, they may be floated in the tidal section, at the times and under the conditions hereinafter prescribed, on the first day between that Monday and the following Monday when the stream flow will permit

(b) From November to July, both inclusive, logs may be floated in the tidal section of the South Fork of Coos River above the mouth of Bessie Creek, at the times and under the conditions prescribed in paragraphs (c) to (j) of this section on Tuesday and Friday only of each week.

(c) On any of the days designated in paragraphs (a) and (b) of this section when the floating of logs is permitted in the tidal section above the mouth of Bessie Creek, they may be floated into the tidal section, at or near the head of tidewater, not more than two hours before the time of high tide at the point of entry, and be floated to the mouth of Bessie Creek: *Provided,* That such movement is handled expeditiously, and is entirely completed within five hours after the time of high tide at the point of entry.

(d) Two high tides normally occur each day. The high tide upon which logs may be floated into the tidal section above the mouth of Bessie Creek shall be the tide that reaches high slack at the point of entry nearest 12:00 o'clock meridian, Pacific standard time. The time of high tide at the head of the tidal section, for the purpose of this section, shall be considered as two hours and forty minutes after the predicted time of high tide at Humbolt Bay, California, the port of reference for Coos Bay, as published by the Coast and Geodetic Survey, Department of Commerce.

(e) In order that the river may be cleared in advance of an anticipated freshet, whenever the river stage above the tidal section rises more than two feet above the normal winter level as determined by the District Engineer, Corps of Engineers, in charge of the waterway, logs may be floated in the tidal section above the mouth of Bessie Creek.

(f) A single floating sheer boom shall be swung across the river above the mouth of Bessie Creek, at a location approved by the District Engineer, for the purpose of catching logs being floated as prescribed in paragraph (e) of this section: *Provided,* That such boom shall be in place only during the period in which the floating of logs is under way: *Provided further,* That at all times when such boom is swung across the river so as to obstruct or interfere with navigation a competent operator shall be in attendance who shall, upon the approach of any craft or tow desiring to pass either upstream or downstream, promptly swing the boom so as to clear the channel and allow such craft or tow to pass.

(g) A written or printed notice giving the day and hour at which time the floating of logs is contemplated in accordance with paragraphs (a) and (b) of this section shall be posted at least twenty-four hours prior thereto at such place at or near the mouth of the South Fork as shall be prescribed by the District Engineer, and shall also be attached to the warning flag pole provided for in paragraph (h) of this section.

(h) At all times between sunrise and sunset when logs are being moved in the tidal section above the mouth of Bessie Creek, and during a period of three hours before such movement is to begin, a red flag not less than three feet square shall be flown from a staff on the river bank near the mouth of Bessie Creek, so located that it can be plainly seen by operators of river craft proceeding upstream in that vicinity, and said flag shall not be flown at any time other than herein designated. Between sunset and sunrise a red light, instead of a red flag, shall be so displayed. After completion of each movement of logs the red signal shall be promptly removed.

(i) In that portion of the South Fork below the mouth of Bessie Creek, the floating of logs shall be prohibited at all times, and rafts shall not exceed 650 feet in length and 45 feet in width.

(j) This section shall not affect the liability of persons in charge of logging operations for any damages resulting therefrom.

§ 207.670 *Columbia and Willamette Rivers; navigation.* (a) No steam vessel shall be navigated on the Willamette River between Ross Island and the head of Swan Island at a speed of more than 8 statute miles per hour.

(b) No steam vessel shall be navigated on the Willamette River between the head of Swan Island and the Associated Oil Company's dock, north of Linnton, at a speed of more that 12 statute miles per hour.

(c) Every steam vessel passing dredges or other plant, that may be employed on the river improvement or at anchor, in the Willamette and Columbia Rivers shall be navigated under a slow bell at a speed not more than 6 statute miles per hour.

§ 207.680 *Willamette River, Oreg.; use, administration, and navigation of canal and locks at Willamette Falls, Oregon City.* (a) The canal and all its appurtenances shall be in charge of the officer of the Corps of Engineers, United States Army, detailed for that duty by the Secretary of War. His representative at the locality shall be the lock master, who shall receive his orders and instructions from the Engineer officer in charge. In case of emergency, however, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Engineer officer in charge.

(b) The lock master shall be charged with the immediate control and management of the canal and locks and of the grounds and public property pertaining thereto. He shall see that all laws, rules, and regulations for the use of the canal and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the canal or the grounds pertaining thereto, whether navigating the canal or not. In case of the absence or disability of the lock master, his duty shall be performed by an assistant or other employee to be designated by the Engineer officer in charge.

(c) The lock master is enjoined to be diligent and attentive in the performance of his duties, courteous but firm to all with whom he comes in contact, and never to lose sight of the fact that the purpose of his employment is to facilitate the use of the canal.

(d) *Authority of lock master.* No one shall cause any movement of any vessel, boat, or other floating thing in the canal except by or under the direction of the lock master or his assistants.

(e) *Signals.* All steamers desiring lockage shall signal the same by one long and one short blast of the whistle.

(f) *Use of canal.* When two or more vessels of the same class are ready at the same time to be passed through the canal they shall be passed through in the order in which they arrived at the canal and became so ready, unless it is otherwise directed by the lock master. When vessels are waiting at both ends of the canal lockages will be made in alternate directions unless the lock master should decide that it would better facilitate navigation for them to be made otherwise.

(g) *Entrance to locks.* The lock master shall decide whether one or more vessels may be locked through at the same time, and no one shall attempt to enter the locks with a vessel or attempt to cause a vessel to enter the locks until he is authorized by the lock master to do so; and no one shall take a vessel, or cause a vessel to be taken, within the limits of 500 feet above the upper gate and 300 feet below the lower gate at all, except for the purpose of entering the locks; and not for this purpose until it has been indicated to him by a proper person by signal that the lock is ready to receive it. And all parties running vessels within these limits must run them under "slow bell" and keep them constantly under control.

(h) *Mooring in locks.* When a vessel is in a lock the persons in charge of it shall fasten one headline, one spring line, and such other lines as may be necessary to the snubbing hooks, or other attachments provided for the purpose, and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(i) *Delays.* No person in charge of a vessel shall permit it to in any way obstruct the locks or free navigation of the canal, or to delay in entering or leaving the locks after the proper signal is given; and the willful neglect of any lawful order by anyone in charge of a vessel in the locks or the canal shall be construed as permitting the vessel to obstruct the free navigation of the canal.

(j) *Mooring outside locks.* Vessels shall be moored to the canal walls by persons in charge of them only at such places as may be provided for that purpose, and then only in such a manner as not to interfere with navigation.

(k) *Landing of freight.* No one shall land freight or baggage on or over the walls of the canal or locks so as to in any way delay or interfere with navigation or the operation of a lock; and freight and baggage consigned to Oregon City locks shall be landed only at such places as may be provided for this purpose.

(l) *Refuse in canal.* No material of any kind shall be thrown or swept into the canal or locks.

(m) *Injury to locks or fixtures.* Persons in charge of vessels must use great care to prevent them from striking any gate or appurtenance thereto; and all boats with metal nosings, or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, or any part of the canal, will not be permitted to enter the locks unless provided with suitable buffers and fenders.

(n) *Handling the gates and machinery.* No person, other than those duly authorized by the United States Engineer officer in charge of the canal, shall open or close any valve or gate, or interfere with any mechanism or appliance connected with the operation of the locks, or located on the canal grounds, nor shall anyone interfere with the employees in the discharge of their duties, except that in case the lock master deems assistance necessary he may call therefor upon the master of any vessel using the locks, and when so called upon such master shall render the assistance called for, or cause it to be rendered.

(o) *Statistics.* Masters or pursers of vessels shall make to the lockmaster or his authorized assistant on each passage such written statement of passengers, freight, and net registered tonnage as may be indicated by blanks approved by the Secretary of War and furnished such masters or pursers for this purpose.

(p) *Trespass.* No one shall trespass on the grounds or buildings, and everyone shall be deemed guilty of trespass within the meaning of this paragraph who shall willfully or carelessly damage or disfigure the canal or any part thereof, or any building or appliance on the

grounds, or who shall carry on any business or trading of any sort, or shall build any fishing stand or lead, or set any fish net within the limits of the reservation, or do any act to or on the grounds or buildings which would be recognized by law as a trespass.

§ 207.690 *Yamhill Lock, Yamhill River, Oreg.; use, administration, and navigation.* (a) The lock and all its appurtenances shall be in charge of the officer of the Corps of Engineers, United States Army, detailed for that duty by the Secretary of the Army. His representative at the locality shall be the lock master, who shall customarily receive his orders and instructions from the Engineer officer in charge. In case of emergency, however, the lock master shall have the authority to take such steps as may be immediately necessary without waiting for instructions from the Engineer officer in charge, but shall inform him of such action as soon as practicable thereafter.

(b) The lock master shall be charged with the immediate control and management thereof, and of the grounds and public property pertaining thereto. He shall see that all laws, rules, and regulations for the use of the lock and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or the grounds pertaining thereto, whether navigating the lock or not. In case of the absence or disability of the lock master his duty shall be performed by such other employee to be designated by the Engineer officer in charge.

(c) The lock master is enjoined to be diligent and attentive in the performance of his duties, courteous but firm to all with whom he comes in contact, and never to lose sight of the fact that the purpose of his employment is to facilitate the use of the lock.

(d) *Authority of lock master.* No one shall cause any movement of any steamboat, barge, or other floating thing, in the lock, except by or under the direction of the lock master or his assistants.

(e) *Signals.* All steamboats desiring lockage shall signal the same by one long and two short blasts of the whistle; the signal for leaving the lock will be one short blast of the whistle.

(f) *Use of lock.* When two or more steamboats of the same class are ready at the same time to be passed through the lock they shall be passed through in the order in which they arrived and became so ready, unless it is otherwise directed by the lock master in immediate charge at the time. If boats are waiting at both ends of the lock, lockages will be made in alternate directions, unless the lock master in immediate charge at the time should decide that it would better facilitate navigation for them to be made otherwise.

(g) *Entrance to locks.* (1) The lock master in immediate charge shall decide whether one or more boats may be locked through at the same time, and no boat shall attempt to enter the lock until the signal to do so is given by the lock master. All boats shall run under "slow bell" when approaching or leaving the lock.

(2) No boat of any kind shall enter the lock drawing more water than is shown by the lock gages.

(h) *Mooring in locks.* When a boat is in the lock the person in charge of it shall fasten one head line, one spring line, and such other lines as may be necessary to the snubbing hooks provided for the purpose, and the lines shall not be loosed until the signal is given for the boat to leave the lock.

(i) *Delays.* No person in charge of a boat shall permit it to in any way obstruct the locks or free navigation of the lock, or to delay in entering or leaving the lock after the proper signal is given; and the willful neglect of any lawful order by anyone in charge of a boat in the lock shall be construed as permitting the boat to obstruct the free navigation of the lock.

(j) *Tows.* Persons in charge of a boat having a tow shall take the same ahead or alongside at a distance of at least 300 feet from the gate nearest the end of the lock which the tow is approaching and keep it in such position until clear of the last gate at the end out of which it is passing.

(k) *Mooring outside lock.* Boats shall be moored to the lock walls or revetments by persons in charge of them only at such places as may be provided by the lock master, and then only in such a manner as not to interfere with navigation.

(l) *Landing of freight.* No one shall land freight or baggage on or over the walls of the lock so as to in any way delay or interfere with navigation or the operation of the lock; and freight and baggage consigned to Yamhill Lock shall be landed only at the place provided at the upper end of the lock, or on the revetment below the lower end of west wall.

(m) *Refuse in lock.* No material of any kind shall be thrown or swept into lock.

(n) *Injury to lock or fixtures.* Persons in charge of boats must use great care to prevent them from striking any gate or appurtenance thereto; and no one shall take any boat into the lock or have one therein, which is not at the time free from projecting irons and rough surfaces that would be liable to damage the gates, lock walls, etc. All boats must be provided with suitable fenders.

(o) *Handling the gates and machinery.* No person, other than those duly authorized by the United States Engineer office in charge of the lock, shall open or close any valve or gate, or interfere with any mechanism or appliance connected with the operation of the lock, or located on the lock grounds, nor shall anyone interfere with the employees in the discharge of their duties, except that in case the lock master deems assistance necessary he may call therefor upon the master of any boat using the lock, and when so called upon such master shall render the assistance called for, or cause it to be rendered.

(p) *Statistics.* Masters or pursers of vessels shall make to the lock master on each passage such written statement of passengers, freight, and registered tonnage as may be indicated by blanks approved by the Secretary of War, and furnished such masters or pursers by the lock master in charge.

(q) *Trespass.* No one shall trespass on the grounds or buildings, and everyone shall be deemed guilty of trespass within the meaning of this paragraph who shall willfully or carelessly damage or disfigure the lock or dam or any part thereof, or any building or appliance on the grounds, or who shall carry on any business or trading of any sort, or do any act to or on the grounds or buildings of the United States which would be recognized by law as a trespass.

(r) *Effective date.* This section shall be in force on and after October 31, 1899.

§ 207.700 *Bonneville Navigation Lock and approach channels, Columbia River, Oreg.; use, administration, and navigation.* (a) The lock and its approach channels, and all its appurtenances, shall be in charge of the district engineer, Engineer Department at Large, in charge of the locality. His representative at Bonneville shall be the superintendent of the lock, who shall customarily receive orders and instructions from the Engineer officer in charge. In case of emergency, however, the superintendent shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Engineer officer.

(b) *Immediate control in superintendent.* The superintendent of the lock shall be charged with the immediate control and management thereof, and of the area set aside as the lock area, including the lock approach channels. He shall see that all laws, rules, and regulations for the use of the lock and lock area are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or the lock area, whether navigating the lock or not. In case of the absence or disability of the superintendent, his duty shall be performed by an assistant superintendent or other lock officer to be designated by the officer in charge.

(c) *Authority of lock officer.* No one shall cause any movement of any vessel, boat or other floating thing in the lock or approaches except by or under the direction of the superintendent or his assistants.

(d) *Signals.* All craft desiring lockage shall signal the same by two long and two short blasts of the whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast. Permission to leave the lock will be given by one short blast.

(e) *Permissible dimensions of boats.* The lock chamber is 76 feet wide by 500 feet long in the clear; boats or rafts of less size than the dimensions given can pass through the lock. The upper sill has an elevation of plus 40 and the lower sill minus 16, corresponding to the elevations shown on the gages which are located on the south wall of the lock. The controlling

depth on the lower sill at adopted low water is 24 feet. A boat must not attempt to enter the lock if its dimensions or draft are greater than above indicated, with due allowance for clearance.

(f) *Precedence at locks.* Ordinarily the boat arriving first at the lock will be locked through first; and in case of boats or other craft approaching the lock simultaneously from opposite directions the ascending boat or craft will ordinarily be locked through first; but when several boats or other craft are to be passed, precedence shall be given:

(1) *First.* To boats and craft owned by the United States or employed upon river and harbor improvement work.

(2) *Second.* To passenger boats.

(3) *Third.* To freight and tow boats.

(4) *Fourth.* To rafts.

(5) *Fifth.* To small vessels and craft bent on pleasure only.

(g) *Loss of turn.* Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(h) *Entry of lock.* The lock officer in immediate charge shall decide whether one or more vessels may be locked through at the same time; and no one shall attempt to enter the lock with a vessel, or attempt to cause a vessel to enter the lock, until he is authorized by such lock officer to do so.

(i) *Lockage of small boats.* Pleasure boats, skiffs, fishing boats, and other small craft will be locked through at one lockage in the morning, and at one lockage in the evening, and, as a rule, separate lockages at other times for such craft will not be made, but such craft will be locked through at other times with larger boats, and will be given advantage of suitable opportunities.

(j) *Mooring.* All boats, rafts, and other craft, when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose; and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(k) *Mooring in approaches prohibited.* The mooring of boats or other craft in the approaches to the lock where such mooring will interfere with navigation of the lock is prohibited. Rafts to be passed through the lock shall be moored in such manner as not to close or interfere with the navigation of the lock or its approaches, and the sections for locking shall be brought into the lock as directed by the lock officer. After passing through the lock the sections shall be reassembled at such a distance from the entrance as not to obstruct navigation of the lock and approaches.

(l) *Waiting for lockage.* Boats and tows waiting for lockage will remain in the approach channels. No craft will be permitted to enter or leave the lock until the gates are fully in the gate recesses and the lock officer has given the signal for the boat to be moved.

(m) *Delay in lock.* Boats or barges must not obstruct navigation by unnecessary delay in entering or leaving the lock. After leaving the lock barges must be so arranged in the approach channel that the entrance to the lock will not be obstructed.

(n) *Damage to lock or other structures.* This section shall not affect the liability of the owners and operators of vessels for any damage caused by their operations to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the approach channels. All boats with metal nosings or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(o) *Tows.* Persons in charge of a vessel having a tow shall take the same alongside at a distance of at least 300 feet from the gate at the end of the lock which the tow is approaching, and keep it alongside until clear of the gate at the end from which it is passing.

(p) *Crew to move craft.* The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts and other craft into and out of the lock easily and promptly.

(q) *Handling valves, gates, and bridge.* No person, unless authorized by the superintendent or his agents, shall open or close any bridge, gate, valve, or in any way interfere with the

employees in the discharge of their duties; but the lock officer may call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance the men so employed shall be strictly under the orders of the lock officer. Masters of boats refusing to give such assistance when it is requested of them may be denied the use of the lock by the officer in charge.

(r) *Use of canal as ice harbor.* Boats will be permitted to use the lock and approach channels as an ice harbor whenever danger from ice is imminent, but all such craft must leave the lock when in the opinion of the superintendent navigation can be resumed.

(s) *Landing of freight.* No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operations of the lock; and freight and baggage consigned to Bonneville project shall be landed only at such places as are designated by the superintendent.

(t) *Refuse in lock.* No material of any kind shall be thrown or swept into the lock, and no material of any kind shall be deposited in the lock area.

(u) *Statistics.* Masters or pursers of vessels shall make to the superintendent on each passage through the lock, such written statement of passengers, freight, and registered tonnage and other information as may be indicated on forms furnished such masters or pursers by the lock officer in charge. Failure to furnish this statement will cause the offending boats to be refused passage through the lock.

(v) *Trespass.* (1) No one shall trespass on the area or buildings, and everyone shall be deemed guilty of trespass within the meaning of this paragraph who shall willfully or carelessly damage or disfigure the lock or any part thereof, or any building or appliance on the grounds, or who shall carry on any business or trading of any sort, or shall build any fishing stand or lead, or set any fish net within the limits of the reservation, or do any act to or on the grounds or buildings which would be recognized by law as a trespass.

(2) All persons found upon the grounds and works who are not employed by the United States about the lock, or who are not at the time necessarily present by reason of their engagement in commerce by water, or who are not passengers temporarily landed from boats while passing through the lock, will be deemed trespassers thereon; *Provided,* That, without permission, boats shall not land excursion or picnic parties on United States lands or works, and that if such parties be so landed they shall be held and deemed to be trespassers. Lounging, visiting, or remaining in or about any office, house, yard, shop, shed, bridge, or other storehouse belonging to the lock is forbidden.

(w) *Persistent violation of regulations.* If the owner or master of any boat persistently violates this section after due notice of the same, the boat may be removed from the lock and thereafter refused passage by the officer in charge.

(x) *Restricted areas.* All waters of the Columbia River and Bradford Slough within 1,000 feet above and 2,000 feet below the spillway dam and 400 feet above and 600 feet below the power house are hereby designated as restricted areas. No vessel or other floating craft shall enter or remain in any of the restricted areas at any time without first obtaining permission from the District Engineer, Corps of Engineers, or his duly authorized representative. The restricted areas will be designated by signs posted in conspicuous and appropriate places.

§ 207.710 *Dalles-Celilo Canal, Columbia River; use, administration, and navigation.* (a) The canal and all its appurtenances shall be in charge of the officer of the Corps of Engineers, United States Army, detailed for that duty by the Secretary of the Army. His representative at the locality shall be the superintendent of the canal, who shall customarily receive his orders and instructions from the Engineer officer in charge. In case of emergency, however, the superintendent shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Engineer officer in charge.

(b) The superintendent of the canal shall be charged with the immediate control and management thereof and of the grounds and public property pertaining thereto. He shall see that all laws, rules, and regulations for the use of the canal and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the canal or the grounds pertaining thereto, whether navigating the canal or not. In case

of the absence or disability of the superintendent, his duty shall be performed by an assistant superintendent or other employee to be designated by the officers in charge.

(c) The superintendent is enjoined to be diligent and attentive in the performance of his duties, courteous but firm to all with whom he comes in contact, and never to lose sight of the fact that the purpose of his employment is to facilitate the use of the canal.

(d) *Authority of canal officer.* No one shall cause any movement of any vessel, boat, or other floating thing in the canal except by or under the direction of the superintendent or his assistants.

(e) *Signals.* (1) All vessels desiring to enter the canal or any of its locks from either direction shall signal by two long and two short blasts of the whistle.

(2) A vessel approaching the downstream end of the canal shall not give the signal (1) until opposite the post on Oregon shore marked "Whistle for locks."

(3) A vessel approaching the upstream end of canal shall not give the signal (1) until it has reached the post on the Oregon shore marked "Whistle for locks."

(4) In navigating the canal, vessels will be governed by rule V of the rules and regulations for the government of pilots navigating seas, gulfs, bays, sounds, or rivers, adopted by the United States Coast Guard. (See § § 80.5 and 90.6 of this title.)

Rule V: Whenever a steamer is nearing a sharp bend or curve in the channel where, from the heights of the banks or other causes, a steamer approaching from the opposite direction cannot be seen from a distance of a half a mile, the pilot of such steamer, when he shall arrive within half a mile of such curve or bend, shall give signal by one long blast of the steam whistle, which signal shall be answered by a similar blast given by the pilot of any approaching steamer that may be within hearing. Should such signal be so answered by a steamer upon the farther side of such bend, then the usual signals for the meeting and passing shall immediately be given and answered, but if the first alarm signal of such pilot be not answered, he is to consider the channel clear and govern himself accordingly.

(5) A vessel approaching a drawspan which is closed shall signal for opening the draw by one long and one short blast of the whistle. Vessels or other craft without steam power shall hail the bridge by horn or megaphone, or draw tender may be notified by verbal communication of the desire to pass through the draw.

(6) The draw shall be opened with the least possible delay upon receiving the signal: *Provided,* That in case of a railway bridge, the following subdivisions shall apply:

(i) The owner of, or agency controlling, the bridge will not be required to keep a draw tender in constant attendance at the bridge.

(ii) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of, or agency controlling, the bridge.

(iii) Upon the receipt of such notice, the authorized representative of the owner of, or agency controlling, the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(iv) The owner of, or agency controlling, the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can easily be read at any time a copy of this section, together with a notice stating exactly how the representative specified in subdivision (ii) of this subparagraph may be reached.

(v) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at least once each quarter to make certain that the machinery is in proper order for satisfactory operation.

(vi) This section, which shall take effect and be in force on and after September 28, 1936, may be revoked upon 30 days' notice by the Secretary of the Army whenever, in his judgment, the interests of navigation so warrant.

(7) Vessels shall not attempt to pass the bridge until the draw has been fully opened and the signal received for passing.

(f) *Permissible dimensions of boats.* The lock chambers are 45 feet wide by 270 feet long in the clear; boats of less size than the dimensions given can pass through the locks. The minimum depth on lock sills is 7 feet and in the canal trunk 8 feet, a boat must not attempt to enter the canal if its dimensions or draft are greater than above mentioned.

949285—52——9

(g) *Precedence at locks.* Ordinarily the boat arriving first at a lock will be locked through first; and in case of boats or other craft approaching the lock simultaneously from opposite directions the ascending boat or craft will be locked through first, but when several boats or other craft are to be passed, precedence shall be given:

(1) *First.* To boats and craft owned by the United States or employed upon river and harbor improvement work.

(2) *Second.* To passenger boats.

(3) *Third.* To freight and tow boats.

(4) *Fourth.* To rafts in their turn.

(5) *Fifth.* To small vessels and craft bent on pleasure only.

Boats that fail to enter a lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(h) *Lockage of small boats.* Pleasure boats, skiffs, fishing boats, and other small craft will be locked through at one lockage in the morning and at one lockage in the evening, and, as a rule, separate lockages at other times for such craft will not be made, but such craft will be locked through at other times with larger boats, and will take advantage of suitable opportunities without notice from lock tenders.

(i) *Mooring in locks.* All boats, rafts, and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose; and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(j) *Damage to locks or other structures.* This section shall not affect the liability of the owners and operators of vessels for any damage caused by their operations to locks or other structures. They must use great care not to strike any part of the lock or sluice walls or any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the canal. All boats with metal nosings or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls or any part of canal, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(k) *Mooring outside of locks.* (1) The mooring of boats or other craft near the entrance of locks, or at other places in the canal where such mooring will interfere with the general navigation of the canal or entrances, is prohibited. Boats or other craft wishing to tie up for several hours or days in any of the passing basins must notify the superintendent, who will assign a mooring place to them and who will also designate the length of time the mooring place may be used.

(2) Rafts to be passed through the canal shall be moored in such manner as not to close or interefere with the navigation of the canal or its entrances, and the sections for locking shall be brought into the lock as directed by the lock master. After passing through the canal the sections shall be reassembled at such a distance from the entrance as not to obstruct the navigation of the canal and the river.

(l) *Time for entering and leaving a lock.* No craft will be permitted to enter or leave a lock until the gates are fully in the gate recesses and the lock master has directed the boat to be moved.

(m) *Handling of boats and rafts.* The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts, and other craft into and out of the lock easily and promptly.

(n) *Handling gates and bridges.* No person, unless authorized by the superintendent or his agents, shall open or close any bridge, gate, valve, or in any way interfere with the employees in the discharge of their duties; but the lock master may call for assistance from the master of any boat using the canal, should such aid be necessary, and when rendering such assistance the men so employed shall be strictly under the orders of the lock master. Masters of boats refusing to give such assistance when it is requested of them may be denied the use of the canal by the engineer in charge.

(o) *Speed in canal.* No boat while in the canal shall be raced or crowded alongside of another, or moved at a greater rate of speed than 6 miles per hour.

(p) *Boats meeting in canal.* Boats meeting in the canal shall pass to starboard; if unable to pass in the canal proper, the boat nearest to the turnout basin shall take it; in case of doubt, the ascending boat shall enter the basin.

(q) *Management of boats in canal.* No boat shall attempt to run ahead of another while in the canal. The boat that enters first shall have precedence, except as provided hereinafter.

(r) *Unnecessary delay in canal.* Boats or barges must not obstruct navigation by unnecessary delay in entering or passing through the canal or locks. After passing through the locks ascending barges must be so arranged in the basin as to leave the passage clear; descending barges as soon as locked through must be removed to some point below the lower end of the canal.

(s) *Station while waiting for lockage.* Descending boats and tows will wait for lockage in the basin above the locks; ascending boats and tows waiting for lockage will remain in the basin below the locks.

(t) *Use of canal as ice harbor.* Boats will be permitted to use the canal as an ice harbor whenever danger from ice is imminent, but all such craft must leave the canal as soon as navigation is resumed.

(u) *Cutting ice.* Permits to cut ice in the canal will be sold at a uniform rate of $1 per 1,000 square feet of surface. Applications for permits should be made through the superintendent of the canal.

(v) *Landing of freight.* No one shall land freight or baggage on or over the walls of the canal or locks so as in any way to delay or interfere with navigation or the operations of a lock; and freight and baggage consigned to canal points shall be landed only at such places designated by the superintendent of the canal.

(w) *Refuse in canal.* No material of any kind shall be thrown or swept into the canal, and no material of any kind shall be deposited on the canal grounds.

(x) *Wagon bridges and tramways.* All wagon bridges and tramways crossing the canal shall be kept open to navigation except when in actual use; and no unauthorized person will be allowed to operate these bridges. During the fishing season, and under authority of the superintendent, these bridges may be kept closed for short periods of time during the day, but the use of these bridges must not in any way interfere with or delay the navigation of the canal.

(y) *Statistics.* Masters or pursers of vessels shall make to the superintendent or his authorized assistant, on each passage through the canal, such written statement of passengers, freight, and registered tonnage as may be indicated by blanks approved by the Secretary of the Army and furnished such masters or pursers by the canal officers in charge, or their assistants. Failure to furnish this statement will cause the offending boats to be refused passage through the canal or any part of it.

(z) *Trespass.* The lands acquired and owned by the United States are held for the purposes of navigation, for sites for Government structures, and for the accommodation and use of employees of the United States. Trespassing on said lands is strictly forbidden, and all persons are hereby expressly warned under penalty of the law:

(1) Not to cut trees, dig up and carry away earth, sand, gravel, or rock, injure or deface fences, locks, bridges, culverts, telephone lines, or any other structures belonging to the United States, or post or paint advertisements thereon, use dynamite for any purpose, erect temporary or permanent structures, or deposit refuse matter of any kind.

(2) Not to permit horses, cattle, sheep, hogs, or other animals to run at large on any portion of the said lands, including those used as public highways.

(3) Not ride or drive along or upon canal embankments, except where such embankments are intended as public highways.

(4) Not to enter upon these lands for the purpose of hunting or taking of game by any means, except with a written permit from the superintendent in charge of the operation of the canal, and then in strict accordance with the game laws of the State of Oregon, except that, for the protection of the canal banks, hunters authorized as above and canal employees may kill or take burrowing animals at any time.

(5) Not to sell or cause to be sold upon these lands, nor upon any boat while in the canal, any spirituous or malt liquors.

(6) Not to fish within 100 feet of any fishway or lock; not to take fish from any fishway; and not to fish with nets of any kind within the canal grounds.

(aa) *Definition of trespassers.* All persons found upon the grounds and works who are not employed by the United States about the canal, or who are not at the time necessarily present by reason of their engagement in commerce by water, or who are not passengers temporarily landed from boats while passing through the canal, will be deemed trespassers thereon: *Provided,* That, without permission, boats shall not land excursion or picnic parties on United States lands or works, and that if such parties be so landed they shall be held and deemed to be trespassers. Lounging, visiting, or remaining in or about any office, house, yard, shop, shed, lock, bridge, or other storehouse belonging to the canal is forbidden.

(bb) *Persistent violation of regulations.* If the owner or master of any boat persistently violates this section after due notice of the same, the boat may be removed from the canal and thereafter refused passage through the canal by the officer in charge.

(cc) *Effective date.* This section shall go into effect May 1, 1915.

§ 207.720 *Willapa Bay and tributaries, Wash.; logging.* (a) The floating of loose logs, or sack rafts of timber and logs, is prohibited in Willapa Bay and at or below points on tributary streams as specified in the following list.

North Fork of Willapa River, below Willapa city.

South Fork of Willapa River, below a point 1 mile above the Northern Pacific Railway bridge.

North River, below the lower end of McGowan's boom, about 1 mile above mouth.

Smith Creek, at its mouth.

Querquellin River, at its mouth.

Palix River, at its mouth.

North Nemah River, below the boom of the Nemah River Logging Co., about 1 mile above mouth.

South Nemah River, at its mouth.

Nasel River, below Nasel boom, about 3 miles above mouth.

Bear River, below new county bridge, about 3 miles above mouth.

(b) Hemlock logs that will not float with at least 6 inches of butt out of water shall not be floated in any of the streams tributary of Willapa Bay, and no boat shall tow any raft containing any log of this character, unless such log is securely fastened so as to prevent its escape from the raft.

(c) This section shall take effect and be in force on and after July 15, 1922.

§ 207.730 *Grays Harbor and tributaries, Wash.; logging.* (a) Before operating on Grays Harbor or tributary streams all loggers, river drivers, log towboats, and log towboat companies shall register at the United States engineer office, Seattle, Wash., giving the firm name, name of manager, and postoffice address. They shall also register annually thereafter on July 1 of each year.

(b) No logs shall be dumped into the rivers or released from storage or sorting booms without being turned over to a registered driving or towboat company, firm, or individual.

(c) River drivers authorized to operate on the streams tributary to Grays Harbor must maintain a sufficient organization of boats and experienced workmen to care for the drivers of their customers.

(d) River drivers shall so conduct their operations that all parts of the rivers upon which they operate will be effectivey patrolled and the formation of jams prevented.

(e) Should a blockade of logs occur below the head of tidewater in any of the rivers at any time, each logger operating on the river above the location of said blockade shall discontinue dumping logs into the river until the blockade shall be broken.

(f) Log drivers must not indifferently operate or delay the transit of logs.

(g) Loggers who entrust their logs to river drivers will be required to satisfy themselves that their logs are being driven in accordance with this section.

(h) The floating of loose logs or of sack rafts of timber and logs is prohibited in the Chehalis River below Preachers Slough; in the Hoquiam River below the forks; and also in the Wishkah River below a point 4 miles above the mouth.

(i) The floating of rafts or tows of timber and logs which exceed 700 feet in length and 60 feet in width is prohibited in the Chehalis River between the Oregon-Washington Railroad Co. bridge at Aberdeen and the Northern Pacific Railroad Co. bridge at Cosmopolis, and also in the Hoquiam River below the forks; and the floating of rafts or tows of timber and logs which exceed 700 feet in length and 55 feet in width is prohibited in the Wishkah River below the North Aberdeen Bridge.

(j) Hemlock logs that will not float with at least 6 inches of butt out of water shall not be floated in any of the streams tributary to Grays Harbor, and no boat shall tow any raft containing any log of this character unless such log is securely fastened so as to prevent its escape from the raft.

(k) This section shall take effect and be in force on and after October 15, 1920.

§ 207.750 *Puget Sound Area, Wash.*—(a) *Strait of Juan de Fuca, eastern end; naval restricted area*—(1) *The area.* Off westerly shore of Whidbey Island, shoreward of a line extending from West Point 270°, approximately 1.9 miles, to Lawson Reef Bell Buoy; thence approximately 222°, 6.3 miles, to Minor Island Light; thence 162°, 6.3 miles, to Point Partridge on the westerly shore of Whidbey Island at approximately latitude 48°13′30″.

NOTE: All bearings in this section are referred to true meridian.

(2) *The regulations.* No vessels other than a Naval vessel shall enter this area or navigate therein without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(b) *Oak Harbor and Crescent Harbor, Whidbey Isand; naval restricted area*—(1) *The area.* All waters of Oak Harbor, Crescent Harbor, and adjacent waters lying north of a line drawn from Blowers Bluff 79° to a point one-half mile south of Point Polnell; thence 45° to the shore of Whidbey Island.

(2) *The regulations.* No vessel shall enter this area or navigate therein without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(c) *Admiralty Inlet, entrance; naval restricted area*—(1) *The area.* Beginning at Partridge Point Light; thence southeasterly along the west shore of Whidbey Island to Lagoon Point at latitude 48°04′30″; thence 270° to the east shore of Marrowstone Island; thence northerly along the shore to Marrowstone Point Light; thence 305° to the east shore of Quimper Peninsula; thence northerly along the shore to Point Wilson Light; thence westerly along the north shore of Quimper Peninsula to Middle Point; thence 26° to the point of beginning.

(2) *The regulations.* (i) Anchorage within this area is prohibited. Fishing by means of trawling or bottom dragging is prohibited.

(ii) The regulations in this paragraph shall be enforced by the Commandant of the Thirteenth Naval District or his duly authorized representative.

(d) *Waterway connecting Port Townsend and Oak Bay; use, administration, and navigation*—(1) *Works to which regulations apply.* The "canal grounds" when used in this paragraph shall mean that area between the south end of the jetties in Oak Bay and the white light on the northerly dolphin located in Port Townsend. The "canal" is the water lying between these two points and the banks containing the same.

(2) *Speed.* The speed limit within the canal grounds shall not exceed five miles per hour.

(3) *Signals.* All boats desiring to use the canal shall give one long and one short whistle. Southbound boats shall sound this signal at the north range light in Port Townsend. Northbound boats shall sound this signal at least 500 feet south from the end of the jetties in Oak Bay. If no other boat answers the signal the first boat shall have the right of way through the canal. Any approaching boat that is in the canal shall answer by giving the same signal and the first boat shall not enter the canal until the second boat shall have passed through the canal. In the case of boats going in the same direction the boat which is in the canal shall not answer the signal of the boat desiring to enter.

(4) *Passing.* Steamers shall not under any circumstances attempt to pass each other in the canal, either when going in the same or opposite directions.

(5) *Anchoring.* No steamers or boats shall anchor or tie up within the canal grounds unless they are well over on the tide flats to the west of the dredged channel, and off to the right of way belonging to the United States.

(6) *Tows.* No tow shall enter or pass through the canal with a towline more than 200 feet in length.

(7) *Statistics.* At the end of each month masters or clerks of vessels or boats that have used the canal during the month shall report to the District Engineer, Corps of Engineers, Seattle, upon prescribed forms, a statement of passengers, freight, and registered tonnage, and such other statistical information as may be required by the blank forms which are issued to them for that purpose.

(8) *Trading, landing, etc.* No business, loading, or landing of freight or baggage will be allowed on or over the canal piers or bulkheads.

(9) *Refuse.* No person shall throw material of any kind into the canal.

(10) *Delaying traffic.* No person shall cause or permit any vessel or boat of which he is in charge, or on which he is employed, to obstruct the canal in any way or delay in passing through it.

(11) *Obstructions.* On the canal's being obstructed by a vessel, raft, or other craft, by sinking, grounding, or otherwise, the District Engineer, Seattle, shall be notified by telephone or telegraph as soon as possible by the person in charge of the obstructing vessel, raft, or craft.

(e) *Hood Canal, Bangor; naval restricted area*—(1) *The area.* The waters within 500 yards on all sides of the Navy pier at Bangor, and all the remaining waters on the easterly side of Hood Canal within 200 feet of the highwater line between latitude 47°46′20″ and latitude 47°43′28″.

(2) *The regulations.* No vessel shall enter this area without permission from the Commandant, Thirteenth Naval District, or his authorized representative.

(f) *Puget Sound, Point Jefferson; naval restricted area*—(1) *The area.* Shoreward of a line beginning at a point bearing 186°, 3,750 yards, from Apple Cove Point Light; thence 116°, 4,450 yards; thence 181°, 2,750 yards; thence 203°30′, 2,700 yards; thence 270°, 2,576 yards, thence 358°, 2,360 yards, to the shore on the south side of Point Jefferson.

(2) *The regulations.* (i) Anchorage within this area is prohibited. Fishing by means of trawling or bottom dragging is prohibited.

(ii) The regulations in this paragraph shall be enforced by the Commandant of the Thirteenth Naval District or his authorized representative.

(g) *Lake Washington Ship Canal; use, administration, and navigation*—(1) *Definitions.* The term "canal" as used in the regulations in this paragraph shall include the water area in the locks and the channel and adjacent waters from a point 5,500 feet northwest of the Great Northern Railway Company bridge to the east end of the channel opposite Webster Point, Lake Washington. The term "canal grounds" shall include all grounds set aside for the use of the canal or occupied in its construction.

(2) *Supervision.* The canal and all its appurtenances shall be in charge of the District Engineer, Corps of Engineers, Seattle. The District Engineer will detail as many assistants as may be necessary for the efficient operation of the canal and the enforcement of the regulations in this paragraph. The movement of all vessels and other floating things in the canal and approaches thereto shall be under the direction of the District Engineer and his authorized assistants. All orders given under the regulations to any master or person in charge of any vessel, raft, or other watercraft by the District Engineer or his authorized assistants, either in person or through any canal operative, shall be acknowledged and obeyed. Failure to see, understand, or comply with signals or instructions shall constitute a violation of the regulations. Any person refusing to comply with the regulations or any orders given in pursuance thereof may be denied the privileges of the canal or canal grounds.

(3) *Speed.* To avoid damage to other vessels and to property along the shores, all vessels shall proceed at reduced speed in the canal as follows:

(i) From the white flash light on the extreme point of high land about 3,000 feet from the west canal entrance to the Great Northern Railway Company bridge, the speed shall not exceed six miles per hour.

(ii) From the Great Northern Railway Company bridge to the east end of the east guide pier, the speed shall not exceed four miles per hour.

(iii) From the Northern Pacific Railway Company bridge to a point 400 feet east of the Fremont Bridge, the speed shall not exceed six miles per hour.

(iv) From the red buoy west of the University Bridge to the east end of the Montlake (Portage) Cut, the speed shall not exceed six miles per hour.

(v) In all other portions of the canal, the speed shall not exceed 10 miles per hour.

NOTE: Speed signs are located along the canal to indicate areas where reduced speeds are required.

(4) *Traffic signal lights.* In addition to the lock signal lights described in subparagraph (5) (ii) of this paragraph, two red lights, one vertically above the other, and two green lights, one vertically above the other, are installed on the west side of the Ballard Bridge, on the east side of the Fremont Bridge, 1,000 feet west of the Montlake Bridge, and 1,000 feet east of the Montlake Bridge, for the guidance of vessels approaching the sections of the canal between Salmon Bay and Lake Union and between Lake Union and Lake Washington, respectively. Vessels of 300 gross tons and over and all vessels with tows, except as hereinafter provided, shall not pass the red lights. The green lights will indicate that vessels may proceed. Vessels of less than 300 gross tons without tows may disregard these signals, but they shall travel at very slow speed when passing other vessels. Vessels of 300 gross tons and over and vessels with tows, except logs, whose destination is between the Ballard Bridge and the Northern Pacific Railway Company bridge, may pass the red signals on the Ballard Bridge: *Provided,* Such passage will not interfere with approaching traffic from Lake Union.

(5) *Approaching and passing through locks*—(i) *Signals for locks.* Vessels with tows desiring to use the locks shall so indicate by two long and three short blasts of a whistle, horn, or megaphone. All other vessels desiring to use the locks shall so indicate by two long and two short blasts.

NOTE: The term "long blasts" means blasts of four seconds' duration, and the term "short blasts" means blasts of one second's duration. Signals for the opening of drawbridges are prescribed in § 203.790 of this chapter.

(ii) *Lock signal lights.* Red and green signal lights are installed on the guide pier west of the Great Northern Railway Company bridge below the locks. The green light will indicate to vessels bound for the large lock that the lock has been made ready. If the red light is burning, vessels bound for the large lock shall moor at the pier. Vessels bound for the small lock shall obtain instructions from the pierman on the end of the pier as to which lock to use and shall be guided into the small lock by traffic signals thereon. The masters of all vessels approaching the locks from Puget Sound shall be alert to receive and shall immediately comply with instructions by voice or signal from the employee on the west pier.

(iii) *Precedence at locks.* All vessels approaching the locks shall stop at the points indicated by signs placed on the canal piers or as directed by a canal operative until ordered to proceed into the lock. Unless otherwise directed by the District Engineer or his authorized assistant, vessels owned or operated by the United States or the City of Seattle and passenger vessels operating on a regular schedule shall have precedence over all others in passing through the locks. Registered merchant vessels shall have precedence over pleasure craft, which shall pass through in the order of their arrival at the locks, and both shall have precedence over vessels towing floated timber or logs. Tows of floated timber and logs may be denied the use of the locks during certain hours when both locks are busy passing other traffic. However, advance notice will be given towboat companies as to the periods when log tows will be denied lockage.

(iv) *Entering locks.* Masters of vessels shall exercise the greatest care when entering either lock. The forward movement of vessels while taking position in the locks shall be very slow, and boats entering the small lock shall reduce their speed to not more than two and one-half miles per hour when within 200 feet of the outer gate and come to practically a full stop before entering the lock so that in case the engine mechanism fails to operate properly the momentum of the boat may be stopped easily by its lines. The masters of vessels entering either lock from either direction shall be alert to receive and shall immediately comply with instructions by voice or signal from the lock attendants.

(v) *Mooring in locks.* Vessels and rafts while in the lock shall be moored at the top of the lock wall, adequate lines at least 50 feet in length being required fore and aft. Lines shall not be released until the signal has been given by the lock force to leave the lock, after which there shall be no delay in leaving. All vessels not equipped to handle tie-up lines with power winches shall be equipped with suitable mooring lines of manila or other suitable fiber, of sufficient size and strength to hold the vessel against the currents to be met within the lock chamber. The use of wire rope for tie-up lines by vessels not equipped to handle such lines with power winches is prohibited. Vessels may be denied the use of the locks if their lines are not in good condition, or if the mooring bits on barges are not accessible or are not equipped to prevent lines from slipping off when the water is lowered in the lock. All vessels entering the locks should have, in addition to the master, at least one person on deck to handle lines. Persons attempting to take vessels through the locks without assistance on deck may be required to wait until the lock is clear of other traffic before passing through. All operators of vessels are especially cautioned to use extreme care while crowded in the locks to avoid accident or fire on their boats. Operators of small vessels and larger vessels operating in the proximity of each other shall be alert to the danger arising from the limited maneuverability of the larger vessels, and shall exercise all precautions to prevent accident.

(6) *Damage to locks or other structures.* The regulations in this paragraph shall not affect the liability of the owners and operators of vessels for any damage caused by their operations to the locks or other structures. The sides and corners of all vessels and rafts passing through the locks should be free from spikes or projections of any kind which might damage the locks or other structures. Vessels with appurtenances or projections which might damage the locks or other structures shall be fitted with adequate fenders. The operators of vessels shall use care to avoid striking the guide walls or other structures pertaining to the canal.

(7) *Commercial statistics.* (i) On each passage through the locks, as required by section 11 of the River and Harbor Act of September 22, 1922 (42 Stat. 1043; 33 U. S. C. 555), the master or clerk of any vessel or other craft shall furnish, upon prescribed forms provided for the purpose and obtainable at the locks, a statement of the passengers, freight, and tonnage, and such other statistical information as may be required by the forms. The total cargo carried must be reported showing separately the tonnage in transit, and the tonnage, kind, and destination of cargo to be unloaded.

(ii) Reports of log rafts passing through the canal shall show the number of sections in the lock at each passage and, in the case of boom sticks, poles, or piles, the number of sticks in the tow. For logs, poles, or piles in cribs or in built-up rafts of more than one layer, the report shall show the total board feet in the raft.

(iii) Except by special permit, no vessel will be allowed to pass through the lock until a correct statement is furnished of the passengers, freight, and tonnage, and such other statistical information as may be required by the prescribed forms provided for that purpose.

(8) *Rafts.* (i) No log rafts exceeding 700 feet in length or 76 feet in width shall pass through the canal. Boom sticks shall be smooth, with rounded ends, and securely tied together with cables, chains, or log swifters to prevent the raft from spreading while in the lock. Rafts containing logs that do not float above water for their entire length, or are in danger of being submerged when they enter fresh water, shall not be towed in the canal until such logs are securely fastened so as to prevent their escape from the raft.

(ii) Whenever required, log rafts passing in through the lock will be given a number that shall be fastened on one of the logs in the raft. This number will identify the raft and shall not be removed until the logs are used.

(iii) Two floats are maintained in Shilshole Bay near the entrance of the canal channel to facilitate the handling of logs in the canal. Rafts bound for the canal may be moored at one of these floats, only the portion of the raft that is to be taken through at a single lockage being brought into the canal. The remainder of the raft may be left at the float until the first portion has been towed to its destination above the lock.

(9) *Tows.* All vessels engaged in towing shall use tow lines of the least practicable length and shall have full control of their tows at all times. Towing more than one craft abreast is forbidden if the total width of the tow, including the towboat, exceeds 70 feet.

(10) *Obstructing navigation.* (i) All vessels and tows passing through the canal shall be kept as close as practicable to the center or, when safer, to the right side of the waterway, except when passing other craft or preparing to moor at a pier or wharf. Slowly moving log rafts, tows, or vessels shall, whenever practicable, pull out of the way when meeting other vessels or when other traffic proceeding in the same direction desires to pass. Vessels are forbidden to obstruct the canal in any way or to delay by slow passage through the canal the progress of other vessels. Small and readily maneuverable vessels operating in the vicinity of larger, less maneuverable vessels shall, in all cases, keep clear and operate with caution in order that the larger vessels may maintain safe steerage way and that hazards to all vessels may be reduced. All vessels shall operate with extreme caution and movements shall be made only when adequate precautions for the safety of other vessels and property are being effectively employed.

(ii) The placing of logs, vessels, or other floating objects within the limits of the dredged channels or anywhere in the canal where they may interfere with navigation to or from piers or industrial plants is prohibited.

(11) *Turning.* Vessels exceeding 100 feet in length shall not turn around, or attempt to turn around, in the portion of the canal between the Northern Pacific Railway Company bridge and a point 400 feet east of the Fremont Bridge, or in the Portage Cut.

(12) *Excessive working of propellers or engines.* Excessive working of the propellers of a vessel for purposes of testing or for other purposes when this creates objectionable or dangerous currents in the canal is forbidden. In case of grounding, the rapid or strong working of the vessel's engines is forbidden.

(13) *Landing or mooring.* No business, trading, or landing of passengers, freight or baggage will be allowed on or over the canal piers or lock walls, or over the piers or grounds forming a part of the canal or its appurtenances. All persons in charge of or employed on any boat are prohibited from landing or mooring such boat at any of the canal piers, unless in transit through the canal or specially permitted to do so by the District Engineer or his authorized assistants.

(14) *Deposit of refuse.* The deposit, either from watercraft or from the shore, of any oil or refuse matter in the canal or upon the canal grounds is prohibited, nor shall water discharged from the side of a vessel be allowed to spill on the lock wall.

(15) *Aids to navigation.* Persons in charge of log rafts or other tows, and the masters of vessels and boats using the canal, shall keep a careful watch when passing buoys or other aids to navigation and promptly report to the District Engineer or his authorized assistants any displacement or damage to such aids.

NOTE: Aids to navigation and other related data are shown on United States Coast and Geodetic Survey Chart No. 6447.

(h) *Lake Washington; seaplane restricted area, U. S. Naval Air Station, Sand Point, Seattle*—(1) *The area.* (i) Beginning at a point bearing 346°07′15″, 2,113.75 yards, from the tower at the northeast corner of Hangar No. 1, U. S. Naval Air Station, Seattle; thence 347°, 2,000 yards; thence 77°, 500 yards; thence 167°, 2,000 yards; and thence 257°, 500 yards, to the point of beginning.

(ii) The area will be marked by special pneumatic buoys as follows: Seven each on the easterly and westerly lines, equally spaced forming two parallel rows 500 yards apart. Each corner buoy will be equipped with a yellow light and all other buoys with green lights. These lights will be lighted only during night flying operations. Each buoy will be marked in addition by black and yellow vertical stripes.

(2) *The regulations.* (i) This area shall be restricted to seaplanes for use in landing.

(ii) No vessel shall operate or anchor in the area except those attendant upon seaplane operations.

(iii) All other watercraft shall exercise due caution in navigating across the lake in the waters to the north and to the south of the restricted area, as there may be danger from planes about to land.

(iv) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

(i) *Elliott Bay, Smith Cove; naval restricted area*—(1) *The area.* Beginning at the southwest corner of Great Northern Railway Pier 89, Smith Cove; thence 180°, 150 yards; thence 270°, 625 yards; thence due north to the shore of Smith Cove.

(2) *The regulations.* No vessel shall enter this area without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(j) *Port Orchard; naval restricted area*—(1) *The area.* Shoreward of a line beginning at a point on the west shoreline of Port Orchard bearing 90° from stack (at latitude 47°42′01″, longitude 122°36′54″); thence 90°, approximately 190 yards, to a point 350 yards from stack; thence 165°, 6,000 yards, to a point bearing 179°, 1,280 yards, from Battle Point Light; thence westerly to the shoreline at latitude 47°39′08″ (approximate location of the Brownsville Pier).

(2) *The regulations.* (i) No vessel shall, at any time, anchor or tow a drag of any kind in this area.

(ii) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

(k) *Sinclair Inlet; naval restricted area*—(1) *The area.* All the waters of Sinclair Inlet westerly of a line drawn from the Bremerton Ferry Landing (approximately latitude 47°33′49″, longitude 122°37′19″) to the Annapolis Ferry Landing (approximately latitude 47°32′59.5″, longitude 122°36′52″).

(2) *The regulations.* No vessel of more than 100 gross tons shall enter this area or navigate therein without permission from the Commandant, Thirteenth Naval District, or his authorized representative.

(1) *West Waterway, Seattle Harbor; navigation.* (1) The movement of vessels of 250 gross tons or over and all vessels with tows of any kind through the narrow section of West Waterway between the bend at Fisher's Flour Mill dock and the bend at the Junction of East Waterway and Duwamish Waterway, and through the draws of the City of Seattle and Northern Pacific Railway Company bridges crossing this narrow section, shall be governed by red and green traffic signal lights mounted on the north and south sides of the west tower of the City Light power crossing at West Spokane Street.

(2) Two green lights, one vertically above the other, displayed ahead of a vessel, shall indicate that the waterway is clear. Two red lights, one vertically above the other, displayed ahead of a vessel, shall indicate that the waterway is not clear.

(3) A vessel approaching the narrow section and drawbridges from either end of the waterway shall give one long blast of a whistle and shall not enter the narrow section until green lights are displayed.

(4) One vessel may follow another vessel in either direction, but the channel shall not be kept open in the same direction for an unreasonable time if a vessel is waiting at the other end.

(5) Tugs, launches, and small craft shall keep close to one side of the channel when vessels or boats with tows are passing.

(6) All craft shall proceed with caution. The display of the green light is not a guarantee that the channel is clear of traffic, and neither the United States nor the City of Seattle will be responsible for any damage to vessels or other property which may be chargeable to mistakes in the operation of the signal lights or to their failure to operate.

(m) *Tacoma Harbor, naval restricted area*—(1) *The area.* The waters surrounding the Naval Station, Tacoma, as follows: Hylebos Waterway and Port-Industrial Waterway (formerly known as Wapato Waterway) within 200 feet of the shore or of structures along the shore or within 100 feet of the outboard face of vessels moored thereto; and Commencement Bay northwesterly of the Naval Station within 1,000 feet of Naval Station buildings and piers or of vessels moored thereto.

(2) *The regulations.* (i) No fishing vessel or pleasure craft shall enter or remain in the restricted area.

(ii) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

§ 207.770 *Snoqualmie and Snohomish Rivers, Wash.; logging.* Loose logs may be floated in navigable ports of the Snoqualmie and Snohomish Rivers under the following conditions:

(a) All loggers and river drivers operating on the Snoqualmie and Snohomish Rivers shall be required to register at the United States Engineer Office, Seattle, Wash., giving the firm name, manager's name, and postoffice address.

(b) No logs shall be dumped into the rivers or released from storage booms without being turned over to a registered driving company, firm, or individual.

(c) River drivers authorized to operate on these streams must maintain a sufficient organization of boats and experienced workmen to care for the drives of their customers.

(d) River drivers shall so conduct their operations that all parts of the river will be effectively patrolled and the formation of jams prevented.

(e) During times of freshet, river drivers shall increase their force and station men at critical points where jams are liable to form.

(f) Loggers who entrust their logs to river drivers will be required to satisfy themselves that their logs are being driven in accordance with this section, and if continued unconcern on their part results in confusion, the privilege of dumping logs into the stream shall be denied to them.

(g) Hemlock logs that will not float for their entire length shall not be deposited in the rivers.

§ 207.780 *Sammamish River, Wash.; Logging.* Logs may be floated on Sammamish River between Lakes Sammamish and Washington under the following conditions:

(a) At least once every 6 months all loggers, log owners, and river drivers operating on the Sammamish River shall be required to register at the United States Engineer office, Seattle, Wash., giving full name and postoffice address.

(b) Logs run from Lake Sammamish shall be in charge of a competent driving crew and kept continuously on the move while in transit.

(c) Loggers putting logs into Sammamish River shall inclose their logs in pocket booms along the bank of the river, and these pocket booms shall be so arranged that a free passageway of ruling depth, at least 12 feet wide, shall be left between the boom and opposite shore.

(d) When logs are released from pocket booms they shall be placed in charge of a competent driving crew and kept continuously on the move to Lake Washington or to the mills located on Sammamish River.

(e) Should a blockade of logs occur in the river at any time, each logger whose brand appears on any of the logs in said blockade shall discontinue dumping logs into the river until the blockade has been broken.

(f) Log drivers who indifferently operate, or who delay the transit of logs, will be nenied the privilege of operating in such capacity on this stream.

(g) To make unnecessary the present practice of storing logs in the Sammamish River, no logs will be started down this stream until provision has been made for boom sticks at the mouth sufficient to hold the entire drive or other means of storage provided.

§ 207.900 *Restricted areas in vicinity of Maritime Administration Reserve Fleets.* (a) The regulations in this section shall govern the use and navigation of waters in the vicinity of the following National Defense Reserve Fleets of the Maritime Administration, Department of Commerce:

(1) Hudson River Reserve Fleet, Jones Point, New York.
(2) Baltimore Reserve Fleet, Hawkins Point Pier, Thoms Cove, Maryland.
(3) James River Reserve Fleet, Fort Eustis, Virginia.
(4) Wilmington Reserve Fleet, Brunswick River near Wilmington, North Carolina.
(5) Mobile Reserve Fleet, Tensaw River near Bay Minette, Alabama.
(6) Beaumont Reserve Fleet, Neches River near Beaumont, Texas.
(7) Suisun Bay Reserve Fleet, near Benicia, California.
(8) Astoria Reserve Fleet, Cathlamet Bay near John Day Point, Oregon.
(9) Olympia Reserve Fleet, Budd Inlet at Olympia, Washington.

(b) No vessel or other watercraft, except those owned or controlled by the United States Government, shall cruise or anchor between Reserve Fleet units, within 500 feet of the end vessels in each Reserve Fleet unit, or within 500 feet of the extreme units of the fleets, unless specific permission to do so has first been granted in each case by the enforcing agency.

5 (c) The regulations in this section shall be enforced by the respective Fleet Superintendents and such agencies as they may designate.

CHAPTER 3

Sailing Directions

ROUTES AND SAILING DIRECTIONS for vessels approaching or standing along this coast and for entering the principal ports are given in tabular form for the convenience of the navigator. The courses and distances given will be found dependable if used judiciously in connection with the latest charts. Unless otherwise noted in the tables these courses lead through water as deep or deeper than that available at the port to which they lead.

These are slack-water courses and due allowance must be made for currents and wind. The courses as tabulated should be used in conjunction with the general information given concerning the currents, depths, and cautions.

All bearings and directions are true. The geographical positions given are those of the turning points and not the reference objects. In cases where a course extends across two or more charts the geographical position of a junction point has been given.

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

Trans-Pacific Routes

Table 1.—From San Diego

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Balboa		
1. San Diego Entrance Range Front Light bearing 353°, distant 600 yards; 32°41.9 N., 117°13.9 W. Chart 5107.	*Degrees*	*Nautical miles*
Direct	173	2.9
Reverse	*353*	*2.9*
2. San Diego Channel lighted bell buoy 5 bearing 270°, distant 250 yards; 32°39.1 N., 117°13.5 W. Chart H. O. 1149 (*5107*).		
Direct	167	286.3
Change to Chart H. O. 1006 (*H. O. 1149*) at 30°00.0 N., 116°31.2 W.		
Reverse	*347*	*286.3*
3. Latitude 28°00.0 N., longitude 116°00.0 W.		
Direct	136½	275.3
Reverse	*316½*	*275.3*

Table 1.—From San Diego—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
4. Latitude 24°40′.0 N., longitude 112°30′.0 W.		
Direct	135	395.2
Reverse	*315*	*395.2*
5. Latitude 20°00′.0 N., longitude 107°30′.0 W. Chart H. O. 1007 (*H. O. 1006*).		
Direct	117	1695.6
Reverse	*297*	*1695.6*
6. Jicarita Island Light bearing 338°, distant 8.0 miles; 7°05′.0 N., 81°45′.0 W. Chart H. O. 1018 (*H. O. 1007*)		
Direct	087½	78.8
Reverse	*267½*	*78.8*
7. Morro Puercos Light bearing 358°, distant 6.5 miles; 7°08′.2 N., 80°25′.7 W.		
Direct	066	31.4
Reverse	*246*	*31.4*
8. Cape Mala Light bearing 335°, distant 8.0 miles; 7°21′.0 N., 79°57′.0 W. Chart H. O. 1019 (*H. O.1018*)		
Direct	018½	92.2
Reverse	*198½*	*92.2*
9. Taboguilla Island Light bearing 270°, distant 3.3 miles; 8°48′.4 N., 79°27′.5 W. Chart H. O. 5006 (*H. O. 1019*)		
Direct	various	11.5
Reverse	*various*	*11.5*
10. Balboa Harbor, 8°57′.5 N., 79°34′.3 W.		
To Hilo		
1. San Diego Entrance Range Front Light bearing 353°, distant 600 yards; 32°41′.9 N., 117°13′.9 W. Chart 5105.		
Direct	173	2.9
Reverse	*353*	*2.9*
2. San Diego Channel lighted bell buoy 5 bearing 270°, distant 250 yards; 32°39′.1 N., 117°13′.5 W.		
Direct	204	2.1
Reverse	*024*	*2.1*
3. San Diego Approach lighted whistle buoy 1SD bearing 304°, distant 0.2 mile; 32°37′.2 N., 117°14′.5 W. Chart 5101 (*5105*).		
Direct	242	5.2
Reverse	*062*	*5.2*
4. Point Loma Light bearing 043°, distant 6.7 miles; 32°35′.0 N., 117°20′.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	259	
(Final Great Circle course)	241½	
Change to Chart 9000 (*5020*) at 32°06′.3 N., 120°00′.0 W.		
Change to Chart 4115 (*9000*) at 20°01′.3 N., 154°40′.0W.		
Reverse (Initial Great Circle course)	*061½*	
(Final Great Circle course)	*079*	
Great Circle distance		2153.0
5. Pepeekeo Point Light bearing 270°, distant 4.9 miles; 19°51′.0 N., 155°00′.0 W.		
Direct	217	7.8
Change to Chart 4103 (*4115*) at 19°46′.0 N., 155°04′.0W.		
Reverse	*037*	*7.8*
6. Blonde Reef lighted bell buoy 1BR close aboard; 19°44′.8 N., 155°05′.0 W. Continue to wharves at Hilo, 19°44′.1 N., 155°03′.4 W.; 1.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		

Table 1.—From San Diego—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Kahului		
1. **San Diego Entrance Range Front Light** bearing 353°, distant 600 yards; 32°41'.9 N., 117°13'.9 W. Chart 5107.	*Degrees*	*Nautical miles*
Direct	173	2.9
Reverse	*353*	*2.9*
2. **San Diego Channel lighted bell buoy 5** bearing 270°, distant 250 yards; 32°39'.1 N., 117°13'.5 W.		
Direct	204	2.1
Reverse	*024*	*2.1*
3. **San Diego Approach lighted whistle buoy 1SD** bearing 304°, distant 0.2 mile; 32°37'.2 N., 117°14'.5 W. Chart 5101 (*5107*).		
Direct	242	5.2
Reverse	*062*	*5.2*
4. **Point Loma Light** bearing 043°, distant 6.7 miles; 32°35'.0 N., 117°20'.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	261½	
(Final Great Circle course)	243	
Change to Chart 9000 (*5020*) at 32°13'.0 N., 120°00'.0 W.		
Change to Chart 4116 (*9000*) at 21°09'.1 N., 156°00'.0 W.		
Reverse (Initial Great Circle course)	*063*	
(Final Great Circle course)	*081½*	
Great Circle distance		2187.0
5. **Pauwela Point Light** bearing 180°, distant 3.0 miles; 21°00'.0 N., 156°19'.5 W. Chart 4124 (*4116*).		
Direct	244	9.5
Reverse	*064*	*9.5*
6. **Waihee Reef lighted buoy 2** bearing 310°, distant 125 yards; 20°55'.9 N., 156°28'.7 W.		
Direct	177	1.6
Reverse	*357*	*1.6*
7. **Kahului Harbor Entrance lighted buoy 1** close aboard; 20°54'.2 N., 156°28'.5 W. Chart 4124.		
Continue to wharves at Kahului, 20°54'.0N., 156°28'.2 W., 0.4 mile by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Honolulu		
1. **San Diego Entrance Range Front Light** bearing 353°, distant 600 yards; 32°41'.9 N., 117°13'.9 W. Chart 5107.		
Direct	173	2.9
Reverse	*353*	*2.9*
2. **San Diego Channel lighted bell buoy 5** bearing 270°, distant 250 yards; 32°39'.1 N., 117°13'.5 W.		
Direct	204	2.1
Reverse	*024*	*2.1*
3. **San Diego Approach lighted whistle buoy 1SD** bearing 304°, distant 0.2 mile; 32°37'.2 N., 117°14'.5 W. Chart 5101 (*5107*).		
Direct	242	5.2
Reverse	*062*	*5.2*
4. **Point Loma Light** bearing 043°, distant 6.7 miles; 32°35'.0 N., 117°20'.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	262½	
(Final Great Circle course)	243½	
Change to Chart 9000 (*5020*) at 32°16'.3 N., 120°00'.0 W.		
Change to Chart 4116 (*9000*) at 21°31'.8 N., 157°00'.0 W.		
Reverse (Initial Great Circle course)	*063½*	
(Final Great Circle course)	*082½*	
Great Circle distance		2247.0

Table 1.—From San Diego—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
5. Makapuu Point Light bearing 000°, distant 5.0 miles; 21°13′.7 N., 157°39′.1 W. Chart 4110 (*4116*).		
Direct	270	9.0
Reverse	*090*	*9.0*
6. Diamond Head Light bearing 000°, distant 1.8 miles; 21°13′.7 N., 157°48′.7 W. Chart 4132 (*4110*).		
Direct	307	5.0
Reverse	*127*	*5.0*
7. Honolulu Harbor Light bearing 026°, distant 2.1 miles; 21°16′.7 N., 157°53′.1 W. Chart 4132.		
Continue to wharves at Honolulu, 21°18′.6 N., 157°52′.2 W., 4.0 miles, by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Port Allen		
1. San Diego Entrance Range Front Light bearing 353°, distant 600 yards; 32°41′.9 N., 117°13′.9 W. Chart 5107.		
Direct	173	2.9
Reverse	*353*	*2.9*
2. San Diego Channel lighted bell buoy 5 bearing 270°, distant 250 yards; 32°39′.1 N., 117°13′.5 W.		
Direct	204	2.1
Reverse	*024*	*2.1*
3. San Diego Approach lighted whistle buoy 1SD bearing 304°, distant 0.2 mile; 32°37′.2 N., 117°14′.5 W. Chart 5101 (*5107*).		
Direct	234	10.6
Reverse	*054*	*10.6*
4. Point Loma Light bearing 045°, distant 12.5 miles; 32°31′.0 N., 117°24′.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	265	
(Final Great Circle course)	245	
Change to Chart 9000 (*5020*) at 32°17′.5 N., 120°00′.0 W.		
Change to Chart 4117 (*9000*) at 22°01′.1 N., 159°00′.0 W.		
Reverse (Initial Great Circle course)	*065*	
(Final Great Circle course)	*085*	
Great Circle distance		2317.3
5. Makahuena Point Light bearing 000°, distant 3.0 miles; 21°49′.4 N., 159°26′.9 W.		
Direct	284	8.4
Reverse	*104*	*8.4*
6. Port Allen Breakwater Light bearing 000°, distant 2.5 miles; 21°51′.5 N., 159°35′.6 W. Chart 4117.		
Continue to wharves at Port Allen, 21°54′.2 N., 159°35′.6 W., 2.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		

Table 2.—From Los Angeles

To Balboa		
1. Los Angeles Approach lighted bell buoy LA close aboard; 33°41′.9 N., 118°14′.5 W. Chart 5101.		
Direct	161½	361.0
Change to Chart H. O. 1006 (*5101*) at 32°30′.0 N., 117°45′.5 W.		
Reverse	*341½*	*361.0*

Table 2.—From Los Angeles—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
2. Latitude 28°00′.0 N., longitude 116°00′.0 W.		
Direct	136½	275.3
Reverse	*316½*	*275.3*
3. Latitude 24°24′.0 N., longitude 112°30′.0 W.		
Direct	135	395.2
Reverse	*315*	*395.2*
4. Latitude 20°00′.0 N., longitude 107°30′.0 W. Chart H. O. 1007 (*1006*).		
Direct	117	1695.6
Reverse	*297*	*1695.6*
5. Jicarita Island Light bearing 338°, distant 8.0 miles; 7°05′.0 N., 81°45′.0 W. Chart H. O. 1018 (*1007*).		
Direct	088	78.8
Reverse	*268*	*78.8*
6. Morro Puercos Light bearing 358°, distant 6.5 miles; 7°08′.2 N., 80°25′.7 W.		
Direct	066	31.4
Reverse	*246*	*31.4*
7. Cape Mala Light bearing 335°, distant 8.0 miles; 7°21′.0 N., 79°57′.0 W. Chart H. O. 1019 (*H. O. 1018*).		
Direct	018½	92.2
Reverse	*198½*	*92.2*
8. Taboguilla Island Light bearing 270°, distant 3.3 miles; 8°48′.4 N., 79°27′.5 W. Chart H. O. 5006 (*H. O. 1019*).		
Direct	various	11.5
Reverse	*various*	*11.5*
9. Balboa Harbor, 8°57′.5 N., 79°34′.3 W.		
To Hilo		
1. Los Angeles Approach lighted bell buoy LA close aboard; 33°41′.9 N., 118°14′.5 W. Chart 5147.		
Direct	252	3.6
Reverse	*072*	*3.6*
2. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40′.7 N., 118°18′.9 W. Chart 5101 (*5147*).		
Direct	272	90.0
Reverse	*092*	*90.0*
3. South Point Light, Santa Rosa Island, bearing 000°, distant 10.0 miles; 33°43′.8 N., 120°07′.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	255	
(Final Great Circle course)	238½	
Change to Chart 9000 (*5020*) at 33°31′.5 N., 121°00′.0 W.		
Change to Chart 4115 (*9000*) at 20°02′.4 N., 154°40′.0 W.		
Reverse (Initial Great Circle course)	*058½*	
(Final Great Circle course)	*075*	
Great Circle distance		2032.5
4. Pepeekeo Point Light bearing 270°, distant 4.9 miles; 19°51′.0 N., 155°00′.0 W.		
Direct	217	7.8
Change to Chart 4103 (*4115*) at 19°46′.0 N., 155°04′.0 W.		
Reverse	*037*	*7.8*
5. Blonde Reef lighted bell buoy 1BR close aboard; 19°44′.8 N., 155°05′.0 W. Chart 4103.		
Continue to wharves at Hilo, 19°44′.1 N., 155°03′.4 W., 1.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		

Table 2.—From Los Angeles—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Kahului		
1. Los Angeles Approach lighted bell buoy LA close aboard; 33°41.9 N., 118°14.5 W. Chart 5147.	*Degrees*	*Nautical miles*
Direct	252	3.6
Reverse	*072*	*3.6*
2. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40.7 N., 118°18.9 W. Chart 5101 (*5147*).		
Direct	272	90.0
Reverse	*092*	*90.0*
3. South Point Light, Santa Rosa Island, bearing 000°, distant 10.0 miles; 33°43.8 N., 120°07.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	258	
(Final Great Circle course)	240½	
Change to Chart 9000 (*5020*) at 33°34.0 N., 121°00.0 W.		
Change to Chart 4116 (*9000*) at 21°10.4 N., 156°00.0 W.		
Reverse (Initial Great Circle course)	*060½*	
(Final Great Circle course)	*078*	
Great Circle distance		2062.0
4. Pauwela Point Light bearing 180°, distant 3.0 miles; 21°00.0 N., 156°19.5 W. Chart 4124 (*4116*).		
Direct	244	9.5
Reverse	*064*	*9.5*
5. Waihee Reef lighted buoy 2 bearing 310°, distant 125 yards; 20°55.9 N., 156°28.7 W.		
Direct	177	1.6
Reverse	*357*	*1.6*
6. Kahului Harbor Entrance lighted buoy 1 close aboard; 20°54.2 N., 156°28.5 W. Chart 4124.		
Continue to wharves at Kahului 20°54.0 N., 156°28.5 W., 0.4 mile by direction given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Honolulu		
1. Los Angeles Approach lighted bell buoy LA close aboard; 33°41.9 N., 118°14.5 W. Chart 5147.		
Direct	252	3.6
Reverse	*072*	*3.6*
2. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40.7 N., 118°18.9 W. Chart 5101 (*5147*).		
Direct	272	90.0
Reverse	*092*	*90.0*
3. South Point Light, Santa Rosa Island, bearing 000°, distant 10.0 miles; 33°43.8 N., 120°07.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	259	
(Final Great Circle course)	241	
Change to Chart 9000 (*5020*) at 33°35.0 N., 121°00.0 W.		
Change to Chart 4116 (*9000*) at 21°33.8 N., 157°00.0 W.		
Reverse (Initial Great Circle course)	*061*	
(Final Great Circle course)	*079*	
Great Circle distance		2120.0
4. Makapuu Point Light bearing 000°, distant 5.0 miles; 21°13.7 N., 157°39.1 W. Chart 4110 (*4116*).		
Direct	270	9.0
Reverse	*090*	*9.0*
5. Diamond Head Light bearing 000°, distant 1.8 miles; 21°13.7 N., 157°48.7 W. Chart 4132 (*4110*).		
Direct	307	5.0
Reverse	*127*	*5.0*

Table 2.—From Los Angeles—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
6. Honolulu Harbor Light bearing 026°, distant 2.1 miles; 21°16′.7 N., 157°53′.1 W. Chart 4132.		
Continue to wharves at Honolulu, 21°18′.6 N., 157°52′.2 W., 4.0 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Port Allen		
1. Los Angeles Approach lighted bell buoy LA close aboard; 33°41′.9 N., 118°14′.5 W. Chart 5147.	*Degrees*	*Nautical miles*
Direct	252	3.6
Reverse	*072*	*3.6*
2. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40′.7 N., 118°18′.9 W. Chart 5101 (*5147*).		
Direct	272	90.0
Reverse	*092*	*90.0*
3. South Point Light, Santa Rosa Island, bearing 000°, distant 10.0 miles; 33°43′.8 N., 120°07′.0 W. Chart 5020 (*5101*).		
Direct (Initial Great Circle course)	261½	
(Final Great Circle course)	242½	
Change to Chart 9000 (*5020*) at 33°36′.3 N., 121°00′.0 W.		
Change to Chart 4117 (*9000*) at 22°02′.2 N., 159°00′.0 W.		
Reverse (Initial Great Circle course)	*062½*	
(Final Great Circle course)	*081½*	
Great Circle distance		2191.5
4. Makahuena Point Light bearing 000°, distant 3.0 miles; 21°49′.4 N., 159°26′.9 W.		
Direct	284	8.4
Reverse	*104*	*8.4*
5. Port Allen Breakwater Light bearing 000°, distant 2.5 miles; 21°51′.5 N., 159°35′.6 W. Chart 4117.		
Continue to wharves at Port Allen, 21°54′.2 N., 159°35′.6 W., 2.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		

Table 3.—From San Francisco

To Balboa		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5402.		
Direct	159	36.6
Reverse	*339*	*36.6*
2. Pigeon Point Light bearing 070°, distant 2.1 miles; 37°10′.2 N., 122°26′.0 W.		
Direct	156	58.1
Reverse	*336*	*58.1*
3. Point Sur Light bearing 060°, distant 2.5 miles; 36°17′.1 N., 121°56′.7 W. Chart 5302 (*5402*).		
Direct	155½	150.9
Change to Chart 5202 (*5203*) at 34°40′.0 N., 121°02′.1 W.		
Reverse	*335½*	*150.9*

949285—52——10

Table 3.—From San Francisco—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
4. Latitude 34°00′.0 N., longitude 120°40′.0 W.		
Direct	146	433.2
Change to Chart 5101 *(5202)* at 33°16′.2 N., 120°05′.0 W.		
Change to Chart H. O. 1006 *(5101)* at 32°30′.0 N., 119°28′.3 W.		
Reverse	*326*	*433.2*
5. Latitude 28°00′.0 N., longitude 116°00′.0 W.		
Direct	136½	275.3
Reverse	*316½*	*275.3*
6. Latitude 24°40′.0 N., longitude 112°30′.0 W.		
Direct	135	395.2
Reverse	*315*	*395.2*
7. Latitude 20°00′.0 N., longitude 107°30′.0 W. Chart H. O. 1007 (*H. O. 1006*).		
Direct	117	1695.6
Reverse	*297*	*1695.6*
8. Jicarita Island Light bearing 338°, distant 8.0 miles; 7°05′.0 N., 81°45′.0 W. Chart H. O. 1018 (*H. O. 1007*).		
Direct	087½	78.8
Reverse	*267½*	*78.8*
9. Morro Puercos Light bearing 358°, distant 6.5 miles; 7°08′.2 N., 80°25′.7 W.		
Direct	066	31.4
Reverse	*246*	*31.4*
10. Cape Mala Light bearing 335°, distant 8.0 miles; 7°21′.0 N., 79°57′.0 W. Chart H. O. 1019 (*H. O. 1018*).		
Direct	018½	92.2
Reverse	*198½*	*92.2*
11. Taboguilla Island Light bearing 270°, distant 3.3 miles; 8°48′.4 N., 79°27′.5 W. Chart H. O. 5006 (*H. O. 1019*).		
Direct	various	11.5
Reverse	*various*	*11.5*
12. Balboa Harbor, 8°57′.5 N., 79°34′.3 W.		
To Hilo		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5021.		
Direct (Initial Great Circle course)	246½	
(Final Great Circle course)	230½	
Change to Chart 9000 (*5021*) at 36°55′.4 N., 125°00′.0 W.		
Change to Chart 4115 (*9000*) at 20°06′.5 N., 154°40′.0 W.		
Reverse (Initial Great Circle course)	*050½*	
(Final Great Circle course)	*066½*	
Great Circle distance		1993.0
2. Pepeekeo Point Light bearing 270°, distant 4.9 miles; 19°51′.0 N., 155°00′.0 W.		
Direct	217	7.8
Change to Chart 4103 (*4115*) at 19°46′.0 N., 155°04′.0 W.		
Reverse	*037*	*7.8*
3. Blonde Reef lighted bell buoy 1BR close aboard; 19°44′.8 N., 155°05′.0 W. Chart 4103.		
Continue to wharves at Hilo, 19°44′.1 N., 155°03′.4 W., 1.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		

Table 3.—From San Francisco—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Kahului		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44.4 N., 122°42.5 W. Chart 5021.	*Degrees*	
Direct (Initial Great Circle course)	249½	
(Final Great Circle course)	232½	
Change to Chart 9000 (*5021*) at 37°03.6 N., 125°00.0 W.		
Change to Chart 4116 (*9000*) at 21°14.0 N., 156°00.0 W.		
Reverse (Initial Great Circle course)	*052½*	*Nautical miles*
(Final Great Circle course)	*069½*	
Great Circle distance		2008.2
2. Pauwela Point Light bearing 180°, distant 3.0 miles; 21°00.0 N., 156°19.0 W. Chart 4124 (*4116*).		
Direct	244	9.5
Reverse	*064*	*9.5*
3. Waihee Reef lighted buoy 2 bearing 310°, distant 125 yards; 20°55.9 N., 156°28.7 W.		
Direct	177	1.6
Reverse	*357*	*1.6*
4. Kahului Harbor Entrance lighted buoy 1 close aboard; 20°54.2 N., 156°28.5 W. Chart 4124.		
Continue to wharves at Kahului, 20°54.0 N., 156°28.2 W., 0.4 mile by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Honolulu		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44.4 N., 122°42.5 W. Chart 5021.		
Direct (Rhumb line)	241½	2075.7
Change to Chart 9000 at 36°44.9 N., 125°00.0 W.		
Change to Chart 4116 at 21°33.6 N., 157°00.0 W.		
Ocean Station Vessel N.—Lat. 30° N., long. 140° W.; always underway, but normally maintains station within 10-mile square, the center of which is the assigned geographical position for the station. See H. O. Pub. No. 205, *Radio Navigational Aids*, for details.		
2. Makapuu Point Light bearing 000°, distant 5.0 miles; 21°13.7 N., 157°39.1 W. Chart 4110 (*4116*).		
Direct	270	9.0
Reverse	*090*	*9.0*
3. Diamond Head Light bearing 000°, distant 1.8 miles; 21°13.7 N., 157°48.7 W. Chart 4132 (*4110*).		
Direct	307	5.0
Reverse	*127*	*5.0*
4. Honolulu Harbor Light bearing 026°, distant 2.1 miles; 21°16.7 N., 157°53.1 W. Chart 4132.		
Continue to wharves at Honolulu, 21°18.6 N., 157°52.2 W., 4.0 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Port Allen		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44.4 N., 122°42.5 W. Chart 5021.		
Direct (Initial Great Circle course)	254	
(Final Great Circle course)	235	
Change to Chart 9000 (*5021*) at 37°11.3 N., 125°00.0 W.		
Change to Chart 4117 (*9000*) at 22°06.8 N., 159°00.0 W.		
Reverse (Initial Great Circle course)	*055*	
(Final Great Circle course)	*074*	
Great Circle distance		2119.8

Table 3.—From San Francisco—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
2. Makahuena Point Light bearing 000°, distant 3.0 miles; 21°49′.4 N., 159°26′.9 W.	*Degrees*	*Nautical miles*
Direct	284	8.4
Reverse	*104*	*8.4*
3. Port Allen Breakwater Light bearing 000°, distant 2.5 miles; 21°51′.5 N., 159°35′.6 W. Chart 4117.		
Continue to wharves at Port Allen, 21°54′.2 N., 159°35′.6 W., 2.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Yokohama, Japan		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5021.		
Direct (Initial Great Circle course)	302½	
(Final Great Circle course)	234½	
Change to Chart 9000 (*5021*) at 40°11′.2 N., 128°00′.0 W.		
Reverse (Initial Great Circle course)	*054½*	
(Final Great Circle course)	*122½*	
Great Circle distance		4470.5
2. Latitude 34°49′.0 N., longitude 140°00′.0 E.		
Continue to Yokohama by directions given in H. O. Pub. No. 123A, *Sailing Directions for Japan, Volume I.*		
To Unimak Pass		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5502.		
Direct	311½	21.4
Reverse	*131½*	*21.4*
2. Point Reyes Light bearing 045°, distant 1.6 miles; 37°58′.6 N., 123°02′.7 W. Chart 5021 (*5502*).		
Direct (Initial Great Circle course)	313½	
(Final Great Circle course)	284	
Change to Chart 9000 (*5021*) at 41°25′.4 N., 128°00′.0 W.		
Change to Chart 8802 (*9000*) at 52°56′.2 N., 157°00′.0 W.		
Reverse (Initial Great Circle course)	*104*	
(Final Great Circle course)	*133½*	
Great Circle distance		1887.8
3. Latitude 54°00′.0 N., longitude 163°00′.0 W. Chart 8860 (*8802*).		
Direct	288½	64.7
Reverse	*108½*	*64.7*
4. Scotch Cap Light bearing 000°, distant 3.2 miles; 54°20′.5 N., 164°44′.5 W.		
Continue to destination by directions given in *U. S. Coast Pilot, Alaska, Part II.*		
To Seward		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5502.		
Direct	311½	21.4
Reverse	*131½*	*21.4*
2. Point Reyes Light bearing 045°, distant 1.6 miles; 37°58′.6 N., 123°02′.7 W.		
Direct	327	67.7
Reverse	*147*	*67.7*

Table 3.—From San Francisco—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
3. Point Arena Light bearing 065°, distant 4.5 miles; 38°55.4 N., 123°49.6 W. Chart 5021 (*5502*).	*Degrees*	
Direct (Initial Great Circle course)	331	
(Final Great Circle course)	311	
Change to Chart 5052 (*5021*) at 43°00.0 N., 127°24.5 W.		
Change to Chart H. O. 0903 (*5052*) at 48°00.0 N., 132°02.2 W.		
Change to Chart 8002 (*H. O. 0903*) at 54°00.0 N., 139°20.1 W.		
Change to Chart 8502 (*8002*) at 56°54.9 N., 144°00.0 W.		
Change to Chart 8552 (*8502*) at 59°07.9 N., 148°20.0 W.		
Reverse (Initial Great Circle course)	*131*	*Nautical miles*
(Final Great Circle course)	*161*	
Great Circle distance		1581.0
4. Barwell Island Light bearing 020°, distant 0.6 mile; 59°51.0 N., 149°17.2 W. Chart 8552.		
Continue to wharf at Seward, 60°06.0 N., 149°26.3 W., 16.4 miles by directions given in *U. S. Coast Pilot, Alaska, Part II.*		
To Ketchikan		
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44.4 N., 122°42.5 W. Chart 5502.		
Direct	311½	21.4
Reverse	*131½*	*21.4*
2. Point Reyes Light bearing 045°, distant 1.6 miles; 37°58.6 N., 123°02.7 W.		
Direct	327	67.7
Reverse	*147*	*67.7*
3. Point Arena Light bearing 065°, distant 4.5 miles; 38°55.4 N., 123°49.6 W. Chart 5602 (*5502*).		
Direct	340	96.1
Reverse	*160*	*96.1*
4. Blunts Reef Lightship bearing 080°, distant 1.5 miles; 40°25.7 N., 124°32.2 W. Chart 5021 (*5602*).		
Direct	335½	881.9
Change to Chart 5022 (*5021*) at 42°40.0 N., 125°53.3 W.		
Change to Chart 5052 (*5022*) at 46°00.4 N., 128°00.0 W.		
Change to Chart H. O. 0903 (*5052*) at 49°00.0 N., 130°00.2 W.		
Reverse	*155½*	*881.9*
5. Latitude 53°48.8 N., longitude 133°30.0 W.		
Direct	000	17.2
Reverse	*180*	*17.2*
6. Latitude 54°06.0 N., longitude 133°30.0 W. Chart 8152 (*H. O. 0903*).		
Direct	047	21.2
Reverse	*227*	*21.2*
7. Cape Santa Margarita (Langara) Light bearing 180°, distant 5.0 miles; 54°20.3 N., 133°03.4 W.		
Direct	062	41.1
Reverse	*242*	*41.1*
8. Cape Chacon Light bearing 000°, distant 2.0 miles; 54°39.5 N., 132°00.9 W.		
Direct	032	1.3
Reverse	*212*	*1.3*
9. Cape Chacon Light bearing 321°, distant 1.1 miles; 54°40.6 N., 131°59.7 W. Chart 8102 (*8152*).		
Continue to wharves at Ketchikan, 55°20.5 N., 131°38.7 W., 43.6 miles, by directions given in *U. S. Coast Pilot, Alaska, Part I.*		

Table 4.—From Columbia River

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Hilo		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′.1 N., 124°11′.7 W. Chart 5022.	*Degrees*	
Direct (Initial Great Circle course)	234	
(Final Great Circle course)	216½	
Change to Chart 5052 *(5022)* at 44°08′.1 N., 128°00′.0 W.		
Change to Chart 9000 *(5052)* at 41°00′.0 N., 133°00′.0 W.		
Change to Chart 4115 *(9000)* at 20°17′.0 N., 154°40′.0 W.		
Reverse (Initial Great Circle course)	*036½*	*Nautical miles*
(Final Great Circle course)	*054*	
Great Circle distance		2187.4
2. Pepeekeo Point Light bearing 270°, distant 4.9 miles; 19°51′.0 N., 155°00′.0W.		
Direct	217	7.8
Change to Chart 4103 *(4115)* at 19°46′.0 N., 155°04′.0 W.		
Reverse	*037*	*7.8*
3. Blonde Reef lighted bell buoy 1BR close aboard; 19°44′.8 N., 155°05′.0 W. Chart 4103.		
Continue to wharves at Hilo, 19°44′.1 N., 155°03′.4 W., 1.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Kahului		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′.1 N., 124°11′.7 W. Chart 5022.		
Direct (Initial Great Circle course)	237	
(Final Great Circle course)	218½	
Change to Chart 5052 *(5022)* at 44°17′.8 N., 128°00′.0 W.		
Change to Chart 9000 *(5052)* at 41°30′.2 N., 133°00′.0 W.		
Change to Chart 4116 *(9000)* at 21°23′.1 N., 156°00′.0 W.		
Reverse (Initial Great Circle course)	*038½*	
(Final Great Circle course)	*057*	
Great Circle distance		2177.9
2. Pauwela Point Light bearing 180°, distant 3.0 miles; 21°00′.0 N., 156°19′.5 W. Chart 4124 *(4116)*.		
Direct	244	9.5
Reverse	*064*	*9.5*
3. Waihee Reef lighted buoy 2 bearing 310°, distant 125 yards; 20°55′.9 N., 156°28′.7 W.		
Direct	177	1.6
Reverse	*357*	*1.6*
4. Kahului Harbor Entrance lighted buoy 1 close aboard; 20°54′.2 N., 156°28′.5 W. Chart 4124.		
Continue to wharves at Kahului, 20°54′.0 N., 156°28′.2 W., 0.4 mile by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Honolulu		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′.1 N., 124°11′.7 W. Chart 5022.		
Direct (Initial Great Circle course)	239	
(Final Great Circle course)	219½	
Change to Chart 5052 *(5022)* at 44°29′.3 N., 128°00′.0 W.		
Change to Chart 9000 *(5052)* at 41°53′.7 N., 133°00′.0 W.		
Change to Chart 4116 *(9000)* at 21°57′.7 N., 157°00′.0 W.		
Reverse (Initial Great Circle course)	*039½*	
(Final Great Circle course)	*059*	
Great Circle distance		2214.0

Table 4.—From Columbia River—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
2. Makapuu Point Light bearing 000°, distant 5.0 miles; 21°13.7′ N., 157°39.1′ W. Chart 4110 (*4116*).	*Degrees*	*Nautical miles*
Direct	270	9.0
Reverse	*090*	*9.0*
3. Diamond Head Light bearing 000°, distant 1.8 miles; 21°13.7′ N., 157°48.7′ W. Chart 4132 (*4110*).		
Direct	307	5.0
Reverse	*127*	*5.0*
4. Honolulu Harbor Light bearing 026°, distant 2.1 miles; 21°16.7′ N., 157°53.1′ W. Chart 4132.		
Continue to wharves at Honolulu, 21°18.6′ N., 157°52.2′ W., 4.0 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Port Allen		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11.1′ N., 124°11.7′ W. Chart 5022.		
Direct (Initial Great Circle course)	241½	
(Final Great Circle course)	221	
Change to Chart 5052 (*5022*) at 44°08.8′ N., 128°00.0′ W.		
Change to Chart 9000 (*5052*) at 41°42.8′ N., 133°00.0′ W.		
Change to Chart 4117 (*9000*) at 22°36.7′ N., 158°40.0′ W.		
Reverse (Initial Great Circle course)	*041*	
(Final Great Circle course)	*061½*	
Great Circle distance		2239.3
2. Nawiliwili Harbor Light bearing 270°, distant 3.0 miles; 21°57.5′ N., 159°17.0′ W.		
Direct	228	12.2
Reverse	*048*	*12.2*
3. Makahuena Point Light bearing 000°, distant 3.0 miles; 21°49.4′ N., 159°26.9′ W.		
Direct	284	8.4
Reverse	*104*	*8.4*
4. Port Allen Breakwater Light bearing 000°, distant 2.5 miles; 21°51.5′ N., 159°35.6′ W. Chart 4117.		
Continue to wharves at Port Allen, 21°54.2′ N., 159°35.6′ W., 2.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Yokohama, Japan		
These tracks lie south of the Aleutian Islands and are also used in whole or in part for various other ports on the west side of the North Pacific. Information for their safe navigation in the vicinity of the Aleutian Islands is contained in *U. S. Coast Pilot, Alaska, Part II.*		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11.1′ N., 124°11.7′ W. Chart 5022.		
Direct (Initial Great Circle course)	302	
(Final Great Circle course)	290	
Change to Chart 5052 at 47°44.0′ N., 128°00.0′ W.		
Change to Chart 9000 at 49°00.0′ N., 131°34.4′ W.		
Great Circle distance		695.5
2. Latitude 51°21.0′ N., longitude 140°00.0′ W.		
Direct (Initial Great Circle course)	281	
(Final Great Circle course)	265	
Change to Chart 8802 at 52°05.3′ N., 157°00.0′ W.		
Great Circle distance		743.0

Table 4.—From Columbia River—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
3. Latitude 52°00′0 N., longitude 160°00′0 W.		
Direct	263	758.5
Change to Chart 9000 at 51°33′3 N., 166°00′0 W.		
Change to Chart 9102 at 51°08′6 N., 171°30′0 W.		
4. Latitude 50°30′0 N., longitude 180°00′0.		
Direct (Initial Great Circle course)	259	
(Final Great Circle course)	237	
Leave Chart 9102 at 48°54′9 N., 170°30′0 E.		
Great Circle distance		1333.5
5. Latitude 42°00′0 N., longitude 150°00′0 E.		
Direct	227½	638.8
6. Latitude 34°49′0 N., longitude 140°00′0 E.		
Continue to Yokohama by directions given in H. O. Pub. No. 123A, *Sailing Directions for Japan, Volume I.*		
From Yokohama		
1. Latitude 34°49′0 N., longitude 140°00′0 E.		
Direct (Initial Great Circle course)	051½	
(Final Great Circle course)	086½	
Change to Chart 9102 at 48°00′0 N., 172°42′2 E.		
Change to Chart 9000 at 49°56′2 N., 171°30′0 W.		
Great Circle distance		2343.1
2. Latitude 50°00′0 N., longitude 170°00′0 W.		
Direct	090	1160.6
Ocean Station Vessel P.—Lat. 50° N., long. 145° W.; always underway, but normally maintains station within 10-mile square, the center of which is the assigned geographical position for the station. See H. O. Pub. No. 205, *Radio Navigational Aids*, for details.		
3. Latitude 50°00′0 N., longitude 140°00′0 W.		
Direct	110	675.1
Change to Chart 5052 at 48°20′7 N., 133°00′0 W.		
Change to Chart 5022 at 47°07′8 N., 128°00′0 W.		
4. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′1 N., 124°11′7 W.		
To Unimak Pass		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′1 N., 124°11′7 W. Chart 5022.		
Direct (Initial Great Circle course)	302	
(Final Great Circle course)	271½	
Change to Chart 5052 (*5022*) at 47°43′0 N., 128°00′0 W.		
Change to Chart 9000 (*5052*) at 49°25′3 N., 133°00′0 W.		
Change to Chart 8802 (*9000*) at 53°44′9 N., 157°00′0 W.		
Reverse (Initial Great Circle course)	*091½*	
(Final Great Circle course)	*122*	
Great Circle distance		1543.5
2. Latitude 54°00′0 N., longitude 163°00′0 W. Chart 8860 (*8802*).		
Direct	288½	64.7
Reverse	*108½*	*64.7*
3. Scotch Cap Light bearing 000°, distant 3.2 miles; 54°20′5 N., 164°44′5 W. Chart 8860.		
Continue to destination by directions given in *U. S. Coast Pilot, Alaska, Part II.*		

Table 4.—From Columbia River—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Seward		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11.1 N., 124°11.7 W. Chart 5022.	*Degrees*	
Direct (Initial Great Circle course)	322	
(Final Great Circle course)	301½	
Change to Chart H. O. 0903 (*5022*) at 48°30.0 N., 127°00.4 W.		
Change to Chart 8002 (*H. O. 0903*) at 54°30.0 N., 136°15.0 W.		
Change to Chart 8502 (*8002*) at 58°01.5 N., 144°00.0 W.		
Change to Chart 8552 (*8502*) at 59°33.1 N., 148°20.0 W.		
Reverse (Initial Great Circle course)	*121½*	*Nautical miles*
(Final Great Circle course)	*142*	
Great Circle distance		1208.0
2. Barwell Island Light bearing 020°, distant 0.6 mile; 59°51.0 N., 149°17.2 W. Chart 8552.		
Continue to wharf at Seward, 60°06.0 N., 149°26.3 W., 16.4 miles by directions given in *U. S. Coast Pilot, Alaska, Part II.*		
To Ketchikan		
1. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11.1 N., 124°11.7 W. Chart 5022.		
Direct	320½	436.1
Change to Chart H. O. 0903 (*5022*) at 48°30.0 N., 126°58.7 W.		
Reverse	*140½*	*436.1*
2. Cape St. James Light bearing 042°, distant 10.0 miles; 51°48.8 N., 131°11.8 W. Chart H. O. 1583 (*H. O. 0903*).		
Direct	325	146.3
Reverse	*145*	*146.3*
3. Latitude 53°48.8 N., longitude 133°30.0 W.		
Direct	000	17.2
Reverse	*180*	*17.2*
4. Latitude 54°06.0 N., longitude 133°30.0 W. Chart 8152 (*H. O. 1583*).		
Direct	047	21.2
Reverse	*227*	*21.2*
5. Cape Santa Margarita (Langara) Light bearing 180°, distant 5.0 miles; 54°20.3 N., 133°03.4 W.		
Direct	062	41.1
Reverse	*242*	*41.1*
6. Cape Chacon Light bearing 000°, distant 2.0 miles, 54°39.5 N., 132°00.9 W. Chart 8102 (*8152*).		
Direct	032	1.3
Reverse	*212*	*1.3*
7. Cape Chacon Light bearing 321°, distant 1.1 mile; 54°40.6 N., 131°59.7 W.		
Continue to wharves at Ketchikan, 55°20.5 N., 131°38.7 W., 43.6 miles via Nichols Passage by directions given in *U. S. Coast Pilot, Alaska, Part I.*		

Table 5.—From Strait of Juan de Fuca

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Hilo		
1. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25.7′ W., 124°46.5′ W. Chart 5022.	*Degrees*	
Direct (Initial Great Circle course)	231	
(Final Great Circle course)	213	
Change to Chart 5052 (*5022*) at 46°35.2′ N., 128°00.0′ W.		
Change to Chart 9000 (*5052*) at 43°16.0′ N., 133°00.0′ W.		
Change to Chart 4115 (*9000*) at 20°19.8′ N., 154°40.0′ W.		
Reverse (Initial Great Circle course)	*033*	*Nautical miles*
(Final Great Circle course)	*051*	
Great Circle distance		2250.2
2. Pepeekeo Point Light bearing 270°, distant 4.9 miles; 19°51.0′ N., 155°00.0′ W.		
Direct	217	7.8
Change to Chart 4103 (*4115*) at 19°46.0′ N., 155°04.0′ W.		
Reverse	*037*	*7.8*
3. Blonde Reef lighted bell buoy 1BR close aboard; 19°44.8′ N., 155°05.0′ W. Chart 4103.		
Continue to wharves at Hilo, 19°44.1′ N., 155°03.4′ W., 1.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Kahului		
1. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25.7′ N., 124°46.5′ W. Chart 5022.		
Direct (Initial Great Circle course)	234	
(Final Great Circle course)	215	
Change to Chart 5052 (*5022*) at 46°46.7′ N., 128°00.0′ W.		
Change to Chart 9000 (*5052*) at 43°48.4′ N., 133°00.0′ W.		
Change to Chart 4116 (*9000*) at 21°26.0′ N., 156°00.0′ W.		
Reverse (Initial Great Circle course)	*035*	
(Final Great Circle course)	*054*	
Great Circle distance		2235.0
2. Pauwela Point Light bearing 180°, distant 3.0 miles; 21°00.0′ N., 156°19.5′ W. Chart 4124 (*4116*).		
Direct	244	9.5
Reverse	*064*	*9.5*
3. Waihee Reef lighted buoy 2 bearing 310°, distant 125 yards; 20°55.9′ N., 156°28.7′ W.		
Direct	177	1.6
Reverse	*357*	*1.6*
4. Kahului Harbor Entrance lighted buoy 1 close aboard; 24°54.2′ N., 156°28.5′ W. Chart 4124.		
Continue to wharves at Kahului, 20°54.0′ N., 156°28.2′ W., 0.4 mile by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Honolulu		
1. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25.7′ N., 124°46.5′ W. Chart 5022.		
Direct (Initial Great Circle course)	235½	
(Final Great Circle course)	216	
Change to Chart 5052 (*5022*) at 46°52.1′ N., 128°00.0′ W.		
Change to Chart 9000 (*5052*) at 44°03.6′ N., 133°00.0′ W.		
Change to Chart 4116 (*9000*) at 21°51.0′ N., 157°10.0′ W.		
Reverse (Initial Great Circle course)	*036*	
(Final Great Circle course)	*055½*	
Great Circle distance		2266.7

Table 5.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
2. Makapuu Point Light bearing 000°, distant 5.0 miles; 21°13′.7 N., 157°39′.1 W. Chart 4110 (*4116*).	*Degrees*	*Nautical miles*
Direct	270	9.0
Reverse	*090*	*9.0*
3. Diamond Head Light bearing 000°, distant 1.8 miles; 21°13′.7 N., 157°48′.7 W. Chart 4132 (*4110*).		
Direct	307	5.0
Reverse	*127*	*5.0*
4. Honolulu Harbor Light bearing 026°, distant 2.1 miles; 21°16′.7 N., 157°53′.1 W. Chart 4132.		
Continue to wharves at Honolulu, 21°18′.6 N., 157°52′.2 W., 4.0 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Port Allen		
1. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25′.7 N., 124°46′.5 W. Chart 5022.		
Direct (Initial Great Circle course)	238½	
(Final Great Circle course)	217½	
Change to Chart 5052 (*5022*) at 47°02′.1 N., 128°00′.0 W.		
Change to Chart 9000 (*5052*) at 44°31′.8 N., 133°00′.0 W.		
Change to Chart 4117 (*9000*) at 22°17′.8 N., 159°00′.0 W.		
Reverse (Initial Great Circle course)	*037½*	
(Final Great Circle course)	*058½*	
Great Circle distance		2286.3
2. Nawiliwili Harbor Light bearing 270°, distant 3.0 miles; 21°57′.5 N., 159°17′.0 W.		
Direct	228	12.2
Reverse	*048*	*12.2*
3. Makahuena Point Light bearing 000°, distant 3.0 miles; 21°49′.4 N., 159°26′.9 W.		
Direct	284	8.4
Reverse	*104*	*8.4*
4. Port Allen Breakwater Light bearing 000°, distant 2.5 miles; 21°51′.5 N., 159°35′.6 W. Chart 4117.		
Continue to wharves at Port Allen, 21°54′.2 N., 159°35′.6 W., 2.7 miles by directions given in *U. S. Coast Pilot, Hawaiian Islands.*		
To Yokohama, Japan		
These tracks lie south of the Aleutian Islands and are also used in whole or in part for various other ports on the west side of the North Pacific. Information for their safe navigation in the vicinity of the Aleutian Islands is contained in *U. S. Coast Pilot, Alaska, Part II.*		
1. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31′.4 N., 125°00′.6 W. Chart 5022.		
Direct (Initial Great Circle course)	292	
(Final Great Circle course)	280½	
Change to Chart 5052 at 48°50′.0 N., 126°12′.4 W.		
Change to Chart 9000 at 49°16′.3 N., 128°00′.0 W.		
Great Circle distance		602.0
2. Latitude 51°21′.0 N., longitude 140°00′.0 W.		
Direct (Initial Great Circle course)	281	
(Final Great Circle course)	265	
Change to Chart 8802 at 52°05′.3 N., 157°00′.0 W.		
Great Circle distance		743.0

Table 5.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
3. Latitude 52°00′.0 N., longitude 160°00′.0 W.		
Direct	263	758.5
Change to Chart 9000 at 51°33′.3 N., 166°00′.0 W.		
Change to Chart 9102 at 51°08′.6 N., 171°30′.0 W.		
4. Latitude 50°30′.0 N., longitude 180°00′.0.		
Direct (Initial Great Circle course)	259	
(Final Great Circle course)	237	
Leave Chart 9102 at 48°54′.9 N., 170°30′.0 E.		
Great Circle distance		1333.5
5. Latitude 42°00′.0 N., longitude 150°00′.0 E.		
Direct	227½	638.8
6. Latitude 34°49′.0 N., longitude 140°00′.0 E.		
Continue to Yokohama by directions given in H. O. Pub. No. 123A, *Sailing Directions for Japan, Volume I.*		
From Yokohama		
1. Latitude 39°49′.0 N., 140°00′.0 E.		
Direct (Initial Great Circle course)	051½	
(Final Great Circle course)	086½	
Change to Chart 9102 at 48°00′.0 N., 172°42′.2 E.		
Change to Chart 9000 at 49°56′.2 N., 171°30′.0 W.		
Great Circle distance		2343.1
2. Latitude 50°00′.0 N., longitude 170°00′.0 W.		
Direct	090	1160.6
Ocean Station Vessel P.—Lat. 50° N., long. 145° W.; always underway, but normally maintains station within 10-mile square, the center of which is the assigned geographical position for the station. See H. O. Pub. No. 205, *Radio Navigational Aids,* for details.		
3. Latitude 50°00′.0 N., longitude 140°00′.0 W.		
Direct	093	593.0
Change to Chart 5052 at 49°00′.0 N., 129°56′.7 W.		
Change to Chart 5022 at 48°59′.0 N., 128°00′.0 W.		
4. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31′.4 N., 125°00′.6 W.		
To Unimak Pass		
1. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31′.4 N., 125°00′.6 W. Chart 5022.		
Direct (Initial Great Circle course)	297½	
(Final Great Circle course)	267½	
Change to Chart H. O. 0903 *(5022)* at 48°58′.0 N., 126°20′.0 W.		
Change to Chart 9000 *(H. O. 0903)* at 52°16′.0 N., 139°30′.0 W.		
Change to Chart 8802 *(9000)* at 54°00′.4 N., 157°00′.0 W.		
Reverse (Initial Great Circle course)	087½	
(Final Great Circle course)	*117½*	
Great Circle distance		1445.2
2. Latitude 54°00′.0 N., longitude 163°00′.0 W. Chart 8860 *(8802)*.		
Direct	288½	64.7
Reverse	*108½*	*64.7*
3. Scotch Cap Light bearing 000°, distant 3.2 miles; 54°20′.5 N., 164°44′.5 W. Chart 8860.		
Continue to destination by directions given in *U. S. Coast Pilot, Alaska, Part II.*		

Table 5.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
To Seward		
1. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31.4 N., 125°00.6 W. Chart 6102.	*Degrees*	*Nautical miles*
Direct	306	31.0
Reverse	*126*	*31.0*
2. Amphitrite Point Light bearing 036°, distant 7.0 miles; 48°49.6 N., 125°38.6 W. Chart H. O. 5362 (*6102*).		
Direct	307	118.3
Reverse	*127*	*118.3*
3. Cape Cook Light bearing 037°, distant 7.0 miles; 50°01.2 N., 128°03.0 W. Chart H. O. 5361 (*H. O. 5362*).		
Direct	312	160.6
Reverse	*132*	*160.6*
4. Cape St. James Light bearing 042°, distant 10.0 miles; 51°48.8 N., 131°11.8 W. Chart H. O. 0903 (*H. O. 5361*).		
Direct (Initial Great Circle course)	315½	
(Final Great Circle course)	300½	
Change to Chart 8002 (*H. O. 0903*) at 54°33.9 N., 136°00.0 W.		
Change to Chart 8502 (*8002*) at 58°05.4 N., 144°00.0 W.		
Change to Chart 8552 (*8502*) at 59°33.7 N., 148°20.0 W.		
Reverse (Initial Great Circle course)	*120½*	
(Final Great Circle course)	*135½*	
Great Circle distance		773.0
5. Barwell Island Light bearing 020°, distant 0.6 miles; 59°51.0 N., 149°17.2 W.		
Continue to wharf at Seward, 60°06.0 N., 149°26.3 W., 16.4 miles by directions given in *U. S. Coast Pilot, Alaska, Part II.*		
To Ketchikan		
1. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31.4 N., 125°00.6 W. Chart 6102.		
Direct	306	31.0
Reverse	*126*	*31.0*
2. Amphitrite Point Light bearing 036°, distant 7.0 miles; 48°49.6 N., 125°38.6 W. Chart H. O. 5362 (*6102*).		
Direct	307	118.3
Reverse	*127*	*118.3*
3. Cape Cook Light bearing 037°, distant 7.0 miles; 50°01.2 N., 128°03.0 W. Chart H. O. 5361 (*H. O. 5362*).		
Direct	312	160.8
Reverse	*132*	*160.8*
4. Cape St. James Light bearing 042°, distant 10.0 miles; 51°48.8 N., 131°11.8 W. Chart H. O. 1583 (*H. O. 5361*).		
Direct	325	146.3
Reverse	*145*	*146.3*
5. Latitude 53°48.8 N., longitude 133°30.0 W.		
Direct	000	17.2
Reverse	*180*	*17.2*
6. Latitude 54°06.0 N., longitude 133°30.0 W. Chart 8152 (*H. O. 1583*).		
Direct	047	21.2
Reverse	*227*	*21.2*
7. Cape Santa Margarita (Langara) Light bearing 180°, distant 5.0 miles; 54°20.3 N., 33°03.4 W.		
Direct	062	41.1
Reverse	*242*	*41.1*
8. Cape Chacon Light bearing 000°, distant 2.0 miles; 54°39.5 N., 132°00.9 W. Chart 8102 (*8152*).		
Direct	032	1.3
Reverse	*212*	*1.3*

Table 5.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
9. Cape Chacon Light bearing 321°, distant 1.1 miles; 54°40′.6 N., 131°59′.7 W.		
Continue to wharves at Ketchikan, 55°20′.5 N., 131°38′.7 W., 43.6 miles via Nichols Passage by directions given in *U. S. Coast Pilot, Alaska, Part I.*		

Coastwise Courses

Vessels may use the following directions, which give approximately the track followed by high-powered steamers plying regularly between San Diego, Los Angeles, San Francisco, Columbia River, and Puget Sound ports. These courses are used by such vessels in preference to others farther offshore by reason of the fact that they lead well within range of the various fog signals and insofar as possible over depths where the lead may be used to obtain a check on the position.

Caution.—Strict adherence to the recommended courses (track lines shown in red on sailing charts) might conceivably result in collision in the case of meeting vessels. This contingency might occur in thick weather on courses where the distances run are short. It is recommended, for southbound vessels, that the course be shaped about ¼ to ½ mile outside the track lines to pass to the right of northbound traffic.

Low-powered local steamers usually keep close inshore, following in general, the curves of the land, in order to escape the full effect of wind and sea. In clear weather strangers may readily follow this inshore track by means of the chart; in thick weather they are advised not to use it, as the fog signals are few and far apart, and the currents variable and uncertain, making detailed local knowledge essential to safety. For that reason no directions for this track are given.

Table 6.—From San Diego to San Francisco

CHARTS 5101, 5202, 5302, 5402

Position (Reverse directions in *italics*—read upward)	True course	Distance
1. San Diego Entrance Range Front Light bearing 353°, distant 600 yards 32°41′.9 N., 117°13′.9 W. Chart 5107.	*Degrees*	*Nautical miles*
Direct	173	2.9
Reverse	*353*	*2.9*
2. San Diego Channel lighted bell buoy 5 bearing 270°, distant 250 yards; 32°39′.1 N., 117°13′.5 W.		
Direct	204	2.1
Reverse	*024*	*2.1*

Table 6.—From San Diego to San Francisco—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
3. San Diego Approach lighted whistle buoy 1SD bearing 304°, distant 0.2 mile; 32°37.2′ N., 117°14.5′ W. Chart 5101 *(5107)*.	*Degrees*	*Nautical miles*
Direct	301	2.0
Reverse	*121*	*2.0*
4. Point Loma Light bearing 045°, distant 2.4 miles; 32°38.2′ N., 117°16.5′ W.		
To Los Angeles Entrance		
4. Point Loma Light bearing 045°, distant 2.4 miles; 32°38.2′ N., 117°16.5′ W.		
Direct	323	80.3
Reverse	*143*	*80.3*
4A. Los Angeles Approach lighted bell buoy LA close aboard; 33°41.9′ N., 118°14.5′ W. Chart 5143. Note: Inbound vessels pass east of buoy, outbound vessels pass west of buoy, see Chapter 4.		
Los Angeles Entrance to San Francisco		
4A. Los Angeles Approach lighted bell buoy LA close aboard; 33°41.9′ N., 118°14.5′ W. Chart 5143. Note: Inbound vessels pass east of buoy, outbound vessels pass west of buoy, see Chapter 4.		
Direct	252	3.6
Reverse	*072*	*3.6*
5. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40.8′ N., 118°18.9′ W.		
4. Point Loma Light bearing 045°, distant 2.4 miles; 32°38.2′ N., 117°16.5′ W.		
Direct	320	81.6
Reverse	*140*	*81.6*
5. Point Fermin Light bearing 035°, distant 1.9 miles; 33°40.8′ N., 118°18.9′ W.		
Direct	293	56.0
Reverse	*113*	*56.0*
6. Anacapa Island Light bearing 202°, distant 1.8 miles; 34°02.6′ N., 119°20.7′ W. Chart 5202 (*5101*).		
Direct	291½	61.2
Reverse	*111½*	*61.2*
7. Point Conception Light bearing 025°, distant 2.0 miles; 34°25.1′ N., 120°29.2′ W.		
Direct	307	12.8
Reverse	*127*	*12.8*
8. Point Arguello Light bearing 050°, distant 2.8 miles; 34°32.8′ N., 120°41.6′ W. Chart 5302 (*5202*).		
Direct	329½	121.1
Reverse	*149½*	*121.1*
9. Point Sur Light bearing 060°, distant 2.5 miles; 36°17.1′ N., 121°56.7′ W. Chart 5402 (*5302*).		
Direct	336	58.1
Reverse	*156*	*58.1*
10. Pigeon Point Light bearing 070°, distant 2.1 miles; 37°10.2′ N., 122°26.0′ W.		
Direct	339	36.6
Reverse	*159*	*36.6*
11. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44.4′ N., 122°42.5′ W.		

The following brief summary of the methods actually employed in thick weather, by the ablest masters on the coast, indicates the methods and precautions by which safety is assured.

Northbound.—From San Diego to Los Angeles the conditions are seldom such as to cause any deviation from the track. If uncertain of the position in approaching San Pedro Bay, steer so as to make sure of being to the eastward of the Los Angeles entrance lighted bell buoy LA and of Los Angeles Harbor Light on outer end of the San Pedro or westerly breakwater. Continue to a depth of 10 fathoms and then haul to the westward in that depth, and the fog signals on Los Angeles Harbor Light, a two-tone air diaphone, and Los Angeles Entrance East Light, an electric diaphragm horn, will be made without difficulty.

Crossing toward Anacapa Island Light from Point Fermin, when bound for San Francisco the possibility of a northerly current setting into Santa Monica Bay should be borne in mind. The fog signal at Anacapa Island Light is a two-tone air diaphone. Having made Anacapa Island Light, there are no dangers until approaching Point Conception. Here soundings should be relied upon to guard against an inshore set, and the depths should not be shoaled to less than 50 fathoms. From Point Conception, Point Arguello will readily be made.

The track from Point Arguello to Point Sur is a long one, on which currents of considerable velocity are frequently encountered, and to the southward of Point Sur depths of over 100 fathoms extend so close to the beach that a vessel cannot count on getting bottom with the lead in time to prevent disaster. Point Sur, therefore, should be given a wide berth. If, on this track, the weather has not cleared by the time Piedras Blancas has been reached, the vessel should be hauled out 2° or 3°, and great caution should be exercised as Point Sur is approached.

The lead should find bottom off Point Sur, but even if it does not, no difficulty should be experienced in making a landfall northward of Monterey Bay, as the depths shoal very gradually from the 100-fathom curve to the beach. The track to the lightship may then be followed by means of sounding.

Vessels equipped with echo sounding apparatus should use this aid to navigation constantly in conjunction with the charts for fixing the vessel's position.

Detailed local knowledge is necessary for entering the Golden Gate in thick weather, because of the strong, irregular currents and tide rips. At times, however, it will be clear within the heads when it is foggy outside. It is well, therefore, to stand in cautiously as far as lighted bell buoy 7; if from that vicinity Point Bonita cannot be seen, the vessel should be anchored until the weather clears.

Southbound.—The courses from the bar to Point Sur are short and should be easy to make good, especially as the 100-fathom curve extends well offshore to the northward of Point Sur, affording ample opportunity for checking the vessel's position by sounding as the point is approached.

Likewise, on the long course from Point Sur to Point Arguello, the latter point may be reached without difficulty. If the soundings show 30 fathoms, haul to a 175° course, keeping in that depth, and if the water deepens to over 40 fathoms the vessel will be past the point, and may be hauled up for Point Conception.

Again, in approaching Anacapa Island, soundings may be used to guide the vessel to within sound of the fog signal. A fix should be obtained off Anacapa Island before attempting to approach Point Vicente.

Point Vicente, formerly considered the most difficult point to make on the southward track, is now marked by a light and fog signal. Deep water extends close to the point, the 100-fathom curve is about 1 mile off the light and the 50-fathom curve is 0.7 mile off. From Anacapa Island, the course should be shaped to pass about 2 miles off Point Vicente, and the sounding apparatus should be used as the point is approached.

Guided by the soundings, Los Angeles Harbor entrance lighted bell buoy LA can be made after passing Point Fermin. Strangers should not attempt to enter Los Angeles inner harbor in thick weather without a pilot.

Vessels bound from Los Angeles to San Diego usually experience little difficulty in making Point Loma. If in doubt, the course may be shaped to pick up the 30-fathom curve to the northward of the point, and that depth followed to the fog signal. The presence or absence of kelp just inside the 30-fathom curve is a good guide in deciding whether the vessel is north or south of the point. Heavy kelp extends for over 1.5 miles southward of Point Loma. Strangers should not attempt to enter San Diego Bay in thick weather without a pilot.

Table 7.—San Francisco to Strait of Juan de Fuca

CHARTS 5502, 5602, 5702, 5802, 5902, 6002, 6102

Position (Reverse directions in *italics*—read upward)	True course	Distance
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5502.	*Degrees*	*Nautical Miles*
Direct	311½	21.4
Reverse	*131½*	*21.4*
2. Point Reyes Light bearing 045°, distant 1.6 miles; 37°58′.6 N., 123°02′.7 W.		
Direct	327	67.7
Reverse	*147*	*67.7*
3. Point Arena Light bearing 065°, distant 4.5 miles; 38°55′.4 N., 123°49′.6 W. Chart 5602 (*5502*).		
Direct	340	96.1
Reverse	*160*	*96.1*
4. Blunts Reef Lightship bearing 080°, distant 1.5 miles; 40°25′.7 N., 124°32′.2 W.		
Direct	356½	144.8
Change to Chart 5702 (*5602*) at 41°03′.0 N., 124°35′.2 W.		
Reverse	*176½*	*144.8*
5. Cape Blanco Light bearing 090°, distant 7.5 miles; 42°50′.2 N., 124°44′.0 W.		
To Columbia River Lightship		
5. Cape Blanco Light bearing 090°, distant 7.5 miles; 42°50′.2 N., 124°44′.0 W. Chart 5802.		
Direct	006½	202.2
Change to Chart 5902 (*5802*) at 44°40′.0 N., 124°26′.6 W.		
Reverse	*186½*	*202.2*

Position (Reverse directions in *italics*—read upward)	True course	Distance
5A. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′.1 N., 124°11′.7 W.		
Columbia River to Strait of Juan de Fuca		
5A. Columbia River Lightship bearing 090°, distant 0.5 mile; 46°11′.1 N., 124°11′.7 W. Chart 6002.	*Degrees*	*Nautical miles*
Direct	347	122.0
Change to Chart 6102 *(6002)* at 47°40′.0 N., 124°41′.6 W.		
Reverse	*167*	*122.0*
6. Umatilla Reef Lightship bearing 095°, distant 1.0 mile; 48°10′.0 N., 124°51′.9 W.		
5. Cape Blanco Light bearing 090°, distant 7.5 miles; 42°50′.2 N., 124°44′.0 W. Chart 5802.		
Direct	359	319.9
Change to Chart 5902 *(5802)* at 44°40′.0 N., 124°46′.6 W.		
Change to Chart 6002 *(5902)* at 46°20′.0 N., 124°49′.1 W.		
Change to Chart 6102 *(6002)* at 47°40′.0 N., 124°51′.1 W.		
Reverse	*179*	*319.9*
6. Umatilla Reef Lightship bearing 095°, distant 1.0 mile; 48°10′.0 N., 124°51′.9 W.		
Direct	013	16.1
Reverse	*193*	*16.1*
7. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25′.7 N., 124°46′.5 W.		

The following brief summary of the methods actually employed in thick weather by the ablest masters on the coast indicates the methods and precautions by which safety is assured.

Northbound.—Taking the departure from Point Bonita, there should be no trouble in making the lightship and very little in making Point Reyes, if the track is checked by sounding.

Approaching Point Arena, start sounding when off Gualala and continue until assured that the ship is not inside the track. Point Arena fog signal will nearly always be heard north and south of the point, but seldom when abeam if over 2 miles distant.

When within 10 miles of Punta Gorda soundings should be taken as rapidly as possible, as the depths shoal abruptly; also, with soundings taken infrequently, there is a possibility with wire sounding that the lead will drop in the successive submarine valleys, entirely missing the shoal areas in between and resulting in the dangerous and erroneous conclusion that the vessel is wide of the point. If Punta Gorda is passed not less than 50 fathoms the vessel will also clear Blunts reef. If, however, the course is changed at Cape Mendocino without making the lightship, sounding should be continued long enough after the change to make certain that the vessel is not behind her reckoning.

Vessels equipped with echo sounding apparatus have a valuable aid in checking the vessel's track. However, caution must be exercised not to confuse the various canyons with consequent erroneous conclusions of the vessel's position.

After safely passing Blunts Reef Lightship, soundings need not be taken

again until approaching the shoal off Rogue River. Here the bottom should be searched for in the same manner as in approaching Punta Gorda, as the soundings obtained on this shoal give a check on the latitude and indicate any change of course necessary in approaching Orford Reef, 20 miles beyond. If less than 60 fathoms is obtained the ship should be hauled out at least 15° and, in any case, the lead should again be used in approaching Orford Reef. The lead may find no bottom off the reef, but to the northward of Cape Blanco bottom, fine, gray sand will be found in 70 to 80 fathoms if the vessel is near the track.

If bound for the Columbia River the vessel, after passing Cape Blanco, will be within soundings obtainable with the lead for practically the entire distance. If uncertain of the position, edge in to a depth of 32 to 35 fathoms anywhere between Cape Meares and Tillamook Rock and steer northwest in that depth and the fog signal on Tillamook Rock will usually be heard. At times difficulty may be experienced in hearing this fog signal, even when passing it in that depth. However, if the vessel keeps outside the 30-fathom curve she cannot get into trouble, and the change in direction of that curve is a good indication of the time at which the vessel passes Tillamook Rock. The lightship can then be made by following the 30-fathom curve.

Vessels bound for the Strait of Juan de Fuca frequently steer one course from Blunts Reef Lightship, Cape Mendocino, applying to the true course the mean of the magnetic variations. This causes the track to curve away from the shores during the first half of the distance, approaching them during the remainder. Approaching the strait, if the position is uncertain, stand in to pick up the 30-fathom curve in the vicinity of Cape Elizabeth or Destruction Island and follow that depth to make Umatilla Reef Lightship. Thence the short distance to Tatoosh Island may be traversed without difficulty.

Caution, currents.—Mariners are warned that a combination of tidal, nontidal, and wind currents may result in a current of considerable velocity along the coast of Washington. A northward velocity of 3⅓ knots at Umatilla Reef Lightship and northwestward velocities of 3 knots at Swiftsure Bank Lightship have been observed.

Southbound.—Taking the departure from Umatilla Reef Lightship steer one course for Cape Mendocino as described above. Use the lead to pick up Heceta Bank, as vessels may overrun their distance, particularly during the summer. The time required in crossing the bank gives a good determination of the vessel's position at the time the lead drops again into deep water.

Cape Blanco should be passed with caution. If soundings taken show less than 60 fathoms, haul out parallel to the coast until the depths are increased materially; the vessel will then be past Cape Blanco. The area off Cape Blanco is of even bottom with the 60-fathom curve 5.5 miles off the cape.

Vessels from the Columbia River should use the lead frequently to guard against an inshore set. Vessels at times have encountered a strong set on or off shore in the region between Heceta Bank and Cape Arago, when none was apparent farther northward. Cape Blanco should be rounded as described in the preceding paragraph.

After passing Orford Reef there are no dangers until in the vicinity of Cape Mendocino. Currents setting the vessels directly on or offshore have been re-

949285—52——11

ported between Trinidad Head and Cape Mendocino. Both eastward and westward velocities up to 3 knots have been observed at Blunts Reef Lightship. From the vicinity of Trinidad Head until abeam of Cape Mendocino it is advisable to take occasional soundings.

This course should lead across the head of a submarine valley about 15 miles northwest of Cape Mendocino. Here the navigator may lose the bottom (unless equipped with echo sounding apparatus, see notes on use of this aid in Chapter 1) as the depths drop off suddenly to 400 fathoms, but in about 5 miles bottom should again be picked up in about 60 fathoms. Cape Mendocino is a dangerous point and many vessels have been lost here. The mariner cannot be too careful in rounding this point. The charts show complete hydrographic surveys of this area, and should be studied carefully with the soundings obtained. After changing course the sounding should be continued to pick up the submarine valleys south of the cape. The echo sounding apparatus, used in conjunction with the chart, is an invaluable aid.

Approaching Point Arena, start sounding 10 or 15 miles north of the point, and if at any time the lead shows 40 fathoms or less, haul out on a 198° course in not less than 40 fathoms. In this way the fog signal will usually be made; if not, and the water deepens to 60 fathoms, the vessel will be past the point and the course may be changed for Point Reyes. Arena Rock, with 2¼ fathoms over it, is only 0.75 mile inside the 30-fathom curve.

Point Reyes fog signal should be made before proceeding beyond it and if the vessel's position has been located off Point Arena little difficulty should be experienced in doing so. But if the vessel has passed wide of Point Arena without obtaining a fix, caution is necessary, as the soundings may be misleading. Practically the same chain of soundings can be obtained in the vicinity of Cordell Bank as on the regular track passing Point Reyes, and vessels, although sounding frequently, have been known to find themselves in the midst of the Farallones while still anxiously trying to pick up Point Reyes. An occasional sounding should, therefore, be taken after passing Point Arena to verify the distance off land.

In the immediate vicinity of Point Reyes the character of the bottom is a better indication of the position than are the depths. North of the point the lead will bring up a muddy substance; south of it, gray sand. This indication is particularly valuable in the area to the northward and eastward of the point.

Having made Point Reyes fog signal, there should be little difficulty experienced in making San Francisco Lightship provided the lead is used to check the course.

Detailed local knowledge is necessary for entering the Golden Gate in thick weather, because of the strong, irregular currents and violent tide rips. At times, however, it will be clear within the heads when it is foggy outside. It is well, therefore, to stand in cautiously as far as lighted bell buoy 7; if from that vicinity Point Bonita cannot be seen, the vessel should be anchored until the weather clears.

Table 8.—Strait of Juan de Fuca to Seattle and Tacoma

CHARTS 6102, 6832

Position (Reverse directions in *italics*—read upward)	True course	Distance
1. Cape Flattery Light bearing 145°, distant 2.7 miles; 48°25.7′ N., 124°46.5′ W. Chart 6102.	*Degrees*	*Nautical miles*
Direct	101½	50.8
Change to Chart 6382 (*6102*) at 48°19.5′ N., 124°00.0′ W.		
Reverse	*281½*	*50.8*
1A. Swiftsure Bank Lightship bearing 030°, distant 1.3 miles; 48°31.4′ N., 125°00.6′ W. Chart 6102.		
Direct	105	61.2
Change to Chart 6382 (*6102*) at 48°20.7′ N., 124°00.0′ W.		
Reverse	*285*	*61.2*
2. Race Rocks Light bearing 000°, distant 2.2 miles; 48°15.7′ N., 123°31.8′ W. Pass New Dungeness Light abeam, distant 1.8 miles.		
Direct (Old Tower on Admiralty Head ahead)	100	31.4
Reverse (Old Tower on Admiralty Head astern)	*280*	*31.4*
3. Point Wilson Light bearing 180°, distant 1.5 miles; 48°10.2′ N., 122°45.3′ W. Chart 6450 (*6382*).		
Direct	137	5.5
Reverse	*317*	*5.5*
4. Marrowstone Point Light bearing 270°, distant 1.0 mile; 48°06.1′ N., 122°39.7′ W.		
Direct	164	4.4
Reverse	*344*	*4.4*
5. Bush Point Light bearing 090°, distant 1.0 mile; 48°01.9′ N., 122°37.8′ W.		
Direct	147	8.5
Reverse	*327*	*8.5*
6. Point No Point Light bearing 270°, distant 0.5 mile; 47°54.7′ N., 122°30.8′ W.		
Direct	157	8.3
Reverse	*337*	*8.3*
7. Point Wells Range Front Light bearing 090°, distant 1.6 miles; 47°47.1′ N., 122°26.1′ W.		
Direct	180	4.5
Reverse	*000*	*4.5*
8. Point Monroe Light bearing 270°, distant 3.1 miles; 47°42.5′ N., 122°26.1′ W.		
Direct	202	3.0
Reverse	*022*	*3.0*
9. West Point Light bearing 090°, distant 1.1 miles; 47°39.7′ N., 122°27.7′ W.		
To Seattle		
9. West Point Light bearing 090°, distant 1.1 miles; 47°39.7′ N., 122°27.7′ W.		
Direct (Duwamish Head Light ahead)	140	3.1
Reverse (Duwamish Head Light astern)	*320*	*3.1*
10. Fourmile Rock Light bearing 000°, distant 1.0 mile; 47°37.3′ N., 122°24.7′ W.		
Direct	116	3.2
Reverse	*296*	*3.2*
11. Seattle, Colman Dock, 47°36.2′ N., 122°20.3′ W.		
To Tacoma		
9. West Point Light bearing 090°, distant 1.1 miles; 47°39.7′ N., 122°27.7′ W.		
Direct	172	5.2
Reverse	*352*	*5.2*

Table 8.—Strait of Juan de Fuca to Seattle and Tacoma—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
10A. Alki Point Light bearing 090°, distant 1.0 mile; 47°34′.6 N., 122°26′.6 W. Chart 6460 (*6450*).	*Degrees*	*Nautical miles*
Direct	164	12.0
Reverse	*344*	*12.0*
11A. Point Robinson Light bearing 295°, distant 0.6 mile; 47°23′.1 N., 122°21′.6 W.		
Direct	223	6.2
Reverse	*043*	*6.2*
12A. Brown Point Light bearing 095°, distant 0.8 mile; 47°18′.4 N., 122°27′.8 W.		
Direct	139	2.0
Reverse	*319*	*2.0*
13A. Tacoma, off the wharves; 47°16′.9 N., 122°25′.9 W.		

Navigation in the Strait of Juan de Fuca is simple in clear weather; the aids to navigation are numerous, and the chart is a good guide. In thick weather, owing to the irregularity of the current, strangers should use a pilot.

The channels in Puget Sound are broad, open, and free from outlying dangers. In thick weather the use of whistle echoes is common by those with local knowledge; in certain localities, soundings will enable the mariner to check his position.

The courses given are the usual ones followed by vessels, but a mid-channel track should be followed when it is desired to make the most of a favorable current.

Strangers when overtaken by fog in these waters are advised to anchor, if practicable, or to employ a pilot who may be obtained in Port Angeles or Port Townsend, or from Seattle on about 12 hours' notice. Available anchorages are pointed out under the descriptions of the various localities. Sailing vessels, except small coasting schooners, are generally towed in these waters.

Table 9.—San Francisco Lightship to San Joaquin River

CHARTS 5532, 5533, 5534

Position (Reverse directions in *italics*—read upward)	True course	Distance
1. San Francisco Lightship bearing 055°, distant 1.0 mile; 37°44′.4 N., 122°42′.5 W. Chart 5532.	*Degrees*	*Nautical miles*
Direct	067	4.1
Reverse	*247*	*4.1*
2. San Francisco Bar Channel lighted bell buoy 1 bearing 338°, distant 410 yards; 37°46′.0 N., 122°37′.8 W.		
Direct	070	5.4
Reverse	*250*	*5.4*
3. Point Bonita Light bearing 344°, distant 1.1 miles; 37°47′.8 N., 122°31′.3 W.		
Direct	057	2.5
Reverse	*237*	*2.5*
4. Golden Gate Bridge (center); 37°49′.2 N., 122°28′.7 W.		

Table 9.—San Francisco Lightship to San Joaquin River—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
Via Raccoon Strait		
4. Golden Gate Bridge (center); 37°49′.2 N., 122°28′.7 W.	*Degrees*	*Nautical Miles*
Direct	062	0.7
Reverse	*242*	*0.7*
5. Lime Point Light bearing 270°, distant 0.6 mile; 37°49′.5 N., 122°27′.9 W.		
Direct	016	2.4
Reverse	*196*	*2.4*
6. Point Stuart Light bearing 125°, distant 600 yards; 37°51′.8 N., 122°27′.0 W.		
Direct	043	2.0
Reverse	*223*	*2.0*
7. California City lighted bell buoy 1 bearing 270°, distant 400 yards; 37°53′.3 N., 122°25′.3 W.		
Via East Side Angel Island		
4. Golden Gate Bridge (center); 37°49′.2 N., 122°28′.7 W.		
Direct	062	3.2
Reverse	*242*	*3.2*
5A. Point Blunt Light bearing 000°, distant 0.5 mile; 37°50′.7 N., 122°25′.0 W.		
Direct	047	0.8
Reverse	*227*	*0.8*
6A. Point Blunt Light bearing 270°, distant 0.6 mile; 37°51′.2 N., 122°24′.3 W.		
Direct	340	2.2
Reverse	*160*	*2.2*
7. California City lighted bell buoy 1 bearing 270°, distant 400 yards; 37°53′.3 N., 122°25′.3 W.		
7. California City lighted bell buoy 1 bearing 270°, distant 400 yards; 37°53′.3 N., 122°25′.3 W.		
Direct	324	1.8
Pass California City lighted bell buoy 3, distant 300 yards.		
Reverse	*144*	*1.8*
8. Red Rock Bank lighted buoy 2 RRB bearing 090°, distant 400 yards; 37°54′.8 N., 122°26′.6 W.		
Direct	359	3.1
Reverse	*179*	*3.1*
9. East Brother Island Light bearing 090°, distant 0.6 mile; 37°57′.8 N., 122°26′.7 W. Change to Chart 5533 (*5532*).		
Direct	037	3.4
Reverse	*217*	*3.4*
10. San Pablo Bay lighted bell buoy 3 bearing 000°, distant 200 yards; 38°00′.6 N., 122°24′.1 W.		
Direct	049	1.9
Reverse	*229*	*1.9*
11. San Pablo Bay lighted buoy 5 bearing 000°, distant 150 yards; 38°01′.8 N., 122°22′.4 W.		
Direct	058	2.4
Reverse	*238*	*2.4*
12. San Pablo lighted buoy 9 bearing 000°, distant 150 yards; 38°03′.1 N., 122°19′.8 W.		
Direct	078	2.2
Reverse	*258*	*2.2*
13. San Pablo lighted bell buoy 13 bearing 000°, distant 150 yards; 38°03′.5 N., 122°17′.0 W.		
Direct	086	2.8
Reverse	*266*	*2.8*

Table 9.—San Francisco Lightship to San Joaquin River—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
14. Carquinez Strait highway bridge, 150 yards northward of center pier. Change to Chart 5534 (*5533*).		
Direct	various	2.1
Reverse	*various*	*2.1*
15. Port Costa Light bearing 180°, distant 700 yards.		
Direct	various	1.6
Reverse	*various*	*1.6*
16. Benicia Shoal lighted bell buoy 1A bearing 000°, distant 400 yards.		
Direct	various	2.0
Reverse	*various*	*2.0*
17. Southern Pacific Railroad bridge, center of lift span.		
Direct	062	1.2
Reverse	*242*	*1.2*
18. Suisun Bay lighted buoy 3 bearing 000°, distant 100 yards.		
Direct	073	0.7
Reverse	*253*	*0.7*
19. Point Edith Crossing Range Front Light bearing 057°, distant 1.5 miles.		
Direct	057	1.2
Reverse	*237*	*1.2*
20. Suisun Bay lighted buoy 7 bearing 000°, distant 100 yards.		
Direct	078	0.9
Reverse	*258*	*0.9*
21. Roe Island Southwest End Light bearing 000°, distant 100 yards.		
Direct	various	2.5
Reverse	*various*	*2.5*
22. Middle Point Light and Echo Board bearing 180°, distant 225 yards.		
Direct	076	0.6
Reverse	*256*	*0.6*
23. Middle Ground Light and Echo Board, Suisun Bay lighted buoy 6; midway between.		
Direct	098	0.7
Reverse	*278*	*0.7*
24. Suisun Bay lighted buoy 8 bearing 180°, distant 100 yards.		
Direct	110	2.3
Reverse	*290*	*2.3*
25. Mallard Island Ferry Slip East Wing Light bearing 180°, distant 200 yards.		
Direct	087	1.3
Reverse	*267*	*1.3*
26. Suisun Bay lighted bell buoy 10 bearing 180°, distant 200 yards.		
Direct	various	3.0
Reverse	*various*	*3.0*
27. New York Slough East End Light and Echo Board bearing 000°, distant 375 yards; 38°01′.6 N., 121°50′.2 W.		

Table 10.—Seattle to Georgia Strait via Rosario Strait

CHARTS 6450, 6380, 6300

1. Seattle, Colman Dock, 47°36′.2 N., 122°20′.3 W. Chart 6450.		
Direct	296	3.2
Reverse	*116*	*3.2*
2. Fourmile Rock Light bearing 000°, distant 1.0 mile; 47°37′.3 N., 122°24′.7 W.		
Direct (Duwamish Head Light astern)	320	3.1
Reverse (Duwamish Head Light ahead)	*140*	*3.1*

Table 10.—Seattle to Georgia Strait via Rosario Strait—Continued

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
3. West Point Light bearing 090°, distant 1.1 miles; 47°39.7′ N., 122°27.7′ W.		
Direct	022	3.0
Reverse	*202*	*3.0*
4. Point Monroe Light bearing 270°, distant 3.1 miles; 47°42.5′ N., 122°26.1′ W.		
Direct	000	4.5
Reverse	*180*	*4.5*
5. Point Wells Range Front Light bearing 090°, distant 1.6 miles; 47°47.1′ N., 122°26.1′ W.		
Direct	337	8.3
Reverse	*157*	*8.3*
6. Point No Point Light bearing 270°, distant 0.5 mile; 47°54.7′ N., 122°30.8′ W.		
Direct	327	8.5
Reverse	*147*	*8.5*
7. Bush Point Light bearing 090°, distant 1.0 mile; 48°01.9′ N., 122°37.8′ W.		
Direct	344	4.4
Reverse	*164*	*4.4*
8. Marrowstone Point Light bearing 270°, distant 1.0 mile; 48°06.1′ N., 122°39.7′ W.		
Direct	317	5.5
Reverse	*137*	*5.5*
9. Point Wilson Light bearing 180°, distant 1.5 miles; 48°10.2′ N., 122°45.3′ W.		
Direct	331	3.6
Reverse	*151*	*3.6*
10. Point Partridge Light bearing 085°, distant 1.0 mile; 48°13.3′ N., 122°47.8′ W.		
Direct	002	11.5
Change to Chart 6380 (*6450*) at 48°20.0′ N., 122°47.5′ W.		
Reverse	*182*	*11.5*
11. Davidson Rock Light bearing 270°, distant 0.9 mile; 48°24.8′ N., 122°47.3′ W.		
Direct	028	5.1
Reverse	*208*	*5.1*
12. Burrows Island Light bearing 135°, distant 0.9 mile; 48°29.3′ N., 122°43.7′ W.		
Direct	350	7.0
Pass Belle Rock Light distant 0.9 mile.		
Pass Black Rock Daybeacon distant 0.8 mile.		
Reverse	*170*	*7.0*
13. Obstruction Pass Light bearing 260°, distant 1.8 miles; 48°36.2′ N., 122°45.5′ W.		
Direct	026	3.5
Pass Peapod Rock Light distant 0.4 mile.		
Pass Buckeye Shoal buoy 2A distant 0.5 mile.		
Reverse	*206*	*3.5*
14. Lawrence Point bearing 290°, distant 0.9 mile; 48°39.4′ N., 122°43.4′ W.		
Direct	342	3.6
Reverse	*162*	*3.6*
15. Clark Island, northern extremity, bearing 250°, distant 0.7 mile; 48°42.7′ N., 122°44.8′ W.		
Direct	315	7.5
Pass Puffin Island Light distant 0.5 mile.		
Reverse	*135*	*7.5*
16. Patos Island Light bearing 260°, distant 3.6 miles; 48°48.0′ N., 122°52.9′ W. Chart 6300 (*6380*).		
Direct	306	35.7
Reverse	*126*	*35.7*
17. Gabriola Reefs Light bearing 275°, distant 1.0 mile; 49°08.9′ N., 123°36.8′ W.		

These directions are available for vessels of any draft in clear weather. In thick weather, strangers are advised to take a pilot. A range should be steered when possible, so as to insure making the compass courses good.

Between Admiralty Inlet and the entrance to Rosario Strait, the current on the flood has a tendency to set a vessel eastward toward Whidbey Island; it also sets strongly through Deception Pass and up Rosario Strait. At night avoid the red sector of Burrows Island Light to clear Lawson Reef and Dennis Shoal. Through Rosario Strait the currents run with considerable velocity. Heavy tide rips and swirls are found off Black Rock, Obstruction Passes, Peapod Rocks, and Lawrence Point.

Table 11.—Seattle to Georgia Strait via Haro Strait

CHARTS 6450, 6380, 6300

Position (Reverse directions in *italics*—read upward)	True course	Distance
	Degrees	*Nautical miles*
1. Seattle, Colman Dock; 47°36.2 N., 122°20.3 W. Chart 6450.		
Direct	296	3.2
Reverse	*116*	*3.2*
2. Fourmile Rock Light bearing 000°, distant 1.0 mile; 47°37.3 N., 122°24.7 W.		
Direct (Duwamish Head Light astern)	320	3.1
Reverse (Duwamish Head Light ahead)	*140*	*3.1*
3. West Point Light bearing 090°, distant 1.1 miles; 47°39.7 N., 122°27.7 W.		
Direct	022	3.0
Reverse	*202*	*3.0*
4. Point Monroe Light bearing 270°, distant 3.1 miles; 47°42.5 N., 122°26.1 W.		
Direct	000	4.5
Reverse	*180*	*4.5*
5. Point Wells Range Front Light bearing 090°, distant 1.6 miles; 47°47.1 N., 122°26.1 W.		
Direct	337	8.3
Reverse	*157*	*8.3*
6. Point No Point Light bearing 270°, distant 0.5 mile; 47°54.7 N., 122°30.8 W.		
Direct	327	8.5
Reverse	*147*	*8.5*
7. Bush Point Light bearing 090°, distant 1.0 mile; 48°01.9 N., 122°37.8 W.		
Direct	344	4.4
Reverse	*164*	*4.4*
8. Marrowstone Point Light bearing 270°, distant 1.0 mile; 48°06.1 N., 122°39.7 W.		
Direct	317	14.4
Pass Point Wilson Light distant 1.0 mile.		
Pass Partridge Bank lighted bell buoy 1A distant 1.0 mile.		
Reverse	*137*	*14.4*
9. Smith Island Light bearing 045°, distant 3.6 miles; 48°16.6 N., 122°54.4 W. Chart 6380 (*6450*).		
Direct	323	17.3
Pass Hein Bank lighted bell buoy distant 1.7 miles.		
Reverse	*143*	*17.3*
10. Lime Kiln Light bearing 050°, distant 1.0 mile; 48°30.4 N., 122°10.2 W.		
Direct	344	11.7
Pass Kellett Bluff Light distant 0.4 mile.		
Reverse	*164*	*11.7*

Table 11.—Seattle to Georgia Strait via Haro Strait—Continued

Position (Reverse directions in *italics*—read upward)	Distance	True course
11. Turn Point Light bearing 100°, distant 0.8 mile; 48°41′.5 N., 123°15′.4 W. Bound through Swanson Channel see directions in *U. S. Coast Pilot, Alaska, Part I.*	*Degrees*	*Nautical miles*
Direct (Patos Island Light ahead)	062	10.0
Reverse (Patos Island Light astern)	*242*	*10.0*
12. Saturna Island Light bearing 330°, distant 1.1 miles; 48°46′.1 N., 123°01′.8 W. Chart 6300 (*6380*).		
Direct	038	4.2
Reverse	*218*	*4.2*
13. Patos Island Light bearing 185°, distant 2.0 miles; 48°49′.3 N., 122°57′.9 W.		
Direct	308	32.2
Reverse	*128*	*32.2*
14. Gabriola Reefs Light bearing 275°, distant 1.0 mile; 49°08′.9 N., 123°36′.8 W. Chart H. O. 1739 (*6300*).		

In crossing from Admiralty Inlet to the entrance of Haro Strait the tidal currents setting to and from Rosario Strait and San Juan Channel, with estimated velocities of 2 to 3 knots, should be kept in mind. Around Turn Point and between Henry Island and Turn Point are heavy tide rips on the ebb. Particularly heavy and dangerous tide rips occur on the ebb between East Point and Patos Island and for 2 miles northward in Georgia Strait. The flood from Rosario Strait, which is felt as soon as the passage between Orcas and Sucia Islands is open, is apt to set a vessel toward East Point. The ebb in this vicinity sets to the eastward even before Georgia Strait is well open.

Blank page retained for pagination

CHAPTER 4

San Diego to Santa Monica Bay

Chart 5101

THIS CHAPTER on southern California includes a description of four of the off-lying islands, San Clemente, Santa Catalina, San Nicolas, and Santa Barbara. Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands are discussed in Chapter 5.

Federal regulations governing danger and restricted areas along this coast are given in Chapter 2. Warnings concerning numerous other areas that are used temporarily from time to time are given in the local Notice to Mariners.

In clear weather, vessels coming from the southward will sight Table Mountain, and its surroundings high land, and Los Coronados before picking up the San Diego landmarks.

Table Mountain, 2,244 feet high, conspicuous and flat-topped, is in Mexican territory, about 25 miles southeastward of Point Loma and about 6 miles inland. It is shown on Charts 5020 and 5002, and on Hydrographic Office Charts 1149, 5195, and 5196.

Los Coronados (Coronado Islands) are four bare, rocky islands, extending 4.5 miles in a northwesterly direction, about 7 miles offshore in Mexican waters. **North Coronado,** the northwesternmost island, is 467 feet high and is about 14 miles 192° from Point Loma. **South Coronado,** the southeasternmost and largest, is 672 feet high. **Middle Coronado** and another islet, 0.5 and 0.8 mile westward of the north end of South Coronado, are small barren rocks, 251 and 101 feet high, respectively. These islands are prominent in clear weather, and the passage eastward of them is commonly used by steamers. Depths in the vicinity of Los Coronados are irregular, and in thick weather or at night caution must be observed when near them.

A light, 190 feet above the water and visible 20 miles, is shown from a white cylindrical masonry tower on the south end of South Coronado; it is obscured from certain directions by both Middle Coronado and North Coronado. Another light, 157 feet above the water and visible 11 miles, is shown from a white square masonry tower near the north end of South Coronado; it is visible from 169° to 341° and has been reported to be visible from 044° to 070°; local fog sometimes obscures it.

The boundary between the United States and Mexico is marked near its Pacific end by a white marble obelisk 14 feet high that rests on a pedestal 41 feet above the water. The marker, which is plainly visible from seaward, is about

200 yards from the beach, is near the edge of a low table bluff, and is about 10 miles 142° from Point Loma Light. A stone mound, 365 feet above the water and about 1 mile eastward of the obelisk, marks another point on the boundary line. Directly northward of the obelisk the mesa falls to the low marshy land south of San Diego Bay.

Approaching from seaward in clear weather, vessels will raise San Clemente Island, the southernmost of the off-lying islands, before seeing the distinguishing features of the coast. This will check the vessel's position and indicate subsequent shaping of the course for Point Loma. Upon a nearer approach, Cuyamaca Peak and the high land of the interior, the Coronado Islands, and Point Loma will be distinguished. Several aviation lights in the vicinity of San Diego are visible from seaward.

The farthest offshore dangers are Bishop Rock and the shoals off San Nicolas Island. **Sixtymile Bank,** which is shown on Chart 5020, is about 65 miles southwestward of Point Loma and has a least depth of 53 fathoms. Differences of 3° or more from the normal magnetic variation have been observed within a radius of 8 miles of this bank.

Bishop Rock, on which the clipper ship *Bishop* struck in 1855, has a depth of only 2½ fathoms over it and is the shoalest point on **Cortes Bank.** The rock is in latitude 32°27′ N., longitude 119°08′ W., about 40 miles southwestward of San Clemente Island, and is the farthest outlying danger along the coast. Great care should be taken in this area. The rock is marked by a lighted whistle buoy and a special station buoy. In January 1920 the buoy broke adrift and when picked up was found to have drifted in a 142° direction at a rate of a little over 0.5 knot. The currents in this vicinity are largely non-tidal in character; velocities between 1 and 2 knots have been measured. These currents cause considerable swell and even in moderate weather the sea usually breaks at this rock.

For about 2.5 miles southeastward of Bishop Rock the bottom is very broken and the locality should be avoided. A 9-fathom spot is about 5 miles west-northwestward of Bishop Rock, and the bottom is extremely broken; although no breakers have been reported here, deep-draft vessels should avoid this spot.

Tanner Bank covers an area about 15 miles long in a west-northwesterly direction and about 5 miles wide. The least depth from surveys is 12 fathoms, but in December 1945 a depth of 9 fathoms was reported in latitude 32°42′ N., longitude 119°08′ W. The northwestern end of the bank is about 28 miles southeastward of San Nicolas Island.

Charts 5105, 5107.—The entrance to **San Diego Bay** is about 10 miles northwestward from the boundary between the United States and Mexico. The bay is the best natural harbor south of San Francisco and affords excellent protection in any weather. A low, narrow sandspit, which expands to a width of 1.5 miles at Coronado and North Island on its northwestern end, separates the bay from the ocean.

The city of **San Diego** is on the northeastern shore of the bay. **Coronado** is on the sandspit opposite San Diego. **National City** and **Chula Vista** are on the southeast side of San Diego, and **Roseville** is on the west side of the city. The principal wharves are at San Diego. **Coronado,** connected to San Diego by pas-

senger and automobile ferry, is of little commercial importance. National City has some water-borne traffic in oil.

Prominent features.—Point Loma, on the west side of the entrance to San Diego Bay, is a ridged peninsula with heights of about 400 feet. The ridge is bare of trees except in the gullies and where planted around the houses near the summit. Otherwise it is sparsely covered with grass, sagebrush, and cactus. At a distance it usually has the appearance of an island. A light, 88 feet above the water and visible 15 miles, is shown from a white square pyramidal skeleton tower at the south end of the point. The fog signal is a two-tone air diaphone; if disabled, a siren will be sounded. The radiobeacon is equipped for distance finding. A radarbeacon (Racon) is operated on the ridge 1.5 miles north of the light. Heavy kelp extends more than 1.5 miles southward of Point Loma.

On a nearer approach, the abandoned lighthouse and a tower will be made out on the highest part of the hill immediately back of Point Loma Light. The old lighthouse and grounds now comprise the **Cabrillo National Monument.** Other prominent objects along the crest of the ridge are a radio mast, a large buff and red elevated tank, an aluminum-colored standpipe, and a tall lookout tower 2.6 miles northward from the light; and the glass dome surmounting the main building of the former Theosophical Institue 3.3 miles northward from the light.

North Island, the filled northwestern end of the sandspit on the eastern side of the bay entrance, is an aviation field. On its southeasterly side is the town of Coronado. Prominent features that show up well from the entrance are the south tower of Hotel del Coronado and the tower of the Naval Administration Building which is surmounted by an aviation light, used in controlling aircraft, that is 92 feet above the water and is operated intermittently with varying characteristics. The high stack of the Marine barracks on the north side of the bay is conspicuous from the western part of the bay.

Ballast Point, low and sandy, projects about 0.4 mile northeastward from the eastern side of Point Loma about 1 mile northward from Point Loma Light. A light, 34 feet above the water and visible 11 miles, is shown from a white square tower attached to dwelling on the extremity of the point. The fog signal is an air diaphone; if disabled, a bell is sounded. The light is shown in daylight hours when the sound signal is in operation. There is deep water close to the outer end of the point.

A jetty extends about 1 mile southward on **Zuniga Shoal** from **Zuniga Point,** the southwest extremity of North Island. The outer third of the jetty has only small sections showing at high water. A lighted buoy marks the outer end of the jetty.

Rules of the Road.—Inland Rules shall be observed inside a line from the southerly tower of the Coronado Hotel to San Diego lighted bell buoy 5, thence to Point Loma Light.

Channels.—A Federal project provides for an entrance channel 40 feet deep and 800 feet wide; a bay channel 35 feet deep and 2,200 feet wide to the Naval Air Station; an anchorage basin 26 to 35 feet deep north of the bay channel; a turning basin 35 feet deep opposite the municipal piers; a channel 30 feet deep; 1,500 to 2,500 feet wide, and about 3.3 miles long in the southerly part of the bay; a channel 20 feet deep and 200 feet wide to National City and Chula Vis-

ta; and two seaplane basins 10 feet deep, one north of the anchorage basin and the other westward of the 30-foot channel. The project is maintained by dredging. A lighted range bearing 353°, and lighted buoys mark the entrance channel. The other channels are marked by buoys and lights.

The dredged channel into **Glorietta Bay,** on the southeast side of Coronado, had a controlling depth of 9 feet in 1949. Lighted ranges mark the axis of the channel, which is used by small pleasure craft proceeding to and from the yacht club.

Anchorage can be had off San Diego except as prohibited in regulations §202.210 and §207.612, in Chapter 2. Depths eastward of the restricted lane between San Diego and Coronado are 18 to 42 feet. A fairway must be left clear for passing vessels. Vessels waiting outside the entrance for a pilot will find good anchorage in depths of 36 or more feet eastward of the entrance buoys.

The anchorage grounds above the municipal piers are usually occupied by Naval craft when the fleet is in home waters. As fore-and-aft mooring is not required, the main channel is often partly obstructed during slack water by vessels trailing in different directions.

The **Embarcadero** boat basin is north of the municipal piers. Another commercial basin is northeast of the mole that extends out from **Fisherman Point,** Roseville, to **Shelter Island;** the municipal yacht harbor is southwest of the mole and behind Shelter Island. See §202.90 in Chapter 2 for regulations.

Caution.—Degaussing circuits extend across the channel from the vicinity of Ballast Point Light to Zuniga Point. In order to prevent damage to this equipment, tows should be streamed and shortened in to seaward of the light, and towing appendages and catenaries should not be dragged along the bottom while proceeding through the channel. Avoid anchoring in this area.

Aircraft warnings.—To avoid danger of collision between patrol planes and small boats operating in and out of San Diego, the Commandant, Eleventh Naval District, has promulgated the following measures:

When patrol planes are operating involving take-offs and landings, there will be displayed on a hangar on the northeast end of North Island the International Danger Flag U by day and two vertical red lights by night.

Shipping should keep a sharp lookout for patrol planes at all times whether on the water, taking off, or landing, and give them a wide berth.

When flights are in progress the take-off or landing area will be patrolled by boats. By day these boats will display a red flag and by night a red lantern. The waving of a red flag or red light at an approaching boat is to be construed as a danger signal. Boats so warned should look for and sight the plane or planes, and alter course as necessary, preferably hauling immediately to the side of the channel and waiting for a clear time to proceed.

Tides.—The mean range of tide at San Diego is 4¼ feet. The range between mean lower low water and mean higher high water is 5¾ feet. A range of about 9 feet may occur at the time of maximum tides. Daily tide predictions for San Diego are given in the *Tide Tables.*

Currents.—The currents set generally in the direction of the channels. In the vicinity of the entrance the usual velocity at strength varies from ½ to 3 knots, depending upon the stage of the tide. Westward of Middle Ground north of Ballast Point is an inshore eddy of 0.1 to 0.3 knot on both flood and ebb. On the

flood the current sets northwestward over Middle Ground, and on the ebb, in the opposite direction. Southward of the end of the jetty there is a slight set toward Zuniga Shoal on the ebb. The average central surface velocity in the channel east of Ballast Point at the time of strength is about 1½ knots. Great care should be taken while passing this point as a vessel may take a sudden shear because of a cross-current deflected from Ballast Point.

The eddy usually encountered along the ends of the municipal piers makes docking difficult. The velocity and direction of the eddy are irregular and the greatest care must be exercised by even the most experienced. Strangers should not attempt to dock large vessels without a pilot.

For daily predictions of the times of slack water and times and velocities of strength and current, see the *Pacific Coast Current Tables.*

Weather.—The prevailing winds are from the northwest and west; the heaviest are from the south and west in winter and early spring. The winds seldom exceed 30 miles per hour, and shipping is considered safe at all times. Fogs occur occasionally, the average being about 20 dense fogs per year. These are mostly night fogs, and seldom occur between the hours of 9 a. m. and 6 p. m.

Storm warnings are displayed day and night at the San Diego Yacht Club on Fisherman Point, and daytime only at the Naval Air Station on North Island, the Naval Radio Station on Point Loma, the Coronado Yacht Club, and the lifeguard station at Mission Beach.

Pilots are usually employed by strangers. The pilot boat station is at the U. S. Army wharf just inside Ballast Point. The pilot's office is in the Harbor Administration Building near Broadway Pier. Pilots may be obtained by signaling the light station at Point Loma or at Ballast Point, but vessels desiring a pilot should radio ahead stating the expected time of arrival off the entrance.

All vessels sailing under enrollment and licensed and engaged in the coasting trade, between the port of San Diego and any other port of the United States, are exempt from all pilotage, unless a pilot is actually employed.

All foreign vessels and vessels from a foreign port or bound thereto, and all vessels sailing under a register between the port of San Diego and any other port of the United States, are liable for pilotage. Rates follow.

Vessels 200 tons or over:	Rates
When cargo is to be laden or unladen solely at San Diego	$2 per foot of draft and 2 cents per net registered ton.
When less than 100 percent but over 50 percent of the cargo is to be laden or unladen at San Diego	$1.50 per foot of draft and 2 cents per net registered ton.
When 50 percent of the cargo or less is to be laden or unladen at San Diego	$1 per foot of draft and 1 cent per net registered ton.
Unmeasured vessels or vessels having no registered net tonnage, such as Naval vessels	$4.25 per foot of maximum draft.
Minimum charge when a pilot is actually employed	$20 inward or outward.

Vessels under 200 net registered tons:

Under 10 net registered tons	$5.00
10 to 20 net registered tons	10.00
20 to 30 net registered tons	12.50
30 to 50 net registered tons	15.00
50 to 100 net registered tons	17.50
100 to 200 net registered tons	20.00

Towboats.—Gas and Diesel towboats ranging from 50 to 1250 horsepower are available. Naval tugs and Coast Guard cutters based at San Diego are available in emergencies.

Quarantine is enforced in accordance with regulations of the United States Public Health Service. Vessels subject to visitation usually are boarded at the piers. Yachts, fishing boats, and small craft are visited at the Embarcadero. The Public Health Service maintains a medical relief station in the city.

Customs.—San Diego is the headquarters of the San Diego customs collection district. The customs offices are in the Federal Building. Marine documents are issued. The boarding dock is on the Embarcadero.

Immigration.—Immigration officials are stationed at San Diego for the inspection of passenger and crews of incoming vessels engaged in the foreign trade. Such vessels are boarded by inspectors at the Embarcadero or in the stream. The immigration offices are in the Federal Building.

Terminal facilities.—Depths at the wharves are 18 to 36 feet. The City of San Diego maintains two modern piers, with depths of 35 feet alongside, that handle practically all the general cargo of the port.

Supplies.—Fuel oil is available in any quantity at docks with depths of 26 feet alongside. Arrangements can also be made to fuel from barges. Coal is supplied only by arrangement.

Fresh water is supplied at the wharves or by water boat. The city water is satisfactory both for drinking and boiler purposes. Provisions and ship chandlery are available in San Diego. There is a **chart agency** of the Coast and Geodetic Survey in San Diego.

Repairs.—The three floating drydocks in San Diego each have a capacity of 1,000 tons. Marine railways and machine shops are available for the repair of small vessels. The largest marine railway has a capacity of 800 tons. Vessels up to 200 feet in length can be hauled out at two of the plants.

Communications.—San Diego has direct transcontinental railway connection, and has communications with points north and south by rail and coasting steamers. There are complete telegraph, telephone, and radio facilities. It is a port of call for many of the intercoastal steamship lines. Several air lines maintain regular service into the city. The municipal airport is only a mile north of the municipal piers.

Chart 5101.—The coast between San Diego and San Pedro Bays is thickly settled. The numerous towns and resorts along the beach have buildings that show up prominently from seaward. Communication is mainly by rail, air, and highway. Water transportation is mostly to Newport Bay which has an improved entrance for vessels drawing up to 20 feet.

Between Point Loma and Point La Jolla the coastline is extremely rocky. Because of the possibility of uncharted rocks, coasting vessels should keep well to seaward of the kelp beds which extend to 2 miles off shore in some places.

From Point Loma, the coast trends northward for 5.5 miles to the entrance to **Mission Bay,** a recreational area where extensive jetty construction and dredging were under way in 1950. The Federal project for Mission Bay provides for three jetties forming two channels, the southern channel for San Diego flood control and the northern channel an entrance 20 feet deep into the bay; and in the bay a main channel and turning basin about 3,500 feet long and 1,000 feet wide, and two anchorage basins, one 3,000 feet long and 800 feet wide and the other about 1,600 feet long and 800 feet wide, all to a depth of 20 feet. Pending completion of the project the entrance is closed.

Mission Beach, just north of the entrance to Mission Bay, is an amusement place with a roller coaster and prominent buildings. From seaward the highest part of the roller coaster looks like a dome.

Pacific Beach is on the north shore of Mission Bay and about 1 mile northward of Mission Beach. The pleasure pier has a large twin-towered structure arching over the shore end and is conspicuous from seaward.

The first high land northward, about 9 miles from Point Loma, is a rounding rocky point, 2 miles in length, the seaward termination of a spur from **Soledad Mountain,** 822 feet high. The southern end of this headland is called **False Point** and the northern end is **Point La Jolla.** In the vicinity of Point La Jolla, rock cliffs, in which are many caves, rise abruptly from the water to heights of 70 or 80 feet. The buildings at La Jolla and Pacific Beach are prominent from seaward. The 247-foot radio tower on Soledad Mountain shows red flashing lights at night.

La Jolla is a resort with no port facilities or waterborne commerce. It has bus connections to San Diego.

North of Point La Jolla is a danger area about 10 miles square; for description and regulations see Chapter 2, §204.190.

Scripps Institute of Oceanography, devoted to research work in oceanography and marine biology, is about 1 mile to the northward of La Jolla. The institute maintains a concrete pier for observation purposes. The restricted area around this pier is described in Chapter 2, §207.613. Just northward of the Scripps Institute the bluffs rise to a height of about 300 feet, then decrease gradually for the next 5 miles to heights of 20 to 80 feet.

A **measured nautical mile,** on course 000°, is about 3 miles northward of Point La Jolla. Each range is marked by two steel towers. A large elevated aluminum-colored tank is just southward of the south rear range tower. A smaller elevated tank is just northward of the north rear range tower.

Del Mar, about 7 miles northward from La Jolla, is a resort with a pleasure pier extending out to the surf line; the outer end of the pier is in poor condition. A hotel with many gables is prominent from the sea.

The coast from Del Mar northward 31 miles to San Mateo Point is a low, flat tableland with abrupt cliffs 60 to 130 feet high and with broad low-water beaches. The tableland is intersected by numerous deep valleys with streams that usually dry in the summer. In the northern part, the high ridges of the interior are

much nearer the coast. Paralleling this coast are U. S. Highway 101 and the Santa Fe Railroad.

Solana Beach, Cardiff-by-the-Sea, and **Encinitas** are small towns 9, 10, and 11.5 miles northward from Point La Jolla. The aluminum-colored standpipe on the top of the ridge at **Leucadia,** 13 miles northward of Point La Jolla, is conspicuous.

Carlsbad, 19 miles northward of Point La Jolla, is a resort with several hotels. The low white square tower on the west end of the San Diego Army and Navy Academy is distinctive.

Oceanside, 21 miles northward of Point La Jolla, is a small town with buildings that are prominent from seaward. A pleasure pier extends out to the surf line. About 1.5 miles northwestward of the pier is the boat basin at **Camp Pendleton.** The entrance to the basin is protected by two jetties and the outer end of the western jetty is marked by a light. In February 1950, the channel had shoaled to depths of 1 or 2 feet.

An aviation light prominent from seaward and a landing field are near **Fallbrook Junction,** 2 miles northward of Oceanside. The bridge and trestlework of the railroad crossing **Santa Margarita River,** 3 miles northward of Oceanside, also are prominent.

San Onofre Mountain, 1,735 feet in elevation and 1.5 miles from the coast, is 12 miles northwestward of Oceanside.

San Mateo Point, 16 miles northwestward of Oceanside, ends in cliffs about 60 feet high, and is the northern head at the mouth of **San Mateo Creek.** Both San Mateo Creek and Arroyo San Onofre are crossed by trestlework. An aviation light on San Mateo Point is conspicuous from seaward.

From San Mateo Point to Dana Point, 7.5 miles northwestward, the land is higher and more rugged, and is broken by the **San Juan Capistrano Valley** and **San Juan Creek** about 1.5 miles eastward of Dana Point. The railroad and the highway run along the beach under the bluffs in this stretch of the coast to the San Juan Capistrano Valley.

San Clemente, 2 miles northward of San Mateo Point, is a small town with a large land area. All the houses are white with red-tiled roofs, making the place conspicuous from the sea. There is a small pleasure pier at the town.

Dana Point, 8 miles northwestward of San Mateo Point, is the seaward end of a high ridge. The spur forming the point ends in a moderately bold sandstone cliff 220 feet high with a precipitous broken face. Outlying rocks and ledges extend offshore for 350 yards. **San Juan Rock,** 10 feet high and about 50 feet in extent, is 340 yards southward of the highest point on the cliff. An aviation light on the point is prominent from seaward.

San Juan Capistrano Anchorage, now seldom used, is 116° from Dana Point in a depth of about 5½ fathoms outside the kelp. Small vessels with local knowledge anchor inside the kelp in depths of 3 fathoms about 0.4 mile from the beach with Dana Point bearing 279°. Along the beach are a pleasure pier and several prominent buildings, the most conspicuous of which is a white tower just east of the pier.

San Juan Capistrano, a small town about 2.5 miles inland, is the site of the old mission founded in 1776. Some of the buildings are in fair preservation.

From Dana Point to Newport Bay, a distance of 11.5 miles, the coast is bold, with rocky cliffs 40 to 100 feet high; these are the seaward ends of ridges transverse to the coast, and separated by narrow, deep valleys. **Laguna Beach,** a summer resort, is midway along this stretch of coast. Three radio towers high on the hill back of Laguna Beach show flashing red lights at night.

Santiago Peak, 5,696 feet high, double-headed and dark in contrast with the immediate coast range, is the dominant feature of this part of the coast. It is about 17 miles northeastward of Dana Point and is visible about 80 miles.

Chart 5108.—Newport Bay is an extensive lagoon bordered on the seaward side by a sandspit 3 miles long. The bay is an important yachting and sport-fishing center, and offers excellent anchorage for large yachts and small crafts under all conditions of weather.

The city of **Newport Beach** embraces the communities of **Newport** and **Balboa,** on the sandspit, and **Corona Del Mar,** east of the entrance. **Balboa, Collins, Bay, Harbor,** and **Shark Islands** and **Lido Isle** are in the bay.

The numerous houses and buildings of the area are prominent from seaward. A light-colored concrete school building with a high tower is on the high ground 1 mile back from the beach. About 4 miles westward of the jetties and a mile inland is a group of concrete reservoir tanks surmounted by an elevated silver-colored tank.

The entrance to Newport Bay is between jetties 900 feet apart with lights at their outer ends. An electric-siren fog signal and a radiobeacon are operated at the western light during thick weather. A lighted bell buoy is 500 yards southward of the western jetty.

A Federal project provides for an entrance channel 20 feet deep and 500 feet wide, a main channel 20 feet deep and generally 350 feet wide to the western end of the bay, anchorage areas 20 feet deep on the north and south sides of the main channel in the easterly end of the bay, a yacht anchorage area 15 feet deep on the south side of the main channel midway of the bay, the Newport Channel 15 feet deep, and varying in width up to 330 feet, a turning basin 20 feet deep at the western end of the bay, and for a depth of 10 feet in the remainder of the main bay area.

Anchorages in the bay are assigned by the harbor master. See Chapter 2, §202.95 and §202.212, for regulations.

Outside the bay, protection from northerly and west winds can be had eastward of the east jetty in depths of 18 to 36 feet, sand bottom. Fishing boats often anchor here.

There are fixed bridges between the mainland and Balboa, Harbor, Bay, and Lido Islands; the anchorage areas can be reached without passing under the bridges. A lift bridge over the bay north of Shark Island has a horizontal clearance of 40 feet and a vertical clearance down of 13 feet.

Severe storms are rare. The *Santa Ana* is an exceptional wind that blows from the northeast or east with great violence, although of short duration; see Chapter 2. **Storm warnings** are displayed day and night from the shore end of Newport Bay west jetty and from a mast on the Harbor Department pier at Balboa.

949285—52——12

The numerous small wharves and landings in the bay are mostly for the use of fishing craft and yachts. Gasoline, water, provisions, and ship chandlery are obtainable. There is a **chart agency** of the Coast and Geodetic Survey in Newport Beach.

The largest marine railway in Newport Bay has a capacity of 325 tons and can haul out craft up to 150 feet in length and 18 feet in draft. Machine shops are available. Several shipyards can haul out small boats for general repairs.

There is communication by rail, bus, and motor truck with Los Angeles and points inland. The city of **Santa Ana** is about 9 miles northward of Newport Bay.

Balboa is the easterly part of the peninsula separating Newport Bay from the sea. About 1 mile westward of the western jetty a pier extends about 800 feet from the beach. Newport is a continuation westward of Balboa. A pleasure pier, with a depth of about 30 feet at its face, is 2.8 miles northwestward from the western jetty. A lighted bell buoy is 1.5 miles southwestward from the pier.

Close off the pleasure pier is the head of a submarine valley that extends in a southerly direction. The valley bottom is green mud, whereas the surrounding ocean bottom is uniformly fine gray sand.

Chart 5101.—From Newport Bay to Point Fermin, nearly 20 miles, the coast is low and there are several lagoons near the beach. The country is treeless and is largely built up. The towns and resorts along the beach are practically continuous.

Huntington Beach State Park is a recreational area that extends 2 miles northwestward along the coast from the mouth of **Santa Ana River,** which is 4.5 miles northwest of Newport Bay entrance. **Huntington Beach,** a resort about 5 miles northwestward of Newport Beach, is identified by its many oil derricks; the city has a concrete fishing and pleasure pier but no landing facilities.

Chart 5142.—**Sunset Beach** is a small town about 5 miles northwestward of Huntington Beach. An elevated wooden tank is near the western extremity of the town.

Anaheim Bay, about 14 miles northwestward of Newport Bay entrance, is a Naval ammunition and net depot. The danger zone in the bay is described in §204.195 of Chapter 2. The channel into the basin is marked by a lighted bell buoy. The entrance is protected by jetties, the outer ends of which are marked by lights. The fog signal at the light on the western jetty is an electric siren.

Seal Beach, just northwestward of Anaheim Bay, has several resort structures and a pleasure pier 550 yards long.

The entrance to **Alamitos Bay,** 1.2 miles northwestward of Anaheim Bay entrance, is protected by short stone jetties. In March 1950, the entrance had a depth of only 2 feet. Local pleasure craft occasionally enter and leave the bay at high water.

Belmont Shore, about 2 miles westward of Seal Beach, has a short concrete pleasure pier. A fog signal is sounded on an electric siren on the outer end of the pier.

Charts 5147, 5148.—San Pedro Bay, between Seal Beach on the east and Point Fermin on the west, is about 82 miles northwestward of San Diego. On the shores of the bay are the city of **Long Beach** and the port areas of the city of **Los Angeles. Terminal Island,** in the northwestern part of San Pedro Bay, separates the outer bay from Los Angeles and Long Beach inner harbors. The bay is protected by breakwaters and is a safe harbor in any weather.

Los Angeles Harbor, at the western end of San Pedro Bay, includes the districts of **San Pedro, Wilmington,** and a major portion of Terminal Island. The harbor, one of the best along the Pacific coast, has extensive traffic, both foreign and domestic, and ample modern port facilities for the largest vessels.

Long Beach Harbor, in the eastern part of San Pedro Bay, is connected north of Terminal Island with Los Angeles Harbor by Cerritos Channel. The distance between the outer entrances to the two harbors is only about 4 miles. Inner Long Beach Harbor is protected by two curving moles.

Prominent features.—San Pedro Hill, 1,475 feet high, is the distinguishing feature for making San Pedro Bay from eastward or westward. The hill terminates seaward in steep, rocky cliffs about 60 feet high, with several horizontal terraces between them and the summit.

Point Fermin, the southeastern extremity of San Pedro Hill, is a bold cliff about 100 feet high. A light, 134 feet above the water and visible 18 miles, is shown from a 30-foot white skeleton tower on the point.

A very conspicuous neon sign 130 feet above the ground at the Union Oil Company plant on the west side of Wilmington has the red numerals **76,** 35 feet high, inside concentric circles of blue. The sign can be seen from south to east for 15 miles.

Signal Hill rises to a height of 355 feet about 2 miles from the beach, and is readily recognized because of the many oil derricks around it.

The high concrete stack of a power house at Seal Beach is an excellent landmark. It is flood-lighted at night and in clear weather is visible 15 miles in the daytime and 12 miles at night.

Several prominent objects of use to the navigator are the two tall, rectangular-shaped towers of the Commodore Schuyler F. Heim Bridge over Cerritos Channel; a tall concrete stack south of Fort McArthur Lower Reservation; a large stack of the Hammond Lumber Company in Los Angeles inner harbor; and the four western stacks, 256 feet high, of the Southern California Edison Power Plant on the eastern end of Terminal Island.

In the central business district of Long Beach, conspicuous buildings include the Ocean Center Building with a yellow tower, near the foot of Pine Avenue; a yellow hotel tower a block eastward of the Ocean Center Building; and a conspicuous white stone tower 0.4 mile eastward of the hotel.

Rules of the Road.—Inland Rules shall be observed inside a line drawn from Los Angeles Harbor Light through the axis of the middle breakwater to the easternmost extremity of the Long Beach Breakwater; thence to the Net Depot East Jetty Light 4 at Anaheim Bay.

Breakwaters.—San Pedro Breakwater extends about 0.9 mile in a southeasterly direction from the eastern side of Point Fermin, then turns northeastward for another 0.9 mile to Los Angeles Harbor Light. **Middle Breakwater** extends

northeastward for 2.1 miles from the Los Angeles entrance, thence eastward for 1 mile to the Long Beach entrance, and is marked at both ends by lights. **Long Beach Breakwater** extends eastward 2.2 miles from Long Beach entrance and is marked by lights on both ends.

Los Angeles Harbor Light, 73 feet above the water and visible 14 miles, is shown from a white cylindrical tower, black pilasters on concrete block, on the outer end of the San Pedro Breakwater. The fog signal is a two-tone air diaphone. The radiobeacon at the light is equipped for distance finding. There is a special radio direction-finder calibration station at the light. See *Light List* for procedure and operation.

A light, 42 feet above the water and visible 12 miles, is shown from a white skeleton tower on a white concrete house on the west end of Middle Breakwater; the fog signal is a diaphragm horn. **Long Beach Harbor Light,** 50 feet above the water and visible 12 miles, is shown from a white rectangular tower on a white building on the east end of Middle Breakwater; the fog signal is an air-diaphragm horn and a marker radiobeacon operates at the light only when the fog signal is in operation. A light, 41 feet above the water and visible 12 miles, is shown from a white skeleton tower on the west end of Long Beach Breakwater, and a light, 43 feet above the water and visible 12 miles, is shown from a steel tower near the east end; the fog signal at the west light is a horn, and the one at the east light is a bell.

Important.—The approach to each channel between the breakwaters is marked by a lighted sound buoy.. All inbound and outbound vessels should leave these buoys to port, should shape courses to about north or south before passing the buoys, and should proceed at speeds no greater than necessary for steerage while making the entrances. Vessels that approach the entrances close in and attempt to turn at or near the entrance are in danger of collision with outbound vessels, especially at night with smaller craft whose lights are not easily distinguishable at low tide or against the background of harbor lights.

Channels.—A Federal project provides for an entrance channel, **Los Angeles Channel,** 40 feet deep and 1,000 feet wide from the outer breakwaters to the outer harbor, with a turning basin 3,500 feet long and 1,500 feet wide of the same depth opposite the end of Pier 1; for an inner harbor channel 35 feet deep and 1,000 feet wide with a turning basin at its northern extremity 35 feet deep; for **East Basin Channel** 35 feet deep and 650 feet wide from the turning basin to Cerritos Channel; for **Cerritos Channel,** on the north side of Terminal Island, 35 feet deep and 400 feet wide to a turning basin 35 feet deep in Long Beach inner harbor; and for an entrance channel to Long Beach inner harbor 35 feet deep and 300 to 500 feet wide. Another project provides for a channel, **Long Beach Channel,** 45 feet deep from the outer breakwaters to Long Beach inner harbor. The lights on the outer breakwaters have been described. A lighted range, bearing 309°23′, marks the axis of Long Beach Channel. Numerous other aids mark the channels in the two harbors.

In February 1950, depths in Cerritos Channel were from 1 to 7 feet greater than project because of **land subsidence** in the vicinity.

Fish Harbor, on the southern side of Terminal Island near its western end, is protected by two sets of breakwaters, the outer ends of which are marked by

lights. The outer breakwaters enclose the Yacht Club Anchorage, sometimes referred to as Fish Harbor Extension, which has depths up to 17 feet. A dredged channel leads between the outer and inner breakwaters to Fish Harbor. Controlling depths reported in 1950 were 20 feet in Fish Harbor Channel and 18 feet in the inner harbor. The sea wall is lined with canneries and other fish works.

Anchorages.—Except in great emergency, vessels shall anchor behind the breakwaters only in the areas prescribed in §202.214 of regulations given in Chapter 2. Special anchorage areas for small craft, wherein vessels of not more than 65 feet in length when at anchor are not required to exhibit anchor lights, are described in §202.100, Chapter 2. The Santa Ana is the only wind dangerous to vessels anchored behind the breakwaters.

Dangers.—A rock with a depth of 3 feet over it is about 0.3 mile east-southeastward of Point Fermin Light. A lighted whistle buoy is about 0.2 mile southward of the rock.

A seaplane landing area in San Pedro Bay and a restricted area behind the mole at Long Beach are described in §207.617 of Chapter 2.

Bridges.—There are no bridges over Los Angeles Channel. The railroad bridge over the channel to the West Basin has a bascule span with a horizontal clearance of 148 feet and a vertical clearance of 5 feet.

Cerritos Channel, north of Terminal Island, is crossed by the Commodore Schuyler F. Heim Bridge, a highway span that has a lift with a horizontal clearance of 180 feet and vertical clearance of 50 feet down and 175 feet up. About 25 yards westward is a railroad bridge that has a double-leaf bascule span with a horizontal clearance of 180 feet and a vertical clearance of 9 feet. Regulations affecting these bridges are given in §203.711, Chapter 2. Several power lines with vertical clearances of about 200 feet cross Cerritos Channel near its eastern end.

A retractable pontoon bridge over the channel to the turning basin in Long Beach Harbor has an open horizontal clearance of 170 feet; small craft can use passageways on either side of the operating section that have a horizontal clearance of 30 feet and a vertical clearance of 18 feet. Regulations affecting this bridge are given in §203.711, Chapter 2.

Tides.—The mean range of tide in Los Angeles and Long Beach Harbors is 3¾ feet and the diurnal range between mean lower low water and mean higher high water is about 5½ feet. A range of about 9 feet may occur at times of maximum tides. The time of tide is about the same for both harbors. Daily tide predictions for Los Angeles Harbor are given in the *Tide Tables.*

Currents.—The tidal currents follow the axes of the channels. They rarely exceed 1 knot and are generally negligible.

Surge.—Both Los Angeles and Long Beach Harbors are characterized by short- period oscillations manifested by vertical and horizontal movements which are designated respectively as seiche and surge. The most persistent and conspicuous oscillation has a period of approximately one hour. In the vicinity of Reservation Point and near the eastern end of Terminal Island, the hourly surge is very prominent, causing velocity variations which at times may be as great as a knot, and which often overcome the lesser tidal current so that the current floods and ebbs at half-hour intervals. Because of the more restricted channel, the surge through the channel at the east end of Terminal Island usually reaches

a greater velocity than through the channel west of Reservation Point. In the first-mentioned channel, the hourly variation may sometimes be 1½ knots or more. The hourly surge, together with other oscillations of shorter period and of more irregular occurrence, at times cause a very rapid change both in height of the water and the velocity and direction of the current and may endanger vessels tied up at the piers. A three-minute surge is said to be responsible for major ship movements and damage. Pilots advise taut lines to reduce the effect of the surge.

Weather.—Fogs occur throughout the year, but most frequently during the early spring and fall months. Ordinarily they are of comparatively short duration, and occur during the night, clearing before 9 a. m. There are times, however, when the fog hangs in Los Angeles Channel for several days without clearing. The outer harbor usually is clear of fog first, then the Los Angeles channel gradually clears.

The prevailing **winds** during the summer are from the northwestward and in winter from the southward and westward; for each season the heaviest winds come from the prevailing direction. Southeasterly gales occur occasionally during the winter.

The only wind likely to be destructive is a local wind known as the *Santa Ana*, or desert wind, which comes from the northeastward. It is a warm, very dry wind, blowing furiously and laden with great clouds of dust. It usually occurs with greatest force during the fall and winter and is most frequent during the night or early morning hours, especially the latter. An excessively low humidity and a very high visibility for some hours before the desert storm reaches the coast are preliminary signs of its approach. A dark brown dust cloud coming from the northeastward gives a few minutes warning of its arrival, but the barometer gives no warning. *A Santa Ana* can usually be predicted from weather maps made from current weather reports. When an area of very high barometric pressure develops over the plateau region of Nevada and northern Arizona with a relatively low area along the southern California coast, a steep barometric gradient is formed, indicating winds from the northeastern quadrant.

Storm warnings.—Day and night storm signals are displayed from a steel tower on the roof of a concrete warehouse at the outer end of Municipal Pier No. 1 in Los Angeles Harbor, from a steel mast on the roof of the Marine Exchange Building in San Pedro, and from the Long Beach Pilot Station on the east mole, Pier A Extension, Long Beach Harbor. Daytime displays are made in Wilmington and from the Los Angeles Yacht Club on Terminal Island.

Pilotage is compulsory except for vessels under 300 gross registered tons and all vessels under enrollment, and licensed and engaged in the coastwise, intercoastal, and fishing trades between Los Angeles or Long Beach and any other port of the United States, while under the control and direction of a pilot duly licensed under the laws of the United States. Vessels subject to pilotage are charged the full pilotage rate of 0.9 cent per gross registered ton, with a minimum charge of $10 and a maximum charge of $180 for either operation.

Los Angeles Harbor Department has two pilot boats on station at all times. The pilot station is at the outer end of Pier 1. Vessels are met outside. The whistle signal for calling pilot is one long, one short blast.

Long Beach Harbor Department has two pilots available at all times. The pilot station is on a short jetty at the southwest end of the east mole. The pilot boats are equipped with ship-to-shore telephone and operate cooperatively with the Radar station at the pilot station. Pilots board one mile south of the harbor entrance. The whistle signal for calling pilot is one short, one long blast.

Towboats are available. Large vessels usually have one or more towboats in attendance while berthing at or departing from wharves along the inner channels.

Quarantine and hospitals.—Quarantine for the ports is enforced in accordance with regulations of the U. S. Public Health Service. The quarantine station is on **Reservation Point** on the eastern side of Los Angeles Channel. Vessels requiring examination by the quarantine, customs, or immigration authorities usually proceed to their docks where they are boarded by the officials. Fishing boats and other small vessels in quarantine proceed to the immigration dock on Reservation Point for quarantine and other visitation. Vessels from foreign ports entering for bunkers only will be boarded at the quarantine anchorage, northwestward of Los Angeles Harbor Light. The U. S. Public Health Service maintains outpatient clinics in Los Angeles proper and in San Pedro, and a relief station in San Pedro. The San Pedro General Hospital is at 1305 Sixth Street and the Seaside Hospital is on Fourteenth Street, near Pacific Avenue, Long Beach. There are also numerous public and private hospitals in the city of Los Angeles.

Customs.—The customhouse is in the Post Office and Customhouse Building on Beacon Street between Eighth and Ninth Streets, San Pedro. The custom district of Los Angeles includes San Pedro, Wilmington, and Long Beach; marine documents are issued.

Immigration.—The United States Immigration Station for the ports is on Reservation Point.

The **Coast and Geodetic Survey District Office** in the United States Post Office and Courthouse, Los Angeles, will furnish, without charge, information relating to the coasts of the United States. The office also has for sale charts, Coast Pilots, tide tables, current tables, and other publications of the Coast and Geodetic Survey. Mariners noting any dangers, changes in channels, shoals, or any discrepancy in the charts or Coast Pilots are urgently requested to forward the information to the supervisor in charge of the district office. **Sales agents** are in San Pedro, Los Angeles, and Long Beach.

At the **Branch Hydrographic Office** in the Federal Building, San Pedro, mariners can consult various publications pertaining to navigation and correct their charts from standards. No charge is made for this service.

The **Eleventh Coast Guard District** headquarters are in the Times Building, Long Beach. Marine inspection offices are maintained in Long Beach and in San Pedro, and an examiner's office is in Long Beach. Among its other duties, the Coast Guard is charged with the establishment and maintenance of aids to navgation. Mariners are requested to report direct to the Coast Guard District Commander at Long Beach by radio, or other prompt means, defects or deficiencies in aids to navigation affecting the water of California south of latitude 34°58′ N. Recommendations as to aids to navigation or their improvement may be submitted to this office. The latest information pertaining to all aids to navigation in these waters is available at the district office.

The **Corps of Engineers** has district headquarters in Los Angeles.

Harbor regulations.—Regulations for Los Angeles Harbor are prescribed by a board of harbor commissioners. Copies may be obtained from the harbor master, whose office is in the Ferry Building, foot of Sixth Street, San Pedro.

Rules and regulations for Long Beach Harbor, as well as the tariff governing the operation of the port, are practically identical with those in force and effect in Los Angeles Harbor, and consequently no confusion arises by reason of the fact that vessels often have part of cargo in both ports. The control of the harbor district is vested in a board of five harbor commissioners appointed by the city manager. Copies of the rules and regulations may be obtained from the harbor engineer's office.

Terminal facilities.—The Los Angeles wharves have depths alongside sufficient for the largest vessels. East Channel, in the outer barbor has depths of 40 feet alongside the bulkhead. Wharfage is assessed at the municipal wharves. There are extensive warehouses in the port.

Most of the wharves in Long Beach inner harbor are privately owned, while those in the outer harbor are owned by the municipality. Depths of 35 feet or more are available at berths in the outer harbor. Wharfage is assessed at the municipal wharves. Limited storage facilities only are available on the water front of Long Beach.

Supplies.—Fuel oil, water, provisions, and ship chandlery can be had in any quantity at both Los Angeles and Long Beach. The fuel oil can be furnished at the oil docks or by barge. Bunker coal can be obtained in Los Angeles outer harbor by advance arrangement.

Repairs.—Los Angeles Harbor is well equipped with marine repair plants, and repairs of any magnitude can be undertaken. The largest drydock has a lifting power of 14,000 tons, will accommodate vessels 550 feet in length, and has depth of 25 feet over the blocks at high water. There are no graving docks. The port is well equipped with wrecking and salvage facilities. A trained salvage crew and a corps of expert divers are in readiness at all times to render aid in any disaster to shipping along the coast and at distant localities.

Long Beach has a floating drydock of 2,500-ton capacity, with 16 feet over the blocks at high water. The plant is well equipped to handle all kinds of repairs. There are also marine railways for small craft.

Communications.—Los Angeles Harbor is a port of call for many foreign, intercoastal, and coastwise steamship lines. Rail communications with three transcontinental lines and one standard gage electric line serve the harbor. Five commercial air lines operate in Los Angeles and vicinity. The many highways provide for rapid bus and truck service to the surrounding territory. The port has complete radio, telegraphic, and telephone facilities. An auto and passenger ferry operates between San Pedro and Terminal Island.

While the ports of Los Angeles and Long Beach are separate entities, the traffic facilities are closely interrelated.

Chart 5142.—From Point Fermin the coast trends in a general westerly direction about 6.5 miles to Point Vicente, and forms the northern shore of San Pedro Channel, which is discussed later in this chapter. From Point Vicente the

shoreline curves northward. The coast is free of offlying dangers and is well marked by kelp. Regulations governing practice firing ranges off Points Fermin and Vicente are given in Chapter 2, §204.197.

A submarine sewer extends seaward 0.8 mile from **Whites Point,** 1.3 miles westward of Point Fermin.

Portuguese Bend is a small bight 2.3 miles eastward from Point Vicente. A private beach community maintains a clubhouse and pier in the northwest corner of the bight. The pier is 430 feet long and has facilities for lifting out small pleasure boats for repair or storage.

Point Vicente is a steep, rocky cliff, 120 feet high, white and red in color, with red predominating. A rock awash is 250 yards southwestward from the point, and kelp extends 100 yards farther off. A small black pyramidal rock, 25 feet high, is close inshore 0.3 mile eastward of Point Vicente. A light, 185 feet above the water and visible 20 miles, is shown from a white cylindrical tower on the southwesterly end of Point Vicente. The fog signal is an air-chime whistle. The Coast Guard maintains a radio station near the light.

A **measured nautical mile,** on course **304°40′,** has been established at Point Vicente. The ranges are marked by daybeacons on shore.

Chart 5144.—Palos Verdes Point, about 2 miles north-northwestward of Point Vicente, is a bold, bluff point, 120 feet high, rising abruptly to the western extremity of San Pedro Hill. There are no dangers off the point, but heavy kelp extends out about 0.6 mile.

Lunada Bay is a small bight on the southern side of Palos Verdes Point. **Resort Point** forms the southern side of this bay.

Flat Rock Point, 1.7 miles northeastward of Palos Verdes Point, is on the southern side of Santa Monica Bay. A narrow spur protrudes from the otherwise rounded point. **Flat Rock,** 6 feet high, and **Bit Rock,** 5 feet high, are 175 yards and 250 yards, respectively, off the end of the spur. **Bluff Cove** is a shallow bight on the southern side of Flat Rock Point. The beach is covered with boulders.

Santa Monica Bay is formed by the curving coast between Point Vicente and Point Dume. From Flat Rock Point to Santa Monica the shore is comparatively low, consisting of sand dunes about 100 feet high backed by the high mountains of the Sierra Madre far in the interior. The shores of Santa Monica Bay are free of outlying dangers, and the depths are comparatively shoal, the 10-fathom curve in general lying about 1 mile from shore, except at Redondo Beach where a deep submarine valley, **Redondo Canyon,** heads close to the shore.

There are several prominent objects in this vicinity. About 1 mile northward of Redondo Beach and about 200 yards inshore is a large powerhouse with four very large smokestacks placed in a line parallel to the beach. The stacks are flood-lighted at night. On Hermosa Beach is a 7-story white concrete beach club, surmounted by an elevator penthouse. Numerous white tanks and several stacks, one much taller than the others, all within the extensive oil refinery area in El Segundo, can be readily seen from seaward. An aluminum-colored water tank is on the southern pleasure pier at Venice. In the city of Santa Monica

are an aluminum-colored gas holder and a terra-cotta office building, surmounted by a tower upon which blazes a huge neon sign.

Malaga Cove, just northward of Flat Rock Point, is used occasionally by fishing boats with local knowledge, but the cove is open to the prevailing westerly winds. Boats enter through a break in the kelp and anchor inside in 6 to 7 fathoms, with the south point of the bight bearing 207°.

Redondo Beach is about 6 miles northward of Point Vicente. Gasoline and fresh water may be obtained by small craft alongside a wharf which is immediately southward of the municipal fishing pier. A yacht basin, with anchorage area protected by a breakwater, is 0.7 mile northward of the fishing pier. The southern end of the breakwater is marked by a lighted gong buoy. **Storm warnings** are displayed, daytime only, from the breakwater.

Submarine oil seepage.—About 1.5 miles off Redondo, in the deep water of Redondo Canyon, there is submarine oil seepage and the water surface is often covered with a film of petroleum. Gas bubbles have been reported in several locations in this vicinity. A second seepage 3.5 to 4 miles to the northwestward is more noticeable and more continuously in action. On calm days, globules and large blobs of oil have been seen projected clear of the water surface. Gas also escapes continuously in large bubbles often 3 to 6 inches in diameter.

Hermosa Beach, a resort with a pleasure pier, is about 1.5 miles northward of Redondo Beach.

Manhattan Beach is another resort northward from Redondo Beach. The development of beach property in this section has been so extensive it is difficult to distinguish the dividing lines between towns. A pleasure pier is at Manhattan Beach.

About 2 miles northward of Manhattan Beach an oil-loading wharf extends out to a depth of 28 feet. About 0.5 mile west-southwestward of this wharf is the outer end of a heavy-oil submarine pipe line. A second line for lighter oils extends about 0.6 mile west-northwestward from the wharf. There are mooring buoys near the wharf and the ends of the pipe lines, and a bell buoy is farther offshore. The larger tankers are handled offshore and the smaller ones at the wharf. A foghorn is maintained by the oil company at the end of this wharf.

El Segundo, about 1 mile back from the oil wharf, has extensive oil refineries. Nearly 100 large white oil tanks on the high ground are prominent. An aviation light in El Segundo is about 2.5 miles from the beach.

The city of Los Angeles outfall sewer extends 0.9 mile seaward from the beach at **Hyperion,** 0.7 mile northward of the oil-loading wharf, and is marked by buoys. An abandoned outfall sewer, 300 yards farther northward, also extends 0.9 mile seaward. Just northward of the outfalls and 300 yards in from the beach, the sewage disposal plant, with a large concrete stack 200 feet high, is very conspicuous. The stack is flood-lighted.

Playa del Rey is a conspicuous real estate development at the southern end of **Ballona Lagoon,** which is about 3 miles northward of El Segundo.

Venice, at the northern end of the lagoon, is a resort, but many oil wells have been drilled along the southern part of its beach. There is a large pleasure pier with buildings, chutes, and domes that are conspicuous from the sea.

Gasoline and water for small craft may be obtained here. Venice is a part of the City of Los Angeles.

Santa Monica is an important city and seaside resort. The buildings and structures along the beach are prominent from seaward. A large pleasure pier extends out to a depth of about 22 feet, but there is no water commerce. Fuel oil, distillate, and gasoline are available. A breakwater 0.3 mile long and parallel to the beach is about 200 yards off the outer end of the pier. A light is shown from a skeleton tower on top of the harbor master's office at the outer end of the Santa Monica wharf. The fog signal is sounded on an air diaphone. A lighted bell buoy is southwestward of the breakwater. **Storm warnings** are displayed day and night at Santa Monica. A special anchorage area off the pier for small boats is described in Chapter 2, §202.110.

Chart 5101.—The coast between Santa Monica and Point Dume is bold, rocky, and rugged. Steep cliffs rise abruptly from the water's edge, ascending gradually within 3 or 4 miles to the summits of the Santa Monica Mountain Range, about 3,000 feet high. The seaward termination of this range is at Point Mugu, 14 miles westward of Point Dume.

Kellers Shelter, 7 miles northeastward of Point Dume, is an open bight offering protection from northerly and westerly winds in depths of 5 to 7 fathoms, sandy bottom. A reef marked by kelp extends a short distance offshore about 0.5 mile westward of the anchorage.

A well constructed fishing and pleasure pier, 700 feet long and with 15 feet of water at its outer end, is on the western side of Kellers Shelter. Twin white buildings are prominent marks at the outer end of the pier. Private mooring buoys are maintained east of the pier for the use of sport fishing boats which leave for the nearby fishing grounds daily except during winter months. An aviation light, 2,859 feet about the water, is about 2 miles northward of the beach at Kellers Shelter. An improved highway extends along the beach in this section. Frequently the headlights of autos are directed toward the sea.

Dume Cove, about 2 miles northeastward of Point Dume, affords protection similar to Kellers Shelter. The anchorage is abreast the fourth break or arroyo in the cliffs from Point Dume, and is immediately outside the kelp line, in a depth of 6 to 7 fathoms, sand bottom, with Point Dume bearing 240°. A high railway trestle crosses this gulch and the grade of the road slopes gradually to the beach eastward from it. Kelp should be avoided on account of possible dangers. A 400-foot pleasure pier and several moorings for small boats are in the cove.

Point Dume is the seaward end of a rather low plateau that terminates in a dome-shaped head, about 200 feet high, rising from a bold rocky bluff. The bluff is reddish, with white cliffs eastward and westward. A small rock visible at all stages of the tide is 150 yards southward of the point, and a reef which bares at low tide is 150 yards farther out. A lighted whistle buoy is 0.5 mile off the point.

Dume Canyon is a submarine valley with extremely steep slopes running about 0.3 mile offshore from Point Dume, and extending northwestward roughly

parallel to the beach. Moderately strong currents of a confused directional nature have been observed in the vicinity of this submarine valley.

San Pedro Channel, about 17 miles wide, is between the mainland, Point Fermin to Point Vicente, and Santa Catalina Island. Current observations have been made 5 miles south of San Pedro Breakwater. Two periodic currents occur at this location; a tidal current, and a daily current apparently due to a land and sea breeze. Both are rotary, turning clockwise, and each is weak, having a velocity at strength of about ¼ knot. The tidal current is very complicated, but the daily current is simple maintaining on the average an approximately constant velocity and shifting direction to the right about 15° each hour. It sets north about 9 a.m., east at 3 p.m., south at 9 p.m., and west at 3 a.m.

Currents due to winds and oceanic drifts vary in velocity and direction. The average current for the period of observations set 112° with a velocity of about 0.1 knot. Currents greater than 1 knot occur infrequently. The greatest velocity measured during five months of observations was 1½ knots.

Outer Santa Barbara Passage is between Santa Catalina and San Clemente Islands.

Chart 5113.—San Nicolas Island, the outermost of the group off southern California, is 53 miles off the nearest point of the mainland, 43 miles west-northwestward of San Clemente Island, and 24 miles southwestward of Santa Barbara Island. The island is 8 miles long in an easterly direction, about 3 miles wide, and about 900 feet high at its highest point. It is visible about 38 miles. From a distance, the island has a gently rounding profile, with no features that can be identified for taking bearings. The western part is covered with sand, some of which has drifted to the middle northern shore. The remainder of the island is cut by deep arroyos and the top of the mesa is spotted with patches of burr clover and bunch grass. With the exception of the rocky points, the beaches are all sand. The island is practically surrounded by kelp. At the western end the kelp extends westward about 3 miles, over very irregular bottom. Two reefs in the kelp extend about 1.6 miles westward from the western extremity of the island. In thick weather great caution must be exercised in approaching from westward, and vessels should in no case pass inside the kelp. No dangers are known to exist outside the kelp.

Begg Rock, 15 feet high, is 8 miles northwestward of the western point of San Nicolas Island. A reef extends northward and southward of the rock a little over 100 yards in each direction. The rock rises abruptly from depths of 50 fathoms. A lighted whistle buoy is about 500 yards northward of the rock. The U. S. Navy has several lighted floats, each about 10 feet long and 4 feet wide, in the vicinity of Begg Rock.

A bank with 30 to 40 fathoms over it extends 7 miles eastward from the eastern point of San Nicolas Island. From the 40-fathom curve the depths increase rapidly to the eastward and southward.

Two restricted anchorage areas are off San Nicolas Island; for description and regulations, see Chapter 2, §202.220. Indifferent anchorage may be had on the southern side of the sandspit, 0.6 mile long, on the eastern end of the island. Small craft anchor in a depth of 8 fathoms, hard sand bottom, near the inshore

edge of the kelp. Larger vessels anchor farther off shore in depths of 10 to 17 fathoms, hard sand bottom. The anchorage often is uncomfortable as the island tends to split the westerly seas and they break with equal force on both sides and meet off the end of the spit in a maelstrom of breakers. This condition tends to move the sand from the western end of the island and build up the sandspit. After sunset there is frequently a strong wind blowing off the mesa, making holding difficult. In a blow, local fishermen are in the habit of leaving this anchorage, preferring the anchorage at Santa Barbara Island as much the better. A landing can usually be made during the summer months without difficulty at the eastern end on the southern side of the island.

Three lights on San Nicolas Island are shown from white pyramidal structures; the light on the east side of the island, 53 feet above the water and visible 7 miles, is obscured from 010° to 155°; the light on the north side of the island 2.3 miles from the easternmost light, is 33 feet above the water, visible 11 miles, and obscured from 308° to 117°; the light on the south side of the island about 2 miles from the easternmost light is 50 feet above the water, visible 7 miles, and obscured from 101° to 262°. A lighted whistle buoy is about 2 miles east of the easternmost light.

Chart 5101.—A bank with depths of from 52 to 70 fathoms over it is 20 miles southward from the San Nicolas Island. The bank extends 9 miles in a northwesterly direction and has an average width of 2 miles. The bottom is hard with fine gray sand and shells. This bank is fished extensively during the winter season.

Chart 5110.—**Santa Barbara Island,** 33 miles south-southwestward of Point Dume and about 21 miles westward from the western end of Santa Catalina Island, is about 1.5 miles long in a northerly direction, and has a greatest width of 1 mile. The profile of the island is saddle-shaped, and at a considerable distance it appears to be two islands. The greatest elevation is 635 feet on the southern side of the saddle, and the island is visible for over 25 miles in clear weather. The shores are bold and precipitous and well marked by kelp extending to about 10 fathoms at irregular distances from the shore. Westward of the island the kelp makes out for over a mile over very irregular bottom; a sunken rock is near the outer and southern edge of the kelp. The water around the island is deep except where the kelp indicates foul or rocky bottom.

Sutil Island, a rocky islet 300 feet high and surrounded by kelp, is about 0.4 mile westward from the southern point of Santa Barbara Island; its northern face is steep. A smaller rock islet, 145 feet high, is 200 yards offshore about 0.2 mile westward from the northern point of Santa Barbara Island.

A fair anchorage for small craft in the prevailing westerly weather may be had off the eastern side of the island about 700 yards southeastward of the northeastern point. Large vessels can anchor off the eastern side of the island within the 30-fathom curve with hard gray sand bottom. A general anchorage has been established by Federal regulations; for description see Chapter 2, §202.222.

Santa Barbara Island Light, 195 feet above the water and visible 11 miles, is

shown from a white pyramidal structure on the northeasterly point of the island; the light is obscured from 356° to 069°. Another light, 486 feet above the water and visible 11 miles, is shown from a white pyramidal structure on the westerly side of the south end of the island; the light is obscured from 146° to 196°.

Chart 5101.—Osborn Bank, about 6.5 miles southward of Santa Barbara Island, is 5 miles long in a northwesterly direction and has an average width of a little over a mile. The least depth found on the bank is 19 fathoms.

About 16 miles north-northwestward of Santa Barbara Island is a submerged pinnacle rock of very small area on which a least depth of 17 fathoms was found.

Chart 5111.—San Clemente Island, 43 miles south-southwestward of Point Fermin and 57 miles west-northwestward of Point Loma, is about 18 miles long in a northwesterly direction, has a greatest width of about 4 miles, and has a greatest elevation of about 1,965 feet. This island is a U. S. Naval Reservation and is closed to the public. Vessels are warned that the vicinity of this island may be dangerous at any time on account of Naval activities, including gunfire, bombing, and rocket firing. This warning applies to yachts and fishing vessels as well as to other vessels. Compass deviations of from 1° to 3° from the normal have been noted in the vicinity of San Clemente Island.

Seen from a distance, the top of San Clemente Island looks like a tableland and presents no definite natural features of value to navigation. Such structures as are shown on the charts may be identified by their positions and the descriptive notes.

The northeastern side of the island is bold, with rocky cliffs. The water is deep close inshore, in general, and kelp grows close to the beach. On this side of the island a prominent white rock is close inshore, about 6 miles northwestward of Pyramid Head. On the beach behind this rock is a fresh-water spring, the only one available during the dry season.

The southwestern side of the island is more irregular, but it is lower and has more gentle slopes. Here the kelp extends several hundred yards offshore, generally to or beyond the 10-fathom curve. Rocks are numerous close inshore and inside the kelp, but outside the kelp line the bottom slope is more gradual than on the other side of the island, and there are many places where vessels might anchor safely in the lee of the island during the northeastern storms, known as the *Santa Anas*.

Seal Cove, on the southwestern side of the island midway between the two ends, affords a boat landing and indifferent anchorage for small craft in northwesterly weather.

Chart 5117.—Pyramid (Smuggler) Cove is the deep bight in the southern end of San Clemente Island. This cove offers protected anchorage during northwesterly weather, in depths of 10 fathoms or more. A danger zone has been established off this cove; for description and regulations see Chapter 2, §204.200. Vessels should not enter the kelp as there are indications of other dangers be-

sides those already shown on the charts. Some swell makes into the cove most of the time, but landing on the beach is usually not difficult.

Pyramid Head, the southeastern point of San Clemente Island and the eastern side of Pyramid Cove, is about 900 feet high, sharp, jagged, and prominent. A light, 226 feet above the water and visible 11 miles, is shown from a white pyramidal structure on the head. The light is obscured from 075° to 147°.

China Point is the southwestern extremity of San Clemente Island and on the western side of Pyramid Cove. A light, 112 feet above the water and visible 11 miles, is shown from a white pyramidal structure on the point. The light is obscured from 128° to 260°.

Chart 5118.—Wilson Cove, on the northeastern shore of San Clemente Island about 2.5 miles southeastward of Northwest Harbor, is a fair anchorage in the prevailing westerly weather but is uncomfortable at times as the swells make around the point from the northwestward. A strong wind usually blows down off the hills in the afternoon. A restricted anchorage area has been established in the vicinity of Wilson Cove; for description and regulations see Chapter 2, §202.218.

Three lights shown from white pyramidal structures and a lighted range are in the vicinity of Wilson Cove. On the hill on the southwestern side of the cove is a light 125 feet above the water, visible 14 miles, and obscured from 317° to 155°; on a point 2 miles south of the cove is a light 140 feet above the water, visible 9 miles, and obscured from 320° to 150°; on a point about 1 mile north of the cove is a light 60 feet above the water, visible 11 miles, and obscured from 330° to 138½°. The range lights, maintained by the Navy, are shown from houses, the front light on the Navy pier and the rear on the shore; the bearing of the range is 198° and coincides with the bearing of the axis of the pier. A fog signal, electric siren, is on the end of the pier.

The buildings on the hill overlooking Wilson Cove are prominent from the southeastward. The best anchorage for small craft is in the lee of the kelp making off from a point nearly a mile northwestward of the wharf.

In the middle of Wilson Cove the U. S. Navy has a steel pier that extends 550 feet from shore. A landing section at its outboard end is 38 feet wide by 210 feet long, with its deck 18 feet above low water. Depths along the landing section vary from 14 feet inboard to 24 feet outboard. Two fixed breast moorings are in place on each side opposite the landing section and should be used to avoid danger of damage from surge. Time of tide is about the same as that of Los Angeles. The mean range is 3½ feet.

A **measured nautical mile,** on course **326°,** is off the northeast side of San Clemente Island north of Wilson Cove.

Northwest Harbor, on the northwestern end of the island, affords shelter in southerly weather and is a comfortable anchorage in the prevailing westerly weather, as the large beds of kelp and the low islet to the northward of the anchorage afford protection. It is open northward, and is unsafe in heavy northwesterly weather.

San Clemente Island Light, 202 feet above the water and visible 11 miles,

is shown from a white pyramidal structure on the headland at the north end of the island. The light is obscured from 276° to 341°.

A line of rocks extends westward from the northwestern extremity of San Clemente Island, terminating about 0.4 mile off the point in Castle Rock, a bold rocky islet. This islet is 72 feet high and is prominent in approaching from the northeastward or southwestward.

Shelter from *Santa Ana* winds may be had off the southwestern side of San Clemente Island, just southward of **West Cove,** 1.5 miles southeastward of Castle Rock.

Chart 5112.—Santa Catalina Island, 18 miles southward of Point Fermin, is about 18.5 miles long in a southeasterly direction and has a greatest width of 7 miles. About 6 miles from the western end, a deep northerly cut almost divides the island in two. The cut forms coves less than 0.5 mile apart at their heads, and because the isthmus separating these coves is low, the island appears as two from a few miles distant. Rugged and mountainous, the island has steep, precipitous shores intersected occasionally by deep gulches and valleys, and is covered with a thick growth of brush and some scrub oak. The highest peak, 2,125 feet, is about in the middle of the eastern part of the island. Sheep and cattle are raised to some extent.

Much of the northern shore is free from kelp, but the southern side in general has a narrow fringe of kelp close to the beach. The island rises abruptly from deep water, the 30-fathom curve being close inshore. Most of the dangers in the approaches to the island are inside the kelp.

Avalon Bay, Isthmus Cove, and Catalina Harbor, the features of most interest to local navigation, are discussed under Chart 5128.

Navigational lights are shown from white pyramidal structures on the island. A light, 212 feet above the water and visible 11 miles, is on the southeast point of the island. A light, 71 feet above the water and visible 11 miles, is shown from **Long Point,** on the northeasterly side of the island 4 miles northwestward from Avalon. A light, 76 feet above the water and visible 11 miles, is on West End, the northwest extremity of the island. Ship Rock Light is discussed with Isthmus Cove.

Ribbon Rock (Bulls Head), on the southern side of Santa Catalina Island, about 3 miles from the western end, shows as a dark vertical rock wall with a gigantic ribbon of quartz veining which is visible many miles.

Farnsworth Bank, 5 miles southward of Catalina Harbor and 1.5 miles offshore has a least known depth of 8 fathoms.

Shelter from *Santa Ana* winds can be had by anchoring in the bight near the **Palisades** on the southern side of the island, 2 to 3 miles northwestward of the southern extremity.

There are two prominent rock quarries on the eastern side of the island; one is about 1.5 miles southward of Avalon Bay, and the other is about 1 mile southeastward of Isthmus Cove.

White Cove, 3.5 miles northwestward of Avalon, affords anchorage in depths of 8 fathoms; the protection is similar to that at Avalon.

Chart 5128.—Avalon Bay is on the northern shore of Santa Catalina Island, about 2.5 miles from its southeastern extremity. The small bay affords indifferent anchorage in a depth of 8 fathoms, sandy bottom. A depth of 20 fathoms is immediately outside the points of the cove. The shelter is good in southwesterly weather, and fair in northwesterly weather if the wind is not too strong. The anchorage is not safe during the *Santa Ana* winds that occasionally blow from the eastward during the fall and winter months. A special anchorage area has been prescribed for the bay; for description and regulations see §202.105 in Chapter 2.

A large white circular building on **Casino Point**, on the north side of the bay, is brilliantly illuminated for about half the night. **The Carillon,** a white concrete tower, is illuminated and is easily identified.

An electric fog siren is on the pump house near **Bathhouse Point,** on the southeastern side of the bay, but it is sounded only upon the approach of regularly scheduled passenger steamers. Manually-operated fog horns at Steamer Pier and at Casino Point are also sounded to aid the scheduled steamers in thick weather. **Storm warnings** are displayed day and night at Avalon.

The village of **Avalon,** an extensive resort and the principal settlement on the island, has several wharves. Daily steamer and airplane service is maintained with San Pedro. A road along the beach extends some distance on each side of the cove, and at night the lights along this road are conspicuous from San Pedro Channel. The cove is important as a yacht anchorage and as a vacation resort. The customary yachting and fishing-boat supplies are available.

A large hotel with a pleasure pier is on **Descanso Bay,** just northwestward of Casino Point. An anchorage area in this bay is described in Chapter 2, §202.216.

A seaplane landing is at **Hamilton Beach,** about 0.4 mile northward of Casino Point. For regulations see §207.620 in Chapter 2.

Isthmus Cove, on the north shore 6 miles from the western end of the island, affords shelter for small vessels in southerly weather, but is dangerous in northwesterly weather. A wharf extends out to a depth of 17 feet. Several prominent buildings are on shore. Isthmus Cove and Avalon are connected by an auto road, and during the tourist season launch service is maintained between these two points.

Anchorage regulations for Isthmus Cove are given in Chapter 2, §202.216.

The approach to Isthmus Cove alongshore from the eastward is clear, but westward of the Cove entrance is **Eagle Reef,** which has a least depth of 3 feet. The reef is marked by growing kelp and by a buoy about 100 yards to the eastward. In approaching from northward, **Ship Rock,** about 1 mile northward of the cove, is the guide. A light, 60 feet above the water and visible 9 miles, is shown from a white pyramidal structure on top of the rock. From the channel the rock looks like a black haystack; the top is mostly white due to bird droppings. A reef extends about 120 yards southward of Ship Rock, ending in a rock that bares 3 feet at low water.

Bird Rock, 37 feet high and about 150 yards in length, is about 500 yards off the beach northward from the eastern part of the cove entrance. The rock is covered with sand and grass. In places reefs extend off Bird Rock more than

100 yards, but the rock may be approached close-to on the eastern side.

Harbor Reefs, 400 yards southwestward of Bird Rock are 350 yards long in a northwesterly direction, and less than 100 yards wide. They usually are well marked by kelp. A rock near the eastern end bares about 2 feet at low water. There is a lighted buoy just southward of the eastern end of the reef and a buoy westward of the western end.

Fisherman Cove, in the eastern part of Isthmus Cove, is small, and little used.

Catalina Harbor, on the southern side of the isthmus separating it from Isthmus Cove, affords shelter for small vessels in all but southerly weather. This harbor is funnel-shaped, open to the southward, free from hidden dangers, and easy of access. **Pin Rock,** a small rock above water close inside the eastern head, is about 150 yards offshore and has deep water around it. The anchorage is in depths of 4 to 5 fathoms, soft bottom, abreast **Ballast Point,** the long low point on the eastern shore. The head of the harbor is shoal. The 3-fathom curve is marked by kelp, and vessels entering should give the shores a berth of 150 yards.

CHAPTER 5

Santa Monica Bay to Point Arguello

Chart 5202

DISCUSSED here, in addition to the mainland, are the Santa Barbara Channel and the off-lying islands, known locally as the Channel Islands. **Santa Barbara Channel** is about 63 miles long and increases gradually in width from 11 miles at the eastern end to 23 miles at the western end. The channel is free of dangers and has depths of 40 to more than 300 fathoms along the recommended steamer track from San Diego and Los Angeles to northern ports.

On the northern side of Santa Barbara Channel is the mainland between Point Hueneme and Point Conception. On the southern side are the **Channel Islands,** Anacapa, Santa Cruz, Santa Rosa, and San Miguel, which break the force of the heavy westerly Pacific swell and afford a lee in winter from the full force of the southeasterly gales.

The eastern entrance to Santa Barbara Channel has a clear width of 2 miles between the 100-fathom curves, and lies between Anacapa Island and Point Hueneme. On the northern side of this entrance is a deep submarine valley, **Hueneme Canyon,** which extends from Point Hueneme in a south-southwesterly direction across the channel. There is a light on Point Hueneme, and a light, radiobeacon, and distance-finding station are on the eastern end of Anacapa Island. Fog signals operate at both lights.

The light on Santa Barbara Point is a prominent aid to navigation about midway through the channel.

The western entrance to the channel is between Richardson Rock and Point Conception; the latter is marked by a light and the former by a lighted whistle buoy. The light, radiobeacon, and distance-finding station at Point Arguello are aids in approaching this entrance.

The prevailing **winds** are westerly and blow nearly every day, especially in the afternoon. Southeasterly storms occur in the winter months, and at times the sea is too rough for several days to permit the passage of small vessels.

In the summer months the winds in the channel are wholly different from those outside the islands and off the coast to the northwestward. Under the northern shore, which is protected by the bold range of the Santa Ynez Mountains, the westerly winds do not reach far eastward of Point Conception with

much strength but are felt toward the islands, a strong northwesterly wind and heavy swell coming in from the open ocean. The climate in the Santa Barbara Channel, because of this blocking of the winds, is much milder than to the northward along the coast. However, during northwesterly weather boats crossing the channel from the mainland usually encounter heavier seas as the islands are approached. The belt of rough seas, locally known as *Windy Lane*, lies along the north shores of the islands and is about 6 miles wide. This sea condition is the opposite to that experienced in the crossing from Los Angeles Breakwater to Santa Catalina Island. Strangers are cautioned that good seamanship sometimes calls for returning to the mainland rather than attempting *Windy Lane* when rough seas are encountered. These westerly winds usually begin about 10 a.m. and grow progressively stronger until sundown.

During heavy northwesterly weather strong squally winds draw down the canyons between Point Conception and Capitan and pass directly offshore, causing a severe choppy sea. Heavy northwesterly gales are often encountered off Point Conception on coming through Santa Barbara Channel, and great changes of climatic and meteorological conditions are experienced, the transition often being remarkably sudden and well defined.

In the fall and winter months, stiff *Northeasters* are occasionally experienced at and near the eastern end of the Channel. They come up without warning, usually at night in clear dry weather, and when the barometer is either high or rising rapidly. At such times small boats should be prepared to seek shelter at a moment's notice.

During the summer season, heavy **fogs** are a common occurrence in the Santa Barbara Channel and envelop the main shore, channel, and islands. Not infrequently the mainland and channel are clear or moderately clear, while the islands alone are hidden. Sometimes all are clear during the day, but wrapped in dense wet fog at night. This condition, the fog lying offshore during the day and enveloping the land at night, is characteristic of the whole southern California coast. The fogs occur mostly during calm weather and light winds, and are generally dissipated by the strong northwesterly winds.

Currents in Santa Barbara Channel are variable, depending to a great extent upon the wind. It appears that a weak nontidal flow sets eastward in the spring and summer and westward in autumn and winter.

It has been observed that a strong inshore set prevails on a rising tide in the deep waters of submarine Hueneme Canyon. In general, there are conflicting currents, at times quite strong, around the slopes of the submarine valleys both here and off Point Mugu.

A tidal current sets along the northern shore of Santa Barbara Channel with velocities at strength of ½ to 1 knot. The strength of flood sets westward or northwestward about 2½ hours before strength of flood in San Francisco Bay entrance. In heavy northwesterly weather, the current and heavy swells make into the southern side of the western entrance to the channel and along the northern shore of San Miguel Island.

The currents in the vicinity of the Channel Islands frequently follow the directions of the wind, with eddies under the lee of the islands and projecting

points. Tidal currents of about 1 knot at strength set through the passages between the islands.

Chart 5114.—Anacapa Island, the easternmost of the Channel Islands, actually consists of three islands separated by two very narrow openings which cannot be used as passages. The easterly opening is filled with rocks, is bare at all stages of the tide, and is crossed by a trestle walkway. The westerly opening is only 50 feet wide and is blocked by sand that is awash at high tide. The eastern point of the island is about 11 miles southwestward of Point Hueneme. A light, 277 feet above the water and visible 23 miles, is shown from a white cylindrical tower on the east end of the island; the fog signal is a two-tone air diaphone on a lower white square tower close eastward of the light. The radiobeacon near the light is synchronized for distance finding; there are three radio masts.

From the eastern point the island extends about 4.5 miles in a general westerly direction. The eastern and lowest island of the Anacapa group is about 1 mile long, 0.2 mile wide, 250 feet high, and rather level on top. The middle one is about 1.5 miles long, 0.2 mile wide, and 325 feet high. The western and largest island is about 2 miles long, 0.6 mile wide, and rises to a peak 930 feet high. The westernmost island is visible at a distance of 35 miles in clear weather, and the other two at 15 to 20 miles. The shores of Anacapa Island are perpendicular and filled with numerous caves. The eastern extremity terminates in **Arch Rock,** 80 feet high, with a 50-foot arch and a pyramidal rock just southward of its eastern end. The island is surrounded by kelp except in a few small places.

The light keepers and one or two fishermen are the only persons on Anacapa Island. Seals and pelicans are present in large numbers. The eight or nine cream-colored houses with tile roofs of the radio-station group are 300 to 400 yards westward of the light. A single large white building is 100 yards farther to the westward. There is a group of four or five weather-beaten shacks on the easternmost island about 100 yards from the pass which separates it from the middle island. These are visible only from the northward.

The best anchorage in southeasterly storms is on the northern side about 0.2 mile northward of the center of the middle island in depths of 9 to 12 fathoms with the eastern opening of the island open. In northwesterly weather the best anchorage is 0.3 mile southward of the eastern passage in depths of 8 to 12 fathoms. However, it is best for larger vessels to lie at Smugglers Cove, on the eastern side of Santa Cruz Island, where the bottom is not so steep-to. Small boats anchor in depths of 5 to 7 fathoms in **East Fish Camp,** a bight about 0.4 mile southwestward of the eastern passage. About the only protection from *Northeasters* is to anchor as close to shore as possible in the bight immediately westward of **Cat Rock,** on the southern side of the western island. The Coast Guard maintains a boat landing and hoist on the northern side near the eastern extremity. Landings can also be made on either side of the island near the western opening and at East Fish Camp. The island rises abruptly from deep water and in thick weather in its vicinity vessels should not shoal the depths to less than 50 fathoms.

Anacapa Passage, between Anacapa and Santa Cruz Islands, is about 4 miles wide and is free from dangers. It is steep-to on the Anacapa Island side and has a gradual slope up to the shore of Santa Cruz Island. Anacapa Passage is seldom used and should not be attempted in thick weather as soundings give no warning of a close approach to the islands. Tide rips are strong under certain conditions of wind and current, especially during southeast storms and during *Northeasters.* In the passage the current is northerly for about 3 hours on either side of high water and southerly for 3 hours on either side of low water.

Charts 5114, 5115.—Santa Cruz Island, the largest of the Channel Islands, is about 21 miles long in a westerly direction and has an average width of about 5 miles. The highest peak, in the western part of the island, rises to 2,434 feet, and in the eastern part the land attains an elevation of about 1,800 feet. The eastern part is very irregular, barren, and destitute of water; the western part has a few trees, is well covered with grass, and has several springs. Sheep and cattle are raised to a considerable extent. The shores are high, steep, and rugged, with deep water close inshore, and there is much less kelp than around the other islands. There are no outlying dangers except Gull Island.

Chart 5114.—Smugglers Cove, immediately southward of the eastern point of Santa Cruz Island, affords shelter in northwesterly weather in depths of 5 fathoms, sandy bottom. Water may be obtained from wells on shore.

San Pedro Point is the eastern extremity of the island. **Scorpion Anchorage,** a shallow bight, is 1.8 miles northwestward of San Pedro Point. There is a small-boat landing which consists of a cribbed area with a float and gangway at the end of the roadway. Several large buildings, one of which is white, are along the roadway. Large clumps of trees are near the houses.

Chinese Harbor, in the eastern part of the broad bight on the northern shore, about 4.5 miles from the eastern point of the island, affords anchorage in the kelp in depths of 5 to 6 fathoms. The northeastern part of the harbor is an excellent anchorage in southeasterly to southwesterly weather in depths of 9 to 10 fathoms. Fresh water may be obtained about 0.8 mile eastward of the anchorage. This harbor affords the best shelter on the island from northeasterly winds.

Prisoners Harbor, in the western part of the bight on the northern shore about 8 miles from the eastern point, affords shelter from all winds except from northeastward to westward. Some protection from northwesterly weather is afforded by the kelp but a heavy swell rolls in. In northeasterly weather the anchorage is unprotected and dangerous. A wharf with a depth of 16 feet at its face is in the harbor. A large white house, with tile roof, and other buildings stand back of this wharf. The best anchorage is in depths of 12 to 15 fathoms, sandy bottom, abreast a white rock on the western shore of the bight, and the outer end of the wharf in range with the buildings at the inner end. Fresh water can be obtained.

Chart 5115.—Pelican Bay, a small indentation in the northern shore of Santa Cruz Island about 1 mile west-northwestward of Prisoners Harbor, is used as a yacht anchorage during the summer season. In northwesterly weather small

boats using Pelican Bay anchor close to the cliff which forms the western shore of the bay.

Painted Cave, about 3 miles east of **West Point,** the northwestern extremity of the island, is a large cave into which small boats may be rowed for a considerable distance. The entrance is over 150 feet high. Depths of 2 fathoms or better are found at the inner end of the first chamber, 600 feet in.

Forney Cove, about 1 mile eastward of **Fraser Point** at the western end of the island, affords shelter in northerly weather in depths of 7 to 8 fathoms. The surf is heavy on the beach, but the rocky islet westward and the reef connecting it with the shore lessen the swell at the anchorage.

Gull Island, 65 feet high and about 0.2 mile in extent, is the largest and outermost of a group of small rocky islets, 0.7 mile southward of **Punta Arena,** on the southern side of Santa Cruz Island. Kelp surrounds Gull Island, and the bottom in the vicinity of the group is foul. A light, 73 feet above the water and visible 9 miles, is shown from a white pyramidal structure on Gull Island. The light is obscured from 126½° to 264½°.

Willows Anchorage, on the southern shore about 3.6 miles eastward of Gull Island, can be used by small craft in northwesterly weather and affords a good boat landing.

Santa Cruz Channel, between Santa Cruz and Santa Rosa Islands, is about 5 miles wide, with good water close to both islands. The rocks off the western and southwestern points of Santa Cruz Island and the eastern and northeastern points of Santa Rosa Island are so close inshore that they cannot be considered as dangers in the channel.

Charts 5115, 5116.—Santa Rosa Island is about 15 miles long in a westerly direction and has a greatest width of nearly 10 miles. The highest point, near the middle of the island, is 1,589 feet and is visible over 40 miles. The island has some water, and is partially covered with vegetation, but there are no large trees. The shores are bold, high, and rocky, and kelp surrounds the greater part of the island. Depths in the approaches to the island shoal more abruptly from southward than from northward, where the 100-fathom curve is over 5 miles and the 20-fathom curve about 2 miles from the beach.

There are no harbors, but anchorage may be made in Bechers Bay and Johnsons Lee. There are several good boat landings.

Chart 5115.—South Point, the southern point of Santa Rosa Island, terminates in a rocky bluff 100 feet high, and rises rapidly to a height of 460 feet, then to 603 feet. Cliffs, several hundred feet high and about 0.5 mile in extent, comprise the southwestern face of the point. A light, 530 feet above the water and visible 17 miles, is shown from a small white house on the point. The light is obscured from 115° to 270°.

Johnsons Lee, an open roadstead immediately eastward of South Point, affords fair shelter from westerly and northwesterly winds but is dangerous in southerly weather. The Coast Guard makes landings on the west shore of Johnsons Lee with supplies for South Point Light.

East Point, the eastern extremity of the island, is moderately high, sharp, and bold. A rock with a depth of 2¾ fathoms over it is in the kelp 0.7 mile northward from the point, and a shoal with a depth of 3½ fathoms over it is about 2 miles northward of the point.

Skunk Point, about 2.5 miles northward of East Point, is formed by drifting sand. There are sand beaches westward and southward, and the sand dunes behind the point are 250 feet high. Care should be taken to avoid the sandspit off Skunk Point. The current is sometimes strong, and Skunk Point is difficult to see on dark nights. In bad weather the sea breaks heavily on the spit.

Bechers Bay, a broad semicircular bight on the northeastern side of Santa Rosa Island, is about 4.5 miles wide between Skunk and Carrington Points and 1.5 miles in depth. **Northwest Anchorage,** in the western part of the bight and about 1.5 miles southward from Carrington Point, affords fair shelter in northwesterly weather. A wharf at the anchorage has a depth of 16 feet at its outer end. The best anchorage is in depths of 6 to 7 fathoms off the end of the wharf. **Southeast Anchorage,** about 1.3 miles westward of Skunk Point, affords protection in southeasterly weather in a depth of about 6 fathoms, sandy bottom.

Carrington Point, the northern point of the island, has a seaward face 0.8 mile in length. It is bold and rocky and rises rapidly to an elevation of 440 feet.

Foul ground extends about 0.3 mile northward from Carrington Point and terminates in **Beacon Reef,** which has a least depth of 2¼ fathoms. The reef rarely breaks, and there is no safe passage behind it.

Chart 5116.—Brockway Point, high, bold, and rounding, is about midway along the northern shore of Santa Rosa Island.

Rodes Reef, marked by kelp, is a patch of three sunken rocks 1.2 miles east-northeastward from Brockway Point and about 0.8 mile offshore. It breaks in nearly all weather.

Sandy Point, the western extremity of the island, is moderately bold and rocky, with a detached rock lying close inshore and sand dunes 400 feet high extending inland. These white dunes are prominent when approaching from southward or westward. Shallow water extends off the point. During the general northwesterly weather, swells form at a considerable distance from the shore. The swell also reaches the point from a southwesterly direction.

Sandy Point Anchorage, on the southern side of the point, affords shelter from northerly and northwesterly winds, to small vessels of 20 to 30 tons, but local knowledge is necessary to avoid outlying rocks.

Talcott Shoal, with a least depth of 1¾ fathoms over it, is on the edge of the kelp, about 1.5 miles north-northeastward from Sandy Point. Depths in the vicinity of the shoal range from 4 to 12 fathoms. The shoal breaks only in heavy weather. In calm weather there is little indication of the shoal as the kelp is light and there is very little lumping of the water. A detached kelp patch is 1 mile northward of the shoal.

Bee Rock, 0.8 mile off the southern shore of the island and about 3.6 miles southeastward of Sandy Point, is 5 feet high, is not easily seen, and is surrounded by the kelp that stretches from South Point to Sandy Point. A smaller rock, 10 feet high, is about 100 yards southeastward of Bee Rock. A rock with a depth of

2 fathoms over it is northwestward from Bee Rock. In average weather there is a lumping of the water with an occasional break at this point. Another rock with a depth of 1¼ fathoms is close southward of Bee Rock. Several other rocks and shoals exist inside the kelp, which should not be entered.

San Miguel Passage, between Santa Rosa and San Miguel Islands, is about 2.5 miles wide between the ledges which project from Sandy Point and Cardwell Point, the opposing points of the two islands. There is much broken water, with many current rips, near these ledges. To avoid Talcott Shoal, described with Santa Rosa Island, vessels making the passage from the southwestward should not allow the outer rock off the western point of Santa Rosa Island to bear westward of south until clear of the shoal. Sailing vessels should avoid this passage as the light airs and calms under the lee of San Miguel Island and the currents frequently combine to set a vessel toward Talcott Shoal.

San Miguel Island, the westernmost of the Channel Islands, is the most dangerous to approach. Its western point is about 25 miles southward of Point Conception Light. San Miguel Island is irregular in shape and about 7.6 miles long in a westerly direction, with an average width of about 2 miles; the highest points, 830 and 822 feet, are near the middle of the island and are visible about 35 miles. The island is covered with grass, but there are no trees. The western part has more sand dunes on it than any of the other islands in the group. The shores are bold, broken, and rocky, with a few short stretches of beach, the southern shore being more precipitous than the northern. Several anchorages and boat landings are available along the northern and southern shores.

Warnings.—All vessels are warned that San Miguel Island and vicinity are dangerous on account of aircraft bombing.

Cardwell Point, the eastern extremity of the island, terminates in a low sandy point extending about 0.5 mile eastward of a cliff about 40 feet high. A dangerous reef extends 0.4 mile eastward of the point, and foul ground extends 0.8 mile north-northwestward. A sunken rock and a rock awash are about 400 yards southward of the middle of the sandy point. During prevailing weather breakers are caused off this point by the meeting of the seas.

Prince Island, 288 feet high, is 2.6 miles northwestward of Cardwell Point and 0.4 mile off the eastern head of Cuyler Harbor. The island is dark in color and rocky, with a precipitous seaward face.

Cuyler Harbor is a bight about 1.2 miles long and 0.6 mile wide on the northern shore southwestward of Prince Island. The anchorage is in the western part of the harbor; the eastern part is foul. Good shelter may be had in southerly weather, but the holding ground is poor. In strong northwesterly weather the heavy swells that sweep around the northern shore and into the harbor make the anchorage dangerous. The harbor is not safe in northerly or easterly winds, which, however, are rare. Water may be obtained at a small spring abreast the anchorage. Prince Island and Harris Point are prominent in the approaches.

Middle Rock, awash at ¾ tide, is about 0.5 mile west-southwestward of Prince Island; foul ground surrounds the rock for a distance of about 100 yards. **Can Rock,** 4 feet high, is 0.3 mile southwestward of Prince Island; there is foul ground between the rock and the southern shore of the harbor. Kelp grows profusely all over the bight.

To enter Cuyler Harbor, bring Harris Point to bear 261°, distant 1.7 miles, and the western point of Prince Island to bear 186°, distant 1.3 miles; thence steer 209°, heading midway between Middle Rock and the western point at the entrance, and when the southern point of Prince Island bears midway between Middle and Can Rocks, anchor in depths of 5 to 8 fathoms. The course heads for **Judge Rock,** small and black, near the western end of the sand beach. The western point at the entrance, **Bat Rock,** should be given a berth of about 0.3 mile to avoid the shoal extending eastward for over 300 yards. If desired, anchorage may be made about 0.1 mile farther westward, where better protection is afforded in northwesterly weather. The passage between Prince Island and the eastern head should not be attempted by any but small craft.

Harris Point, the northern point of the island, is bold and precipitous, rising to a hill, 485 feet high, 1 mile southward of the point. There are no outlying dangers, and the water is deep close-to.

Wilson Rock, 19 feet high and black, is 2.2 miles northwest of Harris Point. A reef, showing in two places at lower water, extends about 1 mile west-northwestward from the rock, and foul ground is a short distance northward of the reef. It breaks in any light swell from the northwestward. There is foul ground southward and southwestward of the rock. The sunken rock 0.3 mile southward of Wilson Rock breaks. These are unmarked by kelp, and this locality should not be approached in thick weather, as the dangers rise abruptly from deep water and soundings give no positive warning of their proximity.

Simonton Cove, on the northwestern side of San Miguel Island, is a very shallow bight about 2.4 miles wide and 0.6 mile in depth. This cove has considerable kelp and a few sunken rocks. There are several fresh water springs in the bluffs just above high water. From the southwestern head of Simonton Cove, foul ground extends northwestward for nearly 1 mile.

Castle Rock, 180 feet high, is a three-headed islet 1.6 miles north-northeastward from Point Bennett, in the middle of the kelp field, and 0.5 mile offshore. A shoal spot 0.5 mile westward of the rock is near the edge of the kelp.

Westcott Shoal, with a depth of 4¾ fathoms over it, is about 0.8 mile northward from Castle Rock. About 0.6 mile northward from the shoal is a 2¾-fathom spot near which is an oil spring.

Point Bennett, the western point of the island, is a long, narrow, jagged bluff, 74 feet high, rising rapidly to 337 feet. High sand dunes extend inland from the point for 2 miles. There are two rocky islets south of and close under the point, and foul ground extends about 0.5 mile westward and 1 mile northward of the point but inside the limit of the kelp. A lighted whistle buoy is moored about 0.8 mile southwestward of the point in 17 fathoms.

Caution.—Navigation in this area should not be attempted without local information.

Richardson Rock, 53 feet high, white-topped, and of small extent, is 5.5 miles northwestward from Point Bennett. Two smaller and lower rocks are close-to on the eastern side. Richardson Rock rises abruptly from deep water, 30 to 40 fathoms being found within 0.3 mile. The rock is prominent in clear weather, but in thick weather the locality should be avoided, as soundings give no warning of a

near approach. A lighted whistle buoy is about 0.5 mile northwestward of the rock.

Anchorage for small craft may be had at **Adams Cove,** immediately eastward of Point Bennett, and at several places along the southern shore of San Miguel Island, but local knowledge is necessary.

Tyler Bight, on the southern shore about 1.8 miles eastward of Point Bennett, affords shelter for small craft in northwesterly weather. Anchor in a depth of 7 fathoms, sand bottom, at the northwestern part of the bight under the high bluff, with **Judith Rock,** at the western entrance of the bight, bearing 265°, 500 yards distant. A large field of kelp is southward and eastward. In moderate northwesterly weather, the winds 0.5 mile off shore may attain velocities up to 50 miles an hour, blowing directly offshore; the sea in the bight, however, is quite smooth.

Wyckoff Ledge, with a depth of 9 feet over it, is about 1.4 miles westward from Crook Point and 0.5 mile offshore.

A boat landing may be made on the southern shore of the island in a small cove immediately westward of Crook Point, but there is no anchorage.

Crook Point, the southern point of the island, is low and irregular. A light, 350 feet above the water and visible 12 miles, is shown from a white skeleton tower on the point.

Chart 5202.—Between Point Dume and Point Mugu, about 14 miles, the coast is very rugged and there are no outlying dangers. About 2 miles eastward of Point Mugu, on the beach at the foot of a very high bluff, is a sand dune 140 feet high. This is quite prominent and can be made out on clear moonlight nights.

Point Mugu, the seaward termination of the Santa Monica Mountains, is prominent on account of the lowland of the Santa Clara Valley to the westward. The cuts and fills of the highway which skirt the shore from Point Mugu eastward are prominent. Aluminum-colored twin tanks, 1.5 miles northwestward of the point and on the western slopes of Laguna Peak, show well from southeastward through west.

Mugu Canyon is a submarine valley with its head near Mugu Lagoon. The 50-fathom curve is about 0.5 mile offshore.

Chart 5007.—Mugu Lagoon, immediately westward of Point Mugu and parallel with the beach, is about 4 miles long at high water. The mouth of the lagoon shifts from year to year, and although fishing boats drawing 4 to 5 feet have entered the lagoon at high tide and a smooth sea, it must not be attempted without local knowledge. A small pleasure pier and a few cottages are just westward of the lagoon entrance. Small boats can anchor about 200 yards east-southeastward of the offshore end of the pier. The 100-fathom curve of a submarine valley is about 1.2 miles off the lagoon. Mugu Lagoon and adjacent lands are restricted to use of the United States Navy.

Laguna Point and **Middle Point** are merely wider portions of the sand beach separating Mugu Lagoon from the sea. They are not prominent from seaward.

Point Hueneme, low, rounding, and sandy, is about 8 miles northwestward of Point Mugu and is the outermost point of the low land at the mouth of the Santa

Clara Valley. A light, 52 feet above the water and visible 13 miles, is shown from a white square tower on the fog signal building on the point. The light is obscured from 155° to 296°. The fog signal is an air diaphone.

Hueneme Canyon is a submarine valley extending in a southerly direction from Point Hueneme.

Port Hueneme is an inland basin protected by two jetties at the entrance on the point. The western jetty has a light at its outer end. A buoy is moored off the end of the eastern jetty. In April 1949, the controlling depth in the entrance channel was 32 feet. A lighted range on the axis of this channel bears 037°.

In addition to Point Hueneme Light, other landmarks include a large yellow building 500 yards east of the channel, a large oil tank the same distance west of the channel, the elevated water tank in the town, and two similar tanks along the shore northwestward of the jetties. The aviation light at Oxnard is a good night mark. A mock ship, used for training and showing spar and cargo booms, is conspicuous on the end of a dock 60 yards east of the west jetty.

The central basin, about 900 by 1,200 feet, has a general depth of 30 feet. A boat basin with a depth of about 15 feet is at the northern end of the central basin. The bulkhead wharf on the southern side of the central basin has a transit shed and railroad tracks.

Port Hueneme Harbor is under the jurisdiction of the U. S. Navy. Pilots holding a Federal pilot's license for Port Hueneme are required for all vessels over 300 gross registered tons. Requests for pilots should be made to the U. S. Navy Port Director, U. S. Naval Station, Port Hueneme, California. Harbor pilots are employed by the U. S. Navy. Vessels will lay-to 1 to 2 miles off the harbor entrance to be boarded by harbor pilots. Port Hueneme has some commerce. Merchant vessels use Wharf 1 on the south side of the basin. Both commercial fishing boats and sport fishing boats use the port. **Storm warnings** are displayed day and night at the Naval Station.

Oxnard, about 3.5 miles northward of Port Hueneme and inland, is the nearest town of any size, and communication may be had by rail, air, and bus. Lemons, sugar beets, and lima beans are grown extensively.

A row of cottages extends northwestward along the beach for 2 miles from Point Hueneme. From the point, low sand beaches and dunes trend northwestward for 9 miles to the mouth of the **Ventura River.**

Ventura, eastward of the Ventura River, has a wharf 1,960 feet long, with depths of 19 feet at the outer end and 18 feet at the inner end of the 250-foot loading face. The outer end of the wharf is marked by a light. Fresh water is piped to the wharf and gasoline is available in the town. The prevailing winds are westerly, and gales are rare.

Small pleasure and fishing boats anchor eastward of the wharf during the summer months, but the anchorage is not safe in winter and spring because of southwesterly swells and comparatively shallow water. Vessels anchor anywhere in the bight with good holding ground, but there is no protection.

The buildings in the town, the oil tanks at the inner end of the wharf, and the railroad trestle crossing Ventura River immediately west of the town are prominent features in approaching. **Padre Serra's Cross,** on a 350-foot hill immediately northwestward of the center of the town, may be seen from the anchor-

age. There are several aluminum colored tanks and many oil derricks high up the slopes of the hills northwestward of the town. An aviation light, 1,025 feet above water and about 4.5 miles northwestward of Ventura, is useful to marine navigation. A lone oil derrick is close eastward of the light.

Two submarine pipe lines to floats eastward of the wharf are used for loading gasoline and fuel oil. Several large mooring buoys are maintained for the tankers loading from the floats. A lighted whistle buoy is moored in 60 feet about 1 mile southwestward from the wharf.

Communication may be had by the main line of the Southern Pacific Railroad, by bus, and by telegraph and telephone. **Pierpont Bay** is a beach resort 1 mile southeastward of the wharf.

Chart 5202.—From the Ventura River, the **Santa Ynez Mountains** extend to Point Conception and Point Arguello. For about 10 miles westward from the river to Rincon Point the coast is very rugged, elevations of over 2,000 feet being found within 1 mile of the beach. The dangers do not extend over 0.5 mile from the beach which is well fringed with kelp. From Ventura to Santa Barbara, both the highway and railroad skirt the shore; retaining walls are a common feature.

Point Las Pitas is the first bold point westward of the river. A very steep arroyo or gulch is on its western side. Eastward of Point Las Pitas is a mile of beach cottages. High on the steep slopes above the cottages are the derricks and tanks of an oil field. Aluminum-colored tanks and oil-processing plants are prominent a mile east of the point; and the aviation light on the hilltop above the tanks is a good mark at night.

Point Gorda, about 3.5 miles westward of Point Las Pitas, is low at its outer extremity but rises rapidly to prominent **Rincon Mountain,** about 2,170 feet high. Eastward of Point Gorda is a long pier supporting many oil pumps. Two derricks are conspicuous on the outer end of the pier. Tanks and numerous derricks are along the highway just east of the pier.

Rincon Point, low and sandy, is about 10 miles northwestward of Ventura River and the same distance eastward of Santa Barbara.

Sand Point, about 3.5 miles westward of Rincon Point, is low and rounding, with the narrow opening to **Carpinteria Lagoon,** shoal and of no importance, lying close under and eastward of it. A rock awash at low tide is 550 yards offshore from Sand Point.

Carpinteria is a small town about 8 miles eastward of Santa Barbara. A light-colored clubhouse and short pier on the beach at the eastern side of Carpinteria are prominent. An aluminum-colored water tank may be seen among the buildings of the town. A submerged pipe line leads to mooring buoys 0.6 mile offshore where tankers are loaded.

Serena is a small settlement in the bight just eastward of Loon Point, about 2 miles westward of Sand Point. **Summerland** is a small town about 4.5 miles eastward of Santa Barbara.

Ortega Hill, about 0.5 mile westward of Summerland and about 250 feet high, is conspicuous because of the extensive cuts for the highway, and from offshore it has the appearance of a large slide.

Chart 5261.—Santa Barbara, 29 miles northwestward of Point Hueneme and 39 miles east of Point Conception, is the yachting center for this section of the coast. **Lavigia Hill,** 459 feet high, is the distinguishing feature in approaching Santa Barbara from eastward or westward, and can be seen before either the light or the mission. **Point Castillo,** the eastern extremity of the hill, terminates in an almost perpendicular cliff about 50 feet high. **Santa Barbara Point,** the southeastern extremity, is a high cliff and is the eastern limit of the narrow tableland upon which a light is located. The light, 142 feet above water and visible 18 miles, is shown from a white square pyramidal tower. The light is obscured in the northern half of the horizon.

An aviation light, 425 feet above water, is about 0.5 mile northeastward of Lavigia Hill. Conspicuous landmarks are St. Anthony's Seminary Spire, the neon-lighted theater spire in the center of the town, the neon-lighted hotel tower on the beach 1 mile eastward of the town, and the many residences on the hillsides back of the town. At night the electric lights of Santa Barbara are prominent from the channel, but they are obscured from the westward by Lavigia Hill.

An angular breakwater 750 yards in length extends from Point Castillo. The outer end is marked by a light. An electric-diaphragm horn fog signal is at the light. Electric lights 32 yards apart mark the length of the breakwater, but at times these lights are difficult to pick up against the background of lights in the city.

In February 1951, an area about 300 by 500 yards in extent just north of the outer end of the breakwater was bare at low water. The shoaling is rapid and it has been estimated that at times the sand moves at the rate of 1,000 cubic yards per day. Vessels entering the basin behind the breakwater must pass Stearns Wharf close-to. Lighted buoys mark the northeast and southeast limits of the shoal.

The prevailing winds are westerly. Southeasterly gales occur occasionally during the winter months. Anchorage may be had inside the kelp, but large vessels anchor outside the kelp in better holding ground. The approach to Stearns Wharf is through a break in a heavy bed of kelp, usually kept clear by passing steamers.

The spire of St. Anthony's Seminary and the white square tower of a building 140 yards northeastward of the shore end of Stearns Wharf form a good range for approaching the wharf from the southeastward. The bearing of this range is 319°.

Small boats anchor in the basin behind the breakwater. A special anchorage area is described in Chapter 2, § 202.115. The holding ground is good. Boats usually are moored fore and aft because of the limited room. Mooring space is assigned by the harbor master, who has an office on the breakwater. Boat landings are on the western side of the harbor at the breakwater where water, gasoline, and oil are available at float landings. Marine and general supplies are available on Stearns Wharf and in the city.

Storm warnings are displayed day and night at the inner end of Stearns Wharf and are plainly visible from the harbor.

Stearns Wharf, which extends 680 yards in a southeasterly direction, has two privately maintained lights on the outer end. Depths alongside the wharf are 18

to 24 feet. Diesel oil, gasoline, and fresh water are available on the wharf. A 30-ton hoist on the wharf can handle boats up to 60 feet in length. Engine and hull repairs can be made. Traffic in the harbor is confined mostly to fishing and pleasure boats.

The U. S. Naval Reserve training station is on Point Castillo at the breakwater. A Coast Guard rescue vessel is stationed here. There is a **chart agency** of the U. S. Coast and Geodetic Survey in Santa Barbara. Communication is by rail, motor vehicle, and plane. The Santa Barbara Municipal Airport is at Goleta, 7 miles west of the harbor.

A **measured nautical mile,** on course 270°, is east of Santa Barbara Light. The east range marks are on Santa Barbara Point and the west range marks are near the light, the front mark being on the Coastal Lookout Station. The front marks are white triangles and the rear marks are inverted triangles. The markers usually can be seen from 3 to 4 miles offshore.

Chart 5202.—From Santa Barbara westward to Goleta Point, the coast consists of bluffs 30 to 100 feet high with short stretches of sand beach and is fringed with kelp 0.2 to 0.5 mile offshore. There are no dangers.

Goleta Point, 6.2 miles westward of Santa Barbara Light, is low and terminates in a cliff about 30 feet high. The aviation light 1 mile northeastward and the lighted radio tower 1.5 miles northeast of the point are good marks at night. A short pleasure wharf is in the bight east of the point.

From Goleta Point to Point Conception, a distance of about 32 miles, the coast is more rugged than that eastward. **Gaviota Canyon,** 12 miles eastward of Point Conception, is a conspicuous break in the mountains back of this coast. A railroad skirts the shore over trestles and embankments which cross the mouths of numerous gulches and arroyos. The kelp grows quite heavily, and in some places extends over a mile offshore. The Pacific Highway parallels the coast from Santa Barbara to Gaviota, where it turns inland.

Coal Oil Point, 1.8 miles westward of Goleta Point, is low and may be distinguished by the strong odor of petroleum discharged by a spring. This odor is noticeable over 2 miles offshore.

Ellwood oil field, about 2 miles northwestward of Coal Oil Point, extends more than 1 mile along the shore and is marked by numerous wharves and many tall derricks. One wharf has a length of more than 2,000 feet. Several large tanks may be seen on the bluffs above the beach. Large tankers call frequently for oil at the submarine pipe line off the wharves. The moorings are in a depth of about 10 fathoms, sandy bottom.

A rock with a depth of 15 feet over it is about 3.7 miles westward of Coal Oil Point and 0.9 mile offshore; it is surrounded by kelp. This rock is the outermost danger along the north side of the Santa Barbara Channel.

Capitan, about 7.5 miles westward of Coal Oil Point, is in a small bight which offers little protection to small craft. About 1 mile northwestward of Capitan a submerged pipe line extends seaward 1 mile, where there are large mooring buoys for tankers receiving oil. There are a few tanks on the bluff above the pipe line, and a lone tank stands on a bare hill 500 feet high and 0.3 mile inland.

Refugio Beach at **Orella,** about 2.5 miles westward of Capitan, is a small auto camp at the mouth of the canyon. A small bight here offers some little protection for small boats in northwesterly winds in a depth of about 15 feet.

Gaviota is about 13.5 miles eastward of Point Conception. An aviation light, 2,904 feet above the water, is about 3 miles northeastward of Gaviota.

Coxo Anchorage, about 1.5 miles eastward of Point Conception, affords protection off the mouth of the **Coxo Valley** from moderate westerly and northwesterly winds in depths of 5 to 10 fathoms, hard sandy bottom. The cove about 1.7 miles eastward of this anchorage, known as **Little (Old) Coxo,** is foul and affords little protection.

Point Conception, at the western end of Santa Barbara Channel, is a bold headland 220 feet high that marks an abrupt change in the trend of the coast. There is comparatively low land immediately behind it. At a distance from northward or eastward, it usually looks like an island. A light, 133 feet above the water and visible 18 miles, is shown from a white tower behind a dwelling near the western part of the point; the fog signal is sounded on a two-tone air diaphone. A low black rock, nearly awash at high tide, is 220 yards offshore, southward and westward of the light.

Point Conception has been called the **Cape Horn of the Pacific** because of the heavy northwesterly gales encountered off it during the passage through Santa Barbara Channel. A marked change of climatic and meteorological conditions is experienced off the point, the transition often being remarkably sudden and well defined. When the northwesterly winds are strong they blow down the canyons between Point Conception and Capitan and cause heavy offshore gusts.

From Point Conception, the coast trends in a gentle curve northwestward for about 12 miles to Point Arguello, and consists of bold rocky cliffs, 100 to 400 feet high. The coast railway runs along these cliffs and through several tunnels.

The 100-fathom depth curve off Point Arguello, and to a lesser extent off Point Conception, is characterized by a succession of indenting deeps or gorges. In following the curve during thick weather with an echo sounder, these submarine features should be found extremely useful.

Espada Bluff is a prominent cliff about 370 feet high 5.5 miles northward of Point Conception. The cliffs on each side drop sharply to less than 100 feet in height.

A Coast Guard station is about 2 miles southeastward of Point Arguello.

Point Arguello is a narrow, jagged, rocky projection, extending about 800 yards westward of the general trend of the coast. An outlying rock is about 200 yards seaward. The extremity of the point overhangs the water's edge, and about 200 yards inshore the point is nearly divided by gullies on the northern and southern sides. These form a saddle which, from northward and southward, looks like two small heads. The western extremity of the point is marked by a light, 124 feet above the water and visible 17 miles, which is shown from a white skeleton steel tower. The fog signal is sounded in a two-tone air diaphone. The radiobeacon at the light is equipped for distance finding. **Point Arguello Loran Station (slave)** is in latitude 34°34.′8 N., longitude 120°38.′6 W.

Tranquillon Mountain, near the seaward end of the Santa Ynez Mountains, is prominent in clear weather. It terminates in Rocky Point, Point Arguello, and Point Pedernales.

Rocky Point, 1.2 miles south of Point Arguello, has numerous detached rocks extending in some cases 300 yards offshore. 5

Blank page retained for pagination

CHAPTER 6

Point Arguello to Point Sur

Chart 5302

FROM Point Arguello to Point Sal, the coast trends northward for about 19.5 miles in two shallow bights, separated by Purisima Point. From Point Sal the coast continues northward for about 14 miles, then bends sharply westward for a little over 6 miles to Point San Luis, forming San Luis Obispo Bay. Soundings are useful along this stretch of the coast, and between Points Arguello and San Luis the 20-fathom curve can be followed with safety in thick weather. In clear weather the headlands and other natural features can be easily recognized.

Point Pedernales, 1.5 miles north of Point Arguello, and the largest of the numerous rocks, as much as 300 yards offshore, are very dark and conspicuous alongside the sand dunes immediately northward of the point.

The **Canada Honda,** about 2 miles northward of Point Arguello, is a deep gulch crossed by a railroad trestle easily distinguished when abreast the mouth. From here the coast to Purisima Point consists of a low tableland and sand dunes that contrast strongly with the dark cliffs southward.

Surf, about 7 miles northward of Point Arguello, is a station along the railroad. The yellow station house is conspicuous.

Purisima Point, 10.6 miles northward of Point Arguello, is low and rocky, with reefs extending southeastward for 0.3 mile. The northern side of the point is bare sand. It has been reported that an inshore set is experienced off the coast in the vicinity of Purisima Point. From Purisima Point to Point Sal, the coast is sandy and lower than that southward.

Point Sal, about 9 miles north of Purisima Point, is a bold dark headland marked by stretches of yellow sandstone. From northwestward the headland looks like a low conical hill with two higher conical hills immediately behind it. It rises gradually to a ridge about 1,625 feet high, 3 miles to the eastward. From southward the hills are not so well defined. **Seal Rock,** 54 feet high, is a large rocky islet 200 yards off the south face of Point Sal, and a small rock is close to the point. Breakers and reefs extend nearly 600 yards southward and westward from Point Sal and 200 yards southwestward of Seal Rock.

Anchorage under Point Sal affords some protection from northwesterly winds in depths of 7 to 9 fathoms, sandy bottom, but is subject to swell. Shoal water extends nearly 0.5 mile westward from the southeastern point of the anchorage.

The best anchorage is in a depth of 7 fathoms 500 yards 303° from Seal Rock and with the northern end of the rock just open of the extremity of Point Sal.

From Point Sal northward the coast is sand beach backed by low dunes for 14 miles, and then changes to bold rocky cliffs that curve sharply westward to Point San Luis and form the northern shore of San Luis Obispo Bay. An aviation light, 2,660 feet above the water, is in the hills northeast of the city of San Luis Obispo.

Oceano is a small summer resort about 12 miles northward of Point Sal. There is a small hotel on the beach.

Pismo Beach is a resort 6 miles eastward of Point San Luis. The pleasure wharf is 1,200 feet long and has a depth of 12 feet at the outer end. There are no facilities for landing at the wharf. Pismo Beach is noted for its clams.

Chart 5386.—San Luis Obispo Bay, a broad bight immediately eastward of Point San Luis, is about 3.6 miles wide in an easterly direction and about a mile in depth. The western shore is high, with rocky bluffs extending 1.5 miles to the mouth of **San Luis Obispo Creek,** where a sand beach extends 0.5 mile to the town of Avila. Eastward of Avila for 1 mile are irregular cliffs 40 to 100 feet high; thence, for about 1.5 miles to the eastern point of the bay is a narrow tableland that ends in cliffs about 40 feet high.

Mount Buchon and **San Luis Hill,** the latter about 700 feet high, are prominent at a considerable distance when approaching from southward. From northward, Lion and Pecho Rocks and Point Buchon are prominent.

Point San Luis, on the western side of the entrance to San Luis Obispo Bay, is bold and rocky. **San Luis Obispo Light,** 130 feet above the water and visible 17 miles, is shown from a white square wooden tower on a dwelling on the point. The fog signal is a two-tone air diaphone; the radiobeacon is synchronized with the fog signal for distance finding.

The best anchorage for small vessels is in depths of 21 to 24 feet, muddy bottom, 300 to 400 yards northeastward from Smith Island. Large vessels can anchor anywhere between Port San Luis Wharf and Pier 2, avoiding the 18-foot spot 250 yards eastward of the warehouse on the former. This anchorage affords good shelter in northerly or westerly weather, but is exposed in southerly or southeasterly weather when heavy swells make anchorage poor. Southeasterly gales occur two or three times during the winter season. A special anchorage for small craft has been established off County Wharf; for description see § 202.120 in Chapter 2.

The eastern part of the bay is foul. **Howell Rock,** 13 feet deep and 1.6 miles east of the light, is the outermost danger; a buoy is 0.2 mile southwest of the rock. **Lansing Rock,** 18 feet deep, and **Atlas Rock,** 13 feet deep, are southward of Port San Luis Wharf and are marked by buoys.

Souza Rock, 16 feet deep, is a little over 2 miles southeastward from the light. The rock rises abruptly from depths of 19 fathoms. A lighted gong buoy is moored about 200 yards southward of the rock.

Whaler Island, 72 feet high, is 125 yards eastward of Point San Luis. The breakwater that extends from the point to the island and thence 650 yards southeastward to a ledge partly bare at low water provides some protection from heavy

westerly or southwesterly swells to vessels at anchor or at the wharves. A lighted whistle buoy is moored about 0.3 mile southeastward from the end of the breakwater.

Smith Island, 44 feet high, is 400 yards northward of Whaler Island and 150 yards offshore. There are several small fishermen's houses on the island.

Directions.—From southward, when Point Arguello Light is 2.8 miles 050°, steer 356° for about 35 miles. This course should lead to the lighted gong buoy southward of Souza Rock. Pass 100 yards westward of the buoy and steer 000° for 2 miles for Middle Dock until the warehouse on the end of Port San Luis Wharf bears 300°. Then haul to 321°, heading about midway between the ends of the two wharves, and select anchorage according to draft.

From northward, when San Luis Obispo Light is 3.5 miles 052°, which position may be reached in thick weather by following the 30-fathom curve to the fog signal abeam, steer 065° for a little over 4 miles, passing 175 yards southeastward of Point San Luis lighted whistle buoy 3, to a position with Middle Dock bearing 000°. Then proceed as directed in the preceding paragraph.

Port San Luis is the principal seaport for **San Luis Obispo,** which is 10 miles inland. The port is about 0.7 mile northward of Point San Luis in the most sheltered part of the bay. **Storm warnings** are displayed daytime only. **Port San Luis Wharf** has a warehouse on the outer end. The berthing space opposite the warehouse has a depth of 28 feet alongside. To reach the wharf, vessels pass 300 yards southeastward of the lighted whistle buoy; then steer 029° for the east stack at Avila, which may be difficult to see, until the end of the wharf bears 305°; then steer 305° for the end of the wharf.

Port San Luis is a subport of the Los Angeles customs district. A deputy collector of customs is stationed at Avila. The port is used solely for the shipment of oil and a few commodities produced locally, and for the receipt of supplies required for local consumption. Shipments of petroleum products are about 99 percent of the total traffic.

Pier 2, known as *Middle Dock* and maintained by the Union Oil Company of California, extends 0.5 mile out near the west side of the entrance to San Luis Obispo Creek. The pier has depths of 31 feet along both sides. Care should be exercised in the vicinity of a rocky patch 17 feet deep and about 200 yards inshore from the outer end of the wharf. A light and a fog signal are privately operated on the outer end of the wharf when ships are expected. The wharf is lighted throughout its length when ships are being loaded. It is not safe for ships to moor alongside in strong northerly weather; vessels usually leave the pier on the approach of such weather and anchor until it moderates. Oil tankers are the only deep-draft vessels that enter the bay and use the wharf. Mooring buoys are used to keep vessels clear of the wharf, and a tug is available for handling lines to the buoys. A tide station is maintained at the outer end of the pier by the Coast and Geodetic Survey.

Avila, about 1.5 miles northeastward of Point San Luis, is a small settlement of little commercial importance. **County Wharf,** built out to a depth of 25 feet and used to some extent by fishing and pleasure boats, is lighted all night. Avila and Port San Luis are connected by a narrow road over the old rail bed.

949285—52——14

Fuel oil, water, and some provisions can be obtained. Small boats can be hoisted onto Port San Luis Wharf. There are no marine railways in the bay.

Communication is by automobile to San Luis Obispo where rail, bus, and air connections can be made. There are telephone and telegraph facilities.

Chart 5302.—From Point San Luis to Point Buchon, the coast trends northwestward for about 9 miles and consists of cliffs 40 to 60 feet high. The land rises rapidly from the cliffs to Mount Buchon. There are numerous outlying rocks and sunken ledges that extend more than a mile from the shore in some places.

Mount Buchon, a rugged mountain mass between San Luis Obispo Bay, Estero Bay, and the valley of San Luis Obispo, is prominent from either northward or southward. **Saddle Peak,** about 1,835 feet high, is visible over 40 miles.

Chart 5386.—A rock 46 feet deep is 1.3 miles southward from San Luis Obispo Light. **Westdahl Rock,** 18 feet deep, is a dangerous pinnacle 1.3 miles southwestward from San Luis Obispo Light. The rock rises abruptly from depths of 60 feet. A lighted bell buoy is moored southwestward of the rock.

Santa Rosa Reef, 17 feet deep and 1.4 miles westward from San Luis Obispo Light, rises abruptly from depths of 70 feet. **Lone Black Rock,** 2 feet high and of small extent, is about 0.5 mile westward from the light and 0.2 mile offshore.

Pecho Rock, 40 feet high, is 3 miles west-northwest from the light and 0.5 mile offshore. A smaller rock, 2 feet high, is 0.3 mile eastward from it. Foul ground, marked by kelp, is between the rocks and the shore.

Chart 5387.—A sharp prominent dark-gray rock, 111 feet high, is 2.9 miles northwestward of Pecho Rock and 0.1 mile offshore.

Lion Rock, 2.6 miles southeastward of Point Buchon and about 0.2 mile offshore, is 240 yards long in a northwesterly direction and 136 feet high. A high rock lies between it and the shore, and a small low rock is 200 yards westward.

Point Buchon ends in an overhanging cliff 40 feet high, with a low tableland behind that rises rapidly to a bare hill, 1,280 feet high, about 1 mile to the eastward. There are a few detached rocks close under the cliffs. A lighted whistle buoy is 1 mile southwestward of the point and about 400 yards westward of a rock 3¾ fathoms deep.

Estero Bay is formed by a curve in the coast between Point Buchon and **Point Estero,** 13.5 miles northwestward. The shore of the bay follows a general northerly direction from Point Buchon for about 11 miles, and then turns sharply westward for about 5 miles to Point Estero. The northern part of Estero Bay is fringed with sunken rocks and scattered kelp. The seaward faces of Cayucos Point and Point Estero are cliffs 50 to 90 feet high.

The coast drops abruptly from bold Mount Buchon to a sandy spit bordering Morro Bay and then rises to a bluff-bordered treeless country of rolling hills.

Morro Rock, 581 feet high, is a prominent cone off the entrance to Morro Bay. **Pillar Rock,** 100 feet high, is about 50 feet from the northern side of Morro Rock. A row of peaks extends inland in a south-southeasterly direction from Morro

Rock. **Hollister Peak,** 1,409 feet high, is most prominent because of its jagged outline.

Morro Bay, a shoal lagoon several miles in extent, is separated from Estero Bay by a narrow strip of sand beach. The Morro Bay channel has been improved under a Federal project which provides for an entrance channel 16 feet deep and 350 feet wide protected by breakwaters, a main channel 16 feet deep varying in width up to 800 feet from the entrance to opposite the town of Morro Bay, and a channel 12 feet deep and generally 150 feet wide from the town to the lower bay. The opening between the outer extremities of the breakwaters is about 300 yards wide. The entrance channel is well marked by lighted buoys.

A sandspit, dry at all stages of the tide, extends northeastward from Morro Rock to the mainland. A 5½-fathom spot, 1.2 miles northwestward from Morro Rock, is marked by a gong buoy. From the northwestward, the aviation light 13 miles inland, near San Luis Obispo, is usually the first light seen.

Currents in the entrance channel and around the breakwaters are strong at times. Because of the currents and the sea conditions, it is advisable to approach the entrance from the southwestward. Sharp turns should be avoided in the vicinity of the breakwaters, especially in heavy weather.

Special anchorage areas in the bay are described in § 202.125, Chapter 2. The Coast Guard rescue vessel stationed in Morro Bay berths at the County Wharf.

The town of **Morro Bay** is on the eastern shore near the entrance. The County Wharf, on the north side of the harbor, has a depth of 20 feet alongside. A fish pier, with a depth of 16 feet alongside, and several small landings are abreast the town. A boat works has facilities for hoisting craft up to 15 tons. There is a good highway to San Luis Obispo and to the northward along the coast.

A submarine oil-loading terminal is at **Morro Beach,** about 1.5 miles northward of Morro Rock. Two other pipes V out from shore to depths of 50 feet off **Toro Creek,** about 2.5 miles northward of Morro Rock; a small-boat wharf at the shore end of the V is marked by a light. Buoys are moored near the outer ends of the pipes. Loading ships lie with their bows in the direction of the prevailing northwesterly wind. Each vessel should have at least five 700-foot lines of good 10- or 12-inch manila line for use as breast and stern moorings. Adequate lines for offshore breast moorings are absolutely essential to prevent damage to the vessel and terminal equipment in case of a southerly wind. Each terminal is connected with the shore station by telephone. Printed instructions are issued, and a mooring master supervises the mooring of vessels.

Cayucos is about 11.5 miles northward of Point Buchon and in the northeastern part of Estero Bay. The County Wharf, built out to a depth of 12 feet, is used by small fishing boats. The general store has a limited amount of provisions. Travel is by bus over a good highway to San Luis Obispo.

Anchorage with fair shelter from the northward and northwestward may be had in depths of 11 fathoms, sandy bottom, with the prominent white concrete tank on a hill westward of Cayucos bearing 017°.

Mouse Rock, ½ fathom deep, is a ledge about 800 yards off the village of Cayucos that breaks heavily in all but smooth weather. The ledge is marked by a bell buoy.

Constantine Rock, 1¼ fathoms deep, is 0.5 mile off **Cayucos Point,** a low rocky promontory about 3 miles eastward of Point Estero. The rock breaks heavily in a moderate swell and is marked on its southward side by a buoy.

Chart 5302.—From Point Estero northward to the village of Cambria, the bluffs increase in height, and the range of grassy hills is close to shore. The shore is well fringed with kelp, with several rocks close inshore. **White Rock,** about 6 miles northwestward of Point Estero, is the most prominent. A pinnacle rock, 5½ fathoms deep, is 0.7 mile southwest of White Rock.

Von Helm Rock, 2½ fathoms deep, is 7.2 miles northwestward of Point Estero, southwestward of the village of Cambria and nearly a mile offshore. The rock is very sharp and breaks only in the roughest weather. A lighted whistle buoy marks the rock.

Cambria is about 1 mile inland, in a grove of pine trees. Some of the streets and buildings are visible from seaward. No landing or anchorage is recommended.

From Cambria to San Simeon, rocks continue close inshore but the bluffs decrease in height and the hills recede from the shoreline. Thick groves of pine trees scatter the hillsides. Of the several rocks offshore, **Cambria Rock,** 10 feet high, and **Pico Rock,** 12 feet high, are the largest, but they are not prominent from seaward. Shoal patches, distant as much as 360 yards, surround Cambria Rock and there is foul ground northwestward and southward of Pico Rock. A shoal 3¾ fathoms deep is 580 yards 249° from Pico Rock.

San Simeon Bay, about 14 miles northwestward of Point Estero, is formed by the shoreline curving sharply to the westward, and on the western side by **San Simeon Point,** a low wooded projection extending southeastward. The trees show well from westward, but from southward the warehouses and buildings in the village are more prominent. From westward the point itself is not easily recognized by those not familiar with it.

A lighted bell buoy 0.4 mile southeast of the point marks the entrance to San Simeon Bay. The bay offers good shelter in northerly weather but is exposed to southerly gales in winter. The best anchorage is in the middle of the bight in depths of 5 to 8 fathoms, hard sand.

San Simeon is a small village with a group of conspicuous white buildings. The village has a general store where a few provisions may be obtained. The post office is in the warehouse near the shore. There are no wharves and no facilities for taking on gasoline or water. The village has no regular bus service. A prominent castle-like structure with turrets is 2.7 miles northeastward of the village and 1,600 feet above the water.

Approaching San Simeon Bay from southward, when 0.5 mile southwestward of Von Helm Rock lighted whistle buoy 12 VH, steer 334° for 7 miles with the warehouse at San Simeon ahead. This leads just eastward of San Simeon lighted bell buoy and to the anchorage.

Approaching from northward, when 1.5 miles 232° from Piedras Blancas Light, steer 105° for 6 miles with Pico Creek bridge ahead. When abeam San Simeon lighted bell buoy, round the buoy, steer 337° for the warehouse, and anchor in the middle of the bay. At the anchorage, San Simeon Point should be given a berth of over 0.2 mile and the eastern shore of the bay a berth of 0.5 mile.

The coast from San Simeon Point to Point Piedras Blancas, a distance of about 5 miles, is low, with numerous detached rocks lying in some cases over 0.5 mile offshore and usually well marked by kelp.

Point Piedras Blancas is a low rocky point projecting about 0.5 mile from the general trend of the coast. A light, 142 feet above the water and visible 18 miles, is shown from a white conical tower on the point. The fog signal is sounded on a two-tone air diaphone.

Piedras Blancas are two large white rocks, 74 and 31 feet high, 500 yards offshore and about 0.8 mile eastward of the point. From the southward they look like one rock.

Outer Islet, a large and prominent white rock 110 feet high, is close westward of the point. In hazy weather this rock is sometimes visible from the northwestward and southward when the light cannot be seen.

Anchorage for a small vessel, with protection from northwesterly winds, may be had under Point Piedras Blancas in depths of 4 to 5 fathoms, sandy bottom, with the light about 0.2 mile 280°.

A bank, 11 fathoms deep and about 3 miles west-northwestward from Piedras Blancas Light, has been reported breaking in a heavy westerly swell.

From Point Piedras Blancas to the mouth of the San Carpoforo Valley, about 8.6 miles, the coast is low, with small bluffs and rolling treeless hills. Numerous rocks, fringed with kelp, extend well offshore. **Harlech Castle Rock,** the outermost, bares 1 foot at low water, and is 1.5 miles northwestward from Piedras Blancas Light and 0.7 mile offshore and is not usually marked by kelp. A shoal, 2¾ fathoms deep and about 0.5 mile northwestward of Harlech Castle Rock, is surrounded by depths of 10 to 12 fathoms.

La Cruz Rock, 48 feet high and fairly prominent, is about 3 miles north-northwestward of Piedras Blancas Light and just southward of Point Sierra Nevada. A sandy beach inshore from La Cruz Rock is a fair landing place in heavy northwesterly weather. This stretch of beach is free from breakers. For small boats, there is suitable anchorage in heavy northwesterly weather, and also in light southerly weather, east of the northerly limits of La Cruz Rock.

Point Sierra Nevada, a low inconspicuous bluff, is named for the steamship *Sierra Nevada* which stranded on the rocks 400 yards northwestward of the point.

About 1.8 miles northward of Point Sierra Nevada is a group of isolated buildings inland from **Breaker Point,** which is not prominent nor easily identified.

The off-lying rocks and kelp end at **Ragged Point,** a low projection made conspicuous by the visible rocks and ledges extending about 0.3 mile westward and readily identified since it is the first point southward of the prominent valley, **Arroyo San Carpoforo.**

From Arroyo San Carpoforo northward to the Sur River, about 41 miles, the coast is very bold and rugged. The cliffs are 200 to 500 feet high and the land rises rapidly to elevations of 2,500 to 5,000 feet within 2 to 3 miles from the coast. There are few beaches and few outlying rocks. The highway along the coast is 100 to 500 feet above water and is plainly visible from seaward.

Northbound coasting steamers keep close inshore from Ragged Point to with-

in 6 miles of Point Sur during northwesterly weather, and thus obtain considerable lee.

Two conspicuous landmarks lie between Ragged Point and Cape San Martin. **White Rock No. 1,** 39 feet high and rather sharp, is about 0.5 mile offshore and 3.8 miles northwestward of Ragged Point; about 200 yards due west of White Rock No. 1 is a rock awash. **White Rock No. 2,** 64 feet high and with a rounded top, is about 0.2 mile offshore and 4.5 miles southeastward of Cape San Martin.

Salmon Cone, 500 feet high, is a rocky butte close to the shore and about 0.5 mile northward of White Rock No. 1. The cone is not conspicuous as it blends into the background.

Several deep narrow gulches indent the coast between Salmon Cone and Cape San Martin. Two of the most prominent, **Villa Canyon** and **Alder Creek,** are crossed by conspicuous white bridges.

A pinnacle rock, 1¾ fathoms deep, is about 1.7 miles southeastward of Cape San Martin and 0.5 mile offshore.

Whaleboat Rock, baring 5 feet at low water, and **Bird Rock,** 5 feet high, are about a mile southeastward of Cape San Martin; they are conspicuous only when close inshore. A white barn is prominent in a group of buildings on the bluff just northward of these rocks.

Cape San Martin, 16 miles northwestward of Point Piedras Blancas, has a ragged precipitous seaward face and is readily identified by the **San Martin Rocks.** From southward, the inner rock, which is about 100 yards offshore, is the most prominent, being 144 feet high and white in appearance. The middle rock is 34 feet high and triangular. The outer rock is cone-shaped, 44 feet high, and about 0.5 mile offshore. A light, 200 feet above the water and visible 11 miles, is shown from a white structure near the western extremity of Cape San Martin. The structure is not conspicuous.

Willow Creek bridge, about 0.3 mile northward of the light, is prominent from westward.

From Cape San Martin to Lopez Point, the coast forms an open bight about 10 miles wide and 2 miles in depth, with rugged shores intersected occasionally by deep narrow valleys. There are a few detached rocks but, with two exceptions, they do not extend far from the shoreline.

Plaskett Rock is a large prominent white rock, 110 feet high, about 2 miles northward of Cape San Martin and about 0.3 mile offshore.

Tide Rock is a small black rock, awash, 4 miles northward of Cape San Martin and 0.7 mile offshore. The rock is quite sharp and is a menace in smooth weather as there is no breaker to indicate its position.

Lopez Point is a narrow tableland, 100 feet high, projecting a short distance from the highland. **Lopez Rock,** 51 feet high, is 0.3 mile offshore and about 0.8 mile northwestward of Lopez Point. A shoal 6 fathoms deep is 0.3 mile southwestward of Lopez Rock.

An open anchorage affording some protection from northwesterly weather may be had about 1 mile southeastward of Lopez Point in a depth of 10 fathoms, sandy bottom. Smaller vessels may obtain better shelter by anchoring inside the kelp bed in a depth of about 5 fathoms, sandy bottom, with Lopez Point bearing

about 287°. A rock, 1¾ fathoms deep, is in the kelp beds about 0.5 mile southeastward of Lopez Point.

Harlan Rock, 10 feet high, is 0.3 mile offshore about 1.7 miles east-southeastward of Lopez Point. The rock is conspicuous only when approaching the anchorage. A shoal, ¾ fathom deep, is 680 yards southeastward from the Harlan Rock.

In clear weather Junipero Serra, Twin, and Cone Peaks are prominent in this vicinity. **Junipero Serra Peak,** 5,844 feet high, is about 10 miles northeastward of Lopez Point; there are pines on and near the summit. The peak is more prominent when well offshore than close in.

Twin Peak, 4,700 feet high, and **Cone Peak,** 5,155 feet high, known to coasting mariners as **Twin Peaks,** are about 3 miles back from the coast and 4 miles northeastward of Lopez Point. The peaks are in line on the bearing of 104°. They have scattered trees on their summits and are good landmarks even at night. An observation tower on the summit of Cone Peak is lighted when occupied.

From Lopez Point to Pfeiffer Point, the coast is rugged and high mountains rise precipitously from the shore. The coastline makes in slightly, forming a shallow bight. Northbound coasting schooners keep about 1 or 2 miles offshore, and thus avoid the fresh northwesterly weather prevalent during the summer months. Several hundred feet above the beach, the slopes are marked by numerous highway cuts.

Square Black Rock, 4 miles northward of Lopez Point, is 62 feet high and has a conspicuous cleft in its center. It is the most prominent landmark visible from offshore between Lopez Point and Pfeiffer Point.

Dolan Cone, 4.5 miles northward of Lopez Point, is white in appearance and 77 feet above the water.

Little Slate Rock, about 7.5 miles northward of Lopez Point, is 4 feet high; **Slate Rock** is 18 feet high. Both rocks are discernible only when close inshore.

A prominent dwelling visible from westward and northward is on a bluff about 5 miles southeastward of Pfeiffer Point. Several conspicuous highway bridges cross the canyons. Some of these, notably an arch bridge over **Dolan Canyon** and a girder bridge over **Andersen Canyon,** are visible well to seaward. The highway leaves the coast about 3.5 miles southward of Pfeiffer Point and does not emerge again until northward of Point Sur.

A deep submarine valley makes in from the southward in the bight about 13.5 miles northward of Lopez Point and 4.5 miles southeastward of Pfeiffer Point. The head of the canyon parallels the shore for about a mile and the 100-fathom curve lies only 500 yards from shore; a depth of 47 fathoms is found only 255 yards southward of Grimes Point.

Chart 5476.—Pfeiffer Point, about 18 miles northward of Lopez Point and 6 miles southward of Point Sur, is 400 to 500 feet high, and is the seaward end of a long ridge 2,000 feet high 1.5 miles northeastward of the point. The point presents a bold, precipitous, light-colored face to seaward. It is distinguished from the southward by its color, and from the northward the pointed summit stands out. The point is more prominent from northward than from southward. **Sycamore Canyon** is immediately northward of Pfeiffer Point.

Anchorage, affording fair protection in northerly and northwesterly weather, may be had for small steamers about 0.9 mile east-southeastward of Pfeiffer Point and 0.5 mile offshore in depths of 10 fathoms, sandy bottom, with cable sufficient to clear the kelp line. Small boats may anchor in a bight in the kelp about 0.2 mile offshore, just northward of the anchorage, and obtain better protection. This anchorage is used extensively by local fishermen. Access by land is difficult as the road is poor.

Cooper Point, 1.5 miles northwestward of Pfeiffer Point, is marked by a prominent pinnacle 172 feet high and an off-lying rock 18 feet high.

From the mouth of the **Sur River,** about 3.5 miles northward of Pfeiffer Point, to Point Sur, the shore is low, with sand beaches and dunes extending eastward. Sunken rocks and ledges extend a mile offshore in some places, between Cooper Point and Point Sur.

False Sur, 206 feet high, is a rounded hillock of somewhat similar appearance to Point Sur, and during fog and low visibility may be mistaken for it. The hillock is close to the beach about a mile southeastward of Point Sur.

Point Sur is a black rocky butte 362 feet high, with low sand dunes extending eastward from it for over 0.5 mile. From northward or southward, it looks like an island and in clear weather it is visible about 25 miles. The buildings on the summit of Point Sur may confuse the stranger. A light, 270 feet above the water and visible 23 miles, is shown from a gray stone tower on the seaward face of the point. The fog signal is an air diaphone; the radiobeacon is synchronized with the fog signal for distance finding.

Pico Blanco (Sur Peak), 3,710 feet high and about 4.5 miles eastward of Point Sur, rises from the long ridge bordering the south side of Little Sur River. The pointed and white-topped peak is prominent from both northward and southward of Point Sur in clear weather.

Sur Rock, 1.8 miles south-southeastward from Point Sur Light, is awash nearly 0.8 mile offshore. A shoal, 2 fathoms deep and 0.3 mile westward of Point Sur, breaks heavily in all but very smooth weather. About 0.5 mile southwestward from Sur Rock is a shoal 4½ fathoms deep that breaks in heavy weather. Extending 0.9 mile from Sur Rock toward Point Sur are many covered rocks that show breakers in moderately smooth weather. Foul ground lies between the rocks and the beach. These dangers are usually well marked by kelp, but it is a dangerous locality in thick or foggy weather, and vessels in this vicinity should stay in depths greater than 30 fathoms.

The bank, 23 to 27 fathoms deep over sand and broken shells, and about 4 miles southwestward of Point Sur, was examined with the wire drag and found to be free of dangers to surface navigation. There is slightly deeper water between it and the point. The 100-fathom curve extends about 8.5 miles to the westward of the point, and at a distance of 12.5 miles there is a depth of 400 fathoms.

CHAPTER 7

Point Sur to Point San Pedro

Chart 5402

THE COAST trends north-northwestward from Point Sur for 17 miles to Point Cypress, then northeastward for 4 miles to Point Pinos. Monterey Bay is a broad open bight 20 miles wide between Point Pinos and Point Santa Cruz. The shores decrease in height and boldness as Point Pinos is approached, while those of Monterey Bay are, as a rule, low and sandy. The valleys of Salinas and Pajaro Rivers, which empty into the eastern part of Monterey Bay, are marked depressions in the coastal mountain range and are prominent from a considerable distance seaward. From Point Santa Cruz the coast curves westward and northward for about 23 miles to Pigeon Point, and then extends for about 25 miles in a general north-northwesterly direction to Point San Pedro, the southern headland of the Gulf of the Farallones.

Between Point Cypress and Point Pinos the coast is bold and the 30-fathom curve is less than a mile from shore in many places; a deep submarine valley extends into Carmel Bay and another heads in Monterey Bay. Northward of Monterey Bay, depths are more regular, and the few dangers extend less than a mile from shore.

Chart 5476.—Just north of Point Sur are a sandy beach and bluff that continue for about 1.8 miles to the **Little Sur River,** where the coast becomes bold, the 30-fathom curve lying in many cases less than a mile from shore. The highway returns to the coast just north of Point Sur and is visible from seaward until it reaches Carmel Point. It is marked by a number of bridges.

Ventura Rocks, about 2.2 miles northward of Point Sur, are two rocks close together, about 0.6 mile offshore. The northern rock is conical-shaped and 12 feet high. It is fairly conspicuous when seen from the northward with the sand bluff north of Point Sur as a background, but when seen from the southward it is confused with the rocks near the beach and to the northward. The southern rock is awash at high water.

From the noticeable valley of the Little Sur River to Soberanes Point, a little over 7 miles, the coast, although moderately straight, is bold, rugged, and broken, with numerous detached rocks and sunken ledges close inshore.

Bixby Landing is identified by a prominent concrete arch bridge showing well to the westward but obscured to the northward. Less prominent is another concrete arch bridge on the north side of the 620-foot hill in this locality.

Soberanes Point projects but slightly from the general trend of the coast. An isolated, grassy hillock, 200 feet high, lies immediately back of the point, and a grassy ridge extends inland to heights of 1,600 feet.

The coastline from Soberanes Point to Carmel Point, about 4.6 miles, is rugged and broken, but becomes less precipitous and the mountain ridges lessen in height as Carmel Point is approached. Innumerable rocks and ledges extend in some cases over 0.3 miles offshore.

Lobos Rocks, a group of small rocky islets, are nearly 0.5 mile westward of Soberanes Point. The two larger islets are white-topped, and each is about 40 feet high. From seaward they rise abruptly from 20 fathoms, but there is foul ground between them.

Mount Carmel, 4,417 feet high, is about 7.3 miles northeastward of Point Sur and is round and bare on the summit. Mount Carmel and **Pico Blanco** sometimes can be seen when the lower land is covered by fog or haze.

Yankee Point, about 2.5 miles northward of Soberanes Point, projects 0.3 mile from the general trend of the coast. The seaward face is irregular and broken, with numerous detached rocks. **Yankee Point Rock,** 6 feet high, is 125 yards westward of the point. A sunken rock that generally breaks is 0.4 mile southward of the point and the same distance offshore.

Carmel Point, the extremity of **Point Lobos** and the southern point at the entrance to Carmel Bay, is an irregular, jagged, rocky point 100 feet high. **Whalers Knoll,** 200 feet high, rocky and prominent, lies on the northern side 0.5 mile from the western extremity of the point. There are rocks off the point. **Whalers Rock,** 12 feet high and 0.5 mile southwestward, is the most conspicuous and is the farthest offshore. This rock is more prominent from northward than from southward.

Carmel Bay, an open bight between Carmel Point and Point Cypress, is about 2.8 miles wide and 1.5 miles in depth. The beach before the town of Carmel is low. The land on the south side of the bay is bare and mountainous, and on the north side it is hilly and heavily wooded. Carmel Bay affords shelter in northerly and southerly weather to small craft having local knowledge. In northerly weather anchorage may be had in two coves on the northern shore, **Pebble Beach** on the west and **Stillwater Cove** on the east. These are shallow kelp-filled bights, with rock and gravel bottom. Anchorage is in depths of 1 to 3 fathoms, but local knowledge is necessary to avoid the dangers. Stillwater Cove has a landing at its head with a depth of 5 feet alongside. In southerly weather, anchorage may be had in **Carmel Cove,** a small indentation on the southern shore about a mile eastward of Carmel Point, in depths of 3 to 4 fathoms, rock or gravel bottom, but there is a rock with 1¾ fathoms of water over it near the middle of the cove.

Carmel Canyon, a deep submarine valley heads in the southeastern part of Carmel Bay and has depths of 50 fathoms less than 0.3 mile from the beach. The bay is not recommended for strangers, and no directions can be given that would be of any value.

On the northeastern shore of Carmel Bay, and northward of **Carmel River,** is the city of **Carmel.** The lights of Carmel are prominent on a clear night. The Carmel Mission at the southern end of the town is a conspicuous isolated structure. Communication may be had by bus over good highways. Carmel has no rail transportation.

Point Cypress, on the northern side of the entrance to Carmel Bay, is comparatively low and extends about 2 miles beyond the general trend of the coast. The cliffs are steep, and numerous detached rocks are close under them. The point is heavily wooded to within 400 yards of its extremity. **Point Cypress Rock,** 12 feet high, is 450 yards northwestward of Point Cypress and is prominent from either northward or southward. A lighted gong buoy is moored northwestward of the point.

Chart 5403.—From Point Cypress to Point Pinos, the coast trends northeastward for about 4 miles. Numerous small rocks and ledges closely border the shoreline. The land is low, with the height of the cliffs decreasing toward **Point Joe,** a rocky extension of the shoreline where the surf breaks heavily. From this point to Point Pinos white sand dunes are conspicuous, even in moonlight, against the dark trees behind them.

Point Pinos, on the southern side of Monterey Bay, is low, rocky, and rounding, with visible rocks extending offshore for less than 0.3 mile. The point is bare for about 0.2 mile back from the Beach, and beyond that is covered with pines. A light, 89 feet above the water and visible 15 miles, is shown from a white tower on a dwelling near the northern end of the point. The fog signal is an air diaphone about 450 yards northwestward of the light. A lighted whistle buoy is moored about 0.8 mile northwestward of the light.

Monterey Bay, between Point Pinos and Point Santa Cruz, is a broad, open roadstead 20 miles wide and 9 miles in depth. The shores are low, with sand beaches backed by dunes or low, sandy bluffs. The low land extending eastward from about the middle of the bay is prominent from seaward as it forms the break between the Santa Lucia mountain range southward and the high land of the Santa Cruz Mountains northward. The bay is free of dangers, the 10-fathom curve lying at an average distance of 0.7 mile offshore. Submarine **Montery Canyon** heads near the middle of the bay with a depth of over 50 fathoms about 0.5 mile from the beach near Moss Landing. Shelter from northwesterly winds is afforded at Santa Cruz Harbor and Soquel Cove, off the northern shore of the bay, and from southeasterly winds at Monterey Harbor, off the southern shore. The tidal currents are weak.

Caution.—A sector in the southeast part of Monterey Bay is used as a firing range. An area in the northeast part of Monterey Bay is used for training in mine warfare. For regulations regarding these areas, see Chapter 2, § 204.205.

Pacific Grove, an important summer resort, is just southeastward of Point Pinos. The town has no wharves, all shipping being done from Monterey.

Monterey Harbor, 3 miles southeastward of Point Pinos, affords good shelter in southerly weather. It is an oil shipping port of some importance and has a small amount of domestic commerce, mostly lumber, by water. It is the home port for a large fishing fleet, and has several sardine and abalone canneries.

Monterey was the capital of California under the Mexican rule, and for some time after it became a State. The old adobe customhouse is still standing.

The aluminum-colored gas tank, 131 feet high, and the radio mast near the inner end of the municipal wharf are good leading marks when approaching this wharf. The granite **Presidio Monument** is prominent on the brow of a barren hill.

A group of large tanks is between the beach and highway at Seaside. A large red-roofed building is conspicuous on the bluff above the shore 4 miles northeastward from the breakwater.

A breakwater extends from the foot of Spence Street in an easterly direction for about 1,700 feet. This affords excellent protection in northwesterly weather to the large fishing fleet that bases at Montery, and is a protection to the municipal wharf. The outer end of the breakwater is marked by a light. Since the construction of the breakwater the harbor shoals with sand and is periodically dredged in the vicinity of the fish wharves.

A special anchorage area for small vessels is described in Chapter 2, § 202.-126.

Directions, *from southward*: From a position 2.5 miles 240° from Point Sur Light, steer **350°** for 17.8 miles when Point Cypress lighted gong guoy 14 CPT should be abeam, distant 1.5 miles. Then steer **042°** for 6.0 miles, passing close aboard the lighted whistle buoy. Round Point Pinos at a distance of 1.5 miles from the light and steer **138°** so as to leave the lighted bell buoy to southward close-to. When about 0.9 mile past the lighted bell buoy, steer various courses and anchor as desired. See coastwise courses, Chapter 3.

From northward: From a position 1.3 miles 222° from Ano Nuevo Island lighted whistle buoy 2 AN, steer **141°** for 32.5 miles, which should lead to a position 1.5 miles 000° from Point Pinos Light. Then steer **138°** so as to leave the lighted bell buoy to southward close-to. When about 0.9 mile past the lighted bell buoy, steer various courses and anchor as desired.

Storm warnings are displayed day and night from the breakwater by the U. S. Weather Bureau.

A submerged fuel-oil pipe line with floating connections has been installed at **Seaside,** about 1 mile eastward of the municipal wharf at Monterey, and tankers moor alongside this float to receive their cargo. Moorings are planted for holding the vessels in position.

San Francisco is the port of entry for Monterey. No customs, quarantine, or immigration officials are stationed at Monterey, but a deputy customs office is there.

A Coast Guard station is near the inner end of the breakwater. A Naval Reserve training center is located at Monterey.

The municipal wharf is about 1,600 feet long and 86 feet wide at the outer end. In 1950, there were depths of 23 feet along the eastern face at the transit shed and 24 feet along the western face. Freight and supplies are handled by trucks over the wharf. An electric-bell fog signal is on the northern end of the wharf. There is considerable surge which at times seriously interferes with loading operations.

Provisions may be had, and Diesel oil, gasoline, and fresh water are piped to the wharves. A **chart agency** of the Coast and Geodetic Survey is in Monterey.

A boat hoist on the large fish wharf can lift boats up to 30 feet long for repairs. A boatyard in Pacific Grove has a marine railway capable of hauling out boats up to 55 feet long. Monterey has several machine shops.

Monterey has good rail and bus connections with San Francisco and points south, and complete telegraph and telephone facilities.

Moss Landing, on the eastern shore of Monterey Bay, is 12 miles northward of Point Pinos. The wharf, in poor condition, is used commercially and has a depth of 50 feet at the end. A fog signal is sounded on an electric siren on the outer end of the wharf. A lighted bell buoy is about 500 yards west-northwestward from the fog signal. The vessels make fast to mooring buoys and the wharf for handling oil. The large aluminum-colored oil tanks near the wharf are prominent. Back of the dredged harbor, the huge power plant, with six tall stacks, and the nearby mineral processing plant with a single stack, are the most conspicuous objects along this stretch of the coast. Fuel oil for the power plant is discharged through a submerged pipe line marked by a buoy about 0.8 mile northwestward from the harbor entrance jetties.

The anchorage off Moss Landing is unprotected, but the holding ground is good. The prevailing winds are northwesterly, but there are a few southeasterly and northerly gales during the winter.

Moss Landing Harbor, the entrance to which is about 650 yards northward of the wharf, is in the inner lagoon and has been improved by dredging. The Federal project provides for an entrance channel 200 feet wide and 15 feet deep, protected by jetties, from Monterey Bay into the inner lagoon; thence a channel in the lagoon 100 feet wide, 15 feet deep, and about 3,200 feet long extending southward from the entrance. In June-August 1949, the controlling depth was 15 feet in the entrance and lagoon channels. The channels are marked by buoys and lighted ranges.

The harbor is used by a substantial fleet of fishing boats and there are landings where fuel and water are available. The village has several fish canneries.

Elkhorn Slough is a shallow stream that empties into Monterey Bay about 1.3 miles northward of Moss Landing. There is a salt works in the slough. A low fixed concrete highway bridge crosses Elkhorn Slough practically at its junction with the lagoon at Moss Landing.

Palm Beach is a small resort and camping ground back of the sand dunes 4 miles northward of Moss Landing. Two lighted radio towers show well from seaward.

Montery Wind Gap.—The great mountain barriers northward and southward of Monterey Bay and the receding shoreline to the eastward offer a broad entrance to the cold foggy northwesterly winds of the summer, and they drive over the bay and well into Salinas Valley to the southward.

Soquel Cove is in the northeastern part of Monterey Bay, eastward of Santa Cruz Harbor. Fair shelter is afforded in northwesterly weather, but the cove is open in southerly weather. The best anchorage is southeastward of the mouth of **Soquel Creek** in depths of 5 to 6 fathoms, sandy bottom.

At **Seacliff Beach,** about 0.5 mile westward of **Aptos Creek,** a concrete ship has been beached and filled with sand. A pier extends from the ship to the shore.

Capitola is a summer resort with a post office. The small fishing and pleasure wharf has a depth of 11 feet alongside the landing at the outer end. There are facilities to hoist out pulling boats. Communication is by rail and bus, and there are telegraph and telephone facilities. Houses have been built on the bluffs about 1.5 miles eastward of Capitola, and considerable beach improvement has been made.

Point Santa Cruz, about 20 miles northward from Point Pinos, is flat, rising in terraces to higher land and terminating in cliffs about 40 feet high; two flat rocks are close under the point, the outer one being the higher.

A light, 55 feet above the water and visible 13 miles, is shown from a white wooden tower near the southern extremity of the point. A whistle buoy is moored 1.1 miles southeast of the light.

Santa Cruz Harbor is on the northern shore of Monterey Bay between Point Santa Cruz and **Soquel Point.** The Casino Building and the roller coaster immediately to the eastward are prominent.

The city of **Santa Cruz** is on the northwestern shore of the bay. **Seabright, Del Mar,** and **Twin Lakes,** suburbs of Santa Cruz, are along the beach to the eastward. Twin radio towers, lighted, are near the shore 0.6 mile northwestward of Soquel Point.

Good shelter is available in Santa Cruz Harbor in northerly weather, but in northwesterly weather a heavy swell is likely to sweep into the anchorage. There is good anchorage anywhere off the wharf in depths of 5 to 6 fathoms, sandy bottom. During southerly weather there is no protection, and vessels run to Monterey for shelter.

Directions, *from southward.*—From a position 2.5 miles 240° from Point Sur Light, steer 350° for 17.8 miles, when Point Cypress lighted gong buoy 14 CPT should be abeam, distant 1.5 miles; then steer 000° for 22 miles for the whistle buoy and thence to the anchorage off the wharf, as desired. See coastwise courses, Chapter 3.

From northward.—From a position 1.3 miles 222° from the Ano Nuevo lighted whistle buoy 2 AN, steer 132° and give the coast a berth of over 1.5 miles. Continue this course 13.8 miles, and when Santa Cruz Light bears 076° steer 084° for the whistle buoy and pass nearly 1 mile southward of the light. When the light is abeam, round it to the anchorage off the wharf.

Santa Cruz is not a port of entry and there are no customs, quarantine, or immigration officials stationed here.

A substantial municipal wharf extends out to depths of 28 feet and has a cargo shed at its outer end. Landings can be made here in all but heavy southerly weather. Few vessels, other than fishing boats, land at this pier. Due to the ocean swell sweeping around the point, there is usually considerable surge, and heavy lines are required. Provisions and launch fuels may be obtained, and city water is piped to the wharf.

There are no repair facilities except for machine work on launches. Launches up to lengths of 30 feet can be hoisted onto the wharf for hull repairs.

Santa Cruz has rail connection with San Francisco and bus service with the interior.

Chart 5402.—From Point Santa Cruz the coast trends westward about 4 miles to Needle Rock Point and then northwestward to Point Ano Nuevo. The shoreline rises from high bluffs, with a few intervening beaches, to a low flat tree-covered mountain range.

About 3.5 miles westward of Point Santa Cruz is an oil derrick that is prominent by day in clear weather.

Needle Rock Point is 4 miles westward of Santa Cruz Light; a slender pillar of rock stands a short distance seaward from the face of the cliffs; another lower pinnacle is about 200 yards eastward. Neither is distinguishable when abreast it.

Sandhill Bluff, about 6.5 miles westward of Santa Cruz Light, is composed of sandstone cliffs about 50 feet high, with a rounding irregular hillock of white sand near the edge of the cliffs; this hillock is white on the northwestern side, and is covered with brush and grass on the southeastern side. Neither this bluff nor Needle Rock Point is a good landmark.

About 3.5 miles northwestward of Sandhill Bluff and 8.5 miles southeastward of Point Ano Nuevo are the large cement works at **Davenport.** The buildings are conspicuous from seaward; smoke from the plant can be seen a long distance off by day, and many lights are visible at night. A large aluminum-colored oil tank and a tall stack are prominent marks. A steel wharf, 2,300 feet long and with a depths of 50 feet at its end, enables vessels to load bulk cement; there are pipe lines for both cement and oil. Because of the current and ground swell, vessels must lay off the dock; mooring buoys are provided. The outer end of the wharf is marked by a light.

A submarine pipe line for unloading fuel oil is off **Scott Creek** about 2 miles northward of Davenport. The end of the pipeline and the ship moorings are marked by buoys. The oil is pumped to the cement works storage tanks at Davenport.

Loma Prieta is a prominent flat-topped peak surmounting the high mountainous ridge about 13 miles north-northeastward of Santa Cruz Light. It is 3,806 feet high and is the predominating mountain feature of this section. A fire observation tower is on the top of the peak.

Waddell Creek, eastward of Point Ano Nuevo, is in a narrow steep-sided valley. The high whitish bluffs, immediately northward, are quite prominent.

Point Ano Nuevo is formed by sand dunes, 20 to 100 feet high. Two radio masts are on the point. A low black rocky islet is 0.3 mile off the point. Foul ground extends northwestward and southeastward from the islet. A white square pyramidal skeleton 49-foot tower is on the islet. Near the tower is a group of red-roofed white houses. A lighted whistle buoy is moored about 0.8 mile southward of the tower.

Anchorage, with protection from northerly and northwesterly winds, can be had in the bight southward of the point in depths of 8 fathoms, with the tower bearing 276°, distant 0.8 mile. The kelp bed and reef, extending a little over 0.5 mile southeastward from the islet, break the force of the swell.

Pigeon Point is about 5 miles northwestward of Point Ano Neuvo, the coast between them being low and rocky. This point is about 50 feet high and rises in a gentle slope to the coastal hills. Several moderately large detached rocks extend 350 yards southwestward. Pigeon Point was named from the wreck at this place of the clipper ship *Carrier Pigeon.*

A light, 148 feet above the water and visible 18 miles, is shown from a white conical tower on Pigeon Point. A fog signal is sounded on a two-tone air diaphone. A radiobeacon at the light is synchronized with the fog signal for distance finding. The light cannot be seen in the bight eastward of a line joining Pigeon Point and Pillar Point, about 20 miles to the northward. The lighthouse buildings on Pig-

eon Point are white with red roofs. A group of farm buildings is about 0.5 mile eastward. A row of trees, conspicuous against a background of barren hills, is about 500 yards northeastward of the light.

From Pigeon Point to **Pescadero Point,** about 4 miles, the coast is nearly straight and is composed of reddish cliffs, with numerous outlying sunken and visible rocks. A rocky patch with a depth of 1¼ fathoms over it is about 0.8 mile south by west of Pescadero Point; a 6½-fathom rocky patch is about 0.7 mile west-southwestward of the point.

A long-range aviation radiobeacon is about a mile eastward of Pescadero Point. The station transmits the code characteristic PES continuously on a frequency of 190 kc.

From **Pescadero Creek,** about 1.5 miles northward of Pescadero Point, the coast for 8 miles northward becomes more broken and rugged, with yellow or white vertical cliffs. A prominent whitish cliff over 100 feet high is about 7.5 miles northward of Pescadero Point. The coast is broken by several small streams in deep steep-sided valleys. Northward of the high cliff, a low flat tableland extends northward for about 9 miles and then bends sharply westward to Pillar Point, forming Halfmoon Bay. The land consists generally of grass-covered rolling hills with ranch houses and cultivated ground in the foreground.

Chart 5520.—**Halfmoon Bay** is northward of **Miramontes Point** and eastward of Pillar Point. The bay affords a good shelter in northerly and northwesterly weather, but is exposed and dangerous in southerly weather. There is no water-borne traffic, all shipments being handled by truck to San Francisco.

Pillar Point, the southeastern extremity of a low ridge about 2.5 miles long, is about 20 miles northward of Pigeon Point. It is 181 feet high, with several black rocks extending over 300 yards southward. From northward these show as three or four rocks, but from southward appear as one. **Sail Rock** is the largest and southernmost rock, a pilar being situated at its southwestern extremity. Foul ground, well marked by kelp, extends southeastward for over a mile. A buoy is moored about 350 yards southeastward from the end of the reef.

A bell buoy, 0.65 mile southwestward of Pillar Point, and a lighted whistle buoy, about 1 mile southeastward, mark the dangers extending from Pillar Point.

Southeast Reef is 650 yards long in a general northwesterly direction and has an average width of 100 yards. It has depths of 4 to 18 feet over it, and a pinnacle rock at the southeastern end is awash a extreme low tides. The northern extremity is 1.6 miles southeastward of Sail Rock. Depths of 30 feet and less extend northwestward from the reef for over 0.4 mile. A buoy is moored about 0.2 mile northwestward from the northern end of the reef. Another buoy is moored about 0.2 mile southeastward of the southern end of the reef.

Masters of coasting steamers bound for San Francisco do not use the South Channel over the bar if they see breakers on this reef.

Directions, Halfmoon Bay, *from southward.*—From a position 2.1 miles 250° from Pigeon Point Light, steer 355° to a position 0.25 mile eastward of the buoy marking the southeastern extremity of Southeast Reef. Then steer 334° heading for the wharf at the mouth of Denniston Creek, and select anchorage as desired. See coastwise courses in Chapter 3.

From northward.—Round Point Montara at a distance of 2 miles. Steer 151° for 5.2 miles, passing 1.4 miles southwestward of Pillar Point. When the large hotel building at Miramar bears 055°, steer for it on that bearing and pass 200 yards southward of the lighted whistle buoy; then haul northward and anchor in the northern part of Halfmoon Bay as desired.

The ruins of a wharf are on the eastern shore of the bight at **Miramar.** There are three wharves, with depths of 7 to 10 feet at the outer ends, built out from the north shore of the bay at the village of **Princeton.** Canneries are located at the heads of the two western wharves. The wharves have hoists for lifting small boats but there is no space for storage and no facilities for repairs. Oil and gasoline are available.

An approved project calls for two protective breakwaters at Halfmoon Bay, but construction had not started in 1950.

The town of **Halfmoon Bay** is about 2 miles southward of Miramar and nearly 1 mile inland. The buildings in the town are prominent, especially a church with a large tower. A limited amount of provisions can be obtained but coal and water are not available. The best anchorage is under Pillar Point, but vessels must be prepared to leave on the approach of southerly weather.

Chart 5402.—Montara Mountain, 1,952 feet high, is about 4.5 miles northward of Pillar Point and 2.5 miles inland; it is covered with grass and bare of trees. From the southward it shows as a long ridge with several small elevations upon it, but from the northwestward, it appears as a flat-topped mountain with four knobs on the summit. It is a prominent feature in approaching the entrance to San Francisco Bay.

Point Montara, about 2.8 miles northward of Pillar Point, is the seaward end of a spur from Montara Mountain and the northwestern extremity of the ridge forming Pillar Point. It terminates in cliffs about 60 feet high with numerous outlying rocks. Sunken rocks and ledges lie 0.8 mile westward of the point and extend in a northwesterly direction for about 1.5 miles. This is a dangerous locality in thick weather, and extreme caution should be used when inside the 30-fathom curve.

A light, 70 feet above the water and visible 14 miles, is shown from a white conical tower on Point Montara. A fog signal is sounded on a two-tone air diaphone. A conspicuous white tank is near the station and in the daytime is more prominent than the light.

From Point Montara to Point San Pedro the coast is bold and rugged, rising sharply from the sea to the spurs extending from Montara Mountain. **Devils Slide** is light-colored and is the highest bluff in this locality. The highway cuts are distinctive features in the bluffs. There are no outlying rocks or dangers other than those off Point Montara.

Point San Pedro is a dark, bold, rocky promontory, 640 feet high. It is the seaward termination of Montara Mountain and is an excellent mark in clear weather from either northward or southward.. A large triple-headed rock, about 100 feet high and white on its southern face, projects 0.3 mile westward from the point. A rocky area, which breaks in a heavy swell, is reported to exist about a mile northward of the point.

Caution.—An ocean area extending from Pillar Point to Point Reyes in the Gulf of the Farallones is used for firing ranges of harbor defenses of San Francisco. For regulations regarding these areas see Chapter 2, § 204.210.

CHAPTER 8

Point San Pedro to Point Arena

Chart 5502

THE APPROACHES to San Francisco Bay are in the area bounded on the north by Point Reyes, on the west by the Farallon Islands, and on the south by Point San Pedro. The **Gulf of the Farallones** is about 35 miles long in a northwesterly direction, has a greatest width of 23 miles, and connects eastward by a narrow entrance, the Golden Gate, with San Francisco Bay. The prominent landfalls and the numerous aids, make navigation of the approaches comparatively simple in clear weather. In thick weather the currents, variable in direction and velocity, render the approaches difficult and dangerous, and strangers should either lie off and wait for clear weather or take a pilot. Point Reyes, Mount Tamalpais, the Farallon Islands, Point San Pedro, and Montara Mountain are all prominent in clear weather and frequently can be used to establish a vessel's position when the lower land near the beach is shut in by fog or haze.

The long-range radiobeacons, synchronized for distance finding at Farallon Light Station and on San Francisco Lightship are valuable aids in any weather.

An aviation light on **Mount Diablo** is 30 miles 083° from the Golden Gate and should be visible in clear weather to vessels approaching San Francisco. Drakes Bay, eastward of Point Reyes, and Bolinas Bay, eastward of Duxbury Point, are open bights affording shelter in northwesterly weather, but are exposed in southerly weather.

Mount Tamalpais, about 7 miles northward of Point Bonita, is a prominent mountain 2,604 feet high. In clear weather it is visible for over 60 miles. From southward and westward it shows three summits of which the westernmost is the highest and the easternmost is the sharpest. It is covered with bushes and scrub trees, giving it a dark appearance which contrasts strongly with the surrounding hills, especially in summer when the hills assume a light reddish color. The lookout tower on the eastern side of Mount Tamalpais is prominent from the central portion of San Francisco Bay.

The **Farallon Islands** are rocky islets extending about 7 miles in a northwesterly direction. **Southeast Farallon,** the largest of the group, is about 18 miles 177° from Point Reyes Light and 23 miles 252° from Point Bonita. Actually it consists of two islands separated by a narrow gorge impassable even for small boats. The eastern island is the larger, is pyramidal in shape, and is 350 feet high. It is surmounted by **Farallon Light,** 358 feet above the water and

visible 26 miles, and shown from a white conical tower. A fog signal is sounded on a two-tone air diaphone. The radiobeacon at the light is synchronized with the fog signal for distance finding. In addition to the regular radiobeacon, there is an aircraft homing beacon which operates continuously, using a modulated signal on a continuous carrier. The antenna tower is about 300 yards 245° from the light. The fog signal and keeper's dwellings are on the lowland on the southern side. The fog signal can seldom be heard northwestward of the island.

Caution.—Do not rely on radiobeacon bearings when within 0.5 mile of Golden Gate Bridge.

The western and smaller island is known as **Maintop** and is 220 feet high. There are several rocky islets lying close-to, the largest of which, **Sugarloaf,** 200 feet high, is northward of the light and forms a small cove where anchorage can be had in depths of 8 fathoms on the line between the points. This islet has a small sand beach where boats can be landed. Another landing is on the southern side of the island. Both landings are marked by derricks and landing stages.

Hurst Shoal, 0.6 mile 152° from the light, is of small extent, is 4 fathoms deep, and breaks only in heavy weather.

The **Middle Farallon,** about 2.3 miles northwestward of the light, is a single black rock 50 yards in diameter and 20 feet high. A rock 5 fathoms deep is 0.5 mile southwestward from it.

The **North Farallon Islands** are about 6.5 miles northwestward of the light and 14 miles south by west of Point Reyes. They are two clusters of bare precipitous islets and rocks extending in a west-northwesterly direction for 0.9 mile, with an average width of 0.3 mile. The highest rock, 155 feet, is in the southeastern group.

Noonday Rock, 2¼ fathoms deep, is 3 miles 296° from the northernmost rock of the North Farallons and 14 miles 209° from Point Reyes. It rises abruptly from depths of 20 fathoms and is the principal danger in the approach from northward. A lighted whistle buoy is moored in about 26 fathoms, 400 yards southwestward of Noonday Rock, which is the shallowest point of **Fanny Shoal.** The shoal is about 2 miles in extent, and has general depths of 10 to 30 fathoms. Noonday Rock derives its name from the clipper ship of that name which struck the rock in 1862 and sank within an hour in 40 fathoms. A bombing target area northwest of Noonday Rock is described in Chapter 2, §204.218.

Cordell Bank, least depth 22 fathoms, is about 27 miles northwestward of Farallon Light. Between the bank and Point Reyes the depths increase to 66 fathoms; outside the bank the depths increase rapidly to 500 fathoms about 3 miles from the bank.

From Point San Pedro to Point Lobos, the coast extends about 11.5 miles in a northerly direction. The first 8 miles consist of whitish bluffs which at a point 5 miles northward of Point San Pedro reach a height of 600 feet. A sand beach extends from these bluffs to Point Lobos. Back of the beach and shore boulevard the higher ground is built up solidly with white houses.

Shelter Cove is on the north side of Point San Pedro. It has been reported that boats can find shelter with good holding ground in this small cove from easterly storms. Shelter is also obtained from southerly storms because of the

protection of **San Pedro Rock,** a small island 150 feet high, close off the point. The bottom of the cove is gray sand to within 0.2 mile of the shore.

Chart 5532.—Point Lobos, on the south side of the entrance to Golden Gate, is high, rocky, and rounding, with black rugged cliffs at its base. A marine lookout and reporting station is on the ridge back of the point, and the summit has upon it several houses and a large water tank on a high scaffolding. **Seal Rocks,** a group of high rocky islets, are close under its western face. The **Cliff House** and several other prominent buildings are on and near the southern point of its western face. A Coast Guard station is 0.5 mile south of Cliff House.

Point Bonita, on the north side of the entrance to Golden Gate, is a black sharp precipitous cliff 100 feet high, increasing to 300 feet on its seaward face, 0.3 mile northward. From northwestward it shows as three heads, the southern one being cut down to form a foundation for **Point Bonita Light.** The light, 124 feet above water and visible 17 miles, is shown from a white tower. A fog signal is sounded on a two-tone air diaphone. There is a low-power radiobeacon. A single radio mast 134 feet high is near the light. In the summer the cliffs are white with bird droppings, but the first heavy rain restores them to their natural black color. There are a few detached rocks surrounding the point, but these do not extend over 200 yards offshore.

San Francisco Lightship is moored in 108 feet about 3 miles outside the bar and west-southwestward of the entrance to the Main Ship Channel. In thick weather this channel is easily entered owing to the short run from the lightship to the bar. The lightship has a red hull, with the words SAN FRANCISCO on each side, and two masts with a gallery at each masthead. The light is 65 feet above the water and is visible 14 miles; a riding light is on the forestay. The fog signal is sounded on air diaphone; if the diaphone is disabled a horn will be blown. The radiobeacon on the lightship is synchronized with the fog signal for distance finding. The code flag signal and radio call is NNCS. **Storm warnings** are displayed daytime only on the lightship.

The San Francisco bar is semicircular; the area with depths of 36 feet or less extends from 0.5 mile westward of Point Bonita to nearly 1 mile offshore 3 miles southward of Point Lobos. The extreme outer point is about 5 miles west-southwestward of Point Bonita. The northern part, the shoalest, is known as **Potatopatch Shoal,** within the limits of which is a small area covered less than 24 feet. The name is said to have originated from the fact that schooners from Bodega Bay frequently lost their deck loads of potatoes while crossing it. Over the remainder of the bar, except the dredged portion of the Main Ship Channel, depths range from 31 to 36 feet, the deepest water being near the southern end, which is nearly a mile wide. Depths in the approach decrease gradually to about 48 feet and then abruptly to the crest of the bar.

Rules of the Road.—Inland rules shall be followed inshore of a line from Bonita Point Light drawn through Mile Rocks Light to the shore.

Channels.—In smooth weather the bar can be crossed anywhere southward of the western end of Potatopatch Shoal, but in heavy weather use is made of the improved channels.

The **Main Ship Channel** is in most general use. The project provides for a channel 50 feet deep and 2,000 feet wide on the bearing 070° toward Alcatraz Island Light.

The **South Channel** parallels the beach southward of Point Lobos at a distance of 0.8 mile, and at its southern end is 0.4 mile wide. Vessels entering this channel and heading for Point Bonita Light, bearing 357°, should find nothing less than 34 feet. Deep-draft vessels may be taken through this channel with a southwesterly swell and, although vessels may roll considerably, they pitch but little and hence lessen the possibility of touching from that cause. The South Channel, however, should not be used when the bar is rough and inclined to break, as heavy breakers on the bar sometimes sweep across the channel.

The **Bonita Channel** is between the eastern end of Potatopatch Shoal and the shore northward of Point Bonita. It is about 2 miles in length, and varies in width from 0.3 mile at its southern end, abreast Point Bonita, to 0.6 mile at the northern end. The navigable width is reduced to less than 0.2 mile by several rocky patches, the outer one being **Centissima Reef,** 33 feet deep. **Sears Rock,** 20 feet deep, is 200 yards north-northwestward of Centissima Reef.

Near Centissima Reef, a rock 33 feet deep has been reported; the reported position is marked by a lighted bell buoy.

The southern portion of the channel is marked by a lighted range bearing 137°, Mile Rocks Light is the front range, and a light shown from a white wooden building on the bluff is the rear range. The rear light, 326 feet above water, is visible only on the range.

Bonita Channel carries a least depth of 54 feet. It has been used by some of the largest vessels on the Pacific.

The **Golden Gate** is the passage between the ocean and San Francisco Bay. The western end is 2 miles wide between Point Bonita and Point Lobos, but the channel width is reduced to 1.5 miles by Mile Rocks, off Point Lobos, and thence it contracts to less than 0.9 mile between Lime Point on the northern shore and Fort Point on the southern. The depths increase from about 118 feet at the western end to over 360 feet near the eastern end. These depths, combined with the currents, render sounding of little value in thick weather. The northern shore is bold and rugged, with reddish cliffs rising abruptly from the water's edge to heights of over 600 feet.

Mile Rocks are two small black rocks 0.35 mile northwestward of the sharp projecting point off **Landsend** on the northern face of Point Lobos. The rocks are 20 feet high and about 100 feet apart, with deep water reported between them.

Mile Rocks Light, 78 feet above the water and visible 14 miles, is shown from a white cylindrical tower on dwelling on the outer and larger rock. A fog signal is sounded on an air diaphone. When vessels are in distress, the fog signal will sound 5 or 6 short blasts and one longer blast to call the Coast Guard.

A rock, 6 feet deep, is 130 yards eastward of Mile Rocks Light. The passage between Mile Rocks and Point Lobos should not be attempted, as a rock, 15 feet deep, is 300 yards 164° from Mile Rocks Light, nearly in the middle of

the passage, and covered and visible rocks extend over 300 yards from the shore.

The southern shore of the Golden Gate extends in a gentle curve eastward to Fort Point, forming a shallow bight known as **South Bay.** The cliffs rise abruptly from narrow beaches, except near the middle of the bight where a valley terminates in a sand beach about 0.3 mile long. Sailing vessels are sometimes obliged to anchor here when becalmed, or when meeting an ebb current, to avoid drifting onto Mile Rocks, but the anchorage is uncomfortable and it is difficult to get under way from it.

Fort Point projects slightly from the high cliffs, and is marked by a square red brick fort with a stone sea wall in front. The fort is obscured by the southern end of the Golden Gate Bridge. A Coast Guard station is a short distance eastward of Fort Point.

The **Golden Gate Bridge** crosses the Golden Gate from Fort Point to Lime Point. The horizontal clearance between towers is 4,028 feet; the towers are 740 feet above the water. The vertical clearance at the center is about 225 feet. The center span is marked by two navigational lights, one on the seaward side, the other on the bay side of the bridge; there is also a fog signal at the center. A light and fog signal are on the channel side of the south pier. The south pier and the mid-channel fog signals are synchronized, the characteristic signal of one occurring successively after the characteristic signal of the other. The south pier signal is sounded on an air-diaphragm horn and the mid-channel signal is on an air diaphone. Aviation obstruction lights mark the tops of the bridge towers.

Lime Point is high and precipitous and rises abruptly to a height of nearly 500 feet in less than 0.3 mile. A light, 19 feet above the water and visible 9 miles, is shown from a white brick building at the end of the point. The fog signal is sounded on a diaphragm horn.

From Lime Point to Point Diablo the shore is a shallow bight with steep cliffs. Near the middle of the bight the cliffs are cut by a narrow valley which ends in a low beach at the shore.

Point Diablo, about midway between Lime Point and Point Bonita, projects sharply into the strait for about 0.1 mile. The point rises abruptly to a height of over 200 feet, with deep water on all sides. A light, 50 feet above the water and visible 12 miles, is shown from a white wooden house. A fog signal is sounded on an electric siren.

Bonita Cove, immediately eastward of Point Bonita, is occasionally used as an anchorage by small vessels. The anchorage is close under Point Bonita in depths of about 36 feet and is used considerably by the pilot boats. There are two wharves in the western part of the cove.

From Point Bonita to Rocky Point, the coast is very rugged and broken. The cliffs, which are the seaward ends of spurs from Mount Tamalpais, rise to heights of over 500 feet and are cut by deep narrow valleys stretching inland.

Rocky Point, about 3.5 miles eastward of Duxbury Point, is 100 feet high and shelving. Numerous detached rocks are within 200 yards of the cliffs, which are high and precipitous on the southern side of the point.

Bolinas Bay, immediately eastward of Duxbury Point, is an open bight about 3.5 miles wide between Duxbury and Rocky Points, and a little over a mile in depth. It affords shelter in northwesterly weather in depths of 24 to 36 feet, sandy bottom, with Duxbury Point about 1.5 miles 277°. This anchorage is seldom used. The only directions necessary are to keep clear of Duxbury Reef and the dangers off the edge of the reef.

Bolinas Lagoon is separated from the bay by a narrow strip of sandy beach that is cut by a narrow shifting channel near the bluffs about the middle of the bight. The lagoon is shoal and is of little commercial importance. It is entered by small light-draft vessels with local knowledge. In May 1950, the controlling depth at the entrance was reported to be 3 feet. The village of **Bolinas** is on the western shore a short distance inside the entrance.

Duxbury Point, 160 feet high and yellowish, is about 5 miles southeastward of Double Point and 9.5 miles northwestward of Point Bonita. The point is the southern extremity of the tableland westward of Bolinas Lagoon.

Duxbury Reef, upon which many vessels have been lost, is long, narrow, and partly bare at low water. It extends 1.2 miles southeastward from Duxbury point. A ledge 30 to 36 feet deep extends southward from the reef; its outer end is 1.4 miles south of the point.

Duxbury Reef lighted whistle buoy is moored about 2 miles from Duxbury Point. Great care should be exercised in passing this reef.

Approaching San Francisco Bay.—Vessels approaching San Francisco Bay in clear weather will experience no difficulty in making a landfall. *From northward,* vessels will make Point Reyes, and when abreast of the point can lay a course for the lightship, observing proper care to avoid Noonday Rock northward of the North Farallon Islands; or they may use Bonita Channel. *From seaward,* vessels should make the Southeast Farallon Island and shape a course for the lightship. *From southward,* vessels should make the lightship or, if desiring to cross the bar southward of the Main Ship Channel, make Point Bonita Light and use South Channel, or cross westward of the channel.

In the approaches to San Francisco Bay, ships equipped with radio-direction finders may obtain checks on their positions by cross bearings on the radiobeacons on Farallon Island and San Francisco Lightship.

In thick weather, which prevails during a considerable portion of the year, vessels approaching San Francisco from any direction must exercise great caution. The currents are variable and uncertain, at times attaining considerable velocity. A detailed description of the conditions which may be encountered and the precautions which should be observed are given later.

From southward, vessels make the fog signal at Pigeon Point and lay a course to pass about 4 miles off Point Montara, when the fog signal at that point should be made; the depths should not be shoaled to less than 25 fathoms. When abreast Point Montara a course can be shaped for the lightship. South Channel should be used only in clear weather and with a smooth or only moderately rough bar.

From seaward, vessels should exercise the greatest caution when inside 100 fathoms, and if inside 50 fathoms should head offshore and wait for clear weather or a pilot, unless the fog signal on the Southeast Farallon can be made. This sig-

nal cannot be heard well from northward, especially during northerly or northwesterly winds.

From northward, vessels endeavor to make Point Reyes fog signal. This signal may not be heard in the bight northward of the point, but soundings will indicate the ship's position. If inside the 30-fathom curve and the signal is not heard, the vessel should be put broad offshore. Under certain conditions, it has sometimes been found difficult to locate the fog signal owing to deflection in the direction of the sound, but by following the 30-fathom curve closely a vessel can round the point safely. Vessels from northward are sometimes guided by soundings on Cordell Bank.

Strangers are advised not to use Bonita Channel in thick weather. The approaches lead past Duxbury Reef on which many vessels have been lost under similar conditions. After passing the reef, unless the buoys are plainly seen and distinguished, the channel, on account of its comparatively narrow width, is dangerous to those not thoroughly familiar with it. It may be used at any time when the aids can readily be seen, and at such times, if the bar is breaking, it should be used in preference to Main Ship Channel.

Strangers crossing the bar are advised to anchor in about 10 fathoms and wait for a pilot or for clearing weather. Unless one is thoroughly familiar with the characteristics of the fog signals in the entrance and the peculiarities of the current, entering in thick weather is hazardous as soundings are of little value in the Golden Gate.

Currents.—Immediately outside the bar there is a slight current to the northward and westward, known as the **Coast Eddy Current.** The currents at the San Francisco Lightship are described in some detail in the *Pacific Coast Current Tables.* The currents most affecting navigation in this vicinity are the tidal currents. Across the bar the flood current converges toward the entrance and is felt sooner around Point Lobos and Point Bonita than across the Main Ship Channel. The ebb current spreads from the entrance over the bar, but the main strength is west-southwestward, parallel with the southern edge of the Potatopatch Shoal, and through the Main Ship Channel. In the Bonita Channel the ebb current is weak and of short duration, the flood current beginning so early that during the last half of the ebb in the Golden Gate the current in Bonita Channel forms an eddy flowing southeastward around Point Bonita into Bonita Cove.

In the vicinity of Mile Rocks the currents attain a considerable velocity within a few minutes after slack on both flood and ebb.

In the Golden Gate the flood current sets straight in, with a slight tendecy toward the north shore, with heavy overfalls both at Lime Point and Fort Point when strong. It causes an eddy in the bight between Point Lobos and Fort Point. The ebb current has been observed to have a velocity of more than 6½ knots between Lime Point and Fort Point and it sets from inside the bay on the north side toward the latter point. Like the flood current, it causes an eddy in the bight between Fort Point and Point Lobos, and a heavy rip and overfall reaching about 0.25 mile southward from Point Bonita.

Daily predictions of the times of slack water and the times and velocities of maximum flood and ebb in the Golden Gate, together with factors and differences for obtaining the times and velocities of the current for other points in San Fran-

cisco Bay, are given in the *Pacific Coast Current Tables*. Additional notes on currents in the Golden Gate are given in a later section. Hourly directions and velocities of the tidal current throughout the bay are shown on the *Tidal Current Charts, San Francisco Bay*.

Directions, San Francisco Entrance.—*By the South Channel.*—From a position 2.1 miles 250° from Pigeon Point Light, steer 344° for 22.5 miles until Point Montara Light bears 074°, distant 2 miles. Then steer **007°** for 13 miles to a position 400 yards 277° from buoy 2. Then steer **357°**, heading for Point Bonita Light, for 2.4 miles, passing 100 yards westward of bell buoy 4, and when Seal Rocks are abeam, distant 0.45 mile, and Mile Rocks Light bears 046°, change to 033° for 1.1 miles to Mile Rocks Light abeam, distant 0.25 mile. Then steer **049°** for 2.5 miles to the center of the Golden Gate Bridge.

By the Main Ship Channel.—Having made the lightship, pass southward of the lightship and steer **070°** until Point Bonita Light bears 344°. Four pairs of lighted buoys mark the bar section of the main channel. Then make good a **057°** course for 2.5 miles to the center of Golden Gate Bridge. An automatic fog signal is on the bridge directly over this point.

By the Bonita Channel.—From a position 1.6 miles 225° from Point Reyes, steer **114°** for 18 miles to a position 0.3 mile 204° from Duxbury Reef lighted whistle buoy. From the position off the buoy, steer **101°** for 6.3 miles to 250 yards 000° from Bonita Channel lighted whistle buoy with Point Bonita Light bearing 122½°. Then steer **129°** for 1.5 miles, where Point Bonita Light will bear 102°, passing 175 yards southwestward of Bonita Channel lighted bell buoy off Centissima Reef. Then on Bonita Channel lighted range, of which Mile Rocks Light is the front range and a light on the bluff is the rear range, steer **137°** for 0.75 mile passing southwestward of Point Bonita Light, and to a position with the light bearing 356°, distant 0.45 mile. The California Palace of the Legion of Honor at Landsend, Point Lobos, is on the range and prominent. Then steer **073°** for 2.5 miles to the center of the Golden Gate Bridge.

Important.—Steamers leaving San Francisco Bay through Bonita Channel on the ebb current must use extreme caution when crossing the tide rip off Point Bonita. When the bow passes the rip the stern is thrown to port and, unless promptly met, the vessel will head straight for the rocks off the point.

Vessels favoring Potatopatch Shoal too closely have reported a set toward it.

San Francisco Bay is the largest harbor on the Pacific coast of the United States. It is landlocked and affords good shelter and anchorage in all weather, except occasional northerly or southerly storms during the winter months. It is the terminus of several trans-Pacific lines of steamers, airlines, and transcontinental railroads, and its commerce, both foreign and domestic, is extensive. Much of the local navigation is carried on by light-draft river steamers and barges that ascend the Sacramento and San Joaquin Rivers.

From its junction with San Pablo Bay between Point San Pedro and Point San Pablo about 10 miles above the entrance, the bay extends southeastward nearly 40 miles. The eastern shore is low and, in the southern part, is composed of extensive marshes intersected by numerous winding sloughs. For about 4.5 miles southeastward of Point San Pablo, the shore is formed by a ridge of rolling grassy hills. The western shore, northward of the entrance, is much bolder than the

eastern shore, with only a few stretches of low marsh. From Fort Point the shore trends eastward for nearly 4 miles and then rounds sharply southward for 10 miles, from which point marshes and flats, intersected by numerous sloughs, extend to the head of the bay. The San Francisco water front extends from 1 mile eastward of Fort Point around to Point Avisadero, a distance of about 8 miles. The first two points within the bay are Point Cavallo on the northern side and Black Point on the southern side. Beyond these, the islands within the bay are the most prominent features.

Fogs.—In common with the more northerly section of the Pacific coast of the United States, the Golden Gate area experiences fogs more frequently during the summer months than during the other periods of the year. These fogs are generally brought in from seaward by westerly winds, about sundown, and ordinarily continue until about noon of the following day. In winter, morning or tule fogs frequently occur, these forming over the lowlands of the central valley and over the bay.

During the summer months the fog often drifts in only as far as the Golden Gate, limiting visibility of the bridge and shoreline while the remainder of the bay is comparatively clear. Sausalito and Richardson Bay have much less fog than the Golden Gate.

Prevailing winds.—Westerly winds prevail in this section of the Pacific coast throughout the greater part of the year. In July and August southwesterly winds prevail, while northerly winds are most prevalent during the months of December and January. Southerly gales are not infrequent in the winter. The wind normally attains its greatest velocity about 4:30 p. m. and its least about 6 a. m.

During certain portions of the year, especially in May and June, the northwesterly winds attain high velocity. This is also true regarding the north-northeasterly winds of November, December, and occasionally January. In the winter the most prevalent high wind is from the southeast and is followed by a southwesterly wind.

The San Francisco Bay section has comparatively few storms. Except in the winter, very few low-pressure areas move from the ocean across California, nearly all the storms that enter the United States from the west passing far northward of central California.

Chart 5535.—San Francisco, the largest city in San Francisco Bay, is on the northern end of the peninsula separating the southern arm of the bay from the ocean. The depths at the wharves are ample for deep-draft vessels.

The port of San Francisco is under the control of the State of California, and its management is vested in the Board of State Harbor Commissioners. The office of the chief wharfinger is on the Embarcadero at the foot of Pier 1. The port maintains extensive terminals with belt-line rail connections and modern cargo-handling facilities.

Prominent features.—Fort Winfield Scott, in the Presidio and on the south side of the Golden Gate, was built in 1860.

The Presidio, now a United States military reservation, was once the garrison of Spanish soldiers.

Point Cavallo, a sharp rocky point with some visible covered rocks under its western face, is about 0.5 mile north-northwestward of Lime Point. Between the point is **Horseshoe Bay,** a shallow bight within the area of restricted anchorages. From Point Cavallo the rocky steep shore trends northward 0.3 mile to **Yellow Bluff,** thence northwestward to Sausalito.

The western end of **Presidio Shoal** is a little over 0.5 mile eastward of Fort Point.

The entrance to St. Francis Yacht Club harbor, 1.6 miles eastward of Fort Point, is marked by a 30-foot lighted stone tower. In the basin east of the harbor a depth of 10 feet is available 200 yards 340° from the flagpole.

Black Point, the site of several large Government buildings and piers, is 2.3 miles eastward of Fort Point. It marks the limit beyond which vessels must not pass before obtaining pratique. Beyond Black Point, and showing just to the left of it when entering the bay, is a large and prominent gas tank. This is at the foot of Powell Street. A prominent stack is on the eastern side of the point.

The United States Military reservations, embracing Fort Point and Black Point, are on the northern shore of the peninsula.

Aquatic Park is a pleasure resort with a curved recreation pier built out from the eastern side of Black Point. In November 1949 there was a depth of 14 feet at the entrance to Aquatic Park. An electric siren fog signal is on Pier 3 just westward of Black Point.

Telegraph Hill, about 1 mile eastward of Black Point is surmounted by a tall cylindrical light-colored tower called **Coit Tower.** The tower is an excellent landmark by day, and is frequently floodlighted at night.

Alcatraz Island, 2.5 miles eastward of Lime Point and 1 mile northward of Black Point, is one of the leading marks in entering from seaward. The small island is 148 feet high and has many prison buildings on it. A light, 214 feet above the water and visible 21 miles, is shown from a gray tower on the highest part of the island. Fog signals, sounded on electric horns, are on the extreme northwestern and southeastern ends of the island.

Unless authorized, vessels are prohibited from navigating within 200 yards of the shoreline of Alcatraz Island. For regulations governing navigation of these waters, see Chapter 2, § 207.640. Buoys mark the restricted area around Alcatraz Island.

A rock awash, marked on its westerly side by a bell buoy, is 125 yards westward of the northwestern end of Alcatraz Island.

Two lighted bell buoys mark the end of a degaussing range southwestward of Alcatraz Island. It is requested that vessels do not foul the submarine cables that extend south from the range to the observation house on the Marina Seawall at the extension of Fillmore Street.

Yerba Buena Island, about 345 feet high and 2.5 miles eastward of Alcatraz Island, is of small extent, irregular in shape, and is covered with a scrubby growth of trees. On its summit is a lookout tower used by the Navy. The wharves of the Naval Training Station and Corps of Engineers are in the small cove on the eastern face of the island. A Coast Guard buoy depot is on the southeast end of the island. On the end of the southernmost wharf is a light.

A light, 95 feet above the water and visible 16 miles, is shown from a white octagonal wooden tower at the extreme southeastern point of Yerba Buena Island The buildings are white and part of the bluff is whitewashed to make the station more discernible. A fog signal is sounded on an air diaphone.

Treasure Island is a low filled area northward of, and connected by causeway to, Yerba Buena Island. Built originally for the San Francisco International Exposition of 1939, the island is now used by the Navy. The 13-foot shoal about 300 yards northwestward of the island is marked by a buoy on the north side.

A measured course, 6,105 feet long in a 330°45′ direction, on the west side of Treasure Island, is marked by white poles with small white targets. The southern range is on the northwestern extremity of Yerba Buena Island and the northern range is near the northwestern end of Treasure Island.

Ferry Building, with a 240-foot clock tower, is one of the most prominent marks on the water front. It is at the foot of Market Street and in the central part of the Embarcadero.

China Basin, 1.1 miles southward of the Ferry Building, is used principally as a lumber terminal, but is also a railroad car-ferry terminal. **Channel Street** is a dredged slip and crossed by several drawbridges and extending about 0.5 mile in a southwesterly direction from the basin. This channel is used by coastwise vessels in the lumber trade.

Mission Rock, just southeastward of China Basin, is the site of an enlarged deep-draft terminal. Pier 50 extends out to this terminal.

Islais Creek, just southward of Mission Rock, has a project depth for the entrance channel of 35 feet, and 25 feet inside the bridge. Shoaling occurs frequently, requiring dredging by the Board of State Harbor Commissioners. In March 1947, the controlling depth in the entrance channel was 20 feet.

Channels.—From the Golden Gate to the anchorage off San Francisco and southward of Point Avisadero, and northward to the entrance of San Pablo Bay, the channels are wide and have ample depth for deep-draft vessels.

Anchorages.—The usual anchorages are westward of Yerba Buena Island and in the general anchorage off Mission Rock. The limits of the anchorage grounds prescribed by the Department of the Army are shown on Charts 5532 and 5535. Anchorage regulations are enforced by the Coast Guard. The regulations governing anchorages are given in Chapter 2, § 202.224.

Vessels subject to quarantine are boarded westward of Black Point at Anchorage 1. When awaiting or undergoing examination, vessels must anchor in Anchorage 1, shown on Chart 5535 as *Temporary Anchorage.*

The Quarantine Anchorage 17, is in the channel leading to San Pablo Bay, about 2.5 miles north-northwestward of Angel Island. It is no longer marked with buoys, and vessels use the anchorage only when so directed by the quarantine officer. Its limits are given in Chapter 2, § 202.224.

Dangers.—**Anita Rock,** bare at low later, is about 300 yards northward of Presidio wharf. It is marked by a buoy on the eastern side and a lighted bell buoy on the western side.

Arch Rock, 33 feet deep, is about 0.9 mile 280° from Alcatraz Light. **Shag Rocks,** 35 feet deep, are 1 mile 300° from Alcatraz Light. **Harding Rock,** 35 feet deep, is 1.3 miles 300° from Alcatraz Light. **Blossom Rock,** nearly a mile 113°

from the southeastern end of Alcatraz Island, is 40 feet deep. Heavy tide rips occur in the vicinity of the island.

Bridges.—San Francisco-Oakland Bridge crosses the bay from Rincon Point in San Francisco to Yerba Buena Island, then to Oakland. The vertical clearance is 218 feet.

Four bridges cross the tributary waterways within the city of San Francisco. Three cross Channel Street, and are the Third Street Bridge, which has a single-leaf bascule span with a horizontal clearance of 103 feet and a vertical clearance of 1½ feet; the Fourth Street Bridge, which has a single-leaf bascule span with a horizontal clearance of 75 feet and a vertical clearance of 8 feet; and the Sixth Street Bridge, which has a swing span with a horizontal clearance of 50 feet and a vertical clearance of 7 feet. The bridge over Islais Creek at Third Street has a bascule span with a horizontal clearance of 75 feet and no vertical clearance. See Chapter 2 for bridge regulations, § 203.710.

Tides.—The mean range of tide at San Francisco is 4 feet. The range between mean lower low water and mean higher high water is 5½ feet. A range of about 9 feet may occur at the time of maximum tides. Daily tide predictions for San Francisco (Golden Gate), together with differences for obtaining predictions for various other places throughout the bay and its tributaries, are found in the *Tide Tables, West Coast.*

Currents.—Inside the Golden Gate the flood current sets into all parts of the bay and causes swirls from the Golden Gate as far eastward as Alcatraz and Angel Islands and through Raccoon Strait, northward of the latter island. The ebb current, inside the Golden Gate, is felt first along the southern shore. In the Golden Gate, the average duration of the ebb stream is somewhat greater than that of the flood. At periods of great freshets in the Sacramento and San Joaquin Rivers, there have been instances of very slight surface current, or none at all, on the small flood in the Golden Gate.

Along the water front of San Francisco the current turns from flood to ebb approximately 2 hours earlier than in the Golden Gate; and from ebb to flood 1½ hours earlier than in the Golden Gate. Farther out in the bay the current turns somewhat later than at the wharves.

At the San Francisco-Oakland Bridge there are large current eddies near the foundation piers which cause ships to sheer off course.

The flow of tidal currents throughout San Francisco Bay is clearly depicted on the *Tidal Current Charts, San Francisco Bay,* published by the Coast and Geodetic Survey. This publication is a set of 12 charts which show the hourly directions and velocities of the tidal currents. The charts present a comprehensive view of the tidal current movement for the bay as a whole. They are also very useful in supplying a means of readily determining for any time the directions and velocities of the tidal currents at various localities throughout the bay. The charts, which may be used for any year, are referred to the times of the maximum flood and ebb currents at San Francisco Bay entrance (Golden Gate), daily predictions for which are included in the *Pacific Coast Current Tables.* Currents in San Francisco entrance have been discussed earlier.

Storm warning displays of the United States Weather Bureau are shown from a staff on the Telephone and Telegraph Building, day and night, and from a

staff on the Marine Exchange Lookout Station, Pier 45, day only, and can be seen by vessels at anchor in the harbor.

Pilotage into and out of San Francisco Bay is compulsory for all foreign vessels and all vessels from or to a foreign port and all vessels sailing under a register between the port of San Francisco and any other port of the United States. All vessels sailing under an enrollment and licensed and engaged in the coasting trade between the port of San Francisco and any other port of the United States are exempt from pilotage unless a pilot is actually employed.

Pilots.—The San Francisco pilot boats keep station between the lightship and the bar, and at times anchor just eastward of the lightship. When on station under sail, a white light is carried at the masthead; when under power, a red light is displayed under the white light. A flare or torch is also burned frequently. To signal for a pilot in fog, approach the lightship as closely as possible, blow four whistles, and lie-to. In answer, the pilot boat will sound four blasts on the electric siren. When clear, burn blue light or show four flashes of the Morse lamp, or by day show the Union Jack at the fore. Pilot boats fly the Union Jack at the mainmast.

Towboats may be had at San Francisco, but they no longer cruise off the bar. Under favorable conditions of wind and tide, sailing vessels do not require them when entering, but strangers are advised to take on a pilot.

Quarantine.—Quarantine regulations for San Francisco Bay are embodied in the national quarantine regulations.

The **Marine Hospital** is in the western part of San Francisco at Fourteenth Avenue and Lake Street. The U. S. Public Health Service has a dispensary in the Appraisers Building, 630 Sansome Street, where out-patients are treated by an officer of the service who is also the proper person to whom to apply for admission to the hospital.

Customs.—The customhouse is at the corner of Washington and Battery Streets.

Immigration.—The United States immigration detention station and offices are in the Appraisers Building, 630 Sansome Street.

A Coast and Geodetic Survey District Office is at 114 Customhouse, San Francisco, where information relating to the coasts of the United States, Alaska, and Hawaii, is furnished without charge. The station also has for sale charts, coast pilots, current tables, tide tables, and other publications of the Coast and Geodetic Survey.

Mariners noting any dangers, changes in channels, shoals, or piers and docks are urgently requested to forward the information to the supervisor in charge of the district office.

A **Branch Hydrographic Office** is in the Customhouse in San Francisco. Bulletins are posted here giving information of value to seamen, who are also enabled to avail themselves of publications pertaining to navigation, to compare barometers and chronometers, and to correct their charts from standards. No charge is made for this service.

The **Coast Guard District Headquarters** and the office of the Captain of the Port are in the Appraisers Building, 630 Sansome Street.

Other **Federal activities** are listed in tables in the Appendix.

The office of the **Chief Wharfinger** is at the foot of Pier 1, just north of the Ferry Building.

Harbor regulations are prescribed by the Board of State Harbor Commissioners, and their enforcement is in charge of the chief wharfinger and his assistants who will furnish information on request.

Terminal facilities.—The port of San Francisco maintains extensive terminals with belt-line connections and modern cargo-handling facilities.

Dockage charges.—The charges made for vessels occupying berths at the wharves, or moored in any slip or channel, vary with the size and class of vessel. Toll charges, the charge made for merchandise passing over State premises, vary with the class of merchandise.

Tariff rates for dockage, tolls, demurrage, and rentals may be had on application to the chief wharfinger.

Supplies.—Coal, fuel oils, provisions, and ship chandlery stores may be had in any desired quantity. Fuel oil is usually delivered by barge, for which there is no extra charge. Coal can be had at the wharves or in lighters. Water can be obtained on the wharves or by water boat.

Repairs.—Repairs to vessels and machinery of all kinds and sizes can be made at San Francisco, Oakland, or Alameda. The largest dock, the graving dock at Hunters Point, has a length of 1,020 feet, breadth at top 153 feet, and at bottom 110 feet. It will take a vessel drawing 40 feet. There are several smaller drydocks on the San Francisco side, and several marine railways and floating docks on the Oakland side.

Communications.—San Francisco is the terminus of several trans-Pacific steamship lines and is the port of call of numerous lines of coastal and intercoastal vessels. It is served by four lines of transcontinental railroads, and has through rail connection with all points. There is excellent air service; also complete radio, telegraph, and telephone facilities. It is the terminus of a trans-Pacific cable via Honolulu and Midway Island.

Special signals.—Special signals in use at San Francisco by International Code Flag and whistle include the following: Quarantine, letter **Q**, 1 long 1 short; Police, Ensign in rigging, 5 short; Fire, no flag, Standard signal of 5 prolonged blasts for ships afire in port; Water boat, letter **W**, no whistle; Customs-Barge office, no flag, 3 short 1 long; Immigration, no flag, 1 short 1 long 1 short; Marine Dept., S.F.C. of C. letter **M**, 1 short 1 long; Stockton pilots, letter **U**, 1 long 3 short; Towboat companies: Bay Cities, letter **B**, 1 long 3 short; Crowley, letter **C**, 4 short 1 long; Harbor, letter **H**, 2 long 2 short; Smith-Rice, letter **S**, 3 short; Red Stack, letter **T**, 1 long 3 short 1 long.

Yacht Clubs.—A list of the larger yacht clubs on the Pacific coast is given in the Appendix.

Chart 5531.—Southward of San Francisco, **Point Avisadero,** which is the eastern extremity of **Hunters Point, Sierra Point, Point San Bruno,** and Point San Mateo, all on the western shore of the bay, are prominent natural features. **Point San Mateo** is covered by a heavy growth of trees and is raised as an island.

There is an aviation light at **San Francisco International Airport** 1 mile southward of Point San Bruno. A seaplane landing channel and protected anchorage

dredged to 10 feet are here. In June 1947 the controlling depth in the channel was 5 feet and 8 feet in the anchorage. The channel is marked by buoys. Seadrome buoys are maintained in this area. For regulations governing navigation in this area, see Chapter 2, § 207.640.

The **San Mateo Bridge** crossing the lower part of San Francisco Bay near **San Mateo** has a vertical lift. The horizontal clearance is 270 feet, the vertical clearances are 35 feet closed and 135 feet open; the opening signal is 3 long blasts. A fog signal is sounded on an electric siren on the westerly pier of the lift span.

Redwood Creek enters the bay at **Redwood (Marsh) Point** about 4 miles southeastward of San Mateo Bridge. The creek has been improved by dredging an entrance channel and a turning basin which are well marked. An overhead cable with a clearance of 125 feet crosses the entrance channel. In October 1950 the controlling depths were 25 feet in the improved channel to the turning basin and 23½ feet in the turning basin. The municipal wharf at the upper end of the turning basin has a face 450 feet in length. About 0.5 mile above the end of the turning basin, near the upper end of the 7-foot channel, is the **Redwood City Yacht Harbor.** There are small piers and a clubhouse. Gasoline, oil, water, and supplies are available for yachtsmen. **Redwood City** is 3 miles from the mouth of the creek. The head of navigation is the bridge at the Bayshore Highway.

Westpoint Slough enters Redwood Creek at the lower end of the turning basin. A prominent cement plant at this junction can always be recognized by the cloud of dust that hangs about it. The shells in the old oyster beds are being utilized in the manufacture of cement and, consequently, there is continual dredging on the former beds.

Ravenswood Point and **Dumbarton Point** are at the head of the bay and the mouth of Coyote Creek. Two bridges and an aqueduct cross the bay at this point. The **Dumbarton Bridge,** the northern of the two, is a lift span with a horizontal clearance of 200 feet and vertical clearance of 9 feet closed and 135 feet open. A fog signal is sounded on an electric siren on the western pier. About 1,100 yards southeastward of the bridge are two flumes, with a clear opening between them of about 900 yards, which supply the city of San Francisco with water. The eastern flume tunnels the entire way and is marked by a large sign showing the word PIPELINE. The western flume is carried on a trestle to a concrete house at the edge of the channel where it tunnels. The railroad bridge, just southward, has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 13 feet. A fog bell is on the bridge keeper's house. The opening signal for both bridges is 3 long blasts.

Coyote Creek has many sloughs entering it. The main channel is marked about 4 miles above the railroad bridge, **Calaveras Point,** and at the entrance to **Jagel Slough** and **Guadalupe River.** There is an overhead power cable crossing the creek near the mouth of **Alviso Slough.** A small channel is marked from the railroad bridge to the mouth of **Mayfield Slough,** southward of the **Palo Alto Municipal Airport.** A yacht club is near the mouth of Mayfield Slough.

South Shore Port, on Jagel Slough, has a small amount of domestic trade in fruit, farm products, and general merchandise. The channel to South Shore Port is feasible for scows and light-draft vessels at high tide. The bar bares at low water.

Alviso is at the headwaters of Alviso Slough. There is little water traffic by scows and light-draft vessels. The trade is similar to that of South Shore Port.

On the eastern side of the bay from Dumbarton Point to the **Oakland Municipal Airport** on **Bay Farm Island**, about 12 miles, the low-water line extends from 0.5 to 1 mile offshore. **Coyote Hill Slough, Alameda Creek,** and **Mount Eden Slough** enter the bay on this side.

Chart 5535.—Alameda and Oakland are two cities on the eastern shore of the bay opposite San Francisco.

Alameda is on an island separated from the mainland by **San Leandro Bay** on the east, and Oakland Harbor and Tidal Canal on the north. The **Naval Air Station** is on a filled area just west of the city and south of Oakland Inner Harbor.

Restricted area.—There is a restricted area southward of the Naval Air Station where no vessel may enter without prior approval of the Naval authorities. The area is outlined on the charts. For regulation governing navigation in this area, see Chapter 2, § 207.640.

Aviation lights.—There are aviation lights at the Naval Air Station and the Oakland Airport. High up in the hills 8 miles eastward of the entrance to the Oakland Harbor is another aviation light that can be seen from the bay.

Repairs.—Alameda has shipbuilding and repair yards with marine ways and floating drydocks. The largest drydock has a length of 528 feet, width of 90 feet, 28 feet on the blocks, and a lifting capacity of 16,500 tons.

Oakland is on the eastern or mainland shore opposite San Francisco, and is the second largest city on San Francisco Bay. It is the physical terminus of the various transcontinental railroads entering the San Francisco Bay area. A **chart agency** of the U. S. Coast and Geodetic Survey is here.

The **Port of Oakland** is under the jurisdiction of the Board of Port Commissioners of the city of Oakland and is entirely distinct from the Port of San Francisco. Oakland is a separate United States Customs Port of Entry. There is an appraiser's store in the city.

Oakland Inner Harbor, which is adjacent to the most highly developed section of Oakland, is an estuary 9 miles long. It is bordered on the north by Oakland and on the south by Alameda. At the eastern end is an artificial **Tidal Canal** leading to San Leandro Bay and thence to the Oakland Municipal Airport by a channel.

Channels.—The controlling depths in various channels were: Entrance Channel to Outer Harbor 33 feet, and Entrance Channel to Inner Harbor, 34 feet in March 1949; channel from entrance of Inner Harbor to Grand Street, Almeda, 29 feet; channel from Grand Street to Oak Street, Almeda, 27 feet in July 1948; Outer Harbor, 30 feet in March 1949. In July 1947 the controlling depth in the Tidal Canal was 16 feet; in Brooklyn Basin 18 feet in 1946. In August 1950 the controlling depth was 7 feet across San Leandro Bay and 24 feet in the upper section of channel to Oakland Airport.

In October 1950, a channel and turning basin at the Naval Air Station had a controlling depth of 36 feet, except for slight shoaling along the northern edge of the channel where the least depth was 31 feet.

Bridges.—There are three bridges over the Tidal Canal, one over San Leandro Bay, and a fixed bridge over the east end of Brooklyn Basin. The bridges ov-

er the Tidal Canal have the following dimensions: Park Street, double-leaf bascule, horizontal clearance 240 feet, vertical clearance 15 feet; Fruitvale Avenue, swing span, horizontal clearances 58 feet on the northern side and 64 feet on the southern side, vertical clearance 6½ feet; High Street, bascule, horizontal clearance 240 feet, vertical clearance 16 feet. The Bay Farm Island Bridge is a swing bridge with a horizontal clearance of 83 feet and a vertical clearance of 5 feet. The signal for all these bridges is 3 long blasts.

All vessels whether towing or being towed or acting singly, including barges but excepting motorboats not engaged in towing, are forbidden to approach the Fruitvale Avenue Bridge except during slack water or when an ebb tide may be expected. Vessels and barges are forbidden to attempt passage through the draw while running with a fair tide, and the bridge will not be opened for vessels under such conditions.

The **Naval Supply Depot** occupies **Middle Harbor,** betwen Oakland Inner Harbor entrance and the Oakland Mole. A channel has been dredged to the depot piers. For regulations governing navigation in this area, see Chapter 2, § 207.640. In June 1950 the controlling depth in the channel was 31 feet. Adjacent to the Naval Supply Depot on the north is the terminus of the Southern Pacific Railroad, which is used largely for passenger ferry service.

The **Outer Harbor,** between the Oakland Mole on the south and the Bay Bridge approach on the north, is the site of several large terminals.

A channel bearing 056° has been dredged across the shoal off Oakland Mole to Oakland Outer Harbor, and is marked by two lighted side ranges and buoys. In March 1949 the controlling depth of the channel was 33 feet.

The Port of Oakland contains several shipbuilding and repair yards with marine ways and floating drydocks. The largest has a length of 610 feet, width of 90 feet, 25 feet on the blocks, and a lifting capacity of 19,000 tons.

Emeryville is a small manufacturing town on the bay shore northward of Oakland. Several small wharves, accessible for light-draft vessels at high tide, are built out in this vicinity.

Berkeley, the seat of the University of California, adjoins Oakland and Emeryville to the northward. There is a long pier extending into the bay, but in 1950 it was used for fishing purposes only. In clear weather the **Campanile** (bell tower) at the University of California shows prominently from the bay. A **chart agency** of the Coast and Geodetic Survey is here.

Chart 5532.—Berkeley Yacht Harbor on the northern side of the long pier is enclosed by breakwaters, the southern side of the entrance being marked by a light. A fog siren is also located on the breakwater, on the southern side of the entrance. Gasoline and oil may be secured at the city wharf which has sufficient depth alongside for the deepest draft able to enter the harbor. The harbor master's office is on the city wharf. There is a boat repair shop and marine railway on the southeastern corner of the basin. A draft of 7 feet could be carried through the entrance channel of the yacht basin in May 1948.

Southampton Shoal extends in a northwesterly and southeasterly direction for about 2 miles, with an average width between the 18-foot curves of 0.25 mile. The least water on the shoal in 1950 was 14 feet. The channel eastward of the

shoal, 20 feet deep, is little used except by vessels bound for the wharves between Point Richmond and Point San Pablo.

A light, 52 feet above water and visible 13 miles, is shown from a white square frame building on piers, near the southern end of the shoal. A fog signal is sounded on an air diaphone.

The radiobeacon at the light will broadcast only on special request to enable vessels to calibrate their radio direction-finders; see *Light List.*

The deep-water channel between Red Rock Bank and the northerly extremity of Southampton Shoal is marked by lighted buoys.

Red Rock, 169 feet high, in the northern part of the bay, is visible in clear weather from the anchorage near Yerba Buena Island. It is reddish, and of small extent. It is about a mile from the eastern shore and 2.3 miles southward of Point San Pablo.

A fog signal on an iron stand just south of the rock is maintained from October 1 to March 31 each year.

A shoal 19 to 30 feet deep extends about 1.3 miles southward of Red Rock. The bottom rises gradually toward the shoal; the usual course of vessels leads westward of the 30-foot curve surrounding it. A 19-foot spot is 350 yards 179° from Red Rock. A lighted buoy marks a 28-foot spot near the western edge of the shoal and a lighted bell buoy is moored on its southeastern point in 30 feet of water. A 20-foot spot is 200 yards 324° from the lighted bell buoy.

The channel eastward of Red Rock and The Brothers is frequently used by river steamers on the ebb, as the current has less velocity, although the rips and swirls are heavy at times.

Point Richmond (Richmond Harbor), on the eastern shore of the bay, nearly 4 miles southward of Point San Pablo, is the terminus of the Santa Fe Railroad, and is an important oil refining center. In the inner harbor are two modern deep-water terminals, one oil wharf, four inactive shipbuilding yards, and numerous wharves for small yachts.

A motor car company assembly plant is near the Parr-Richmond Terminals.

Between Point Richmond and Potrero Point is a huge gas tank which is one of the most prominent objects in the bay area.

The inner harbor has been improved by dredging a channel from deep water off Point Richmond toward Potrero Point, thence northward to Ellis Landing and Municipal Wharf No. 2. In April 1950 the controlling depths in the channel were: channel from deep water in San Francisco Bay to east side of turning basin at Terminal No. 1, 28 feet; thence 29 feet to Potro Point, thence 28 feet to Santa Fe Channel. In January 1949 the controlling depth in Santa Fe Channel was 24 feet.

A training wall 10,000 feet long extends westward from **Brooks Island,** and has a light and bell on the outer end. The railway car ferry slips are built out from Point Richmond just northward of the dredged channel. An echo board has been established on the southeastern side of the sharp bend in the channel off **Potrero Point.** The oil tanks on the hill back of Potrero Point are prominent. Many deep draft vessels now make Richmond Harbor a regular port of call. They approach from the south through the buoyed channel and make a sharp turn just off the Standard Oil Company dock. The dock is being rebuilt and expanded to

permit berthing of vessels on both sides of the outer pier. Considerable dredging is being done. A large basin dredged to the eastward of the motor car company assembly plant was used for shipbuilding.

Midway between Potrero Point and Point San Pablo are numerous oil tanks. This area as far northward as Point San Pablo is part of Richmond Harbor, and is an important oil shipping point. Many large vessels load petroleum products from the wharf 1.2 miles north of Point Richmond and from the wharf at **Point Orient.** The ferry slip and pier for the San Rafael Ferry is at Castro Point. A T-wharf extends about 625 yards 270° from Molate Point. Each end of the head is marked by a light. A fog signal at the southerly light is sounded on an air-diaphragm horn. The outer end of the wharf is in a basin dredged to 30 feet, marked by buoys. A private wharf, partially in ruins, is at **Winehaven,** just northward of **Molate Point.** For regulations regarding navigation in this vicinity, see Chapter 2, § 207.640. The wharf at Point San Pablo is used by large vessels for general cargo and petroleum products.

Castro Rocks are small and low, and lie 0.3 mile off **Castro Point,** on the eastern shore abreast Red Rock. The southwestern edge of the surrounding shoal is marked by a lighted buoy. Vessels should not pass eastward of this buoy.

Invincible Rock, 7 feet deep, is 0.5 mile 216° from East Brother Island Light, and is marked on its southwestern side by a lighted buoy. **Whiting Rock,** with 13 feet over it, is northward of Invincible Rock and nearly 0.4 mile 229° from East Brother Island Light. It is marked off its southern side by a buoy.

The Brothers are two small low flat-topped islands 0.3 mile westward of Point San Pablo. The eastern one is surmounted by a light and fog signal. The light, 61 feet above water and visible 13 miles, is shown from a square white tower on dwelling. The fog signal is a two-tone air diaphone.

Point San Pablo is the northwestern extremity of a low ridge of hills on the eastern shore of the bay at its junction with San Pablo Bay. The point rises abruptly to a height of 140 feet. A railway wharf with a warehouse upon it is built southward from the point parallel with the channel. There are several oil tanks just to the southward of Point San Pablo. A channel and turning basin have been dredged for a large shipbuilding plant. In August 1949 the controlling depth in the channel off the northeastern shore of Point San Pablo was 11½ feet. San Pablo Bay and the area northward are described later.

Chart 5532.—Lime Point has been described earlier, as well as Horseshoe Bay, Point Cavallo, and Yellow Bluff.

Sausalito, on the western shore about 2 miles northward of Lime Point, is the terminus of a railroad extending northward to Humboldt Bay. The anchorage off Sausalito is much used by yachts and small pleasure craft.

A channel and turning basin have been dredged for a large shipbuilding plant. The plant (Marinship) is no longer in use. A **chart agency** of the Coast and Geodetic Survey is in Sausalito.

Richardson Bay, northward of Sausalito, is shoal and of little importance commercially. For regulations regarding anchorage in Richardson Bay see Chapter 2, § 202.224. The upper end of the bay is crossed by a highway bridge with a ver-

tical lift span; having a horizontal clearance of 40 feet, and vertical clearance of 27 feet closed, 57 feet open.

Belvedere, on the eastern shore of Richardson Bay opposite Sausalito, is a summer resort and of little commercial importance.

Tiburon, near **Point Tiburon,** is the the terminus of a railroad connecting with interior points to the northward.

Angel Island, partially wooded, is about 1.5 miles northward of Alcatraz Island, and is separated from the mainland by Raccoon Strait on its northern side. The island is irregular in shape, its greatest length being about 1.3 miles in an easterly direction, and its width over a mile. The highest point, 782 feet, is in about the center of the island.

Point Knox, the southwestern point of Angel Island, is marked by a light and fog signal. A light, 50 feet above the water and visible 12 miles, is shown from a white square dwelling on Point Knox. The fog signal is sounded on a bell. A shoal 16 feet deep at its outer end, marked by a lighted buoy, extends 400 yards southward of Point Knox.

Point Knox Shoal, westward of Point Knox, has a least depth of 35 feet.

Point Blunt, the southeastern extremity of Angel Island, terminates in a knob 60 feet high, and is connected with the island by a low neck of land. A shoal with visible and covered rocks extends southeastward for about 0.1 mile. The tide rips and swirls are heavy around Point Blunt, especially on the ebb of a large tide. A light, 60 feet above the water and visible 13 miles, is shown from a white house. A fog signal is sounded on an air diaphragm horn.

Quarry Point, the eastern extremity of the island, is a bold bluff, with deep water close-to. Just northward of **Point Simpton,** the northeastern point of the island, are a wharf and buildings partly destroyed by fire.

Hospital Cove is a small bight on the northern shore of Angel Island. The wharf for the national quarantine station is on the eastern shore of the cove.

Point Stuart, the westerly point of Angel Island, has a light, 80 feet above water, shown from a white frame house. The fog signal is sounded on an air-diaphragm horn.

Raccoon Strait, on the northwestern side of Angel Island, is nearly 0.5 mile wide, and is sometimes used by vessels bound northward in San Francisco Bay from Lime Point. The strait is free of dangers, but the tidal currents have considerable velocity and the rips and swirls are heavy at times. A mid-channel course can be followed with safety. A strong ebb current sets directly across the channel at the east entrance.

Caution.—In navigating Raccoon Strait with a deep-draft vessel, care should be taken to avoid **Raccoon Shoal,** least depth 26 feet, 600 yards northward of Point Stuart Light.

A Naval net depot, 0.5 mile northward of Bluff Point, is marked by an elevated water tank. Vessels are cautioned against navigating in the restricted area. For regulations regarding navigation in the vicinity of the net depot, see Chapter 2, § 207.640. A fog signal sounded on an air horn is on the wharf at **Point Chauncey,** the northern end of the net depot.

California Point, about 1.7 miles northwestward of Point Chauncey, is a knoll separated from the shore by a saddle. The 30-foot curve is 1,400 yards east of the

point and extends about 1,400 yards northward and 400 yards southward from that position. Mariners should proceed with caution in this vicinity as shoaling may extend northward of this area.

Point San Quentin, on the western shore, about 3 miles southward of Point San Pedro, is prominent on account of the low land on either side. The buildings of the State Prison, and the wharf built out from the eastern extremity of the point, are prominent. Just southward of the wharf is a ferry slip with a long approach.

Heavy shoaling has occurred near Point San Quentin and California Point, amounting to 12 feet in extreme cases. The area is westward of a line extending from a point 0.5 mile east of Point San Quentin Ferry Slip, south for 1.5 miles and thence to California Point.

Corte Madera Creek is at the head of the bight southward of Point San Quentin. Two drawbridges cross the creek about 0.4 mile from its mouth, a railroad bascule bridge having a horizontal clearance of 40 feet and a vertical clearance of 8½ feet, and a highway bascule bridge having a horizontal clearance of 40 feet and a vertical clearance of 10 feet. See Chapter 2, § 203.712, for regulations governing opening of these bridges.

The **Marin Islands,** about 1.3 miles northward of Point San Quentin in **San Rafael Bay,** are two small islands lying close together about 1 mile offshore. There is shoal water around them and all the way inshore. There are several houses on the northern side of the eastern island.

San Rafael is about 3 miles westward of Marin Islands. A channel marked by lights and a lighted range has been dredged through the flats to the mouth of **San Rafael Creek,** and the creek has been improved to the city. The entrance light, 26 feet above water, is shown from a white framework on a black four-pile structure. A bell fog signal is maintained from October 1 to March 31. In October 1950 the controlling depth in mid-channel for a width of 50 feet was 8 feet in the channel across the flats in San Francisco Bay to the mouth of the creek, 5 feet to the yacht harbor, and thence 2 feet to Irvin Street, the head of navigation in San Rafael. A **chart agency** of the Coast and Geodetic Survey is in San Rafael.

Point San Pedro, at the western entrance to San Pablo Bay, extends about 100 yards eastward of **San Pedro Hill,** 356 feet high. There is a large quarry just northward of the point.

Chart 5533.—San Pablo Bay is nearly circular, about 10 miles long in a northeasterly direction, and of about 8 miles greatest width. The northern part consists of low marshes intersected by numerous sloughs and a large area of shoal water and mud flats that bare at extreme low tides. The southern shore is bolder, except between Point San Pablo and Pinole Point, where it is low and marshy for about 3 miles. At its eastern extremity it communicates with Suisun Bay by Carquinez Strait, and by Mare Island Strait northward with Napa River. There is considerable traffic through the bay. Deep-water vessels pass through to load grain at points on Carquinez Strait, and to South Vallejo to load flour and discharge lumber, while many oil tankers and sugar-laden vessels pass through the bay bound for Crockett and Martinez, and up the San Joaquin River to Stockton. Light-draft

vessels pass through bound for points on Suisun Bay, Sacramento and San Joaquin Rivers, and on Petaluma Creek.

There are several landings on the southern shore of San Pablo Bay used by light-draft vessels.

The main channel through the bay extends in a gentle curve northward and eastward from the entrance to the eastern end of the bay. The average width between the 18-foot curves is a little over 1.3 miles, being a little wider at the southern end and about 0.8 mile wide at the eastern end. **Pinole Shoal Channel** has been improved by dredging; in July 1948 the controlling depth in the channel was 35 feet from the entrance to San Pablo Bay lighted buoy 5, thence 34 feet to deep water in Carquinez Strait. The dredged channel is marked by lighted buoys at intermediate points and lighted bell buoys at each end.

For directions to San Pablo Bay see tables in Chapter 3.

For regulations regarding navigation in Pinole Shoal Channel, see Chapter 2, § 207.640.

A survey in October 1947 shows a depth of 26 feet at mean low water at the mine dock at the southern extremity of Mare Island.

Notice.—Ships destined for the Navy Yard, Mare Island, should await arrival of a Navy Yard pilot at Carquinez Strait.

For regulations regarding navigation in the vicinity of Mare Island, see Chapter 2, § 207.640.

Danger zone.—A sector in San Pablo Bay adjacent to the westerly shore of Mare Island is designated a target practice area. For regulations regarding this area, see Chapter 2, § 204.215.

For directions to Carquinez Strait, see tables in Chapter 3.

For directions to Suisun Bay and San Joaquin River, see tables in Chapter 3.

Pinole Point is a moderately high, rocky bluff projecting about a mile from the southeastern shore of San Pablo Bay. A wharf is built out from the eastern side. Powder works are on the point, and about 2 miles back of it are numerous oil tanks.

Shoals and flats, bare at low water, extend from Point San Pablo to Pinole Point, and from Pinole Point northwestward to **Lonetree Point.**

Oleum, on **Davis Point,** is an oil town with a wharf built out to deep water. Oil tankers call frequently. Care must be taken to avoid shoal areas east of the wharf. The many oil tanks on the hills back of the town are prominent.

Selby is a smelting town about a mile eastward of Oleum. The smelter is distinguished by a concrete stack about 630 feet high, claimed to be the tallest in the world.

The fixed highway bridge and the pyramidal skeleton towers that carry electric power cables across Carquinez Strait, are prominent. The cables have a clearance of 206 feet.

Mare Island Strait (Chart 5525), at the mouth of the Napa River, is between the mainland and **Mare Island.** South Vallejo and Vallejo are on the eastern side of the strait, and the Navy Yard is on the western side, about 2 miles above the southern entrance. A channel about 30 feet deep and 600 feet wide, widened to 1,000 feet abreast the Navy Yard, has been dredged from the entrance to the

Navy Yard. It is subject to shoaling and is redredged at intervals. In September 1950 the controlling depth was 23 feet to the first bridge between Vallejo and Mare Island. Mare Island Strait is well marked by lights and buoys. The channel is constricted by jetties on each side at the entrance and in several places above the entrance.

Notice.—Ships destined for Navy Yard, Mare Island, should await arrival of a Navy Yard pilot at Carquinez Strait.

The aerial power transmission line crossing lower Mare Island Strait between South Vallejo and Mare Island has a minimum clearance of 163 feet. If the clearance between the masthead and the cable is less than 10 feet or if the clearance is not known, vessels shall not move under the cable without authority from the pilot.

Carquinez Strait Light, 40 feet above the water and visible 12 miles, is shown from a white frame tower on a dwelling at the end of the jetty on the eastern side of the entrance to Mare Island Strait.

South Vallejo, on the eastern shore of Mare Island Strait, inside the entrance, is the terminal of a railroad connecting interior northern points. A large flour mill is southward of the railroad wharf, and lumber wharves to northward are prominent in entering. The flour mill wharf has 30 feet alongside and 28 feet can be carried from the entrance to this point with local knowledge. From 10 to 21 feet can be taken alongside the other wharves, depending on the locality.

Communication may be had by rail and highway with other points on the bay; there are telegraph and telephone facilities.

Vallejo, about 1 mile above South Vallejo, is of little commercial importance. It supplies a large amount of fresh provisions to the Naval Station and affords residences for employees and others attached there. It is also a distributing point for a considerable agricultural area in its vicinity. Communication with San Francisco and other points may be had by rail and bus. **Napa** is at the head of navigation on the Napa River. The United States Naval Station, on the western side of Mare Island Strait, has drydocks and extensive facilities for repairing and building vessels of all sizes. A **chart agency** of the U. S. Coast and Geodetic Survey is here.

The Vallejo-Mare Island Causeway and drawbridge connects Mare Island with the city of Vallejo at the northern end of the Navy Yard. The drawspan has a horizontal clearance of 73 feet and vertical clearance of 5½ feet. At **Sears Point,** 1 mile above Vallejo, is a highway bridge with a bascule span having 75 feet horizontal clearance and 11 feet vertical clearance. For regulations regarding these bridges, see Chapter 2, § 203.712. If practicable, approach the bridge only when running against the current. No passage should be attempted during periods of peak flood or ebb current.

Napa River, the continuation of Mare Island Strait above the Navy Yard, has been improved by dredging. In March 1950 the controlling depth was 14½ feet from the mouth of the river to Horseshoe Bend Cut, thence 9 feet to Napa. The former channel through **Horseshoe Bend** is closed to navigation by a dam near the northern end. The mean tidal range is about 5 feet, and the river channel is subject to some shoaling. The channel is marked by lights and buoys. There is barge and towboat freight service on the river and some traffic in farm and dairy

products by light-draft vessels. Petroleum products, principally gasoline, are shipped to Napa in large quantities, from which point they are distributed.

The Napa River is crossed by a railroad swing bridge about 8.5 miles above Vallejo. The drawspan has a horizontal clearance of 75 feet and a vertical clearance of 11 feet; and a highway lift bridge at **Imola,** about 0.5 mile southward of Napa, has a horizontal clearance of 90 feet and a vertical clearance of 25 feet down and 60 feet up. Two fixed bridges across the river in Napa have minimum clearances of 47 feet horizontal and 10 feet vertical.

The railroad bridge is built over a curved section of the river where the thread of the deep-water channel crosses from one bank to the other. The ebb current flows in a direction as much as 50° from the axis of the navigation channel through the bridge. This condition constitutes a hazard, particularly in taking loaded barges downstream through the bridge.

Dutton Landing is on the eastern side of Napa River about 75 yards below the railroad bridge.

Petaluma Creek enters San Pablo Bay at its western end. It is improved by a channel and turning basin with a project depth of 8 feet to the city of **Petaluma,** which is the center of an extensive poultry and egg industry. Large quantities of feed and petroleum products are shipped in, and fruit, poultry, and eggs are shipped out. In June 1948 the controlling depth was 6½ feet to the mouth of Petaluma Creek. In September 1947 the controlling depth from the mouth to McNear Canal was 5 feet with a mid-channel depth of 7 feet; thence from McNear Canal to just above the turning basin at Petaluma, 8 feet; thence to the head of the project beyond the Washington Street bridge, 4 feet. A lighted buoy and an echo board are near the entrance to the channel across the flats. This channel is marked by lights. Above the entrance the chart is the guide. The creek is crossed by a highway bascule bridge and a railroad drawbridge near its mouth; a railroad swing bridge 1 mile below Petaluma, and by a railroad and two highway bridges in Petaluma. The controlling horizontal clearance of these bridges is 47 feet and the least vertical clearance is 4 feet.

A 3½-foot channel leads to **Hamilton Field.** The channel is southward of a line of lights and daybeacons. There is a tall black and yellow tank a little to the northward of the channel.

For regulations regarding anchorage grounds for San Pablo Bay, Carquinez Strait, and Suisun Bay, see Chapter 2, §202.224. The limits of the anchorages are shown on Charts 5533 and 5534.

Currents.—When the land water discharge is small, the times of the currents in San Pablo Bay, off Mare Island, and in Suisun Bay, follow the times of the currents in the Golden Gate by approximately 1, 2, and 3 hours respectively. See *Pacific Coast Current Tables* for more precise information.

Chart 5534.—Carquinez Strait connects San Pablo and Suisun Bays and is about 6 miles in length in a general easterly direction. For the first 3.5 miles it is a little less than 0.5 mile in width, and then expands to a width of about a mile. It is deep throughout with the exception of a small stretch of flats on the northern shore, and a small area in the bight on the southern shore near the eastern end. There are several small settlements on both shores.

The California State Maritime Academy and pier are in **Morrow Cove,** on the northern shore at the western entrance to the strait.

A fixed highway bridge crosses the strait at **Semple Point.** It is a cantilever bridge with one pier in the middle of the strait. The fog signal on the north side of the center pier is a bell, and the one on the south side is an air diaphone; there is a bell on the northern pier. An aviation light is on top of the center pier. The northern span has a horizontal clearance of 1,032 feet and the southern span has a horizontal clearance of 1,037 feet; vertical clearances are 157 feet at the north pier, 146 feet at the center pier, and 135 feet at the south pier.

Crockett, on the southern shore, is built around a large sugar refinery. The wharves accommodate the deep-draft vessels that discharge sugar from the Hawaiian Islands.

Overhead cables cross at a point about 0.3 mile west of Carquinez Strait Bridge with vertical clearances of 206 feet and another overhead cable crosses between **Eckley,** on the southern side of the strait and about 0.6 mile eastward of Crockett, and **Dillon Point** on the northern side, with a vertical clearance of 200 feet.

The grain elevators at **Port Costa,** on the southern shore, have been destroyed by fire. There is a light and a fog bell at Porta Costa and a light at the northwestern extremity of the old wharf ruins about 0.7 mile to the westward.

An oil wharf with deep water alongside is on Point Carquinez, about 0.5 mile southeastward of Port Costa. Several large oil tanks are on top of the hill above the wharf. A brickyard with a wharf for lighters and small craft is about 0.2 mile above the oil wharf.

A shoal spot, with a least depth of 12 feet, is 600 yards 176° from Benicia City Wharf Light. It is marked by a lighted bell buoy.

Benicia is on the northern point at the eastern entrance. The United States Army reservation and arsenal are at the eastern end of the town. For regulations regarding navigation in the vicinity of Benicia Arsenal, see Chapter 2, § 207.640. A railroad lift bridge across the strait from **Army Point** to **Suisun Point** has a horizontal clearance of 291 feet and vertical clearances of 71 feet closed and 136 feet open. Three fog signals are on the bridge, two on Pier 13 and the other on Pier 17. An automobile ferry operates between Benicia and Martinez.

Martinez, on the southern shore in the bight near the eastern entrance, is a town of some commercial importance. There are two wharves off the town. The shorter and westernmost pier is not used at present. The longer pier is used by light-draft vessels, fishermen, and yachts, and has a ferry slip built on the western side at about its mid-point. In 1950 there was 20 feet at the end of the pier. There is a small yacht harbor on the eastern side of this pier with depths of from 3 to 6 feet. It is protected in most weather. A harbor master, whose office is on the pier, assigns berths to yachts. Just to the eastward of the town are two piers built out to deep water and used for handling oil. In 1950 there was a depth of 35 feet at the face of the westerly T-shaped pier and 33 feet at the end of the easterly pier. Both piers are lighted and each has a fog signal.

Bulls Head Point shows as a rounding hill and is 100 feet high. The high brick stack on the point is prominent.

Chart 5534.—Suisun Bay is a broad shallow body of water with marshy shores and filled with numerous marshy islands, many of which have been reclaimed and are now under cultivation. It is practically the delta of the Sacramento and San Joaquin Rivers which empty in the eastern part of the bay. Two narrow winding channels, northern and southern, lead to the mouths of the rivers. They are well marked by buoys, daybeacons, and several lights. The rivers and the channels near their mouths have been improved by the Government with a view of increasing the depth, removing obstructions, and providing relief during seasons of freshet. The main channel has been dredged to 30 feet depth all the way to Stockton. In June 1949 the controlling depths were 30 feet in the main channel and 16 feet in the Seal Islands Channel. The bay is used by many light-draft vessels having local knowledge. Strangers should take a pilot if bound above Benicia. For regulations governing anchorage area in Suisun Bay, see Chapter 2, § 202.224.

Suisun Slough, emptying into the northwestern side of Suisun Bay about 5.5 miles northward of Benicia, has been improved by dredging, and in June 1946 there was a least depth of 8 feet to the head of navigation at **Suisun City,** about 15 miles above the entrance. The mean range of tide is about 5 feet. Fuel oil is carried by vessels of not over 6-foot draft, and rock for building purposes is barged out.

Northward of the main channel are two shallow bays, several islands, and many sloughs. **Grizzly Island** is separated from the mainland by **Montezuma Slough. Grizzly Bay,** very shallow, cuts into the island on the southwestern side. **Honker Bay** is just northward of the channel and is bounded on the north and east by **Dutton, Wheeler,** and **Chipps Islands. Spoonbill Creek** separates Chipps Island from **Van Sickle Island.** A light on Van Sickle Island is about 1.5 miles westward from Sherman Island North End Light. Entrance to Grizzly Bay from the eastward is by **Suisun Cutoff,** which passes westward of **Snag, Freeman,** and **Simmons Islands,** and eastward of **Ryer Island. Roe Island** is northward of the channel opposite Port Chicago. A white square house on piles is on the southern point of Roe Island.

At **Avon,** about 1.5 miles eastward of Bulls Head Point, an oil wharf has been built across the flats to the deep water of the channel to accommodate large oil tankers. The wharf is marked by two lights and a fog signal, privately maintained, sounded on an air-diaphragm horn. For Port Chicago and vicinity, see Chart 5575.

Sealbluff Landing, 4 miles eastward of Bulls Head Point, is the site of a former shipyard. The lumber wharf 0.5 mile eastward of Sealbluff Landing is still standing, but the mill has burned down. Three large Government piers are along the water front of Port Chicago, and the area is closed to navigation. For regulations regarding navigation along the water front of Port Chicago, see Chapter 2, § 207.640. An aviation light is on the hill about a mile southeastward of the town of **Port Chicago.**

The San Francisco and Sacramento Railroad maintains a car ferry between Mallard Island and Chipps Island. There is a ferry slip on each side of the channel; each is marked by two lights and a fog bell.

Pittsburg, a manufacturing town of growing importance, at the mouth of New York Slough, has rail connections and a small amount of water-borne commerce and is the center of a considerable fishing industry. The wharves have depths up to 33 feet alongside, and there is a yacht basin with about 6 feet of water. A **chart agency** of the U. S. Coast and Geodetic Survey is here.

Chart 5527.—Antioch, about 5 miles eastward of Pittsburg, is a manufacturing city with but little water-borne commerce. The water of the San Joaquin River is generally fresh at this point.

The **San Joaquin River** rises in the Sierra Nevada and flows 275 miles westerly and northerly to enter the eastern side of Suisun Bay on the southern side of **Sherman Island.** The river, a winding stream navigable for deep-draft vessels to Stockton, is tidal as far as Mossdale. The mean tidal range is about 6 feet at the mouth and 3 feet at the Stockton Channel. Major floods in the river valley occur from November to April, caused by intense general storms of several days duration. At the mouth of the river an ordinary flood will cause a rise of 8 feet and an extreme flood a rise of 10 feet in the river level. At Stockton, ordinary flood will cause a rise of 8½ feet, and extreme flood a rise of 13½ feet in the river level. The delta of the river is formed of many marshy islands intersected by sloughs and channels. The islands are reclaimed tule and cattail marshes which have been converted to agriculture. *Tule* is the name given to a tall aquatic plant growth similar to bulrush. Bordering the river are levees which are 12 feet or more higher than the land behind them.

Current reports of gage heights of the San Joaquin River Delta can be obtained from the Sacramento Weather Bureau Office at any time of the year. The information is published in the *Sacramento Bee* and, in addition, is reported on the radio broadcasts from station KFBK whenever the gage heights are of sufficient magnitude to be of general interest.

Information on gage heights can also be obtained from the State Department of Public Works, Division of Water Resources, Public Works Building, Sacramento.

The project for the San Joaquin River provides for a channel 30 feet deep and for a width of 400 feet below Criminal Point and 225 feet above that point from the mouth of New York Slough to Mormon Channel at Stockton; for a channel 26 feet deep and 100 feet wide thence to Edison Street; for a 9-foot depth thence to the head of navigation at El Dorado Street; for a 9-foot depth in Fremont Channel and McLeod Lake, arms of Stockton Channel; and for a channel 9 feet deep and 100 feet wide in Mormon Channel from its mouth to Center Street, head of navigation. It also provides for suitable passing and settling basins and a turning basin.

In June 1949 the controlling depths in the channel were 30 feet to Mormon Channel; 22 feet to Edison Street; thence 10 feet to El Dorado Street and in Fremont Channel and McLeod Lake (Stockton Harbor); Mormon Channel, 3 feet; and from the junction of Stockton Channel to Hills Ferry, 4 feet.

Anchorages.—For regulations regarding anchorages in San Joaquin River, see Chapter 2, § 202.224.

Two overhead cables cross the main channel about 2 miles eastward of Antioch. The vertical clearance is 140 feet. The Antioch Bridge, about 0.6 mile eastward of the eastern end of West Island, has a lift span with a horizontal clearance of 265 feet and a vertical clearance of 70 feet lowered and 135 feet raised.

Four overhead cables cross the San Joaquin River below Stockton and the minimum vertical clearance is 135 feet.

From the span of the Antioch Bridge the channel crosses to the eastern side, passing close to **Blind Point** and **Jersey Point.** False River enters about 0.6 mile northeastward of Jersey Point. This river is described later. The channel follows the **Bradford Island** shore to the turn where it swings northward along **Twitchell Island** shore, and then swings back to Bradford Island, with **Santa Clara Shoal** between the channel and Twitchell Island. After passing the mouth of Fishermans Cut, it swings northward close to **Oulton Point,** again skirting the point of Twitchell Island to the mouth of Sevenmile Slough, and then turns southerly between tule banks and **San Andreas Shoal.** Then the channel turns sharply southward at **Webb Point** to **Potato Point.**

Mokelume River enters from the eastward opposite Webb Point. This river is described later. Potato Slough enters from the eastward at Potato Point. Old River enters from the southward at this point. The channel then continues southward by **Haynes Point** to **Prisoners Point;** then enters the **Mandeville Cut,** crossing Middle River, and continuing through **Venice Cut** and through **Burns Reach,** it enters **Wards Cut,** where Little Connection Slough from the northward intersects. Disappointment Slough enters the channel from the eastward. **Hog Island Cut** is the last cut on the river, whence, to the Stockton Channel, the channel follows the river. Turner Cut enters Hog Island Cut from the southwestward.

Caution.—At Mandeville and Venice Cuts, care must be exercised in navigating the dredged channel of the San Joaquin River. The river still follows its old channel and violent sheers are experienced if the navigator is not prepared to meet the river current when passing from the cuts into the river and from the river into the relatively quiet waters of the dredged channel.

Maximum speed.—For regulations regarding maximum speed on San Joaquin River, see Chapter 2, § 207.640.

Directions, San Joaquin River.—Detailed directions are not given for this river. Deep-draft vessels should have no difficulty with the chart as a guide. The channel is well marked between Antioch and Stockton.

Regulations.—For rules and regulations to govern use, administration, and navigation of the San Joaquin Channel, see Chapter 2, § 207.640.

Stockton is in the center of the fertile San Joaquin Valley. The harbor, which is open to deep-water traffic, is near the westerly city limits.

Tides and currents.—The mean range of tide is 3 feet and the tidal current is negligible.

Pilots.—River pilots may be obtained by calling the offices of the Masters, Mates and Pilots of America, 14 Ferry Building, San Francisco.

Towage.—It has not been necessary for towage companies to operate at this port because all vessels have operated under their own power. A tugboat of 260 horsepower is available.

Quarantine.—Information is given under San Francisco previously in this chapter.

Customs matters are handled through the customhouse in San Francisco.

Wharves.—There are three terminals at the Port of Stockton: the general cargo terminal for deep-draft vessels, the oil terminal, and the general shallow-draft terminal. The wharves for deep-water shipping are on the southern side of the channel westward of the turning basin. They are of modern concrete construction, with a total-berthing space of over 3,000 lineal feet, capable of accommodating seven vessels at a time. These wharves are provided with ample transit shed areas, railroad facilities, and cargo handling equipment. In 1950 the depths at the deep-water berths ranged from 29 to 33 feet. The wharves eastward of the turning basin are for small craft and river steamers. The average depth alongside these shallow-draft wharves is 9 feet.

Storage.—There are warehouses available for general cargo, grain, cotton, and cement, and facilities for the storage of crude molasses and lumber. The oil terminal is just westward of the port docks. Rough and Ready Island, west of the San Joaquin River, is restricted to Government use.

Lighterage.—There is practically no lighterage service.

Supplies.—Supplies and water may be obtained in any quantity. Gasoline and oil are available for small craft. There are no provisions for bunkering large vessels.

Repairs.—There are several small marine railways and a skidway at Stockton. Vessels up to 125 feet in length and 300 tons in weigth can be hauled out. A machine shop is available.

Communication.—Communication may be had to all points in the United States by railroad, bus, truck, airplane, telephone, and telegraph.

The San Joaquin River, from its junction with Stockton Channel, is navigable to Hills Ferry, a distance of 75 miles. Navigation above the Southern Pacific Railroad bridge near Lathrop is impractiable in the low stages after June. The river is tidal as far as Mossdale. At the San Joaquin Bridge the ordinary flood range is 17 feet and the extreme flood is 21 feet. At Hills Ferry the ordinary flood is 12 feet and extreme flood, 16 feet.

Current reports of gage heights of the San Joaquin River below the mouth of the Tuolumne River can be obtained from the Sacramento Weather Bureau Office at any time of the year. The information is published in the *Sacramento Bee* and, in addition, is reported on the radio broadcast from station KFBK whenever the gage heights are of sufficient magnitude to be of general interest. Gage heights of the San Joaquin River above the mouth of the Tuolumne River can be obtained from the Fresno Weather Bureau Office.

Information on gage heights can also be obtained from the State Department of Public Works, Division of Water Resources, Public Works Building, Sacramento.

Bridges.—Fifteen bridges cross the river between Stockton and Hills Ferry; regulations governing their operation are given in Chapter 2, § 203.714. The vertical bridge clearances stated are the clearance at mean higher high water for bridges to San Joaquin City, about 64 miles above the mouth, and at low water for bridges beyond that point. The Stockton Port District railroad bridge just above

the junction with Stockton Channel is a swing bridge with a horizontal clearance of 100 feet and a vertical clearance of 13 feet. The San Joaquin County Highway bridge, a short distance above the railroad bridge, has a swing span with a horizontal clearance of 102 feet on the north and 70 feet on the south side, and a vertical clearance of 14 feet. The Atchison, Topeka and Santa Fe Railway bridge about 1.3 miles above the junction with Stockton Channel is a bascule bridge with a horizontal clearance of 98 feet and a vertical clearance of 13 feet. The Garwood Ferry Highway bridge, 2.2 miles above the junction with Stockton Channel, is a swing bridge with a horizontal clearance of 102 feet on the east side and a vertical clearance of 13 feet. Brandt Highway Bridge, 6.5 miles above the junction with Stockton Channel, is a swing bridge with a horizontal clearance of 103 feet and a vertical clearance of 15 feet.

Four bridges cross the San Joaquin River near Lathrop. The Southern Pacific Company railroad bridge, 14.2 miles above the junction with Stockton Channel, is a vertical lift bridge with a horizontal clearance of 100 feet and a vertical clearance of 121 feet raised and 23 feet closed. The Mossdale Highway Bridge, 14.3 feet above the junction, is a bascule bridge with a horizontal clearance of 100 feet and a vertical clearance of 27 feet. A bascule highway bridge, 14.3 miles above the junction, parallels the Mossdale Highway Bridge; its horizontal clearance is 88 feet and vertical clearance, 24 feet. The Western Pacific Railroad bridge, 14.8 miles above the junction, is a swing bridge with a horizontal clearance of 81 feet and a vertical clearance of 22 feet.

Between **Paradise Dam** and Hills Ferry, which is the head of navigation, are the following bridges: the San Joaquin City-Durham Ferry bridge, 29.7 miles above the junction with Stockton Channel, a bascule highway bridge with a horizontal clearance of 120 feet and a vertical clearance of 21 feet. At **Modesto,** 37.4 miles above the junction, a fixed highway bridge with a horizontal clearance of 130 feet and a vertical clearance of 39 feet. At **Grayson,** 46.8 miles above the junction, a bascule highway bridge with a horizontal clearance of 130 feet and a vertical clearance of 19 feet. At **Patterson,** 59.5 miles above the junction, a removable-span highway bridge with a horizontal clearance of 20 feet and a vertical clearance of 21 feet. At **Crows Landing,** 65.1 miles above the junction, a bascule highway bridge with a horizontal clearance of 110 feet and a vertical clearance of 25 feet. At **Hills Ferry,** 74.6 miles above the junction, a bascule highway bridge with a horizontal clearance of 100 feet and a vertical clearance of 20 feet. The drawbridges above Paradise Dam require at least seven days' advance notice.

Chart 5527.—The tributaries of the San Joaquin River are the feeder rivers, sloughs, and canals which flow into or connect with it. They are described in sequence as the river is ascended. Bridge clearances are at mean higher high water.

Bordering the various waterways are levees which are 12 feet or more higher than the land behind them. The levees are built up from dredged material taken from the adjacent waterway, and due to settlement of the levees, dredging has to be done periodically to keep the top at height and grade. As material is needed for levee work, the dredge pays more attention to the requirements of the levee than to the depth of the channel for navigation purposes. This leaves an uneven

bottom. The tops of the levees for the most part have dirt roads. Tule is often found growing on the channel side of the levees.

Practically all of the waterways are used for navigation, either by pleasure craft or by commercial vessels. The pleasure craft draw from 1½ to 4 feet, while tugs and barges draw from 4 to 9 feet. There are very few wharves on these sloughs. The boats and barges using the channels make fast alongside the levee at practically any place desired. Usually landings are made at various sheds shown on the levee.

Caution.—The river and its tributaries are crossed by ferries which are guided by cables fastened to shore, and sometimes propelled by a cable rig attached to the shore. Caution must be used not to navigate in the vicinity of the ferry lane when the ferry is underway because of the danger of fouling the cables.

Dutch Slough enters the San Joaquin at Blind Point, about 1.5 miles from Antioch bridge; to eastward it joins **Sand Mound Slough** which in turn makes junction with Old River at a point about 2.5 miles from the mouth. Two fixed bridges cross the slough; the Jersey Island bridge, between **Jersey Island** and **Veale Tract,** a fixed highway bridge with a horizontal clearance of 13 feet and a vertical clearance of 10 feet, and the Farrar Park bridge, between **Bethel Tract** and Veale Tract, a fixed highway bridge with a horizontal clearance of 11 feet and a vertical clearance of 8 feet.

False River enters the San Joaquin about 0.6 mile northeastward of Jersey Point and connects with the Old River near its mouth, about 2.6 miles to eastward. **Taylor Slough** and **Piper Slough** branch off from False River to southward and connect with Dutch Slough and Sand Mound Slough, respectively. **Fishermans Cut** branches to northward and joins the San Joaquin.

Threemile Slough, about 1.5 miles north of the mouth of False River, follows a northerly and westerly direction for about 2.5 miles and joins the Sacramento at the north end of Decker Island. The slough is a route frequently used by river steamers making passage between Sacramento and Stockton. Near the junction with the Sacramento is a highway swing bridge with a horizontal clearance of 150 feet and a vertical clearance of 11 feet. Parallel with and close by the swing bridge is a highway lift bridge with a horizontal clearance of 150 feet and a vertical clearance of 10 feet. In the same vicinity an overhead cable with a clearance of 120 feet crosses the river.

Sevenmile Slough enters the San Joaquin at a point 1.5 miles northeastward of Oulton Point.

The **Mokelumne River,** one of the principal tributaries of the San Joaquin, rises in the Sierra Nevada and empties into the San Joaquin at a point about 17.4 miles above the mouth of the latter. The river separates, 3.5 miles above its mouth, into two branches, the **North Fork** and the **South Fork.** The forks continue in a northerly direction and rejoin at **New Hope Landing,** about 11 miles north-northeastward from the mouth. The river then describes a semi-circular route to the northward and eastward to the head of navigation at the Galt-New Hope bridge, a distance of about 7 miles.

The existing project provides for the removal of snags and obstructions and occasional dredging of shoals from the mouth of the river to Galt-New Hope bridge, a distance of 30.4 miles, including both forks.

In June 1949 the controlling depths were as follows: Mouth of the river to lower junction north and south forks, 12 feet; lower junction north and south forks to Snodgrass Slough via north fork, 9 feet; Snodgrass Slough to upper junction north and south forks via north fork, 2 feet; lower junction north and south forks to upper junction of same at New Hope Landing via south fork, 8 feet; New Hope Landing to Galt-New Hope bridge, 3 feet.

The Mokelumne River is crossed by the following bridges: a highway swing bridge, about 0.8 mile below the junction of north and south forks, having a horizontal clearance of 100 feet and a vertical clearance of 8 feet. A highway swing bridge, near the junction of North Fork, Mokelumne River and Snodgrass Slough, having a horizontal clearance of 84 feet. A highway swing bridge near the upper junction of the north and south forks, with a horizontal clearance of 55 feet and a vertical clearance of 8 feet. A highway swing bridge, just below the junction of the Cosumnes and Mokelumne Rivers, with a horizontal clearance of 65 feet and a vertical clearance of 14 feet. A railroad swing bridge, about 0.4 mile above junction of Cosumnes and Mokelumne Rivers, with a horizontal clearance of 61 feet and a vertical clearance of 16 feet. A highway swing bridge at **Thornton,** the head of navigation, with a horizontal clearance of 62 feet and a vertical clearance of 16 feet. For regulations governing opening of these bridges, see Chapter 2, § 230.714.

At low-river stages the range between mean lower low water and mean higher high water at the mouth is 4 feet, with extreme tidal range of 5 feet; there is no tide at the upper end, just above Galt-New Hope bridge. Ordinarily flood fluctuation is 5½ feet at the mouth and 12 feet at the upper end. Extreme flood fluctuation is 8 feet at the mouth and 17 feet at the upper end.

Freight is handled at small wharves, landings, or on the banks at various points.

Beaver Slough, a tributary of the South Fork, Mokelumne River, enters that river about 2.5 miles below the bridge at New Hope Landing. A highway removable-span bridge crosses the slough about 2 miles above the mouth. The horizontal clearance is 68 feet and the vertical clearance is 9 feet.

Georgiana Slough enters the Mokelumne River about 3 miles above the mouth, and connects that river with the Sacramento River at Walnut Grove. There is deep water the entire length of the slough. River steamers formerly used the slough in making the run from Sacramento to Stockton, but to avoid the snags and sharp turns they now favor the route through Threemile Slough.

Three bridges cross Georgiana Slough. A highway swing bridge, 3.9 miles above the mouth, has a horizontal clearance of 80 feet and a vertical clearance of 10 feet. A railroad bascule bridge, 5 miles above the mouth, has a horizontal clearance of 80 feet and a vertical clearance of 11 feet. A highway swing bridge, 10.8 miles above the mouth and near Walnut Grove, has a horizontal clearance of 80 feet. For regulations governing opening of these bridges, see Chapter 2, § 203.715.

Snodgrass Slough, a tributary of the North Fork, Mokelumne River, enters that river near the upper junction of north and south forks, Mokelumne River. The slough is crossed by two bridges as follows: a railroad swing bridge, about 2 miles above upper junction Mokelumne River, with a horizontal clearance of 66 feet and a vertical clearance of 17 feet. A highway swing bridge, about 0.8 mile

above the railroad bridge, with a horizontal clearance of 75 feet and a vertical clearance of 19 feet. For regulations governing opening of these bridges, see Chapter 2, § 203.714.

Potato Slough enters the San Joaquin about 0.7 mile above the mouth of the Mokelumne River. It joins **Little Potato Slough** and **Little Connection Slough** about 3.3 miles to the eastward. Little Connection Slough joins the San Joaquin at **Wards Island** to the southward and Little Potato Slough joins the South Fork, Mokelumne River, at Terminous to the northward. There is a small amount of barge traffic on the river but most commodities are shipped by rail or truck.

The Western Pacific Railroad has warehouses at **Terminous.** At this town a highway swing bridge across the slough has a horizontal clearance of 100 feet and vertical clearance of 11 feet. For regulations governing opening of this bridge, see Chapter 2, § 203.714.

The **Old River** leaves the San Joaquin about 47 miles above the mouth and enters about 0.7 mile above the mouth of Potato Slough. It is the most westerly branch of the interconnecting tidal channels into which the San Joaquin divided in crossing its delta.

The project provides for the easing of three sharp bends between its mouth and Orwood (Santa Fe) Bridge; a channel 10 feet deep to the Santa Fe wharves and Phillips Cannery at Orwood Station; entrances 8 feet deep to the Fabian-Bell Canal at its western end, and just westward of the Grant Line Highway Bridge; enlargement of Grant Line Canal, westward of Doughty Cut, to a depth of 10 feet; a channel 10 feet deep from the westerly end of Doughty Cut to the Holly Sugar Factory; a channel 8 feet deep from the southerly end of Doughty Cut to the head of Old River; and a channel 6 feet deep in the original channel of Old River from the westerly end of Grant Line Canal to the Lammers Ferry Road.

In June 1949 the controlling depth was 9 feet up to Grant Line Canal; in the several channels above there, the project depths, are available.

The following bridges cross Old River: A railway bascule bridge at **Orwood** having a horizontal clearance of 98 feet and a vertical clearance of 10 feet. A highway swing bridge above North Victoria Canal and connecting **Victoria Island** with **Bryan Tract,** has a horizontal clearance of 100 feet in the left span and 98 feet in the right span, and a vertical clearance of 10 feet. A highway fixed bridge at **Naglee** has a horizontal clearance between middle pier and north shoreline of 67 feet and a vertical clearance of 13 feet. **Caution.** Under this bridge old piling spaced 20 feet apart bares at mean lower low water, and care must be used to avoid the piles.

Old River has many sloughs and canals which connect with the Middle River to the eastward. The principal ones in ascending order are as follows: **Connection Slough** separating **Mandeville Island** and **Bacon Island; North Victoria Canal** between Woodward Island and Victoria Island; **Victoria Canal** between Victoria Island and **Union Island;** the **Grant Line Canal** and **Fabian-Bell Canal** between Union Island and **Fabian Tract. Tom Paine Slough** enters the Old River above Grant Line Canal.

Connection Slough is crossed by a pontoon bridge with a horizontal clearance of 85 feet.

Grant Line Canal is crossed by a highway swing bridge with a horizontal clearance of 94 feet and a vertical clearance of 12 feet.

Tom Paine Slough is crossed by a private highway fixed bridge with a horizontal clearance of 14 feet and a vertical clearance of 7 feet. The tidal range between mean lower low water and mean higher high water at the head of Old River is about 2 feet, and at its mouth about 4 feet; ordinary flood fluctuations are, respectively, 15 feet and 5½ feet, and extreme flood fluctuations are, respectively, 19 and 8 feet.

The Santa Fe Railway has a warehouse and wharf at Orwood for transfer of farm produce from boat to rail. The Phillips cannery at Orwood has similar facilities. The Holly Sugar Company refinery and terminal near Tracy has a large wharf and an unloading basin; a passing basin is about 0.5 mile downstream from the terminal. Along the project channel are about 100 private bank-landings; some have sheds for storage.

Middle River enters the San Joaquin about 2 miles above the mouth of Old River. The river and connecting channels are a part of a complicated network of tidal canals, some natural and some artificial, in the delta of the San Joaquin. One of the principal channels, Middle River, is a bychannel of the San Joaquin, leaving Old River above the city of Stockton and rejoining the San Joaquin about 13 miles below the city. Middle River is not considered navigable any farther upstream than Union Island (Mowry) bridge, 22.3 miles above the mouth.

Turner Cut enters the San Joaquin 6 miles upstream from Middle River and is connected by **Empire Cut,** an artificial waterway, with **Latham Slough** and Middle River. **Whiskey Slough** terminates in a dead end at a point 3 miles above its junction with Turner Cut.

The project provides for a channel 9 feet deep in Middle River below Borden Highway Bridge, in Latham Slough between Middle River and Empire Cut, and in Empire Cut, Whiskey Slough, and Turner Cut between Middle River and San Joaquin River.

In June 1949 the controlling depth was 9 feet in all of the channels.

Four drawbridges and a fixed bridge cross Middle River as follows: The Atchison, Topeka and Santa Fe Railway bridge at **Middle River,** 8.5 miles above the mouth, has a bascule span with a horizontal clearance of 90 feet and a vertical clearance of 10 feet. The highway swing bridge between Victoria Island and **Drexler Tract,** about 13 miles above the mouth, has a horizontal clearance of 105 feet and a vertical clearance of 13 feet. The highway bridge between Union Island and Drexler Tract, at **Fish Camp Landing,** about 15 miles above the mouth, has a swing span with a horizontal clearance of 100 feet and a vertical clearance of 12 feet. The Williams bridge between Union Island and **Roberts Island,** about 19.3 miles above the mouth, is a highway swing bridge with a horizontal clearance of 75 feet and a vertical clearance of 16 feet. The Union Island (Mowry) bridge between Union Island and Roberts Island, about 22.3 miles above the mouth, is a highway fixed bridge with a horizontal clearance of 45 feet and a vertical clearance of 18 feet. The vertical clearances of the drawbridges are at mean high water. For regulations governing opening of these bridges, see Chapter 2, § 203.714.

The mean range of the tide is about 3 feet during stages of extreme low water.

There are no extensive terminal facilities on these waterways, other than bank landings along the channels. At Middle River is one large wharf with warehouse and rail connection.

Disappointment Slough enters the San Joaquin about 2.5 miles above the mouth of Middle River. The slough connects with **White Slough** by **Honker Cut** and **Bishop Cut.** A highway swing bridge across Honker Cut, at the western end of **King Island** has a horizontal clearance of 75 feet and vertical clearance of 7 feet. A highway swing bridge crossing Bishop Cut has a horizontal clearance of 75 feet and a vertical clearance of 7 feet. For regulations governing opening of the bridges, see Chapter 2, § 203.714.

Fourteenmile Slough enters the San Joaquin at **Morrison Island,** about 4.5 miles above the mouth of Disappointment Slough, and joins the latter near its junction with Bishop Cut.

Burns Cutoff, a channel with a ruling depth of 4 feet, branches off to the westward from the San Joaquin 0.8 mile above the junction with Stockton Channel and rejoins the river about 2 miles below the junction, thus forming **Rough and Ready Island.** The cutoff is crossed by two bridges as follows: The Lower (Jacobs Road) Highway bridge, 1.4 miles above the mouth, is a swing bridge with a horizontal clearance of 75 feet and a vertical clearance of 13 feet. The Upper Highway bridge, 2.6 miles above the mouth, is a swing bridge with a horizontal clearance of 61 feet on the north and 67 feet on the south side, and a vertical clearance of 10 feet.

Mormon Slough enters the Stockton Channel from the southeastward at the end of the turning basin. The present project provides for a channel 9 feet deep to Center Street, but in 1950 a proposed project calls for this depth to Main Street only, inasmuch as the remainder of the slough is being filled. In May 1948 the controlling depth in Mormon Slough to Main Street was 10 feet.

Sacramento River rises in the Trinity Mountains in north central California, flows in a general southerly direction 324 miles, and enters the eastern side of Suisun Bay on the northern side of Sherman Island. The river has been improved by dredging to Sacramento and by snagging to Red Bluff, about 246 miles above the mouth. The project provides for the development of a ship channel 30 feet deep and 200 to 300 feet wide from deep water in Suisun Bay to Washington Lake; a basin of equal depth, 1,000 feet wide and 1,200 feet long at Washington Lake; and a connecting canal 13 feet deep and 120 feet wide, with lock and drawbridge, thence to Sacramento River; thence 6 feet deep at low water to Colusa; thence 5 feet deep at low water to Chico Landing; and such depths as practicable thence to Red Bluff. The 10-foot project by the river route has been completed and is still to be maintained for local navigation.

In June 1949 the controlling depths in the channel were: From the mouth of the river to the mouth of Cache Slough, 20 feet; thence to Sacramento, 10 feet; thence to Colusa, 2½ feet in low water season; thence to Sidds Landing 178 miles above the mouth, 3 feet. There is no regular navigation above Colusa.

There is regular steamer service between San Francisco and Sacramento. Most of the river landings have been abandoned, but there is occasional traffic by

barges and tugs between river points and San Francisco. Bridges and submarine cables cross the river. The submarine cables are marked by signs.

Currents in the Sacramento River depend on the river stage. During high-river stages there is little or no flood current and the ebb current is strong to Sacramento. During the dry season a flood current can be carried to Paintersville and from there slack water to Freeport. At times of extreme low-river stages flood current may be evident as far as Sacramento. Local knowledge is required to estimate current conditions for a particular time.

Major floods in the Sacramento River valley usually occur from November to April and are generally caused by intense general storms of several days' duration, the run-off from which may be augmented by the melting of snow in the mountains. At the mouth of the river an ordinary flood will cause a rise of 8 feet and an extreme flood a rise of 10 feet in the river level. At Sacramento ordinary flood will cause a rise in the river level of 20 feet and extreme flood, a rise of 30 feet.

Current reports of gage heights of the Sacramento River can be obtained from the Sacramento Weather Bureau Office at any time of the year. The information is published in the *Sacramento Bee* and, in addition, is reported on the radio broadcast from station KFBK whenever the gage heights are of sufficient magnitude to be of general interest.

Information on gage heights can also be obtained from the State Department of Public Works, Division of Water Resources, Public Works Building, Sacramento.

Directions, Sacramento River.—From a position 200 yards northward of Mallard Island car ferry slip, steer 087° for 1.4 miles to a position 200 yards northward of lighted bell buoy off New York Point; then the course is **054°**, distance 1.5 miles to abeam Van Sickle Island Light, distant 300 yards. Alter course gradually to **085°**, distance on course 1.1 miles to a position 200 yards northward of Point Sacramento Light. Lighted buoy northwest of Fraser Shoal will be passed 125 yards to starboard. After passing Point Sacramento Light, set a mid-channel course. Keep to mid-channel or slightly favor the western shore until Rio Vista is reached. The bridge opening here is on the western side of the river. Take the right-hand or eastern fork 1.4 miles above the Rio Vista Bridge, keeping near mid-channel and favoring the ebb-tide bends. **Ida Island** is 1.2 miles above that fork.

From Ida Island for a distance of 3.5 miles upstream there are shifting shoals. After passing Ida Island, work gradually over to the southern shore and keep within 200 feet or less of it until near the bridge above Isleton, then gradually work over to the western half of the channel and favor that side around the next bend. From this point to Clarksburg the channel is all clear, and mid-channel courses may be followed favoring the ebb-tide bends. At Clarksburg favor the eastern shore a little until just past the town, then swing into mid-channel again. From just below Freeport the channel is rather shoal and wing dams have been built at several places to scour out the channel. These are covered at high-water stages and may be struck if the shore is approached too closely. By favoring the ebb-tide bends no trouble should be encountered from here to Sacramento.

Note.—Care should be exercised at all times to keep clear of the levees, as most of them are faced with rock which may damage vessels that drag along them.

Chart 5527.—Rio Vista, about 9.5 miles above the mouth of the river, is the most important town commercially below Sacramento. Gasoline, Diesel and lubricating oils, and provisions may be obtained. There are hotels, telephone, and bus service. A highway bridge with a double-bascule span across the river at the northern end of the town has a horizontal clearance of 200 feet, and vertical clearance of 13 feet.

About 1.4 miles above the highway bridge the rive turns sharply eastward and Cache and Steamboat Sloughs enter from the northward.

Isleton, on the south bank, is about 4 miles above Rio Vista. There is an oil landing where gasoline and other petroleum products, and supplies in moderate quantities may be obtained. Communication may be had by rail, telegraph, telephone, or bus. A highway bridge with a double-bascule span across the river about 0.7 mile above Isleton has a horizontal clearance of 200 feet and vertical clearance of 15 feet. About 0.5 mile above Isleton, on the south bank, are conspicuous grain elevators.

Ryde is a small village with a hotel and telephone communication about 5 miles above Isleton.

Chart 5528.—Walnut Grove, 2.8 miles above Ryde, is at the junction of Georgiana Slough and the Sacramento River. Gasoline, oils, and supplies may be obtained in moderate quantities. There are railroad, telephone, telegraph, and paved highway connections. The river is crossed here by a highway bridge with a double-bascule span having horizontal clearance of 200 feet and vertical clearance of 17 feet. Five miles above Walnut Grove at the small village of **Paintersville,** a highway bridge with a double-bascule span across the river has horizontal clearance of 200 feet and vertical clearance of 21 feet. For regulations governing opening of these bridges, see Chapter 2, § 203.716.

Courtland is about 6 miles above Walnut Grove. Supplies may be had in moderate quantities, and gasoline and oils may be obtained from an oil company's landing. There are hotel accommodations and telephone and telegraph service.

Hood is a small village on the east bank 3.5 miles above Courtland.

The small village of **Clarksburg** is about 2.8 miles above Hood. Two oil companies have landings here and it is a distributing point for petroleum products.

Freeport is a small town about 3 miles above Clarksburg. Gasoline, oils, and provisions may be obtained in small quantities. There is railroad, telegraph, and telephone service. The highway bascule bridge at Freeport has a horizontal clearance of 200 feet and a vertical clearance of 27 feet.

Two bridges cross at Sacramento. The Capitol Street bridge is a railway and highway vertical-lift bridge with a horizontal clearance of 170 feet and a vertical clearance of 100 feet when raised. The H Street bridge is a railway and highway swing bridge with a horizontal clearance of 150 feet and a vertical clearance of 29 feet. For regulations governing opening of the swing bridge, see Chapter 2, § 203.716.

A paved highway between Antioch and Sacramento runs along the levee of the river for nearly its entire distance.

Sacramento, the State capital, is the head of navigation for most of the shipping on the river. A draft of well over 10 feet can be carried to Sacramento ex-

949285—52——17

cept at low-river stage, which usually occurs during July, August, and September. Dredges work as needed during this period to maintain a depth of 10 feet.

Tide.—At low-river stages the mean range of tide at Sacramento is 2½ feet, but at other stages it is negligible. Currents have been described earlier.

Pilots.—The River Lines, acting for the city of Sacramento, will furnish pilots between Sacramento and other points on the Sacramento River, San Joaquin River, and San Francisco Bay area, on call.

Towage.—Towboats up to 750 horsepower will be furnished by the River Lines, on call.

Quarantine, customs, and immigration.—Control is exercised by the offices of these services having jurisdiction over San Francisco Bay.

Wharves.—On both sides of the river the wharves have ample depths alongside to accommodate vessels able to negotiate the river. There are transit sheds and storage warehouses.

Lighterage.—Nearly all freight is handled by shipside loading, shifting the ship if necessary.

Supplies.—Fuel and Diesel oils and water are available; coal for bunkers is not supplied.

Repairs.—A skidway has a depth of water over the foot of about 3½ feet at extreme low water. Flat-bottom river craft up to 6-foot draft can be handled on the marine ways.

Communications.—Two railroads serve the city. There is airplane service in all directions.

Bridges.—The following bridges cross the Sacramento River above the city. All vertical clearances are at low water. A railway swing bridge, about 77.8 miles above the mouth, has a horizontal clearance of 105 feet and a vertical clearance of 32 feet. A highway bascule bridge, about 0.2 mile above the railway bridge, has a horizontal clearance of 200 feet and a vertical clearance of 37 feet. A railway and highway swing bridge, about 116.3 miles above the mouth, has a horizontal clearance of 150 feet and a vertical clearance of 29 feet. A highway swing bridge, about 124.6 miles above the mouth, has a horizontal clearance of 94 feet and a vertical clearance of 28 feet. A highway swing bridge, about 146.2 miles above the mouth, has a horizontal clearance of 105 feet and a vertical clearance of 35 feet. A highway swing bridge, about 174.6 miles above the mouth, has a horizontal clearance of 135 feet and a vertical clearance of 29 feet. A highway swing bridge, about 189.8 miles above the mouth, has a horizontal clearance of 115 feet and a vertical clearance of 29 feet. A highway vertical lift bridge, about 199.7 miles above the mouth, has a horizontal clearance of 160 feet and a vertical clearance of 29 feet. A railway swing bridge, about 35 yards beyond the vertical lift bridge, has a horizontal clearance of 100 feet and a vertical clearance of 25 feet. A highway fixed bridge is at Red Bluff, the head of navigation. For regulations governing opening of these bridges, see Chapter 2, §203.716.

Above Sacramento the prevailing flood conditions are as follows: At Verona at the junction of Feather River and 70 miles above the mouth, 20 feet at ordinary floods and 24 feet at extreme floods. At **Colusa,** 125 miles above the mouth, 25 feet at ordinary and 32 feet at extreme floods. At **Chico Landing,** 167 miles above

the mouth, 20 feet at ordinary and 25 feet at extreme flods. At **Red Bluff,** 214 miles above the mouth, 24 feet at ordinary and 29 feet at extreme floods.

Between Sacramento and Chico Landing are 47 warehouses and numerous small landings. Freight is also handled on the bank.

Charts 5527, 5528.—The principal rivers and sloughs which flow into the Sacramento are described in sequence as the river is ascended. The vertical clearances of the bridges is at mean higher high water.

Threemile Slough enters the Sacramento River from the east at the northern end of **Decker Island.** The slough is described under the tributaries of the San Joaquin River.

Cache Slough and Steamboat Slough join and enter the Sacramento about 1.7 miles above Rio Vista bridge. Cache Slough has many smaller sloughs flowing into it, the largest of them being **Lindsey Slough, Shag Slough, Prospect Slough,** and **Miner Slough. Steamboat Slough** leaves the river about 0.8 mile southward of Paintersville bridge. The largest tributary of Steamboat Slough is **Sutter Slough** which joins Miner Slough at a point about 5 miles northwesterly of Walnut Grove. **Elkhorn Slough** joints Sutter Slough about 3 miles northerly of this point.

Miner Slough is crossed by two bridges. A highway swing bridge, about 1.2 miles west of the junction of Miner and Sutter Sloughs, has a horizontal clearance of 72½ feet and a vertical clearance of 19 feet. A pontoon bridge, about 2.4 miles northeasterly of the junction at Miner and Cache Sloughs, has a horizontal clearance of 85 feet.

A bascule highway bridge across Steamboat Slough at its junction with the Sacramento at the head of **Grand Island** has a horizontal clearance of 75 feet and vertical clearance of 21 feet. A highway swing bridge across Sutter Slough at its junction with the Sacramento has a horizontal clearance of 75 feet and vertical clearance of 20 feet. For regulations governing opening of these bridges, see Chapter 2, § 203.716.

A highway removable-span bridge across the junction of Elkhorn and Sutter Sloughs has a horizontal clearance of 44½ feet and vertical clearance of 18 feet.

American River, one of the principal tributaries of the Sacramento River, rises in the Sierra Nevada, flows in a westerly direction and enters the Sacramento about 1 mile above the city. The river is not navigable.

Feather River rises in the Sierra Nevada and empties into the Sacramento at **Verona,** about 18 miles above the city. The river has been improved by snagging and the construction of wing dams at **Marysville,** about 26 miles above the mouth. The controlling depth is usually 3 feet from about February 15 to June 15. Ordinary flood fluctuation is 20 feet and extreme flood fluctuation is about 25 feet. With the exception of several small privately-owned landings, all loading is handled on the banks. There has been no commercial navigation on the Feather River in recent years. A highway swing bridge across the river about 8.4 miles above the mouth has a horizontal clearance of 100 feet and vertical clearance of 35 feet at low water (September 1915). A railroad fixed bridge crosses at Marysville, 24.7 miles above the mouth.

Chart 5599.—From Duxbury Point, described earlier in this chapter, the coast swings northwestward for about 1.3 miles to Bolinas Point.

Bolinas Point, 160 feet high, is the western point of the comparatively level tableland extending eastward to Bolinas Lagoon. Owing to its proximity to Duxbury Point, it is not particularly prominent. The radio towers of a large commercial transmitting station about 0.6 mile northward of the point are prominent. There are about 20 steel towers and nearly 100 wooden towers covering an area about 0.5 mile square, with no apparent design when viewed from seaward and no particularly prominent tower. The power house, brown with red roof, is about the most conspicuous part of this station.

From Bolinas Point to Double Point, about 3.5 miles, the coast is bold with high rocky cliffs bordered by narrow sand beaches and no outlying dangers outside the 10-fathom curve.

A vessel stranded close inshore about 500 yards northward of Bolinas Point is breaking up.

Double Point has two high spurs about 0.4 mile apart extending 320 and 200 yards from the coastline. The southerly one, which is the longer and lower spur, has a rock close under the point and nearly connected with it at low water. About 250 yards off the northern spur is a small island 47 feet high.

From Double Point the rocky cliffs, 100 to 200 feet high, extend westward and northward for about 6 miles to the sand dunes near the eastern part of Drakes Bay.

Drakes Bay, named after Sir Francis Drake who anchored here in 1579, affords shelter in northwesterly weather in 5 to 6 fathoms, sandy bottom. From the western headland, which is the eastern termination of the ridge forming Point Reyes, high white cliffs extend northward and eastward in a gentle curve for 6 miles and terminate in high white sand dunes. Several lagoons on the northern shore empty through a common channel which is navigable by light-draft vessels having local knowledge. The western point is 230 feet high, with **Chimney Rock,** a detached rock, lying close under the eastern extremity. A reef which breaks in moderate weather extends more than 0.5 mile eastward of the point. The bay is used extensively by vessels in heavy northwesterly weather and many fishing boats operate from here during the season. Fuel oil and water, but no stores, are available at the fish wharf in the harbor 0.5 mile westward of Chimney Rock. Shelter has been obtained in southeasterly weather, close under the western point, in 4 fathoms, sticky bottom, the force of the swell being broken by the reef off the point. This anchorage, however, is not recommended. No directions for entering are necessary, other than to give the point a berth of not less than 0.8 mile to avoid the reef previously mentioned. The telegraph cable to Farallon Island is laid close around the inside of the reef off the point and landed abreast the first depression in the ridge westward. Vessels should avoid anchoring near it. A wreck in 12 fathoms is about 4.4 miles 075° from Point Reyes Coast Guard Station.

Point Reyes, a bold dark rocky headland 612 feet high, is the western and higher extremity of a ridge running in an easterly direction for 3 miles. There is low land northward of it, so that from northward and southward it is usually made as an island, and also from seaward in hazy weather. It is visible for over 25 miles and can be seen off Point Bonita, the northern headland at the entrance to the Golden Gate.

A light, 294 feet above the water and visible 24 miles, shown from a white pyramidal tower, is on the western extremity of the point. The fog signal, a two-tone air diaphone, is on the western pitch of Point Reyes about 30 feet below the light. A radiobeacon is at the light. There is a telephone line to the Coast Guard station in Drakes Bay, and to San Francisco.

A Coast Guard station is on the western side of Drakes Bay, about 2.4 miles eastward of Point Reyes Light.

Two sunken rocks with about 3 feet of water over them lie about 275 yards westward of Point Reyes Light. These rocks break in a moderate swell.

Chart 5603.—From Point Reyes, the coast trends in a general northerly direction for about 10 miles as a broad white sand beach backed by high grassy sand dunes.

A commercial radio station is about 7 miles northward of Point Reyes; the large white building is prominent from seaward. A radiotelephone station, about 0.5 mile southwesterly from this station, is not prominent.

The entrance to **Abbotts Lagoon,** about 7.5 miles northward of Point Reyes, is completely closed by a sand and gravel bar.

From the northern end of the sand beach the coast curves northwestward for about 6 miles in high yellow rocky cliffs, terminating in **Tomales Point,** which is the southern point at the entrance to Bodega Bay. **Bird Rock,** small and rocky, 60 feet high, lies 0.6 mile southward of the point and about 0.2 mile offshore.

Bodega Head, 266 feet high, is about 4.5 miles northwestward of Tomales Point. The summit is rounding and grassy, with steep rocky cliffs on the southern and western ends. **Bodega Rock,** low in elevation, is 0.3 mile southeastward of the southeastern face of the head. Foul ground extends 0.4 mile southward and southeastward of the rock. A lighted whistle buoy is moored about 1.1 miles southwestward of Bodega Rock.

Bodega Bay, included between Tomales Point and Bodega Head, is about 6 miles in length in a northwesterly direction, and 1.5 miles wide. It affords shelter from northwesterly weather at its northern end, but is dangerous in southerly or westerly weather. **Bodega Harbor,** northward of the bay, has jetties and a dredged channel, 100 feet wide and 12 feet deep, from the entrance to the town of **Bodega Bay,** thence southward along the shore for a distance of 4,200 feet; suitable turning basins are provided. In May 1948 the controlling depth in the channel was 9½ feet. A lighted bell buoy is off the entrance channel. The channels are marked by lighted ranges, lights, and daybeacons. At the town are numerous small privately owned fishing and pleasure wharves, a boatbuilding and repair yard, and 3 marine fueling stations. Boats up to 40 feet in length and 5 feet in draft can be hauled out on the marine railways. Bodega Harbor is used extensively by small fishing craft based in the harbor and small craft en route between ports north and south along the coast.

To anchor in Bodega Bay, round Bodega Rock, giving it a berth of 0.6 mile, a lighted gong buoy marking the deep water channel is 1,400 yards 142° from the rock, until Bodega Head bears 280° and is just open northward of Bodega Rock, then steer 333° for about 0.8 mile and anchor in 30 to 36 feet, 0.5 mile from the beach, with Bodega Rock bearing about 215°. Anchorage may be had closer to the

beach if the vessel's draft permits. On the approach of southerly or westerly weather, vessels should leave at once.

In good weather small boats having local knowledge sometimes use the passage between Bodega Head and Bodega Rock, but the passage is dangerous during periods of heavy ground swells because of the combers.

Tomales Bay enters the southern part of Bodega Bay immediately eastward of Tomales Point, and extends southeastward for about 12 miles with an average width of 0.5 mile. A whistle buoy is moored 0.8 mile northwestward of **Tomales Bluff**, and the bar, which has 8 to 9 feet over it, is marked by an outer-bar bell buoy and an inside-bar black buoy. In 1950 there was no commerce by water; fish, clams, and oysters are hauled by truck from here to San Francisco. Communication may be had by rail and telegraph from points at the head of the bay. An excellent paved highway follows along the eastern shore of the bay paralleling the old Northwestern Pacific Railroad, the tracks of which have been taken up. **Point Reyes Station** is at the head of Tomales Bay.

A 300-foot wharf, having a depth of about 10 feet at the outer end, is just inside **Sand Point**, on the eastern side at the entrance to the bay. Most of the small pleasure and fish wharves farther within the bay have depths of only 1 or 2 feet.

At the entrance to Tomales Bay a current of 6 knots may be encountered on a spring tide. The bar is dangerous and should not be attempted by a stranger.

Caution.—Inside Tomales Bay at the mouth of **Walker Creek** is a prohibited area used as an aircraft bombing range. For regulations governing this area, see Chapter 2, § 204.220.

Chart 5502.—The coast from Bodega Head to Point Arena, about 57 miles, trends in a general northwesterly direction. There are but few dangers and these do not extend over a mile from shore, and in thick weather the 30-fathom curve may be followed with safety. During the summer months the rocks are generally marked by kelp which extends in some cases to the 10-fathom curve. During the winer gales much of this is torn away, but it is a safe rule to avoid all kelp.

In clear weather the mountains inland may be readily seen, and at times are visible when the lower land is shut in by haze or fog. In thick weather soundings should be taken frequently, as the currents are extremely irregular both in direction and velocity.

Protection from the prevailing northwesterly winds of summer may be had at several places, but there is no shelter from the winter winds, which are usually accompanied by a heavy westerly swell.

Northward of Bodega Head the cliffs are about 200 feet in height for 2 miles, and then are succeeded by a broad sand beach 2 miles long, backed by sand dunes 120 feet high. From this point the coast northward consists of abrupt rocky cliffs, broken by gulches, to the mouth of the Russian River, about 10 miles northward of Bodega Head.

Numerous rocks, from 20 to 130 feet high, are offshore, in some cases over 0.3 mile. **Gull Rock,** 100 feet high, is about 1.7 miles southeastward of the mouth of Russian River and 0.3 mile offshore. About 0.5 mile northwestward of Gull Rock and 400 yards offshore is a large arched rock, 85 feet high and flat on top. This is the largest arched rock on this part of the coast.

Duncans Landing, about 6 miles northward of Bodega Head, is a fair small-boat landing in northwesterly weather.

The spit making out from the southern point of the mouth of **Russian River** has been partially reinforced by a short rock jetty, but the mouth of the river is closed by a shallow bar. The bold sharp point immediately to the southward of the river appears as an island from the southward; it is connected to the mainland by a roadway which is bare at all stages of the tide. Many summer resorts are on Russian River.

Ross Mountain, 2,204 feet high, is the highest knob on the ridge backing the coast northward of Russian River. It is about 3 miles inland, northward from its mouth. A few clusters of trees are near its summit; the slopes are bare of trees and the gulches are wooded.

From Russian River to Fort Ross Cove the coast is high, consisting of bare steep spurs from Ross Mountain. **Sunken Reef** extends about 0.8 mile from shore 4.5 miles northwestward of Russian River. It is marked by a lighted whistle buoy moored about 0.3 mile southward of the reef. Vessels should not attempt to pass eastward of the buoy.

Fort Ross Reef, about 5.7 miles northward of Russian River and nearly 1 mile eastward of Fort Ross Cove, consists of pinnacle rocks 35 feet high, about 600 yards offshore, and connected with the beach by a reef which is partially marked by kelp.

Fort Ross Cove, about 15 miles northward of Bodega Head and nearly 33 miles northward of Point Reyes, affords good shelter in northwesterly weather. The holding ground is poor and the anchorage is contracted by a rock, awash at low water, in the middle of the cove and a sunken rock about 50 yards northward of it with but 14 feet over it. The cove is divided into two bights, the western one being slightly the larger. This anchorage is suitable for small vessels only, and if used by strangers should be entered with caution as no directions can be given that would be of value. Communication by paved highway and telephone may be had with the interior.

Fort Ross was first settled by the Russians in 1812, and the old Russian church is still standing. The buildings have been restored and the area is now a State Historical Monument. There is no sea-borne commerce here, and the landing facilities have been abandoned.

From Fort Ross Cove the coast extends northwestward and is nearly straight. It is bold and wooded to the crests of the hills which approach the coast closely, and is cut by numerous gulches and bordered by many rocks which, as a rule, are close inshore. Several landings, practically all abandoned, are along this stretch of the coast. The 30-fathom curve is at an average distance of 0.7 mile from shore from Fort Ross Cove to near the Gualala River.

Salt Point, about 5 miles northward of Fort Ross Cove, is about 35 feet high, very rocky, and bare of trees; it is bordered by outlying rocks for about 200 yards. The 30-fathom curve is less than 0.5 mile off this point.

Gerstle Cove, or **Salt Point Landing,** is a contracted cove and landing under Salt Point, and is now abandoned.

Fisk Mill Cove, 2.5 miles northward of Salt Point, affords fair shelter for small vessels in northwesterly weather. The bottom is rocky but there are no hidden dangers.

Horseshoe Point, about 3 miles northward of Salt Point, is a cliff 180 feet high, with a depression of 60 feet immediately behind it. It is bare of trees; the summit is marked by several projecting rocks.

From Horseshoe Point the coast trends northwestward for about 12.5 miles to the Gualala River, and consists of cliffs about 60 feet high, bordered by numerous outlying rocks. The tree line is from 0.1 to 0.5 mile back from the edge of the cliffs.

Stewarts Point is a village with a post office about 3 miles northward of Horseshoe Point. It is in a small cove that was formerly used as a shipping point. About 350 yards off the southern point of the cove are two sunken rocks, each of which is well marked by kelp. The cove is a fair shelter for small craft in northwesterly weather. There is a general store, and the buildings are readily made from seaward. Communication may be had by telephone, and by bus over improved roads north and south and to the interior.

Black Point Landing, about 5.5 miles northwestward of Horseshoe Point, is unprotected and the landing is no longer used.

About 4 miles northwestward of **Black Point** and 3 miles southeastward of the Gualala River is a sand beach about 0.5 mile long, backed by high dunes parallel with the beach. The dunes are quite prominent.

Del Mar Landing is about 5 miles northwestward of Black Point and 2 miles southeastward of Gualala River. It is unprotected and is no longer used.

Local magnetic attraction has been reported in the vicinity of Del Mar Landing and Saunders Reef, amounting to 4° to 8° easterly of the normal magnetic variation.

Gualala Point Island is about 16 miles southeastward of Point Arena and 1 mile southward of Gualala River. It is 42 feet high, about 300 yards offshore, and connected with the bluff by a rocky reef, covered with sand and bare at high water. Sand dunes extend behind the bluff for 600 yards.

The **Gualala River** intersects the coast about 15 miles southeastward of Point Arena. A long sand beach extends a mile southward from the mouth. The mills at **Gualala** and the white hotel building can be seen from the west and southwestward.

Robinson Reef lies northward of the mouth of Gualala River and 1.1 miles northward of Gualala Point Island. It consists of a cluster of 25 or 30 rocks above water, about 600 yards offshore, with a covered rock 70 yards west-northwestward of the outer visible rock.

Bournes (Bowen) Landing is about 1.5 miles northwestward of Gualala River. The anchorage here is exposed and can be used only in the summer. Local knowledge is necessary because of several covered rocks in the approaches. Lumber from the Gualala mills was formerly shipped from here. An improved highway parallels this section of the coast.

Havens Anchorage is 12 miles southeastward of Point Arena and 4 miles northwestward of Gualala Point Island. Shelter from the prevailing northwesterly winds may be had in the cove southward of Fish Rocks. Vessels of 200 tons

may use the cove which is constricted by rocks and sunken ledges extending 250 yards southeastward from the western head. Strangers should approach the anchorage with caution. During the summer the anchorage is used extensively by fishing boats in northwesterly weather. Communication may be had by bus and telephone.

Fish Rocks are two rocky islets about 4.2 miles northwestward of Gualala Point Island, connected at low water with the shore and surrounded by numerous smaller rocks. The outer rock is 150 feet high and the inner 100 feet high and 100 yards offshore. A rock 40 feet high lies 175 yards southeastward of the outer rock.

Havens Neck, 145 feet high and prominent, is about 0.6 mile northwestward of Fish Rocks. It is bare of trees and connected with the bluffs by a narrow neck.

Gualala Mountain, 2,238 feet high and heavily wooded, is a prominent feature in clear weather. It is about 5 miles inland northeastward of Havens Neck.

Sail Rock, 44 feet high, is a sharp, pyramidal rock 800 yards offshore, about 2.8 miles northwestward of Fish Rocks. From off Point Arena it resembles a small vessel under sail.

Saunders Reef, about 4.5 miles northwestward of Fish Rocks, lies a little over 0.5 mile offshore. It shows several rocks awash at low water and is well marked by kelp. Foul ground exists between it and the shore. A lighted whistle buoy is moored 0.4 mile southwestward of the outer rock and 7.5 miles southeastward of Point Arena. Vessels should not pass inside the buoy.

Arena Cove, about 2.5 miles southeastward of Point Arena, is a slight indentation affording shelter to small vessels in northwesterly weather. The southern head is a high yellow cliff that under favorable circumstances is visible for a considerable distance seaward. A wharf in fair condition is at the head of the cove with 14 feet of water at its outer end. Fuel oil and water are piped to the wharf. A fish house is near the foot of the wharf. Some provisions may be had. The village of **Point Arena** is about 1 mile back from the landing. It has a post office and communication may be had by bus and telegraph. A Coast Guard station is in the cove. A lookout tower, white enclosure with a red roof on a steel tower, is prominent. A lighted bell buoy is moored 0.6 mile southwestward from the end of the wharf.

To enter, make the lighted bell buoy; then bring the end of the wharf to bear 074° and stand in on this course. This leads about 150 feet southward of a rock with 16 feet over it that lies 300 yards 264° from the end of the wharf. In thick weather during the summer in approaching the cove from northward or southward, the edge of the kelp may be followed, which will lead to within 300 yards of the lighted bell buoy.

The limits and regulations relative to the restricted area in the vicinity of Arena Cove are given in Chapter 2, § 207.645.

A breaker is reported in heavy southwesterly swell about 0.8 mile west-southwestward of the northern point of Arena Cove, and scattered kelp extends almost out to that position.

Point Arena is the first prominent point northward of Point Reyes. It consists of a long level plateau, diminishing in height to the end of the point which is 60 feet high. The point is bare of trees for about a mile back of the point.

A light, 155 feet above the water and visible 19 miles, is shown from a white cylindrical tower at the extremity of the point. The fog signal is a two-tone air diaphone. The radiobeacon is synchronized with the fog signal for distance finding. A Loran station is near the light. A sunken reef, usually showing breakers, extends about 0.6 mile northwestward from the extremity of the point.

Arena Rock, with 13 feet over it, is a little over 1.2 miles 346° from Point Arena Light and shows a breaker except in very smooth weather. A submerged rock which breaks only in heavy weather has been located about 200 yards northward of Arena Rock. It is thought to be a part of Arena Rock, and should be given a good berth as it rises abruptly from deep water.

Caution.—In view of the fact that Arena Rock is only 0.8 mile inside the 30-fathom curve, and that the shoaling is abrupt, vessels approaching Point Arena from northward in thick weather are advised to keep outside a depth of 40 fathoms.

CHAPTER 9

Point Arena to Trinidad Head

Chart 5602

FROM Point Arena the coast extends in a general north-northwesterly direction for about 50 miles and then trends northwesterly for nearly 35 miles to Punta Gorda, from which point it trends north-northwesterly for 10 miles to Cape Mendocino. The southern portion is less bold and rugged than the northern portion, and the mountains are neither as high nor as close to the coast. The dangers are all included within the 30-fathom curve, and with exception of Blunts Reef and the other reefs in the vicinity of Cape Mendocino, do not extend more than a mile offshore. Between Point Delgada and Cape Mendocino are several deep submarine valleys, heading in some cases within 0.5 mile of the beach; great caution and frequent soundings are necessary in thick weather when in the vicinity, owing to the irregularity of the currents and soundings.

From Cape Mendocino to Trinidad Head the coast trends in a north-northeasterly direction for 40 miles and, with the exception of the rocks off False Cape, is free of dangers if the beach is given a berth of over 0.5 mile. The land is generally low with sandy beaches, broken by the mouths of the Eel and Mad Rivers and the entrance to Humboldt Bay, the only marked elevations northward of False Cape being Table Bluff and Buhne Point.

In clear weather the mountains are good landmarks and can frequently be seen when the lower land is obscured by fog or haze.

Between Point Arena and Elk protection from the prevailing northwesterly winds of summer may be had in a few places but there is none from southward or westward.

From Point Arena the cliffs of the point extend 0.5 mile northeastward to the mouth of the **Garcia River,** from which sand dunes and beaches extend northward for about 4 miles. Beyond this for 40 miles to **Ten Mile River Beach** the coast is rugged, with high, bold cliffs bordered by numerous outlying rocks.

Mal Pass is a steep gulch about 5.2 miles northward of Point Arena; the bluffs on each side are nearly 280 feet high.

Red Bluff, a prominent reddish cliff about 200 feet high, is 8 miles northward of Point Arena.

Elk Rock, 95 feet high and 0.5 mile offshore, is about 8.5 miles northward of Point Arena.

Chart 5703.—Elk is about 10.5 miles northward of Point Arena. The ruins of an incline from the 150-foot cliff down to the most easterly of a cluster of three large rocks are prominent. The shelter is only fair. Communication may be had by bus and telephone. Some provisions are available. The group of cypress trees in the graveyard 500 yards northward from Cuffey Cove is a good landmark from any direction. **Nose Rock,** 24 feet high, lies about 0.6 mile southwestward of the cliff. **Casket Rock,** 91 feet high, is the outermost of the three large rocks westward of the cliff.

Approaching from the southward, steer 082° heading for the yellow and red church spire with cross. This course passes about 200 yards southward of a group of sunken rocks with a least depth of ¾ fathom over them.

Cuffey Cove, about 0.8 mile northward of Elk, is a small, contracted anchorage affording fair shelter in northwesterly winds. The outer point at the entrance to the cove is 140 feet high, with a rocky islet 49 feet high 450 yards westward and a series of three small offlying rocks extending 170 yards southwestward. Immediately east of this point is an inlet 300 yards long which is an excellent anchorage for small boats in northerly and westerly weather. A small kelp-covered rock, awash at low tide, lies near the center of the entrance to the inlet, and boats enter midway between this rock and the point. Vessels entering the cove pass midway between the rock awash at the entrance to the inlet and the foul ground 300 yards southward of the inlet. The cove is covered with patches of kelp during most of the year. The landing and village are abandoned.

From Cuffey Cove to the **Navarro River,** a distance of about 3 miles, the coast consists of cliffs 200 feet high, bordered by outlying rocks.

Navarro Landing, at the mouth of Navarro River, is abandoned. There is fair shelter from northwesterly winds. The mouth of the river is nearly always closed by a bar with only 1 or 2 feet of water over it.

Navarro Head, 405 feet high, is on the northern bank of the Navarro River.

Chart 5711.—Salmon Point, the southern entrance point to **Whitesboro (Salmon Creek) Cove,** about 1.2 miles northward of the Navarro River, is a treeless cliff 109 feet high. Detached rocks extend westward of the point for 0.2 mile, with **Bull Rock,** a sunken ledge, usually showing a breaker 0.5 mile west by northward of the extremity of the point. In a heavy swell there are breakers showing between it and the visible rocks off the point. Whitesboro Cove is rocky, exposed to northwest and west winds, and is seldom used as an anchorage.

Albion River and **Albion (Bay) Cove** are about 2 miles northward of Navarro Head, and 16.5 miles northward of Point Arena. The cove affords good shelter in northerly weather, but is open southwestward. The south point at the river entrance rises to a knoll 179 feet high and lies 0.7 mile from Salmon Point. Low rocks extend nearly 0.25 mile westward of the point. The north point is a rocky islet 80 feet high lying close to the point which has the same elevation; both are bare. Small visible rocks lie 200 yards westward of the islet and sunken rocks, showing breakers in a moderate swell, extend out more than 0.25 mile west-southwestward from it. Two hundred and fifty yards southward of the islet and fairly in the middle of the entrance lies a sunken rock, usually showing a breaker, which is the principal danger in the approach. In the middle of the cove as seen from

seaward lies **Mooring Rock,** a pyramidal rock about 30 feet high, from which small rocks stretch to a point on the northern shore. A whistle buoy is moored off the cove nearly 0.6 mile 261° from Mooring Rock.

The village of **Albion,** which has a post office, is on both high banks of the river. Considerable lumber was formerly shipped to both foreign and domestic ports, but the landing wharf has been removed and there has been no shipping for many years. Communication may be had by bus, truck, and telephone. Water and some provisions may be obtained here.

To enter Albion Cove from the whistle buoy head for the Mooring Rock, course 081°, until within 200 yards of it.

Northward of Albion River, between it and Colby Reef, breakers are seen in heavy swell nearly 0.5 mile from shore, and vessels should not approach closer than 1 mile.

Stillwell Point is a bold, sharp cliff 190 feet high about 1.6 miles northward of Albion River. A rocky islet, 141 feet high, lies close inshore on its northwestern side. A yelow slide is on the southern face of Stillwell Point.

Colby Reef, 1.6 miles northward of Albion River, lies 0.5 mile offshore, abreast Stillwell Point. It consists of a rocky patch with a least charted depth of 1½ fathoms. Numerous other dangers are just inside the 20-fathom curve along this stretch of coast.

Little River lies 4.6 miles northward of Navarro Head and about 19 miles northward of Point Arena. The northwestern shore of the cove is bluff and rocky, and bare of trees for over 0.5 mile. Good shelter from northwestward and fair protection from southward is afforded by the reef and rocks on the southern side of the cove which are well marked by kelp. It is open westward, and bad, especially for sailing vessels, owing to the narrow entrance and heavy undertow when in the vicinity of the rocks. The anchorage is about 300 yards in diameter, with depths of 4 to 4½ fathoms. The channel in entering is about 125 yards wide but is obstructed by two sunken rocks which reduce it to about 60 yards in width abreast the inner visible rock. Strangers should not enter without a pilot. No supplies are obtainable. Communication may be had by bus, truck, and telephone. The beach area at Little River is now a State Park.

From Little River to Mendocino Bay the coast is a broad tableland with a seaward face of cliffs, 40 to 60 feet high, bordered by numerous low rocks. The tree line is over 0.5 mile from the cliffs.

Mendocino Bay is about 21 miles northward of Point Arena and affords fair shelter in northwesterly weather, but vessels are obliged to leave in southerly or westerly weather. In heavy southwesterly gales the sea breaks clear across the entrance. The bay is about 0.8 mile long in a northerly direction with a width of a little over 0.3 mile. The northern point at the entrance is a broken cliff 60 feet high, bordered by numerous rocks close inshore. The southern point is a rocky, irregular cliff 100 feet high, bordered by numerous rocks, with a reef extending 150 yards northwestward toward the northern point. A continuation of this reef, in the form of a rocky area having a least depth of 3¼ fathoms, extends northwestward of the outermost bare rock a farther distance of 500 yards. This area should be avoided when there is any swell running. A knoll 156 feet high is 300 yards back from the southern point.

The town of **Mendocino** is on the northern shore of the cove; **Big River** enters in the northeastern part of the cove. The ruins of the old lumber loading tower stand on the cliff on the northwest side of the bay. Provisions, fresh meat, and water may be had; coal is not available. Communication may be had by bus, truck, and telegraph or telephone. The buildings in the town are the prominent features when in the vicinity of the bay.

Mendocino Bay bell buoy is in 108 feet, 1,600 yards 218° from the high school building on the hill in Mendocino.

To enter, bring the south bluff of the river to bear 068° and stand in on that bearing, passing 100 yards southward of the bell buoy and giving the northern point at the entrance a berth of 250 yards. When this northern point is a little abaft the beam, anchor in from 5 to 6 fathoms. This course clears the dangerous sunken ledge lying 500 yards northwestward of the outer visible rock off the southern point.

Russian Gulch, 2 miles northward of Mendocino, is a small indentation of no commercial importance. The cove is occasionally used as an anchorage by small craft with local knowledge as it affords excellent protection. The new concrete arch highway bridge across Russian Gulch should show well from southward to westward. An important danger is a rock awash 400 yards 284° from the southern entrance point. A reef with a least depth of 1¼ fathoms extends 200 yards southeastward of the rock.

Point Cabrillo is about 3 miles northward of the town of Mendocino and 24 miles northward of Point Arena. It is a flat-topped point 50 to 60 feet high, terminating seaward in nearly vertical cliffs; numerous low rocks extend offshore over 200 yards, and the 30-fathom curve is barely 0.2 mile outside of them. The point here is bare except for a few dark trees at the houses near the light.

Point Cabrillo Light is shown from a white octagonal frame tower on a dwelling and marks the point. The light is 84 feet above the water and visible 15 miles. The fog signal is sounded on an air diaphone. A *racon* station is maintained near the light.

From Point Cabrillo the coast trends northward for about 9 miles to Laguna Point as a nearly straight line of bluffs, with numerous rocks close under the cliffs. It is moderately high, partly wooded to the face of the cliffs, and is broken by several indentations and small streams. The 30-fathom curve is an average distance of 1 mile from shore.

Caspar Anchorage, about a mile northward of Point Cabrillo, is a small cove about 0.3 mile wide, at the head of which is the mouth of **Caspar Creek.** Fair shelter, except from westward, is afforded. The anchorage is contracted and is seldom used. The village of **Caspar,** which has a post office, is on the northern bank of the creek near its mouth. Communication may be had by bus, truck, and telephone. Provisions may be obtained in limited quantities.

From Caspar Creek to Noyo Anchorage the coast consists of broken irregular cliffs, 40 to 60 feet high, with numerous rocks extending in some cases 400 yards offshore. These are fairly well fringed by kelp, especially in summer.

Chart 5703.—Noyo Anchorage, about 5 miles northward of Point Cabrillo, is less than 0.5 mile long and 0.25 mile wide, and while affording fair shelter from

northward or southward, is open westward. The anchorage is limited to an area about 400 yards long and less than 200 yards wide, with depths of 3½ to 6½ fathoms. A lighted whistle buoy is 0.8 mile westward of the anchorage and a bell buoy lies 600 yards west-southwesterly from the northwest point of the cove.

Noyo River enters at the head of the cove, and the village of **Noyo** is on the banks of the river near its mouth. A fixed highway bridge across the river 300 yards east of the mouth. The horizontal clearance is 360 feet and the vertical clearance is 80 feet. The river has been improved by short jetties and by a dredged channel for 1.0 mile upstream. The project depth is 10 feet; in June 1948 the controlling depth at the entrance was 10 feet; between the jetties 6.5 feet; thence 9 feet to the head of the project. The outer end of the north jetty is marked by a light. An electric siren fog signal is on the bank about 80 yards eastward of the jetty light.

Noyo is the principal fishing center of this section of the coast and many fishing boats are based here. There are several fish houses with wharves having depths from 4 to 8 feet alongside. Water and fuel oil are piped to some of the wharves, and general and marine supplies are available here and at Fort Bragg. There are marine railways where boats up to 45 feet long with a draft of 6½ feet can be hauled out.

In May 1950 fishermen using the river reported the deepest water in the entrance to be about midway between the jetties. A rock with about 3½ feet over it is reported to be near the northern edge of the channel in the general vicinity of the fog signal station. Caution must be used in entering. With a heavy westerly or southwesterly swell there are breakers at the entrance to the Noyo River, so that it is necessary to enter before this condition occurs. Inside the river is shelter from any condition of wind or sea.

Communication by rail, bus, and air is available in Fort Bragg, 1 mile north of Noyo.

From Noyo River to Fort Bragg Landing, about 0.7 mile, the coast consists of rocky cliffs, 40 to 60 feet high, bordered by rocks and sunken ledges extending 100 to 400 yards offshore.

Fort Bragg Landing, about 1 mile northward of Noyo River and 30 miles northward of Point Arena, is located in the small cove formerly known as **Soldiers Harbor.** The cove is 0.4 mile long and 0.2 mile wide, but is contracted by the rocks and ledges extending from both points, and only small boats have room to anchor. In westerly weather the cove is wide open. Because of better protection at Noyo River the cove is seldom used. A rocky reef, partly bare at high water, extends southwestward from the northern head and breaks the force of the swell from northwestward.

The town of **Fort Bragg**, the largest coast town between San Francisco and Eureka, is situated near the head of the cove. The former loading wharf has been removed and lumber is now shipped out by rail and truck.

Fort Bragg is on the California Western Railroad which connects with the main line of the Northwestern Pacific Railroad at Willits. The buildings of the town are prominent by day and the electric lights by night. Communication is available by rail, bus, and air. Provisions can be obtained, and minor repairs to machinery can be made at the saw-mill machine shop.

A **chart agency** of the U. S. Coast and Geodetic Survey is in Fort Bragg.

From Fort Bragg Landing to Laguna Point, about 3 miles, the coast is moderately low and rocky and cut by two small streams; the tree line is within 0.2 mile of the beach.

Laguna Point, 8.5 miles northward of Point Cabrillo, is near the southern end of Ten Mile River Beach. It is a small, projecting cliff, 30 feet high, flat-topped, and bare of trees for 600 yards. It is noticeable only when close inshore. A bare reef extends 300 yards northwestward from the point.

Cleone (Laguna Landing), immediately northward of Laguna Point, is of little commercial importance. It is exposed and only available for small steamers. It affords fair protection in southerly weather and is occasionally used in winter.

Bald Hill, 810 feet high, is about 2.5 miles 120° from Laguna Point and is a prominent landmark, its summit and southwestern slope being bare of timber.

Chart 5602.—For about 0.5 mile northward of Laguna Point the bluffs are low, and northward of these a straight sand beach extends for about 3 miles to the mouth of **Ten Mile River.** The beach is backed by sand dunes for 0.5 mile inland, with tree line about 1.5 miles from the beach.

From Ten Mile River the coast extends in a general northwesterly direction for about 52 miles to Punta Gorda. This stretch of the coast is particularly bold and rugged, bordered by numerous rocks, and as far as Point Delgada, is heavily timbered. Northward of Point Delgada the tops of the ridges are generally bare or only partly covered with trees and brush. The cliffs along the shore range from 40 to 100 feet in height. The high, rugged mountains in the vicinity of the coast, which reach elevations of 3,000 to 4,000 feet, are prominent.

Kibesillah Rock, 1.2 miles northward of Ten Mile River, is a rock awash and is the farthest offshore of any rock for many miles north and south. It is a small rock washed over almost continuously even in ordinary weather, and is 0.4 mile off the line of the cliffs. Other rocks and rocky islets are inside of it, some of which are 80 feet high and some 100 to 200 yards in extent, flat topped and covered with soil.

Bruhel and **Bells Points** are two small points, 3 and 4.5 miles, respectively, northward of Ten Mile River. They are not noticeable unless close inshore.

Bells Mountain, 0.5 mile eastward of Bells Point, is 1,040 feet high, bare on top, and with a few trees on the oceanside. It is the principal landmark for Westport Landing.

Westport Landing, 12 miles northward of Fort Bragg Landing, is abandoned. It is exposed, and suitable only in summer and in smooth weather.

The town of **Westport** is just back of the landing and is a small community adjacent to farms and timber. All shipments are made by truck. The schoolhouse, in a clearing northward and slightly higher than the town, is useful as a landmark. No ship supplies are available.

Switzer Rock is a small low rock 600 yards broad off the coast and 0.6 mile to the northwestward of Westport Landing. Every large swell washes over it. About 170 yards southeast of it is a sunken rock marked by a breaker. Switzer Rock has 6 fathoms of water close around it. The 3-fathom curve is 200 yards inside, and the 10-fathom curve 400 yards outside of it.

Gordon Hill, 772 feet high, lies about 6.5 miles northward of Ten Mile River. It is bare to the summit and terminates seaward in **Abalone Point,** 60 feet high, with low, outlying rocks.

Union Landing and **Hardy Creek Landing,** about 0.5 mile apart, near the mouths of **Juan Creek** and **Hardy Creek,** respectively, are 2.5 miles northward of Abalone Point. They were formerly wire-cable landings. The wharf at Hardy Creek is gone; the loading structure at Union Creek Landing is in ruins, but is fairly prominent. Both landings have been abandoned.

Hardy Rock, about 2.3 miles north-northwest of Abalone Point, is a small islet 47 feet in elevation.

From Abalone Point the coast trends northwestward for about 4 miles to **Cape Vizcaino,** which is a broad, irregular line of precipitous cliffs, 100 feet high, very broken, and bordered by low rocks, 200 to 300 yards offshore.

A rocky, lime-covered islet, **Island Knob,** 200 yards long and 120 feet high, lies close-to and almost connected with Cape Vizcaino. A breaker lies 275 yards westward and southward from the northwestern point of the islet. **Cottaneva Rock,** 20 feet high, is a small rock about 500 yards southeastward of Island Knob, 275 yards offshore. Several smaller rocks lie inside of it and two others about 160 yards northwestward.

Rockport (Cottaneva) Cove is about 0.5 mile northward of Cape Vizcaino. The shelter is poor. It was formerly used as a cable landing for loading lumber. The sawmill situated in the narrow Cottaneva Valley is in operation, but all lumber is shipped by truck at present (1950).

A pinnacle rock having 3 fathoms over it lies 200 yards westward of the outermost visible rock in the cove.

Cahto Mountain, 4,231 feet high, is about 11.5 miles eastward of Cape Vizcaino, and in clear weather is a prominent landmark.

Sea Lion Rock is 325 yards northwest of the high, sharp northwest point of Rockport Cove. It is 5 feet above water, 35 yards long, and 15 yards broad. It is resorted to by sea lions.

Cottaneva Needle, 0.5 mile north of Sea Lion Rock, is a prominent black pinnacle rock 55 feet high.

Between Cape Vizcaino and Point Delgada are several small exposed landings available for use only in the summer and in smooth weather. The landings formerly were used to ship ties, tanback, and shingles which were loaded on vessels by means of wire cables. There are no good roads along this section of the coast and supplies are not obtainable. The principle landings are **Monroe Landing, Usal,** and Needle Rock. None of these have been used for many years. All traffic is handled by truck.

Double Cone Rock is 3.5 miles northward of Cape Vizcaino and 300 yards offshore.

Usal Rock, about 5.5 miles northward of Cape Vizcaino, is 45 feet high and black in color. It lies 200 yards off a small point of rocks.

The mouth of **Usal Valley** is about a mile northward of Usal Rock, and is a narrow, steep gulch, in front of which is a small area of flat land with a low beach. A small grassy hillock is just inside the gulch. The view up the valley is open for a very short time while passing.

Big White Rock, 95 feet high, lies about 2 miles northward of Usal Valley, and 125 yards offshore from the steep cliffs, which are bordered by numerous rocks. This rock is a prominent feature when the higher points of the land are in fog.

Anderson Cliff, about 2 miles northward of Big White Rock, is a projecting rocky spur 715 feet high, with one large rock and numerous smaller ones close inshore.

Jackson Pinnacle, about 1.1 miles northward of Anderson Cliff, is a black rock 45 feet high so close to the rocky beach that from seaward it is hard to distinguish it from the bluff behind it. When seen from along shore it is prominent.

Cluster Cone Rock, a prominent 68-foot pinnacle, is the largest and whitest of a small cluster of 6 high rocks, 200 yards offshore, lying about 4.8 miles northward of Big White Rock.

Morgan Rock, a large white-topped, block-shaped rock 57 feet high, and about 0.5 mile northwestward of Cluster Cone Rock, shows prominently. It is the largest of a group of rocks extending some 200 yards from a high rocky cliff and is particularly valuable as a landmark when higher land is covered by fog.

Bear Harbor Ridge, a detached coastal ridge about a mile northwestward of Cluster Cone Rock, has two peaks, the southern one, 375 feet high, being the higher. It is the most prominent feature in this vicinity when viewed from the northwestward. The seaward face of the ridge is marked by steep, loose slides.

Needle Rock, 46 feet high, is 2 miles northward of Morgan Rock; the rock blends into the bluff from offshore. A group of old mill buildings, a few houses, and an old landing platform about midway up the flat mark the abandoned **Needle Rock Landing.**

Small White Rock, 37 feet high, lies 5 miles northward of Cluster Cone Rock and 4 miles southward of Point Delgada. It is close inshore and just outside the low-water beach; once identified this rock makes a valuable landmark.

From a little below Small Rock to Point Delgada the country is not timbered but is covered with dense, low brush, which present a uniform dark green appearance.

A submarine ridge known as the **Tolo Bank** extends southward from Point Delgada for about 7 miles. The depths are quite irregular, the least found being 9 fathoms. The area was swept by wire drag in 1936 to a depth of 47 to 50 feet and no dangers of less depth than 9 fathoms were found. No kelp was found on the bank at any time during the summers of 1935 and 1936.

Caution.—The area just south of Shelter Cove is subject to slides which might deposit rocks along the shores.

Chart 5773.—Point Delgada lies about 66 miles northward of Point Arena, and nearly 20 miles southward of Punta Gorda. It is a cliff-faced plateau making out about a mile from the general trend of the coast. The seaward face of the plateau is a mile long and bordered by numerous rocks. A lighted whistle buoy is moored 1.1 miles southwestward from the point and a bell buoy 0.8 mile southeastward from the point. The small white bell tower on the east end of Point Delgada is prominent from the anchorage.

On the point is a county airplane landing strip 1,500 feet long. The words SHELTER COVE in large white letters are painted on the slanting roof of a building 100 yards northward of the bell tower. This sign shows well from seaward.

Shelter Cove lies under the southern face of Point Delgada and affords fair shelter in northwesterly weather, but is exposed and dangerous with southerly or westerly winds. There is nearly always a swell running. In 1950 there were no wharves in the cove. Gasoline and water can be obtained ashore but must be carried down from the plateau.

Shelter Cove is extensively used as an anchorage by a large fishing fleet. A good dirt and gravel road is kept open in all but the worst weather; there are telephone facilities. Two pinnacle rocks close together with 2½ fathoms over them, lie a little over 0.5 mile 154° from the point. These are usually well marked by kelp. A rock with 1¼ fathoms over it lies a little over 0.25 mile 143° from the point. This also is usually well marked by kelp.

The following directions lead over an area covered by the wire drag: From a position 100 yards southward of Point Delgada lighted whistle buoy, steer **110°** for 0.9 mile; then steer **016½°** for 1 mile, passing 150 yards east of the bell buoy, and anchor in 9½ fathoms, with the bell tower bearing 315½°, distant 0.7 mile. The 2½ and 2¾-fathom spots are within 500 yards to the westward of this anchorage. The 3¼-fathom spot lying 1.15 miles 184°, and the 3½-fathom spot 0.85 mile 201° from the bell tower will be avoided if a careful course is steered.

Chart 5602.—From Point Delgada the coast extends northwestward for about 19 miles to Punta Gorda, backed by steep mountains covered with chaparral and trees. About 0.8 mile northward of Point Delgada is a sand beach that extends northward for 4 miles. **Kaluna Cliff,** 1,474 feet high, overlooks the southern end of the sand beach and its steep face, scarred by frequent slides, is a noticeable landmark.

King Peak, 4,090 feet high, the highest of three, is the well-known landfall generally called **Three Peaks.** It lies about 8.5 miles northward of Point Delgada, 2.5 miles from the coast, and in clear weather is visible seaward for about 75 miles.

About 6 miles northward from Point Delgada is the head of **Delgada Canyon,** a submarine valley, the 100-fathom curve lying within 0.5 mile of the beach. This valley extends in a northerly direction, with an average width of 1 mile between the 100-fathom curves for 3.5 miles, and then expands, funnel-shaped, for 3 miles more. Over 400 fathoms are found at its mouth and 300 fathoms within 4 miles of the beach. The side slopes are steep.

Big Flat is a narrow strip of low, flat land about 7 miles northwestward of Point Delgada. It is 2 miles long and is bordered by sand beaches. A few abandoned ranch houses and barns are at the southern end of the flat. **Shubrick Rock,** low and small, lies 300 yards off the southern end.

About 11.5 miles northward of Point Delgada is the head of **Spanish Canyon,** a submarine valley. The 100-fathom curve lies within 2 miles of the shore.

949285—52——18

Reynolds Rock, 10 feet high, is about 6.5 miles northwestward of Big Flat. It is about 550 yards offshore and when seen from close inshore appears as a double-headed rock over which the swell breaks in nearly all weather.

Rodgers Break is a sunken rock with ½ fathom over it, 0.5 mile westward of Reynolds Rock. It lies about 4 miles southeastward of Gorda Rock and 6.8 miles west-northwestward of Big Flat. It is a pinnacle rock that seldom breaks; the top is occasionally seen in a heavy swell. Rodgers Break is marked by a lighted whistle buoy. A pinnace rock with 3 fathoms over it lies about 0.5 mile northwestward of Rodgers Break and about the same distance offshore. It probably breaks in very heavy weather. This pinnacle and Rodgers Break are the outermost known dangers on this stretch of the coast.

From Reynolds Rock northwestward to Punta Gorda the shore is bordered by numerous rocks extending about 0.3 mile offshore. The sharp depression in the hills near the coast, caused by the gulch of **Cooskie Creek,** 3.5 miles southward of Punta Gorda, is sometimes useful on dark nights to vessels close inshore in making the point from southward.

Chart 5795.—Punta Gorda is a high, bold, rounding cape about 83.5 miles northwestward of Point Arena and 11 miles southward of Cape Mendocino. The seaward face rises to 800 or 900 feet, 400 yards back from the beach, and terminates in a spur, 140 feet high, almost overhanging the sea. It is bare of trees except in the gulches. For over 1.5 miles northward and about 2 miles southward of the point, the beach is bordered by numerous rocks and shoals extending in some cases 0.6 miles offshore.

The wind, sea, and currents off Punta Gorda are probably as strong as off any point on the coast; frequent and strong tide rips have been noted. Many times when the weather at Shelter Cove and even at Big Flat is clear and calm and the sea smooth, both the wind and the sea will pick up as Punta Gorda is approached, until just northward of this point strong breezes to moderate gales will be experienced. At other times clear weather southward of this point will lead to fog northward, or vice versa.

A gray rectangular structure about 25 feet high, on Punta Gorda, is a disused light.

Gorda Rock, 10 feet high, is a conical rock a little over 0.7 mile southward of Punta Gorda and 0.6 mile offshore. A lighted whistle buoy is 300 yards southwest from the rock.

Conical Rock, 20 feet high, lies 200 yards off the point. A small, low rock lies 350 yards westward from it, with foul ground between.

From Punta Gorda to Cape Mendocino the hills back of the coast are lower than those southward; they are bare of trees and bordered by stretches of low, narrow, sandy flats with a narrow, low-water beach. The outlying rocks are not over 0.7 mile offshore until within 2.5 miles of Cape Mendocino, where they extend farther and terminate in Blunts Reef, 2.5 miles broad off the cape. At 3 miles northward of Punta Gorda, **Mattole Canyon,** a narrow submarine valley, makes in, with 100 fathoms a little over 1 mile from the beach. **Mendocino Canyon** makes in 4.5 miles southward of Cape Mendocino with 100 fathoms 2 miles from the beach.

Christmas Rock, with a depth of 1¼ fathoms over it, is 1.8 miles 321½° from Punta Gorda tower.

The **Mattole River** enters 2 miles northward of Punta Gorda. This river is not navigable and cannot be entered with a small boat at any stage of the tide. The northern head is bare and about 360 feet high, and the southern head is about the same height and partially covered with oak trees. A prominent sand dune is on the southern side at the entrance to the valley. Another large sand dune about 3.5 miles to the northward marks the northern side of **McNutt Gulch** and should not be confused with the one at Mattole River.

Mattole Point is about 0.3 mile northward of the river at the base of **Moore Hill,** 1,210 feet high. A rock 8 feet high is 0.3 mile northward of Mattole Point and 250 yards off the beach at the head of Mattole Canyon. This rock was formerly used to support the end of a wharf. A rock with ½ fathom lies 0.4 mile 328° from Mattole Point.

Sea Lion Rock, 16 feet high, is the largest of a cluster of small rocks 0.5 mile offshore and nearly 4 miles northward of Punta Gorda.

The Brothers, 8 feet high, consists of two small rocks, close together, 800 yards offshore and 0.5 mile northward of Sea Lion Rock.

Mussel Rock, 0.9 mile north of The Brothers, is a ledge that projects 400 yards from the shore. A whistle buoy is about 0.6 mile westward of the rock.

Devils Gate Rock, 20 feet high, lies nearly 2.8 miles southward of Cape Mendocino and 0.5 mile offshore. It is low and pyramidal, with a smaller rock close under the northwestern face. A reef extends 200 yards westward from the rock; numerous rocks lie inshore. A rocky shoal of 3¾ fathoms lies about 1.4 miles westward of Devils Gate Rock.

Outer Break, which bares 1 foot at MLLW, lies 1.15 miles 316° from Devils Gate Rock.

Steamboat Rock, 30 feet high, lies 1.5 miles southward of Cape Mendocino and 600 yards offshore. The upper part of the rock is white and the lower black, somewhat resembling a steamer with a low black hull and white upper works.

Cape Mendocino is a mountainous headland, the famous landmark of the old Spanish navigators and the galleons from the Indies. The cape is the turning point for nearly all vessels bound northward or southward. In view of the dangers in the vicinity, it should be approached with considerable caution in thick weather; the bottom and the currents are very irregular. It is in the latitude of great climatic change; the meteorological conditions northward of the cape are quite different from those southward. The winds do not blow home so violently in the bight southward of it, and the amount of rainfall increases rapidly to the northward. Fog is more prevalent southward. The strong northwesterly winds of summer are less violent southward of the cape which forms a partial lee for vessels working their way northward.

The seaward face of Cape Mendocino is steep, rocky and water worn toward the shoreline. Above the light the general appearance is rolling and grass-covered, except in the deep ravines and upon some of the steep hillsides where the northern exposure is covered with forest or brush. For about 3 miles south-

ward of the cape the beach is bordered by numerous rocks and sunken ledges extending in some cases to over 0.5 mile offshore.

Cape Mendocino Light is shown from a white pyramidal tower, 43 feet high, on one of the western spurs about 400 feet above the sea. The light is 422 feet above the water and is visible 28 miles.

Sugar Loaf, 326 feet high, is 250 yards westward of Cape Mendocino and is connected with it at low water by a narrow neck of rocks and shingle beach. This rock is a prominent feature in making the cape from either northward or southward, but in thick or hazy weather care should be taken to avoid mistaking it for False Cape Rock, which it somewhat resembles, that is in a similiar position off False Cape, 4.5 miles northward of Cape Mendocino. False Cape Rock is about 216 feet high and is not so regular in outline as the Sugar Loaf, and from the westward or northwestward, shows two large rocks, 95 and 54 feet high, immediately inside of it, whereas the Sugar Loaf stands solitary and compact. As seen from the southwestward, Sugar Loaf shows a cave on its southwestern face, extending about ⅓ the height of the rock.

Blunts Reef is one of the outermost visible dangers off Cape Mendocino. It consists of two small, black rocks awash at high tides, about 230 yards apart with 15 fathoms between. The southern and outer rock lies 2.6 miles 283° from the Sugar Loaf. This is the larger of the two rocks.

Blunts Reef Lightship is moored in 27 fathoms 1.9 miles southwestward of the outer rock. It has a red hull with BLUNTS lettered on each side and two masts with a circular grating at each masthead. The light, shown from the main mast only, is 65 feet above the water and visible 14 miles. The fog signal is sounded on a two-tone air diaphone; if diaphone is disabled, the signal will be given on a bell struck by hand. A fixed white riding light is shown on the forestay. A radiobeacon is synchronized with the fog signal for distance finding. The station receives and sends radio emergency messages only. The lightship will display storm warnings and small craft warnings while on station during daytime only. The code flag and radio call is NNCB.

The currents at the lightship are described in the *Current Tables, Pacific Coast.*

An area about 1.5 miles long in an easterly direction, having rocky patches from 4½ to 5¾ fathoms, is about 3 miles northwestward of Blunts Reef.

Fauntleroy Rock, with ¾ fathom over it, is 1.65 miles 251° from Cape Mendocino Light.

A rock, with 1¾ fathoms over it, is 0.5 mile 162° from the outer rock of Blunts Reef. The **Great Break,** with 3¾ fathoms over it, is 0.75 mile 188° from the outer rock of Blunts Reef.

Eastward of Blunts Reef and the Great Break are dangerous rocks and sunken ledges, a detailed description of which is unnecessary. Vessels should not attempt the passage between Blunts Reef and the cape under any circumstances. A heavy westerly swell breaks even in 9 to 10 fathoms in this locality.

From Cape Mendocino to False Cape, a distance of 4.5 miles, the coast is straight and bold and bordered by a broad, low-water beach.

Bear River, a small stream, enters through a narrow valley about midway between the two capes.

False Cape is a steep, bold headland, rising to a height of over 600 feet in less than 0.2 mile from the beach; it projects but little from the general trend of the coast. It is covered with grass, but the gulches on its sides are wooded. The base of the cape is bordered by a narrow, low-water beach of shingle and sand. For about a mile on each side of the cape are numerous rocks and sunken ledges the outermost of which are about a mile from the beach.

False Cape Rock, 216 feet high, lies 0.4 mile westward of the cape, with two rocky islets, 95 and 54 feet high between. It is not as regularly shaped nor as high as the Sugar Loaf off Cape Mendocino, and the top is much flatter. A rock with 1¾ fathoms over it lies a little over 0.5 mile westward of False Cape Rock.

Mussel Rock, 7 feet high, is 0.8 mile northward of False Cape Rock.

Chart 5602.—Northward of False Cape the hills decrease in height, and 4 miles beyond the cape is the beginning of a stretch of sand beach and dunes, broken only by Table Bluff and Buhne Point, that extend to Trinidad Head.

Centerville, about 4 miles northward of False Cape, is not prominent from seaward. There are two houses, two tanks with windmills, and a few barns near the beach to the northward of the bluffs and hills, but they are partially hidden by the hills when viewed from the southwestward. A white cross is one the 120-foot bluff just southward of Centerville.

Eel River empties nearly 9.5 miles northward from False Cape. This is a stream of considerable size and is occasionally entered by light-draft vessels, but the channel over the bar is continually shifting. The depth on the bar varies largely with the amount of water in the river, depending upon the character of the winter, and has been at times as much as 14 feet, but generally the depth is about 8 or 9 feet. The river is seldom entered except by fishing boats and other very small craft, and then only by those with local knowledge of the bar.

Eel Canyon is a submarine valley extending in a northwesterly direction. It comes to a head 10 miles northwestward of Cape Mendocino. Vessels are cautioned against mistaking this valley for one of those southward of the cape.

Chart 5832.—Table Bluff, about 12 miles northward of False Cape and 4.5 miles southward of Humboldt Bay entrance, is a prominent feature from seaward. The western face is 0.5 mile long, 165 feet high, very steep, and has a narrow sand beach under it.

The elevated tank and white buildings at Table Bluff are prominent.

Table Bluff Light is shown from a white square tower near the extreme western edge of the bluff. The light is 176 feet above the water and is visible 20 miles. The fog signal is sounded on an air diaphone.

From Table Bluff to Humboldt Bay entrance the coast consists of a narrow sand spit for 4 miles, behind which lies the southern part of Humboldt Bay.

Humboldt Bay is the first important harbor northward of San Francisco. The entrance is 21 miles northward of Cape Mendocino Light. A large quantity of lumber is shipped to both foreign and domestic ports; some farm and dairy produce, livestock, leather, and fish are also shipped, mostly to San Francisco. General merchandise, gasoline, and fuel oil are received.

Since the improvements by the Government, the bay can be used as a harbor of refuge in impending bad weather, provided it can be made before the bar becomes impassable.

The bay consists of two shallow basins connected by a narrow channel about 5 miles long, the entrance to the bay being at the junction of this channel with the southern basin.

Prominent features.—Table Bluff Light, 4 miles southward of the entrance, is the best landmark by night. By day the tall stacks and the smoke from the sawmills in the bay can usually be seen. **North Spit** has clumps of trees along the bay shore near the channel while **South Spit** is barren.

The red bluff at **Buhne Point** is abreast the entrance on the eastern shore of Humboldt Bay and is a conspicuous feature from seaward because of its color and elevation. While only 100 feet high, it is prominent on account of the surrounding lowland, and in a low-lying haze frequently resembles an island.

A Coast Guard station is inside the northern spit, about 0.5 mile northward from the end. The lookout tower is on top of an 86-foot elevated tank, 1,500 yards northeast of the south end of the North Spit and 740 yards east of the beach. Night **storm warnings** are displayed from the tower. When these storm warnings are not on display several red aviation lights are shown. Day storm warnings and International Code signals are made on the 100-foot mast located 85 yards, about 165° from the lookout tower.

The approach to the bay is marked by a lighted whistle buoy moored 1.25 miles westward of the end of the southern jetty. The outer bar bell buoy is 0.5 mile westward of the same point. A light is on the southern jetty, 165 yards from its outer end.

Humboldt Bay fog signal station is in a small white house on a wooden tower on the North Spit, with the diaphone 30 feet above water. The fog signal is sounded on a two-tone air diaphone. If the diaphone is disabled, a siren will be sounded from the tank near the bay end of the northern spit.

The Humboldt Bay Approach Range Front Light, 35 feet above the water, is marked by a white triangular daymark, a black vertical stripe with the vertex up. The Humboldt Approach Range Rear Light, 55 feet above the water, is on a white wooden tower and is marked with a white triangular daymark, a black vertical stripe with the vertex down. The bearing of the range is 099½°. Humboldt Bay Entrance Range Front Light is shown from a white skeleton tower placed in 8 feet of water on Buhne Spit Shoal. The rear light is on a white skeleton tower on Buhne Point; 38 feet above the water. The bearing of the range is 140°.

Note.—Humboldt Bay Entrance Range should be used in conjunction with Humboldt Bay Approach Range. The entrance range should not normally be used beyond the outer end of the Humboldt Bay jetties. The approach range should normally be used when approaching from seaward.

The **Humboldt Bar** has been improved by the Government by the construction of two jetties 750 yards apart. The southern jetty extends northwestward a distance of 0.7 mile from the northwestern point of the southern spit; the northern jetty is even with the southern jetty. The bar northwestward of the southern jetty is subject to considerable shifting and shoaling at times, especially during the winter months. The approach and entrance ranges must be followed closely.

Local pilots keep careful watch over the bar conditions, and sometimes sound out the channel before attempting to take out deep-draft vessels. In 1950 due to conditions of the inside channel as well as the bar, 22½ feet was the usual maximum draft to which vessels were loaded in Humboldt Bay.

In the past Humboldt Bar was considered treacherous and dangerous, and many disasters have occurred here. With the present improvements, however, and by employing local pilots, vessels may enter or leave with comparative safety. The strong currents that may be encountered, and the abrupt turn at the outer end of the southern jetty are apt to be dangerous for strangers. The bar is smoothest during the last of the flood current and it is often passable at this time and impassable two hours later, when the ebb current has set in. Deep-draft vessels are usually taken in and out of the bay during daylight hours.

Within the jetties is an area of rapid changes which must be navigated with great caution. From within the jetties the channel curves northward and passes close under the eastern point of the northern spit, then continues northward for 3.2 miles to the entrance of the northern basin. Here it divides into three branches, the eastern one called the **Eureka Channel,** passing along the water front of Eureka, the middle one between Gunther and Woodley Islands, and the western and largest one between the northern spit and Gunther Island. The western channel divides into Mud River Slough and Arcata Channels immediately northward of Gunther Island; the eastern channel connects with **Eureka Slough.**

Channels.—The project is as follows: An entrance channel 30 feet deep; a channel 26 feet deep from deep water in Humboldt Bay to the foot of N Street, Eureka; a channel 26 feet deep across Gunther Island Shoal to Samoa; a channel 18 feet deep to Arcata Wharf; a channel (Hookton) 26 feet deep to Fields Landing, with a turning basin 600 feet wide and 800 feet long and 26 feet deep off the Fields Landing Wharf.

In June 1950 the following depths were available: Entrance Channel, 33 feet; Entrance Channel to Bucksport, 25½ feet; Bucksport north to Eureka Channel, 27 feet; Eureka Channel to D Street, 18½ feet; Eureka Channel, D Street to N Street, 13½ feet; Samoa Channel, 27 feet; Fields Channel from Main Entrance to Turning Basin, 25 feet; Turning Basin, 27 feet. The Arcata Wharf Channel is not maintained.

The northern basin, **Arcata Bay,** is about 3 miles in diameter, with low, marshy shores, cut by many sloughs. There are two channels, the **Mad River Slough Channel,** leading into **Mad River Slough,** and the **Arcata Channel,** leading to the railroad wharf, now in ruins, at Arcata. **Gunther** (formerly **Indian**), **Woodley,** and **Daby Islands,** low and marshy, lie in the entrance to the northern basin.

Along the eastern shore of the bay, northward to Eureka, are several sawmills, with docks built out to the channel, from which lumber is shipped.

Fairhaven is a small town on the western shore 2 miles southward of Samoa. A small boatyard has a marine railway capable of hauling out craft up to 50-ton weight, 65-foot length, and 6-foot draft. A plywood plant with tall black stack is here.

Eureka, the principal town on the bay, is on the eastern shore, about 4 miles northward of the entrance. It handles most of the waterborne traffic of the bay,

and is the terminus of a railroad from San Francisco, although a branch of the road continues to Arcata and Samoa.

The approach to Eureka from the main channel through the bay is through an almost straight natural channel which has been improved by dredging.

Samoa, on the western shore opposite Eureka, is the terminus of a railroad from Arcata. There are large sawmills, and a considerable amount of lumber is shipped. The least depth in the channel leading to Samoa is 23 feet, with 23 feet alongside the docks. The high concrete stack is very prominent from offshore. There are three black tanks westward of the stack and two similar tanks to the southward. A privately owned passenger ferry provides regular service between Samoa and Eureka.

Arcata is on the northern shore of the northern basin. There are no serviceable wharves in Arcata. The ruins of several old wharves are near the head of Arcata Channel. A radiobeacon at Arcata has the code characteristic signal ACV.

The southern basin is about 3 miles long and 2 miles wide. There are two channels, one leading toward **Southport Landing,** the other past Fields Landing to **Hookton,** at the head of **Hookton Slough.** The **Southport Channel** has a least depth of 6 feet, but is little used. The **Hookton Channel** to Fields Landing is marked by lights, buoys, and a daybeacon.

Fields Landing, on the eastern shore of the southern basin, is reached by the Hookton Channel. A large lumber yard is here and lumber is shipped both by rail and water. There are depths of 18 to 20 feet alongside the loading wharf. Fields Landing is on the railroad and highway. A small boatyard has a marine railway having a capacity of 150 tons and capable of hauling out boats not over 80 feet in length or 8½-foot draft.

Anchorage.—The best anchorage is from a point about 0.2 mile northward of the buoy abreast Bucksport wharf to the post light marking the entrance to the channel leading to the water front at Eureka. Vessels in anchoring must keep clear of the cable crossing the channel from a little below the post light on the Union Oil Company's wharf to the western shore. It is forbidden to anchor in Eureka Channel longer than 24 hours at a time. If obliged to anchor outside the bar, the best anchorage will be found a little southward and westward of the lighted whistle buoy in about 90 feet, sand and clay bottom.

Directions, Humboldt Bay.—A pilot should be engaged by strangers if there is any sea on the bar or if they have deep-draft vessels. It should be borne in mind that the bar is subject to change, so that strangers cannot rely on finding the charts correct or the ranges indicating the best water.

From southward.—From a position 1.5 miles 260° from Blunts Reef Lightship, steer 356½° for 5.0 miles, when Table Bluff Light should bear 048°; thence a 038½° course made good for 20.0 miles leads to Humboldt Bay Entrance lighted whistle buoy HB. At night Table Bluff Light should be made shortly after passing Blunts Reef Lightship, and when nearing the entrance, the lights in Eureka will be seen. In thick weather, after passing False Cape Rock, all dangers will be cleared by keeping in a depth of over 15 fathoms until up with the lighted whistle buoy, where anchorage should be made until a pilot is obtained.

From northward.—From a position 3 miles westward of Trinidad Head Light, a 187° course, made good for 17 miles, leads to the Humboldt Bay Entrance

lighted whistle buoy HB. On this course Table Bluff Light, 5 miles southward of the Humboldt Bay Entrance lighted whistle buoy HB, should be made ahead. In thick weather the depths should not be shoaled to less than 20 fathoms between Turtle Rocks and Trinidad Head and, when southward of the head, the depths should not be shoaled to less than 15 fathoms until up with the lighted whistle buoy, where a vessel should anchor until a pilot is obtained.

From seaward.—In clear weather the high land of Cape Mendocino and Punta Gorda southward, and Trinidad Head northward of the entrance, are good landmarks. At night, the lights are a good guide. In thick weather soundings should be taken frequently, and upon getting depths of 30 fathoms or less great caution must be exercised until sure of the vessel's position, when the course should be shaped for the lighted whistle buoy.

Sailing vessels during the prevailing northwesterly winds of summer should endeavor to make the land in the vicinity of Trinidad Head, which gives them a fair slant for the entrance, and is an additional precaution against the irregular southerly set of the current. In thick weather soundings should be taken constantly when inside of 50 fathoms. Making the land northward of the entrance avoids the irregular bottom and dangerous currents in the vicinity of Cape Mendocino.

From the Humboldt Bay Entrance lighted whistle buoy HB, Humboldt Bay Approach Range, course **099½°**, and Humboldt Bay Entrance Range, course **140°**, lead into the bay. The entrance range parallels the south jetty and is only about 150 yards from it. The turn from the approach to the entrance range, 200 yards off the outer end of the south jetty, is rather abrupt and is difficult under certain conditions of wind, sea, and current. Inside the bay the channels are well marked by daybeacons and buoys, and are easy to follow.

Tides.—The mean range of tide at Eureka is 5 feet. The range between mean lower low water and mean higher high water is 6½ feet. A range of about 11 feet may occur at the time of maximum tides. Daily predictions for Humboldt Bay (South Jetty Landing) are given in the *Tide Tables.*

Currents.—The tidal currents follow the general direction of the channels. In the main channel, the average velocity at strength is less than 2 knots, and the maximum does not exceed 3 knots. Between the jetties, the average velocity at strength is about 2 knots, with a maximum of about 4 knots. For current predictions the *Current Tables, Pacific Coast* should be consulted.

Storm warnings are displayed day and night from the Humboldt Coast Guard Station on North Spit. Daytime signals only are displayed from the Signal Oil dock.

Pilotage.—Pilots and towboats are available. Vessels requiring services should radio their agents at Eureka. The pilotage rates are based on draft and tonnage.

Towage.—Towage rates between berths inside the harbor, known as harbor moves, are based on draft and tonnage.

Quarantine.—Regulations of the United States Public Health Service are enforced. The quarantine station is at 507 F Street.

Marine hospital.—A relief station of the United States Public Health Service, in charge of a service officer, is at Eureka. Out-patient offices are in the Medical-Dental Building, 730 Seventh Street.

Eureka is a port of entry and marine documents are issued. The Bureau of Customs is in the Federal Building. The **Immigration Service** office is in the Federal Building at Eureka. A **chart agency** of the Coast and Geodetic Survey is here also.

Harbor regulations are prescribed by the Board of Harbor Commissioners, and are enforced by the surveyor of port.

Supplies.—Fuel oils, provisions, water, and ship chandler's stores can be obtained at Eureka.

Repairs.—Minor repairs to machinery and to woodwork above water can be made. There are no drydocks in the area. Two marine railways are in the bay and boats up to 80 feet in length and with 8½-foot draft can be hauled out. The capacity of the largest railway is about 150 tons.

Communication is by rail to San Francisco and by bus and air to points north and south. Communication is available by telegraph and telephone or by commercial radio at Eureka.

Chart 5602.—Northward of the entrance to Humboldt Bay, the coast consists of sand dunes partly covered with timber for 11 miles to the mouth of **Mad River,** and for the first 7 miles forms the western shore of Humboldt Bay. Above the bay the land behind the dunes is low and marshy as far as the river.

From the mouth of Mad River, the sand dunes varying in height from 20 to 60 feet, continue for about 5.5 miles to **Little River,** a small shallow stream. The northern point at the mouth of the stream is rocky, and from this point the coast consists of rocky cliffs extending beyond Trinidad Head.

Chart 5846.—Little River Rock, 126 feet high, is 0.8 mile northwestward of the mouth of Little River, and about 0.3 mile offshore. Several rocks and foul ground are between it and the beach, and a rock 4 feet high is about 100 yards northwestward.

From Little River Rock to Trinidad Head the shore is bordered by numerous rocks and sunken ledges extending 0.3 mile offshore.

Pilot Rock, 93 feet high, is 0.5 mile southward of Trinidad Head. It is of small extent, conical, and whitish in color, rising abruptly from depths of 48 to 59 feet on all sides. Pilot Rock is marked on its western side by a gong buoy.

Trinidad Head is nearly 39 miles north-northeast of Cape Mendocino and 17.5 miles northward of the entrance to Humboldt Bay. It covers an area 700 yards long and 500 yards wide and rises to a height of 380 feet. The sides are steep and covered with chaparral. From northward or southward the head is generally raised as a dark, round-topped island. Near the northern end it is joined to the mainland by a narrow neck, from the southern side of which **Little Head,** a rocky knoll 125 feet high, projects into the bay. The white cross 200 yards northward of the southern point of Trinidad Head is fairly prominent. The old tank platform about 200 yards northward of the cross is prominent from the westward and eastward.

Trinidad Head Light is near the southwest side of the head on a white pyramidal tower. The light is 196 feet above the water and visible 20 miles. A fog signal is sounded on an air diaphragm horn; this signal is not sounded from December 1 to April 1 of each year. A lighted whistle buoy is moored 1.0 mile west of the head.

Trinidad Harbor is the small cove eastward of Trinidad Head. It affords shelter in northwesterly weather but is dangerous in westerly or southerly weather. The cove is small and is further contracted by several rocks, and as a rule, there is always a swell even in northerly weather and, although the holding ground is only fair, it is used by fishing boats to a considerable extent during the summer months. A wharf with fish house has been built out from the bight west of Little Head. Fish are unloaded at the wharf and are trucked to Eureka.

Trinidad is a village on the northern shore of the cove. It is on the Redwood Highway, which parallels this section of the coast. There is a hotel in Trinidad and telephone and bus service. Provisions may be had in small quantities.

Prisoner Rock, 42 feet high, is the most prominent of the rocks in the cove, and consists of two rocks so close together that they are usually taken for one. From southward they resemble an animal lying down with its head toward the west. It is 220 yards eastward from the eastern shore of the head. A rock with 7 feet over it is 150 yards north-northwestward from it.

Flat Rock, low and small, lies 350 yards northeastward from Prisoner Rock; a rock with 5 feet over it lies 150 yards southeastward from it. Another rock with 9 feet over it lies 400 yards 142° from Prisoner Rock. A bell buoy is moored in 42 feet of water 350 yards southward of Prisoner Rock.

The best anchorage is in 42 feet, muddy bottom, about halfway between Prisoner Rock and Trinidad Head, with Flat Rock, bearing 073°, just open southward of Prisoner Rock.

In entering from southward, vessels should not pass eastward of the line with the west tangent of Prisoner Rock on range with Little Head, to avoid the 9-foot spot southward of Prisoner Rock. Pilot Rock may be passed close-to on either hand. From northward, steer **180°** for 5.3 miles, when Trinidad Head Light and the lighted whistle buoy off the head should be in range; bearing 086½°. A **090°** course will then lead to the bell buoy south of Prisoner Rock. The southern face of the head may be kept close aboard.

Blank Rock, 111 feet high, lies a little over 0.3 mile westward of the head. Foul ground is between it and the head. A smaller rock is 150 yards northward of Blank Rock. A rock awash and a ledge with 15 feet over it are 275 yards southeastward of Blank Rock.

Off-Trinidad Rock, 72 feet high, lies 0.3 mile northwestward of Blank Rock. It is considerably larger than Blank Rock, with two rocky heads of about the same height. A sunken rock lies 300 yards off its southwestern face, and numerous ledges extend southeastward toward the head.

Blank page retained for pagination

CHAPTER 10

Trinidad Head to Cape Blanco

Chart 5702

FROM Trinidad Head to Rocky Point, 5.5 miles, the coast is rocky, with numerous outlying, rocky islets, and sunken ledges extending as much as 1.2 miles offshore. Above Rocky Point the beach is low and sandy, with several lagoons behind it, for nearly 11 miles to the southern end of the Gold Bluffs. From this point to Point St. George the coast is rocky, the cliffs being from 100 to 500 feet in height and bordered by numerous rocks. The Klamath River breaks through the cliffs 16 miles southward of Point St. George. From Point St. George to Cape Blanco, a distant of about 60 miles, the coast trends in a general northwesterly direction, with a shallow bight, Pelican Bay, immediately northward of Point St. George. The beach is fringed by numerous rocks and sunken ledges, but, with the exception of Rogue River and Orford Reefs, these in general do not extend over a mile from shore. The 30-fathom curve follows the general trend of the coast, and in thick weather may be considered as the limit inside of which it is unsafe to approach, but in the vicinity of Rogue River and Orford Reefs, the depths should not be shoaled to less than 50 fathoms.

From Trinidad Head to Rocky Point, a distance of 5.5 miles, the coast is rugged and rocky, the cliffs reaching elevations of over 100 feet. Rocks and sunken ledges extend in some cases over a mile offshore. The mountains back of Trinidad Head are good landmarks for vessels approaching from seaward.

Rodgers Mountain, 2,800 feet high and heavily wooded, is nearly 7 miles northeastward of Rocky Point, and is easily made out. **Hupa Mountain,** 4,093 feet high lies farther inland, about 16 miles eastward of Rocky Point.

Green Rock, 108 feet high and of small extent, lies 1.5 miles northward of Trinidad Head and nearly 600 yards offshore. The top is covered with grass. Numerous rocks lie inshore, and a rock awash at high water lies 700 yards 275° from it. A rock with 3 fathoms over it lies about 0.5 mile 267° from Green Rock. It seldom breaks, and rises abruptly from 15 fathoms. Two sunken rocks lie 0.5 and 0.8 mile 329° from Green Rock.

White Rock, 118 feet high, lies 1.9 miles northward of Trinidad Head. It is of small extent and is 250 yards off a wooded, projecting head of about the same height. Another rocky islet 129 feet high is 1 mile northward of White Rock.

Cone Rock, 17 feet high, is 3.8 miles northward of Trinidad Head and a little over a mile offshore. It is conical in shape and of small extent. A smaller rock 15 feet high lies 0.5 mile eastward.

Turtle Rocks, two rocks of small extent 20 and 29 feet high, are 1.5 miles northward of Cone Rock and abreast of Rocky Point. Eastward of Turtle Rocks the ground is foul, with two breakers 600 and 800 yards from the outer rock and numerous visible rocks extending to the beach. A bell buoy is moored 0.5 mile westward of Turtle Rocks.

Rocky Point, 5.5 miles northward of Trinidad Head, is a bold feature with cliffs about 200 feet high, bordered by numerous rocks and ledges extending 200 to 300 yards offshore. The point is covered with oak and scrub pine for 0.5 mile back to the redwood forest; through this oak growth two rocky pinnacles about 250 feet high are visible.

Northward of Rocky Point the cliffs are succeeded by a low sandy beach for 4.5 miles to the north end of **Big Lagoon,** which is immediately behind the sand beach. Above Big Lagoon the cliff formation is resumed and extends 2 miles to **Stone Lagoon.**

A conical rock is 6.2 miles northward of Rocky Point and 1.5 miles northward of the northern end of the narrow strip of beach separating Big Lagoon from the ocean. It is a sharp-pointed cliff about 400 feet high, of light-gray rock distinguishable 15 miles in clear weather from any direction.

Sharp Point, at the northern end of the sand beach in front of Stone Lagoon, lies 7.8 miles northward of Rocky Point. It is a high, projecting point with a precipitous face southward, and sharp slope northward, where a low sandspit extends for 0.5 mile to a second rocky head and from there for another 0.5 mile to Gold Bluffs. A fresh water lagoon is behind each sand beach. Numerous rocks extending about 0.8 mile offshore border the beach.

The southern point of **Gold Bluffs** lies about 9 miles northward of Rocky Point. They extend northward for 9 miles, ranging from 100 to 500 feet in height, the first 3 miles being comparatively low and bordered by several outlying rocks. About 4 miles from the southern end the cliffs are broken by two moderately broad valleys. These bluffs are composed of gravel and sand and are not rocky.

Mussel Point, 11.2 miles northward of Rocky Point, is a light gray cliff about 300 feet high, with a small, flat top distinguishable at 10 to 12 miles in clear weather.

Redding Rock, 94 feet high and of small extent, is broad off Mussel Point, nearly 4.5 miles offshore. It is dark for about one-third the height and white above with a cleft on the southern face. It rises abruptly from depths of 20 fathoms and can be approached close-to with safety. It is marked by Redding Rock Daybeacon, a white 18-foot square pyramidal skeleton tower on house. A lighted whistle buoy is in 28 fathoms of water 400 yards 240° from the daybeacon.

Northward of Gold Bluffs the coast becomes rocky, irregular, and broken, the bold cliffs being bordered by many rocks.

A yellow clay slide extending from the top of a 900-foot slope to the beach is 9 miles northward of Mussel Point. It is sharp at the top, broad at the base, and the highest and most prominent of the bluffs in that vicinity. It may be seen in clear weather for a distance of 15 to 18 miles.

Split Rock is a slightly projecting head 3.5 miles northward of the northern end of Gold Bluffs; it is named on account of the cut on the northern face.

High Bluff is a slightly projecting head 0.8 mile northward of Split Rock. It

is prominent on account of an enormous split or chasm on its northern face; at the southern edge of the cut the bluff is 340 feet high.

White Rock, 107 feet high, lies 600 yards northward of High Bluff and 300 yards offshore. Numerous rocks, covered and visible, lie between it and the beach. Its southern face is very precipitous, and its western face is steep, sloping northward. It can be distinguished by its color for several miles.

Flint Rock Head, 177 feet high, is a detached rocky head connected with the cliffs by a low sandspit. It is at the southern end of the Klamath River sand beach, 1.8 miles northward of Split Rock. Its southwest face is precipitous. A rock awash lies 0.6 mile 315° from Flint Rock Head and about 0.5 mile offshore.

The **Klamath River** empties about 16 miles southward of Point St. George and 30 miles northward of Trinidad Head. It it a large river draining an extensive mountainous area. The mouth of the river in 1950 was on the northern side of the valley near the northern headland. The sandspit extending from the southward is partially reinforced by pilings. Local boats carry 4 to 6 feet into the river. The bar has not changed much recently, but local knowledge is essential to make the entrance. The entrance is seldom used, but there are milling operations and some small boat traffic on the river.

The coast highway crosses the river at **Klamath,** a small town 2 miles inland. **Requa,** a small village on the north shore of the river just inside the mouth, has a hotel and landings for sport fishing boats.

Red Mountain (Mount Turep), 4,305 feet high, 8 miles eastward of the mouth of Klamath River, is prominent. In clear weather it is visible about 60 miles seaward.

From the mouth of the Klamath River the coast curves northwestward for 3 miles to the mouth of **Wilson Creek.** The cliffs are high, irregular, and jagged, and the hills above are covered with grass and chaparral. Numerous rocks extend about 300 yards offshore.

A covered rock 0.6 mile offshore is 1.4 miles 297° from the mouth of Klamath River. A rock 37 feet high is 1 mile offshore a little over 2.5 miles 318° from the mouth of Klamath River and about 1.5 miles southward of Wilson Creek.

False Klamath Rock, 203 feet high, reddish, and round-topped, is the most prominent rock on this part of the coast. It lies 650 yards westward of the southern point of the small cove into which Wilson Creek empties.

Wilson Rock, 2½ feet deep, is 0.5 mile 270° from False Klamath Rock.

A rock awash is 0.9 mile 324° from False Klamath Rock. Numerous covered rocks lie eastward and northeastward of the line from this rock to the rock 37 feet high southward of False Klamath Rock.

From False Klamath Rock the coast for 7 miles northward consists of bold rocky cliffs, much broken and bordered by numerous covered and exposed rocks. Beyond these, extending about 4 miles to Crescent City, is a broad sand beach backed by flat cultivated land.

Midway Point, 4 miles northward of False Klamath Rock, is bold, rising to a height of 820 feet 800 yards from the beach.

Sister Rocks, a cluster of prominent rocks 0.5 mile westward of Midway Point, consists of three large and several smaller rocks covering a limited area; the outer one is 69 feet and the inner one 72 feet high.

Chart 5895.—Crescent City is on the northern side of a small rocky constricted bay about 3 miles southeastward of Point St. George and midway between San Francisco Bay and the mouth of the Columbia River. The Federal project provides for a breakwater approximately 5,700 feet in length, extending from Battery Point to Round Rock, a rubble mound sand barrier from Whaler Island to the eastern shore, and an inner breakwater extending northwestward from Whaler Island, so as to form a protected harbor for fishing boats. It also provides for a basin off the wharves, 1,800 feet long, 1,400 feet wide, and 20 feet deep. In May 1949 the controlling depths were 9 feet at the edge of Pauls Cannery wharf and 11 feet at edge of Citizens Dock to 20 feet in the harbor basin, and in the fish boat harbor, 10 feet. The west breakwater is incomplete and extends 4,500 feet from Battery Point toward Round Rock, with 1,200 feet remaining to be built. This gives good protection from the northwestward, but the anchorage, except for Fishboat Harbor, is open to the southward.

The easterly of the two wharves in the west part of the harbor is in ruins; the westerly is a fish cannery wharf. In 1950 a wharf for shipping lumber was being constructed out from the foot of B Street, just eastward of the west breakwater.

Fishboat Harbor (Inner Harbor Basin) is formed by the inner breakwater extending northwestward from Whaler Island and the sand barrier from that island to the eastern shore. Although small, the harbor affords excellent shelter; it is used extensively by fishing boats. A town wharf called Citizens Dock has been built out to a depth of 13 feet. Lumber is shipped from the head of the wharf, and fishing boats use a spur built out from the end of the wharf. Water, gasoline, and fuel oil are piped to the wharf. The end of the inner breakwater is marked by a light.

In 1950 Crescent City had no facilities for hauling out. Some local boats are beached for minor repairs. Neither pilots nor towboats are available. Communication is by motor vehicle over highways to the interior, north and south. There is no through rail connection. An excellent hospital is at Crescent City.

The approaches to the harbor are bad. Greatest caution must be used.

Crescent City Light, 77 feet above water and visible 14 miles, is shown from a white tower on a dwelling situated on a small rocky islet 45 feet high, 200 yards southward of **Battery Point.** The beach between the islet and the point is bare at half tide.

From Crescent City Light numerous rocks both above and under water extend southward for 0.8 mile and also east-southeastward for 0.7 mile to a buoy marking the western side of the entrance. The eastern side of the entrance channel is marked by a lighted bell buoy. A lighted whistle buoy is moored about 250 yards off the end of the west breakwater on a prolongation of its axis. This buoy is relocated as construction of the breakwater progresses. Occasionally the buoy is forced out of position by heavy seas during southerly storms. **Round Rock,** 0.9 mile 145° from the light, is 45 feet high and has deep water close-to. A pinnacle rock is 0.4 mile westward of Round Rock and is marked on its southern side by a gong buoy. **Mussel Rock,** only a few feet high, is 0.6 mile southeastward of Round Rock. Eastward of Round Rock are numerous covered rocks which extend northward to **Whaler Island,** 90 feet high, the largest in the cove. The channel between the westernmost of these rocks and **Fauntleroy Rock** is

marked by the buoys just mentioned. Crescent City lighted whistle buoy CC is 1.6 miles 182° from the light.

In approaching from southward, keep the light bearing northward of 346° until up with Crescent City lighted whistle buoy CC, to clear **Chase Ledge,** lying 0.9 mile 175° from Round Rock. In thick weather the depth should not be shoaled to less than 100 feet until the lighted whistle buoy is made. From Crescent City lighted whistle buoy CC, steer 032° so as to pass over 100 yards westward of Round Rock, and from the rock steer 026° and pass between the buoy and the lighted bell buoy. After passing these buoys, haul gradually westward for the wharf and anchor in 21 feet.

In approaching from westward, when Round Rock is made, it may be steered for on any bearing northward of 088°, passing 0.8 mile or more southward of Crescent City Light. When up with Round Rock proceed as directed in the preceding paragraph.

Caution.—Vessels anchored in the harbor should take precaution against a local southeasterly wind known as the *kick back* or *back draft,* which frequently blows with considerable violence at night. This wind follows only periods of strong northwesterly winds outside. It usually starts in about 9:30 p. m. and dies out about midnight.

From Crescent City Light to Point St. George, 3.4 miles, the coast is moderately low but rocky, with numerous rocks above and under water extending 0.8 mile offshore. **Castle Rock,** the largest, is 233 feet high, and lies 2.3 miles 301° from Crescent City Light and 0.5 mile southward of the southern point of Point St. George. It has a rather flat top with a small knob near the eastern edge. By passing 0.8 mile or more southward of Crescent City Light and over 0.3 mile southward of the outer visible rocks, all dangers between the light and Castle Rock will be avoided.

Point St. George is low, with several irregular and rocky hillocks near the beach. The seaward face is about a mile long in a northwesterly direction, with sand dunes and low land immediately behind it. The tree line is about 0.6 mile inland, with a few trees near the southern end of the point. Numerous conspicuous rocks fringe the point between Castle Rock and Brown Rock, one of which, **White Rock,** 45 feet high, shows an arch from westward. **Brown Rock,** 28 feet high, is at the end of the reef of exposed rocks that extends 0.5 mile west-northwestward of the northwestern end of Point St. George.

St. George Channel, over a mile wide, is clear between the visible rocks fringing Point St. George and the easternmost rocks of St. George Reef. It is frequently used in clear weather by coastwise steamers.

St. George Reef is composed of rocks and covered ledges extending 6.5 miles northwestward and westward from Point St. George. Nine visible rocks are in the group.

St. George Reef Light, 146 feet above water and visible 18 miles, is shown from a white square pyramidal tower on a pier on **Northwest Seal Rock,** the outmost rock. From November 1 to March 1, the light is displayed from 1 hour before sunset to 1 hour after sunrise. A fog signal is sounded on a two-tone air diaphone. A marker radiobeacon which operates continuously on a frequency of 310 kc. is at the light.

Star Rock, the southeasternmost rock of the group, is 64 feet high. It is 2 miles 277° from the southern end of Point St. George. Between Star and Northwest Seal Rocks are three rocks, **Hump, Whale,** and **Southwest Seal,** almost in line, varying in height from 18 to 45 feet. Southward of these visible rocks are two covered ledges, **Mansfield Break** and **Jonathan Rock.** The latter is 2.5 miles 289° from Star Rock and 3.2 miles 155° from Northwest Seal Rock. It breaks only in a heavy swell, and not continuously then; deep water surrounds it. Mansfield Break lies 2.3 miles 162° from northwest Seal Rock and nearly 3.5 miles 298° from Star Rock. It is about 100 yards in extent with 20 fathoms close-to and around it.

Great Break, 0.5 mile 149° from Southwest Seal Rock, is about 150 yards in extent. A covered ledge that breaks at low tide is 125 yards southwestward of Southwest Seal Rock.

Dragon Channel, which leads northward of Jonathan Rock and between Mansfield Break and Great Break, is not recommended.

East and **Long Rocks** are 2.1 and 1.6 miles, respectively, 349° from Star Rock. On this line and 1 mile northward from Star Rock is a rock visible at lowest tides; 0.3 mile southeastward from this rock is a rocky patch 15 feet deep in which a rock 5 feet deep has been reported.

Flat Rock lies nearly midway between Long and Whale Rocks, and about 0.6 mile from the former. **Mussel Rock** is nearly 0.5 mile 284° from Long Rock; a covered ledge showing a breaker is 200 yards 009° from the rock. A covered rock that breaks in moderate swells is 330 yards 026° from Hump Rock.

All the rocks of St. George Reef rise abruptly, and in the vicinity soundings give no warning of their presence. In thick weather the greatest caution should be observed and the reef given a wide berth.

Chart 5702.—For about 10 miles northward of Point St. George, the shores of **Pelican Bay** are composed of sand dunes, with a broad beach extending to the mouth of **Smith River. Lake Talawa** and **Lake Earl** are surrounded by low marshy land behind this stretch of dunes.

A small rock about 10 feet high is 1.8 miles southward of the mouth of Smith River and nearly 0.5 mile offshore. A cluster of three low rocks is nearly a mile offshore and 0.9 mile north-northeastward of the 10-foot rock.

Chart 5896.—Pyramid Point, a rocky knoll 213 feet high, marks the northern point of Smith River.

Prince Island, of small extent and 171 feet high, lies 0.1 mile offshore abreast Pyramid Point. **Hunter Rock,** 177 feet high, double-headed and somewhat smaller, is 0.3 mile northward of Prince Island. Several other smaller rocks are in the vicinity.

The California-Oregon boundary is about 3.1 miles north of Pyramid Point.

Between Smith River and Chetco River, a distance of nearly 7 miles, the coast is composed of low rocky cliffs, bordered by numerous rocks and ledges, covered and awash, and backed by a low narrow tableland. Several prominent rocky knolls rise from 100 to 200 feet above this tableland.

Cone Rock, 1.3 miles northward of Prince Island and 0.6 mile offshore, is the most prominent of the visible dangers in this vicinity. It is 68 feet high and of small extent.

The **Winchuck River,** a small stream with 0.5 mile of low sand dunes on the southern side of its mouth, empties 3 miles northward of Prince Island. A rock awash is 1 mile offshore southwestward of the Winchuck River, 2.6 miles 342° from Prince Island.

The remaining dangers are too numerous for description, and this stretch of coast should not be approached closer than 1.5 miles.

Chetco Cove, at the mouth of the Chetco River, is about 15.5 miles northward of Point St. George. It affords an indifferent anchorage, with some protection from northwesterly winds, but is exposed in southerly weather. There are numerous visible and sunken rocks fringing the shore of the cove and its approaches, necessitating caution in its use. Near the middle of the cove at the mouth of the river is a sand and gravel beach over 0.5 mile in length. From southward the valley of the river is well marked, even in hazy weather. Just inside the entrance to the river on the west bank is a conspicuous concrete bridge pier. On the northern shore of the cove, westward of the mouth of the river is the village of **Brookings,** which has a post office. The ruins of a wharf extend out from shore 300 feet to **Bell Rock.** Anchorage may be had in 9 fathoms, sandy bottom, about 1,100 yards southward of **Yellow Rock.** Protection from northerly weather and good holding ground are afforded.

A Federal project provides for stabilization of the channel through the bar at the mouth of the **Chetco River** by construction of jetties and by dredging. In 1950, however, no work had been done. A fixed highway bridge crosses the river at the village of **Harbor,** 0.6 mile upstream from the mouth of the river. This bridge has a horizontal clearance of 160 feet and a vertical clearance of 23 feet.

From **Chetco Point** to Cape Ferrelo, about 4.5 miles, the coast is composed of high broken cliffs, bordered by numerous rocky islets and ledges extending, in some cases, over 0.5 mile offshore.

Goat Island, 184 feet high, lies 2 miles northward of Chetco Point and 500 yards offshore. There is deep water off its western and southwestern faces, but rocks and foul ground extend 200 yards southward from the southeastern point. The island is readily identified; its profile closely resembles that of Prince Island off Pyramid Point.

Cape Ferrelo is the first prominent headland northward of St. George Reef and, though not projecting seaward to any considerable extent, is conspicuous because of its bold, rugged face. Several rocks and islets lie directly off the cape to a distance of 0.5 mile.

From Cape Ferrelo to Crook Point the coast is very rugged and rocky, with several large and prominent islets and reefs extending well offshore. In some cases, these form anchorages for small vessels in northerly weather.

Whalehead Island, the outer of two rocky islets 2.3 miles northward of Cape Ferrelo, is 107 feet high. The inner of the two islets is 128 feet high. A rock awash lies 800 yards southward of the highest point of Whalehead Island.

A rugged cliff from 200 to 300 feet high is 3.3 miles northward of Cape Ferrelo. The face is about a mile in length and behind it rises a treeless triple-headed hill to heights of 700 to 800 feet.

Leaning Rock, 49 feet high, lies 0.5 mile offshore and about 3.5 miles northward of Whalehead Island. It has a perpendicular face on its northwestern side and slopes gradually southeastward. Several other rocks are in its vicinity.

Between Whalehead Island and Crook Point are two prominent, apparently grassy areas in the forest near the crest of the hills, about 2 miles apart and situated at an elevation of nearly 2,000 feet; the southern one is known as **Rocky Prairie.** These are noticeable when off this section of the coast.

Yellow Rock, 84 feet high, lies about 4.5 miles northward of Whalehead Island, and 0.5 mile offshore. The rock is yellowish in color and can be recognized from 4 miles offshore.

Bosley Butte, 3,403 feet in height, from westerly and northwesterly positions offshore shows above the coast ridges as flat-topped, with two summits separated by a slight depression. From offshore, what appears as the northeasterly summit shows rounded, and appears somewhat larger and slightly lower than the eastern summit.

Mack Arch is a double headed, rocky islet 0.8 mile offshore, 1.5 miles southward of Crook Point and about 8 miles northward of Cape Ferrelo. The western head is 231 feet high and the eastern a little lower; both are black to near the summits which are generally white from bird droppings. The arch, about 100 feet high, is under the eastern summit and shows prominently from southward. A rock awash lies 125 yards southward of the eastern point.

Anchorage.—The bight to the east-southeastward of Mack Arch has been used as a temporary anchorage during moderate northwesterly weather. The rocks and reefs break the swell. In approaching the anchorage, pass to the southward of Mack Arch about midway between it and Yellow Rock. Anchor in 11 fathoms, sand bottom, with Mack Arch bearing 296° and Yellow Rock bearing 155°. No breaks were noted, but caution is to be exercised as the place has not been closely surveyed. There is a farm in the cove northeastward of Mack Arch.

Mack Reef extends from Mack Arch to Crook Point, and comprises some 30 rocks, visible or sunken, varying in height from awash to 125 feet. From southward these rocks stand out conspicuously when seen against the white sand dunes northward of Crook Point, Mack Arch, on account of its size and height, being the most prominent.

Mack Arch Cove lies immediately eastward of the reef and affords fair shelter in northwesterly weather in 6 to 7 fathoms, sandy bottom. In entering from southward, pass eastward of Mack Arch, giving it a berth of about 150 yards, but taking care to avoid the rock 125 yards southward of its eastern point. Then bring the 125-foot rock, the highest of the northern part of the reef, to bear 352° and steer for it on that bearing until up to the anchorage abreast the group of rocks 0.5 mile northward of Mack Arch. Local small boats find smoother water by continuing the 352° course through the kelp and anchoring in 4 fathoms with the 125-foot rock bearing 333°, distant 300 yards. This latter anchorage is contracted and is not recommended.

Crook Point is moderately low, but terminates seaward in a rocky knoll 175 feet high, with a slight depression immediately behind it. The rocks close to the point often show up during moderately thick weather, several being of very noticeable pinnacle formation.

From the vicinity of Crook Point to the mouth of the **Pistol River** are sand dunes which show up prominently in clear weather and distinctly mark this section. In thick weather these dunes cannot be readily distinguished. From the mouth of the river to Cape Sebastian are numerous rocks and rocky islets extending 0.3 mile offshore, reaching in some cases a height of 150 feet. The Pistol River bar opens in the rainy season; its location varies from year to year.

Hunter Cove is a small, contracted anchorage under the southeastern face of Cape Sebastian. It is formed partly by the cape and partly by **Hunter Island** in the entrance. The island is 0.2 mile in extent, rocky, flat-topped, and 113 feet high. Shoal water extends from it eastward to the beach. The cove is used occasionally by launches and small craft. During strong northwesterly weather the sea at the entrance is rather lumpy for small boats. There is a small stream at the head of the cove which furnishes good clear water. With moderate southwesterly weather a heavy sea piles up across the entrance between the cape and Hunter Island. The cove is not recommended as an anchorage.

Chart 5951.—Cape Sebastian is conspicuous from either northward or southward. It is the seaward termination of a ridge transverse to the coast, and rises abruptly from seaward to a height of 694 feet, with a depression behind it, and then more gradually to a height of about 2,000 feet. The seaward face is precipitous and broken and has a few trees; southward the lower part is grass covered. A rock with 1¾ fathoms over it that seldom breaks is 0.5 mile offshore, 0.9 mile 342° from the western extremity of the cape.

From Cape Sebastian to the mouth of Rogue River, a distance of about 6 miles, the coast is considerably broken and quite rugged but rather low in the vicinity of the beach, and has but few outlying rocks.

Hunter Creek empties about 4 miles northward of Cape Sebastian; it is small and unimportant. Off the mouth are three exposed rocks, the outer or middle one 2 feet high, lying nearly 0.5 mile offshore.

Rogue River is an important sport-fishing stream. **Gold Beach,** on the southern bank of the river near its mouth, is the principal town, and opposite it, on the north bank, is **Wedderburn,** having several float landings with depths up to 5 feet at low tide. Only a few boats are engaged in commercial fishing. The bar at the entrance has a depth of 4 to 5 feet at low water, and is crossed only at high tide during the summer months by light-draft vessels with local knowledge. Owing to the shifting character of the bar, no directions of value can be given. A concrete arch highway bridge of approximately 60 feet vertical clearance crosses the Rogue River about 0.8 mile above its mouth. The bridge is prominent from seaward when off the mouth of the river.

The northern head at Rogue River entrance that reaches an elevation of 700 feet about a mile northward of the river mouth, the marked depression in the coast range made by the river valley, and the rocks of Rogue River Reef, are all prominent from seaward.

Rogue River Reef extends in a general northwesterly direction from the mouth of Rogue River for 4 miles, with a channel 0.5 mile wide separating it from the beach. This channel has been used occasionally, but it is not safe without local knowledge. **Northwest Rock,** 4 miles 308° from the entrance to Rogue River, is the outermost rock of the reef and is 6 feet in height. In 1925 two vessels reported striking an obstruction westward of Northwest Rock. The bottom is very broken here and, inasmuch as the area has not been swept by a wire drag, vessels are advised to give this rock a berth of at least 1.5 miles. A rock 2½ fathoms deep is 0.3 mile 282° from Northwest Rock. **Needle Rock,** 106 feet high, is the most prominent of the rocks in the reef; it lies nearly in the middle of the group, 3 miles 302° from the northern point of the river. The needle is on the southern side of the rock. **Pyramid** and **Double Rocks** are prominent, and are 46 and 53 feet high, respectively. A rock with 2¾ fathoms over it lies 2 miles 185° from Needle Rock and 2.8 miles 262° from the mouth of the river, and breaks with an ordinary swell. A rocky patch 4¾ fathoms deep lies 2.5 miles 248° from the mouth of the river and 2.5 miles 172° from Needle Rock; this patch generally shows a breaker.

Northward of Rogue River the coast trends northerly for about 10 miles and then northwestward to Cape Blanco. The mountains are high, irregular, dark, and covered with chaparral. For 5 miles northward from the mouth of the river the beach is bordered by numerous rocks, but beyond that the coast is comparatively clear with the exception of Orford and Blanco Reefs.

A group of sunken and visible rocks, 1 mile long and 0.5 mile wide, lies 5 miles northward of Rogue River and nearly 2 miles offshore; these rise abruptly from 12 fathoms. **North Rock,** 7 feet high, is the largest and is nearest the beach. A sunken rock with 1¼ fathoms over it lies 1,345 yards 298° from North Rock.

The channel between Rogue River Reef and the mainland, and North Rock and the mainland, is sometimes used by coastwise freighters in clear weather. This channel should not be attempted by strangers.

Brushy Bald Mountain, 2,493 feet high, shows up in hazy weather as a flat rounded peak, with a gentle slope from westerly and southerly direction.

Sisters Rocks are a group of three rocky islets 10.5 miles northward from the mouth of Rogue River. The northern and largest one is about 350 yards in breadth and 394 feet high. It is connected to a projecting rocky point, 260 feet high. The second one, 250 yards southward of the first, is 150 yards in diameter and 149 feet high. The southern and outermost is about 150 yards long and only 15 feet above water. It lies a little over 0.4 mile southward of the middle rock and nearly 0.8 mile offshore. There is fairly smooth water in northwesterly weather under the lee of the largest islet, which was the site of the old landing of the village of **Frankport.**

Colebrooke Butte, 2,050 feet high, due east of Sisters Rocks, appears from the westward as a cone with gentle sloping sides. The upper part usually shows against the skyline and is readily recognized. From the southward, it shows as a rounded peak which resembles Brushy Bald Mountain, though it is somewhat lower. The northern part of the summit is tree-covered and dark green, and the southern part is grass- and brush-covered and light green. The slopes are timbered except for the lower part of the seaward slope which is bare and brown.

Lookout Rock, 2.3 miles northward of Sisters Rocks, is a prominent, projecting cliff, 560 feet high, with a marked depression behind it. The seaward face is precipitous.

Bald Mountain, 2,954 feet in height, appears from offshore as an irregular knob at the northwesterly end of a long ridge. **Rocky Peak,** 3,187 feet high, on the southeastern end of the ridge, is a sharp conical peak. From a southwesterly direction, three peaks or knobs show; from a north-northwesterly direction, two peaks show almost in range. These peaks were used by the early navigators as a landfall for Port Orford in coming from the northward.

Humbug Mountain, 1,748 feet high, lies 5.3 miles northward of Sisters Rocks and 4 miles southward of Port Orford. It is conical in shape, and its seaward face is steep and rugged. It is a prominent feature from seaward.

Chart 5952.—Island Rock, 222 feet high, lies 1.3 miles off the seaward face of Humbug Mountain. It is about 350 yards in extent and flat on top. About 200 yards off its northwestern end is a needle rock 109 feet high. These islands are prominent when approaching Port Orford from southward. Except for two small rocky patches with least depths of 10 fathoms and 6¾ fathoms, 900 and 600 yards, respectively, northward of Island Rock, there is deep water around these islands and between them and the beach. The passage between Humbug Mountain and Island Rock has been used by northbound coast steamers in northwesterly weather.

Redfish Rocks are a group of islets covering an area about 0.5 mile square, lying 2 miles northward of Island Rock and nearly 1 mile offshore. They are five in number and range from 10 to 140 feet in height. Many sunken rocks lie within this area.

Port Orford is about 6.5 miles southward of Cape Blanco and 19 miles northward of Rogue River. It affords good shelter in northwesterly weather, but is exposed and dangerous in southerly weather. It is easy of access, and is probably the best natural northwesterly lee northward of Point Reyes.

The Heads, 300 feet high, forming the western point of the cove, appear from the southward as a long ridge with three knobs. The inner two are slightly higher, and tree-covered. **Tichenor Rock,** 92 feet high, lies 175 yards southward of The Heads.

Battle Rock, high, narrow, and black, lies in the northern part of the cove close to the shore and is detached only at extreme high tides.

A wharf is in the northern part of the cove close under **Graveyard Point.** The depths alongside are 15 feet at the inner end of the loading face, and at the outer end are controlled by three small rocky pinnacles with depths of 17 and 18 feet. Vessels moor alongside the northeastern face of the wharf to load. Inshore of this loading face the depths are shoaler; this part of the wharf is used by crab fishermen. Water, gasoline, and Diesel oil are piped to the wharf. Hoists on the wharf have a capacity of 15 tons; fishing boats are hoisted to cradles on the wharf.

Dangers.—There is a rock with least depth of 5 feet, 165 feet from the inner end of the wharf. It is usually marked by kelp. The remains of a former breakwater, the outer end of which is submerged and marked by kelp, extends about 100 yards southeastward of Graveyard Point to just southward of the wharf, and af-

fords a fair lee for the wharf in southwesterly weather. Several dangerous rocky patches marked by kelp are in the area eastward of a line drawn about east-southeastward from the foot of the wharf. Other important rocky patches are 2¾ fathoms 2,075 yards 308° from **Rocky Point**; 2¾ fathoms 1,225 yards 294° from Rocky Point; 4¼ fathoms 1,550 yards 230° from Rocky Point.

Anchorage may be had slightly to the westward of the center of the cove, in 10 fathoms, sand bottom. A bell buoy is moored 0.5 mile southward of Tichenor Rock. Small craft may anchor closer to The Heads where better protection is afforded against the northwesterly winds which sweep with considerable force through the depression at the head of the cove. Two rocks, awash at high tide, lie near the western side of the cove, near The Heads. In approaching Port Orford at night, a neon sign and a few other lights in the town will usually be seen.

Port Orford is a small town on the cove. It is noted chiefly as being the home of the famous Port Orford yellow cedar. Yellow cedar logs are shipped to Coos Bay by truck over the Oregon Coast Highway. Communication is by bus, telephone, and telegraph. Ordinary supplies can be obtained in the village. The main coastal highway passes through here and marine supplies can be ordered from larger nearby towns.

Port Orford Coast Guard Station is located at **Nelly Cove,** 0.4 mile westward of the Port Orford Wharf. The Coast Guard lookout tower, white, 253 feet above the water, is prominent from the southward and is reported to be mistaken at times during daylight hours for Cape Blanco Lighthouse. The white water tank on the summit at an elevation of 362 feet and northward of the tower, shows just clear of the nearby trees. When seen from a considerable distance offshore, it also resembles Cape Blanco Lighthouse. It is visible farther to seaward than the lighthouse by reason of the dark solid timber background which brings it into prominence.

Klooqueh Rock, 101 feet high, black, and conical, lies 0.3 mile off the northwestern face of The Heads. It is prominent, especially when coming from the northward inside Orford Reef. A rocky ledge, bare at low water, extends about 50 yards from the eastern face of this rock, and another rock, bare 2 feet at high water, lies about 330 yards eastward.

From The Heads to Cape Blanco, about 6.5 miles, the coast extends in a general north-northwesterly direction. Northward of The Heads the shore is a narrow sand ridge, rising at one point to 160 feet, covered with grass, fern, and brush, and ending abruptly nearly 3 miles from The Heads at the edge of the Elk River Valley. Northward of this point are sand dunes extending to the mouth of **Elk River,** a small, unimportant stream. Beyond the mouth of Elk River to Cape Blanco, the coast consists of vertical cliffs, wooded to the edges, and in some places over 150 feet high.

Orford Reef is composed of a group of irregular rocks and sunken ledges, about 2.5 miles long by 1.5 miles wide, extending in a northerly direction. The northernmost limit of the reef is about 2 miles southward of Cape Blanco Light, and the southernmost limit lies about 5.5 miles west-northwestward of the western extremity of The Heads. A channel 2 miles wide leads eastward of the reef, following the general trend of the coast, but at its northern end where it turns westward, it is contracted to 0.8 mile by Blanco Reef which extends southward and westward from

Cape Blanco. This channel is much used in clear weather, but should not be attempted in thick weather. Considerable kelp is eastward of and inside Orford Reef. Orford Reef lighted whistle buoy, 1.3 miles 218° from Fox Rock, is the guide for clearing this reef.

Fox and **Southeast Black Rocks,** 1.3 miles apart, are the two southernmost rocks of Orford Reef. The former is 2 feet high, and lies 5.9 miles 291° from The Heads, the latter is 6 feet high and lies 1.3 miles 093° from Fox Rock, with a heavy break, and 2 rocks awash at extreme low water, about 0.2 mile 312° from it. Fox Rock is always breaking.

Steamboat, West Conical, and Arch Rocks are the prominent ones in the southern part of Orford Reef, and extend in a general north-northeasterly direction about 0.25 mile apart.

Steamboat Rock, 40 feet high, is so named on account of its appearance from northward or southward.

West Conical Rock, 112 feet high, is so named on account of its shape, the highest point being on the northwesterly side.

Arch Rock is 149 feet high, with steep sides and a large square arch visible from southward or southwestward; it is the inshore one of the three rocks.

Conical White Rock, 81 feet high, is nearly in the middle of Orford Reef, and 0.3 mile northwestward of Arch Rock.

Best Rock, 147 feet high, is the largest of the northern group of rocks. Foul ground extends southward and eastward from it for nearly 0.4 mile, and for 0.8 mile northward in the direction of Cape Blanco. The northernmost part of this danger lies 1 mile 092° from Northwest Rock with the eastern edge of Seal Rock in range with Arch Rock; Klooqueh Rock is also in range with Tichenor Rock off The Heads.

Seal Rock, 53 feet high, is large and lies 0.2 mile southward of Best Rock. **Long Brown Rock,** 70 feet high, lies nearly 0.5 mile westward of Best Rock; **Large Brown Rock** lies midway between and a little northward. **Square White Rock,** 72 feet high, lies about 0.5 mile westward of Seal Rock, with **Round Rock** midway between and a little northward of them. Between these rocks are numerous smaller ones, some sunken and some visible.

Northwest Rock, 15 feet high, the northwesternmost rock of Orford Reef, lies 3 miles 226° from Cape Blanco Light. Keeping Northwest Rock bearing north of 072° will clear all shoals on Orford Reef of less than 10 fathoms. There is a 9-fathom spot 600 yards 338° from Northwest Rock.

Blanco Reef extends about 1.5 miles southwestward from Cape Blanco, and consists of numerous rocks and sunken ledges, some of which are marked by kelp. **Pyramid Rock,** 30 feet high, lies nearly 1 mile 260° from the light. There are no visible rocks outside of it, but several between it and the cape and Orford Reef. **Black Rock,** 24 feet high, black, and narrow, about 125 yards long, lies 0.6 mile 176° from Pyramid Rock. The following rocky patches are the outermost known dangers on Blanco Reef: 5¾ fathoms 600 yards 228° from Black Rock; 5¼ fathoms 900 yards 257° from Black Rock; 3¾ fathoms 900 yards 238° from Pyramid Rock; 4¾ fathoms 650 yards 275° from Pyramid Rock. A rock awash at half

tide is 0.4 mile northward of Pyramid Rock. A rocky patch with 1¾ fathoms over it is 1,350 yards 092° from Black Rock.

Cape Blanco projects about 1.5 miles from the general trend of the coast. It is a small bare tableland, terminating seaward in a cliff 225 feet high, with low land behind it. A large high rock lies close under the southern side of the cape. From seaward the cape is not prominent, but from northward or southward, it appears like a moderately low, bluff islet. The group of buildings at Cape Blanco is very prominent.

Cape Blanco Light is shown from a 59-foot white conical tower near the center of the flat part of the cape. The light is 245 feet above the water and visible 22 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. There is a radiobeacon but no fog signal. **Storm warnings** are displayed both day and night. The water tank and lookout tower at The Heads should not be mistaken for Cape Blanco Light.

Numerous sunken and visible rocks extend 0.5 mile or more northwestward from the cape.

CHAPTER 11

Cape Blanco to Yaquina Head

Chart 5802

FROM Cape Blanco to Yaquina Head, 112 miles, the coast is remarkably straight and trends in a north by east direction. It differs considerably from the coast to the southward. The coastal mountains are much lower, the difference being more marked because of the high mountains inland. The shore consists of high yellow sand dunes and cliffs broken by bold rocky headlands of moderate height and backed by low pine-covered hills. There are few outlying dangers, the farthest offshore being at Blacklock Point, Coquille River, and Cape Arago.

Chart 5952.—Gull Rock, 108 feet high and about 1 mile northward of Cape Blanco Light, is surrounded by covered rocks. Its seaward face is black and rugged, and the summit has two knobs, the higher being to the southward. A rocky patch 3 fathoms deep lies 0.5 mile westward of Gull Rock.

Castle Rock, 180 feet high, is about 1.5 miles northward of Cape Blanco Light and about 300 yards off the mouth of **Sixes River.** The rock rises abruptly from the sea and is readily made out 10 miles to seaward. Many low rocks and sunken ledges are within 400 yards. Two rocky islets, 54 and 24 feet high, are to the west and northwest.

Blacklock Point is a precipitous rocky point about 2.5 miles northward of Cape Blanco. The cliff is 157 feet high. A sharp, high point, bordered by rocks, stretches out nearly 300 yards. A narrow curved line of rocks extends 0.8 mile west-southwestward from the point. **Tower Rock,** 113 feet high, is nearly 700 yards from the point. A rock, 10 feet deep, that breaks in heavy weather is 1.0 mile 300° from Blacklock Point. Rocky patches about 4 fathoms deep are within 1.3 miles of Blacklock Point in a westerly and northwesterly direction.

Chart 5802.—From Blacklock Point the shore continues rocky with cliffs gradually decreasing in height for 1.5 miles northward. Thence for about 11 miles the shore is a broad sandy beach backed by dunes and long narrow lakes. The tree line is at an average distance of 0.2 mile from the sea. From the end of the sand beach to the mouth of the Coquille River, 2 miles, the shore again consists of rocky cliffs 40 to 80 feet high, with several outlying rocks as much as 0.5 mile from shore and covered dangers extending 1.6 miles westward from

Coquille Point. The land directly behind this stretch of coast is comparatively flat and wooded, rising to heights of 1,000 feet in 2.5 to 3 miles.

Chart 5971.—The jettied entrance of **Coquille River** is about 18 miles northward of Cape Blanco. **Coquille Point,** 0.6 mile south of the south jetty, is 60 feet high. Off the point are several rocky islets, the highest of which rises to 86 feet. Broken rocky bottom, showing breakers in any swell, extends a little more than a mile seaward of the entrance. The outermost danger is **Coquille Rock,** 28 feet deep and 1.6 miles northwest of Coquille Point. All other known offshore dangers are southward of a line between Coquille Rock and **Table Rock,** which is 82 feet high and about 0.2 mile north of Coquille Point.

The south jetty is marked by a light shown from a white skeleton tower on a concrete base; the fog signal is a horn.

A lighted whistle buoy is moored about 2 miles west-northwestward from the jetties. A gong buoy is about 0.3 mile off the entrance.

Northward of the north jetty is a long, low area of shifting dunes. The abandoned lighthouse near the jetty is a white conical tower attached to a dwelling.

The Federal project for the river provides for a north and south jetty which are built out to a depth of 12 feet, and for a channel 13 feet deep from the entrance to 1 mile above the abandoned lighthouse. In June 1950 the controlling depth was 13 feet on the bar and 12 feet from the entrance to Bandon. A lighted range and buoys mark the channel. The channel is subject to frequent change and the deepest water is not always on the range. Above Bandon, controlling depths reported in June 1950 were 6½ feet to Coquille and 3½ feet to Myrtle Point. The shipping above Bandon consists of an occasional raft of logs or barges of lumber between the mills on the river and the railroad at Coquille.

Special regulations governing logging operations on the North Fork of Coquille River are in Chapter 2, § 207.660.

Bandon, on the southern bank of the Coquille River and about half a mile above the entrance, is the principal port. Water-borne traffic includes shipment of lumber, railroad ties, and logs for plywood fabrication. Depths at the wharves are 12 to 17 feet. The port dock, 375 feet long, has a depth of 14 feet along the face. Lumber steamers usually load to a draft of 14 to 15 feet at Bandon and go to Coos Bay to finish loading.

A Coast Guard station is near the western end of the Bandon water front. **Storm warnings** are displayed daytime only at the station.

At high water and with a smooth bar, vessels drawing less than 11 feet should have no difficulty in reaching the wharves at Bandon.

Pilots and towboats.—The port of Bandon owns and operates a towboat, the captain of which acts as port pilot. The boat is stationed about 200 yards upstream from the Coast Guard station. Vessels desiring a pilot should signal the Coast Guard at Cape Arago Light or at Bandon.

Vessels drawing more than 11 feet should take a pilot, as local knowledge is essential for following the best water. When the bar is rough, local knowledge of the undertow is necessary to avoid being carried onto the jetties.

Customs.—Coquille River is in the customs collection district of Oregon. The nearest port of entry is Coos Bay.

Supplies.—Limited amounts of provisions and ship chandlery are available at Bandon. Water is piped to the wharves. Diesel oil and gasoline are delivered by truck, and some fuel oil may be had in drums.

Repairs.—Ship carpenters may be had, and there is a machine shop and foundry in Bandon. Boats up to 45 feet in length can be hauled out on the marine ways at Prosper.

Communication is by bus and truck to Coquille and southward along the coast. There are telegraph and telephone connections. Coquille is on the railroad.

Prosper, about 4 miles above the mouth of Coquille River, is a deserted area of old piling and ruined lumber docks. The mills are in ruins, and most houses have been abandoned. A small marine railway still operates and can handle boats up to 45 feet in length.

Riverton, about 14 miles above the mouth of the river, has coal mines but they were not in operation in 1950.

Coquille, about 21 miles above the mouth, is the distributing center for several agricultural communities of the river valley and has railway connection with the interior.

Chart 5802.—From the entrance to Coquille River the sand dunes extend northward for about 4 miles and are then succeeded by cliffs.

Fivemile Point, about 6 miles northward to the river, is a rocky cliff about 60 feet high with a cluster of rocks, 10 to 40 feet high, extending more than 0.3 mile offshore.

Northward of Fivemile Point the coast consists of cliffs, 40 to 80 feet high, which rise to heights of 100 to 250 feet 2 miles southward of Cape Arago and are cut by deep gulches, named the **Seven Devils.** Numerous rocks of varying shapes and sizes border the beach.

South Cove, immediately under the southern point of Cape Arago, can be used as an anchorage in summer by small vessels with local knowledge.

Cape Arago, about 29 miles northward of Cape Blanco, is an irregular jagged point projecting about a mile from the general trend of the coast. There are no high mountains immediately behind the cape, and it is conspicuous only when the mountains in the interior are obscured. The seaward face of the cape, 2.5 miles long in a northerly direction, is a narrow sparsely wooded tableland 50 feet high, with rugged and broken cliffs and outlying rocks of the same height as the cliff. Immediately off the cape are reefs extending northwestward for about a mile. A small cove near the northern end, inside the reefs, is sometimes used by very small vessels with local knowledge.

Chart 5984.—**Cape Arago Light,** 100 feet above the water and visible 16 miles, is shown from a white frame octagonal tower attached to a building on a rocky, partially wooded island close inshore, 2.5 miles northward of the cape. The fog signal is sounded on an air-diaphragm horn. The radiobeacon is synchron-

ized with the fog signal for distance finding. Occasional difficulty in hearing the fog signal has been reported. **Storm warnings** are displayed day and night at the light station.

Baltimore Rock, 11 feet deep and 0.6 mile northwestward of the light, usually breaks. It is the outermost rock of a covered ledge extending northwestward from the lighthouse island, and has 42 feet close around it. A bell buoy is moored about 450 yards northward of the rock.

Coos Head, 1.8 miles east-northeastward of Cape Arago Light, is 229 feet high and is on the south side of the entrance to Coos Bay. The cliffs are about 100 feet high and terminate in several small rocky points with sand beaches between them. Coast Guard Station No. 320 is on the southern point at the entrance 0.3 mile eastward of Coos Head.

Coos Bay is about 12 miles in length by 1 mile in width and has a tidal area of about 15 square miles. The entrance is about 33 miles northward of Cape Blanco. The bay can be used as a harbor of refuge and may be entered in any but exceptionally heavy weather.

Prominent features.—Coos Head, Umpqua River Light, and Cape Arago Light are good guides to the entrance. The sand dunes northward toward Umpqua River are prominent. The entrance near the southern part of the bay has been improved by the construction of two jetties and by maintenance dredging on the bar.

The Federal project provides for an entrance channel 40 feet deep between the jetties to Guano Rock, thence 30 feet deep to Isthmus Slough, and thence 22 feet deep to Millington; for turning basins 30 feet deep at Coalbank Slough and at the city of North Bend, and anchorage basins 30 feet deep near the Jarvis Range Lights and north of Pigeon Point, and for a channel 10 feet deep to a basin 10 feet deep at Charleston.

In February 1951, the controlling depth was 25 feet to Isthmus Slough. A depth of 5 feet was available to Charleston in February 1950.

It is quite usual for the bar channel to shoal 8 or 9 feet during the winter. The channels are well marked by lighted ranges, lights, buoys, and daybeacons.

Sitka Dock is a privately owned lumber wharf with a frontage of 500 feet on the east side of the channel about 1.3 miles below Empire.

Anchorage can be had almost anywhere in the bay below the railroad bridge, depending upon the draft. Outside the bay vessels have ridden out southeasterly gales by anchoring close to Cape Arago in depths of 30 to 36 feet, but this is dangerous if the wind shifts to the southwest.

Dangers.—Guano Rock, on the southern side of the entrance channel and about 280 yards northwestward of Coos Head, shows only at extreme low water. A lighted whistle buoy is about 125 yards northwestward of the rock.

The outer end of a submerged jetty, marked by three iron poles in a line, extends 700 yards southwestward from Fossil Point. Entering with a strong northwesterly wind, large vessels have difficulty in making the turn and may find themselves being set toward the submerged jetty.

A pinnacle rock 9 feet deep is 75 yards westward of the outer end of the submerged jetty but clear of the channel. A lighted buoy is moored about 125 yards west-southwestward from the rock.

Bridges.—The railroad bridge over the bay westward of **North Point** has a swing span with a horizontal clearance of 198 feet and a vertical clearance of 14 feet. Between North Point and **Russell Point,** 0.6 mile eastward of the railroad bridge, there is a fixed highway bridge with a horizontal clearance of 515 feet and a vertical clearance of 124 feet. For special regulations governing the opening of bridges in Coos Bay, see Chapter 2, § 203.720.

Directions, Coos Bay.—Vessels should make sure of the entrance range before standing close in. There is usually a current sweeping either northward or southward just off the jetties, and this current should be guarded against, especially when outward bound. The shore range should be watched carefully until clear of all dangers. The southerly current is often encountered during the summer months. With strong southerly winds during the winter, the current sometimes sets to the northward.

From the entrance, the bay extends northward for 6.5 miles, with an average width of 0.8 mile, then bends southeastward for 3.8 miles into a shallow basin, 1.5 miles in width, surrounded by marshland and intersected by several sloughs.

Vessels up to 20 feet in draft should have little difficulty in reaching the wharves at North Bend or Coos Bay through the well marked channels.

The time of slack water at the entrance to Coos Bay varies with the height of tide. The ebb runs from 1 to 1½ hours after low water, and the flood from ½ to ¾ hours after high water. During long runouts an ebb current of 5 knots has been found at Guano Rock, and up to 7 knots at the bell buoy, same buoy being run under at times in winter months. Flood current usually has a maximum velocity of 3½ knots.

In 1927, a Navy destroyer reported that the best time to enter Coos Bay and go alongside dock was to arrive off whistle buoy about 45 minutes before slack water at Coos Bay entrance. By entering at this time and steaming at 12 knots a small flood current can be carried all the way up. To dock at North Bend, get into the turning basin and swing the ship to go alongside against the flood current. If it is not desired to dock heading out, it is best to wait an hour. The time of change of current at North Bend is about 45 minutes later than at the entrance.

In general, Coos Bay does not present any particular difficulties for ships drawing 15 feet or less, but a commanding officer who has not been in before should be particularly careful not to mistake piles, which are driven indiscriminately for log booms, for spar buoys and range dolphins. From the information gathered from pilots it is always unsafe to cross the bar if there is a medium or heavy swell running, and care should be used in steering through the jetties where whirlpools are likely to be encountered.

From either northward or southward, the course should be shaped for the lighted whistle buoy. From seaward Cape Blanco and Cape Arago are prominent features, and at night their lights furnish an excellent means for determining a vessel's position, after which a course can be laid for the lighted whistle buoy.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reef and Swiftsure Bank, and veloci-

ties considerably in excess of these amounts have been reported. The most favorable time for crossing the bar is on the last of the flood current, and on many occasions it is passable only at this time.

Tides.—The mean range of tide at Coos Bay is about 5½feet. The range between mean lower low water and mean higher high water is about 7½ feet. A range of about 12 feet may occur at the time of maximum tides.

Currents.—A short series of current observations in the entrance taken during the month of September indicated a mean velocity of about 2 knots. The greatest observed ebb velocity was a little over 3 knots. Predictions for the entrance may be obtained from the *Current Tables*.

Storm warnings are displayed day and night from Cape Arago Light and from a steel tower at Coos Bay. Daytime signals are displayed at the entrance to Coos Bay and at North Bend.

Pilotage.—Pilots are available and can be called by radio, or by signal to the Coast Guard station. Pilot charges each way are $2.50 per foot draft and 2 cents per net register ton. Deductions from the fixed charges are made depending on the vessel's tonnage. This applies to vessels under registry.

Quarantine and hospitals.—Quarantine regulations of the U. S. Public Health Service are enforced by the contract surgeon at Coos Bay. Vessels with communicable diseases on board should not pass Empire until the quarantine officer has been notified and permission granted. Facilities for fumigation can be obtained. An out-patient office is in Coos Bay.

Customs.—Coos Bay is the port of entry for southern Oregon. Vessels subject to customs usually proceed to the dock.

Chart agencies of the U. S. Coast and Geodetic Survey are in Coos Bay and North Bend.

Supplies.—Fuel oils, water, provisions, and ship chandlery can be obtained at Coos Bay and North Bend. The water is reported to be of poor quality, but is suitable for boilers.

Repairs.—Machine shops are available, and in the area there are several marine ways, the largest of which has a capacity of 350 tons and can haul out boats up to 135 feet in length and 10 feet in draft.

Communication is by rail, truck, and bus. No passenger vessels enter this port although a few passengers occasionally are carried on lumber ships. There is also considerable local traffic in smaller vessels to points north and south.

South Slough, shoal and navigable only by small boats, extends 4 miles southward from its junction with the bay near the entrance. The slough is crossed by a highway drawbridge 0.5 mile southward of the entering range rear light. The bridge has a horizontal clearance of 60 feet and a vertical clearance of 11 feet.

The western shore of the bay as far as the bend is formed by a sandspit covered with dunes, partly wooded, and in some places as much as 90 feet high. On the eastern shore and above the bend are low rolling hills, covered with timber.

Empire is on the eastern shore of the bay about 4 miles above the entrance. The sawmill wharf has a 300-foot berthing space with a depth of 17 feet along-

side. There are two prominent oil tanks. The Government has constructed a dock here for the use of a seagoing dredge employed in dredging the bar.

At the pulp mill 1.5 miles below Empire, a trestle leads to a loading wharf with 20 feet alongside. The southward corner of the wharf is marked by a privately maintained light.

Haynes Inlet and **North Slough,** which join the bay through a common entrance on the northern side, are navigated by small boats and launches.

Local magnetic attraction with differences of as much as 2½° less than the normal variation has been observed on land on each side of the channel from **Pony Point** to **White Point.**

Coos Bay and **North Bend** now form practically one continuous settlement extending along the shore from North Point to the mouth of Coalbank Slough.

The water front between Coos Bay and North Bend is called *The Strip,* locally. The Coast Guard station vessel berths here, and oil docks, lumber mills, and Coos Bay Yacht Club are on this water front.

North Bend, 4.5 miles above Empire on the eastern side of North Point, is a prosperous town with sawmills, factories, and a small shipyard. Considerable lumber is shipped from here.

For special regulations governing logging in the tidal section in the South Fork of Coos River, see Chapter 2, § 207.663.

Coos Bay, on the western shore near the head of the bay, is the principal town. A deputy collector of customs is stationed there. The town is the distributing center for a considerable section of the country devoted to lumbering, dairying, and agriculture. There are ample wharfage facilities with depths of 9 to 30 feet.

Three sloughs empty into Coos Bay, between Coos River and the town of Coos Bay. **Coalbank Slough** is unused and has a drawbridge across it near the mouth. A Federal project provides for a channel 22 feet deep and 150 feet wide in **Isthmus Slough** from Smiths Mill to Millington about 1.7 miles above the mouth of the slough. In June 1950 the controlling depth in Isthmus Slough was 22 feet to Millington. Smiths Mill is a landing at the junction of Coalbank Slough and Isthmus Slough. Much of the lumber from the bay is shipped from sawmills on this slough. **Catching Slough** is navigable for several miles by light-draft vessels and is used mainly for logging operations. Isthmus and Catching Sloughs are crossed by highway drawbridges, the horizontal clearance of the bascule span across Isthmus Slough being 110 feet, with a vertical clearance of 28 feet. The swingspan across Catching Slough has a horizontal clearance of 50 feet and a vertical clearance of 13 feet.

The **Coos River** empties through two channels into the bay at its head. The northern channel, unmarked, follows the eastern side of the bay and empties abreast of North Bend. **Marshfield Channel,** marked by a lighted range and daybeacons, crosses the flats and empties abreast the town of Coos Bay. The river divides at a point 3.2 miles above Graveyard Point into South Fork and Millicoma River. Allegany, 7.5 miles above the confluence, is the head of navigation on the Millicoma River. Dellwood, 8.2 miles above the confluence, is the head of navigation on the South Fork. The project provides for a channel 5 feet deep over a width of 50 feet to Allegany and 3 feet deep over a width of 50 feet in the South

Fork to Dellwood. In June 1950 the controlling depths were 4 feet to the junction, 2 to 3 feet to Allegany, and 2 to 3 feet to Dellwood. The South Fork is crossed by a fixed highway bridge 0.7 mile above the confluence which has a horizontal clearance of 130 feet and a vertical clearance of 41 feet. A county-owned vehicular ferry crosses the river 0.25 mile below the confluence.

Chart 5802.—From Coos Bay to Umpqua River, about 19.5 miles, the coast consists of sand beaches and dunes backed by moderately low hills. The mouth of **Tenmile Creek** is 13.7 miles northward of Coos Head.

Chart 6004.—Umpqua River is entered 20 miles northward of Cape Arago Light. Considerable lumber, fish, and farm and dairy produce are shipped, and general merchandise is received. The port of entry is at Coos Bay.

The southern point at the entrance to the river is marked by sand dunes, partly covered with trees, that reach elevations of 300 feet. About a mile below the entrance is a bright bare spot in the dunes that shows prominently among the trees.

A light, 165 feet above the water and visible 19 miles, is shown from a white conical tower on the southern entrance point. Trees surround the light, but the lantern shows over their tops.

The northern point at the entrance consists of shifting sand dunes extending northward for about 3 miles. These are bare as a rule and, on the river side, rise to 100 to 124 feet.

A Coast Guard station is on the Umpqua River Light Reservation on the southeast bank of the river. The trees have been cleared from the dunes directly in front of the station which makes the buildings clearly visible from offshore.

The entrance has been improved by the construction of north and south jetties. About 1,000 feet of the outer end of the southern jetty has been beaten down to low-water level. In 1950 a training jetty was being constructed west-southwesterly from the south bank of the river at the mouth. The channel over the bar is reported to be shoalest usually during September. Later in the season the river cuts a deeper channel through the bar.

A Federal project provides for an entrance channel 26 feet deep; a river channel 22 feet deep and 200 feet wide from the mouth to Reedsport, with a turning basin at Reedsport 22 feet deep, 600 feet wide, and 1,000 feet long; a side channel 12 feet deep and 100 feet wide from main channel to docks in Winchester Bay with a mooring and turning basin 12 feet deep, 175 feet wide, and 300 feet long at the inner end; a side channel 22 feet deep and 200 feet wide from main channel near Three Mile Directional Light to Gardiner, and a turning basin of the same depth, 500 feet wide and 800 feet long, opposite Gardiner; a channel 6 feet deep and 100 feet wide from mouth of Smith River to mouth of North Fork, then 4 feet deep and 75 feet wide to Sulphur Springs Landing; and a passing place near the mouth of North Fork 125 feet wide and 800 feet long. At high tide the river is navigable by vessels of 6 feet draft to **Scottsburg,** 23 miles above the entrance, and a draft of 3 feet can be taken up the **Smith River** to **Sulphur Springs,** about 25 miles above the entrance.

In September 1950 the controlling depth over the bar was 21 feet. The entrance channel is subject to frequent changes. Strangers should obtain local information before entering. In September 1950 the controlling depths in the channel were 21 feet from the entrance to Three Mile Directional Light, thence 13 feet to Reedsport; from Three Mile Directional Light to Gardiner the controlling depth was 21 feet.

The channel to Reedsport is marked by lights and buoys. Just above the mouth of **Scholfield Creek** is a highway bridge with a swing span having a horizontal clearance of 195 feet through both openings and a vertical clearance of 30 feet. About 500 yards above this is a railroad drawbridge with a horizontal clearance of 150 feet on either side of the central pier and a vertical clearance of 15 feet. For regulations regarding these bridges see Chapter 2, § 203.725.

A cut-off channel 2 to 4 feet deep across the flats northwesterly from **Bolon Island** is a nearly straight passage between Reedsport and Gardiner. The cut-off is marked by two lights.

Pilots and towboats.—Pilots can be arranged for by radio or by making a signal to the light or the Coast Guard station. There are several Diesel tugs available for work on the bar.

Winchester Bay is a small open cove on the eastern bank just inside the entrance to the river. The municipal pier is in the northeastern part of the bay. Close southward of the pier is a fish wharf with a cold storage and ice plant at the outer end. The village of Winchester Bay is a small fishing resort.

Ork Reef, a patch of rocks and sand awash at half tide, is near the northern end of Winchester Bay. Depths of 2 to 5 feet extend about 0.4 mile southwestward of the reef. The eastern side of the channel near Ork Reef is marked by a lighted buoy.

Gardiner, on the northeastern bank of the river 7.5 miles inside the entrance, is the site of a large lumber mill.

Reedsport is a station on the railroad and the principal town on the lower river. Considerable lumber is shipped by the three sawmills. The port wharf has a depth of 23 feet alongside the loading face. Lumber steamers load to a maximum draft of 18½ feet.

Supplies.—Provisions, water, gasoline, and fuel oil for launches may be obtained.

Repairs.—Minor repairs to hulls or machinery can be made. Carpenters are available and a machine shop is at the lumber mill. There are facilities for docking launches up to 60 tons.

Communication is by rail to the interior or to Coos Bay, and by truck or bus to all other points. Communication is by telegraph and telephone.

Storm warnings are displayed day and night from a flagpole west of the Coast Guard station.

Chart 5802.—From Umpqua River to Siuslaw River, about 21 miles, the coast is straight and consists of sand dunes broken only by the mouths of **Threemile Creek, Tahkenitch Creek, Siltcoos River,** and the stream flowing from **Cleawox Lake.**

Chart 6023.—Siuslaw River empties into the ocean about 42 miles northward of Cape Arago Light and 7.5 miles southward of Heceta Head Light. The river is in the Oregon customs collection district; the port of entry is at Coos Bay.

The southern entrance point is a narrow spit of high shifting sand dunes. The northern point consists of a low flat sand beach, backed by rocky wooded cliffs 50 to 100 feet high.

Cannery Hill, 145 feet high and wooded, on the eastern shore about 1 mile above the entrance, is prominent from seaward.

The approach to the entrance is marked by a whistle buoy and the entrance by a lighted range and gong buoy.

A Federal project provides for a channel 8 feet deep over the ocean bar, thence 12 feet deep, 200 feet wide to Florence; 12 feet deep and 150 feet wide from Florence to Cushman (Acme). Bar channel to be secured by two rubble-stone jetties; river channel to be secured by dredging.

The bar is narrow and the depths vary greatly because of storms and freshets. In May 1950 the controlling depth in the bar channel was 9 feet. In 1947 the controlling depth between jetties to a point 1.7 miles upstream was 12 feet; thence 9 feet to Florence and 4 feet to Cushman.

Light-draft vessels can ascend the river to Mapleton, but the channel is narrow and crooked.

A Coast Guard station is on the eastern bank southward of Cannery Hill. The lookout station is on Cannery Hill.

Florence is a small town on the northern bank of the river 4 miles inside the entrance. The fish dock has an ice plant. Fish are shipped by truck. The river has some logging operations, but there was no commerce by water in 1950.

Glenada is a small town on the southern bank of the river opposite Florence. The river is crossed here by a double-leaf bascule highway bridge having a horizontal clearance of 110 feet and a vertical clearance of 27 feet.

Cushman, on the northern bank of the river 2.5 miles above Florence, has lumber and shingle mills. The products from these mills are shipped by rail.

About 1 mile above Cushman the river is crossed by a railway drawbridge with a horizontal clearance of 100 feet on either side of the central drawspan, and 15 feet vertical clearance. For regulations regarding bridges on Siuslaw River see Chapter 2, § 203.730.

Neither pilot nor towboats are available, but strangers desiring a pilot might obtain the services of local fishermen by signaling the Coast Guard station.

Gasoline, oil, water, and limited amounts of provisions are obtainable. Minor repairs can be made. Carpenters are available and minor machine work can be handled at the mills.

Communication is by rail to the interior and by the Oregon Coast Highway along the coast. There are telegraph and telephone connections.

Chart 5802.—From Siuslaw River to Heceta Head, about 7.5 miles, the coast is composed of sand dunes that are quite conspicuous in contrast with the dark trees partly covering them.

Heceta Bank is 70 miles 350° from Cape Blanco and about 30 miles offshore west of Heceta Head. The bank covers an irregular area about 30 miles long and

10 miles wide. The least water found on the bank is 25 fathoms, but the soundings are irregular. Northward and southward of the bank the depths are considerably greater.

Heceta Head lies 28.5 miles 007° from Umpqua River Light. The seaward face is 2.5 miles long with nearly vertical cliffs 100 to 200 feet high. The summit of the head which reaches an elevation of 1,000 feet in 0.5 mile from the cliffs, is covered with grass and a few pines. A sharp black conical rock, 180 feet high, marks the extreme western and northern part of the head and is easily made out from either northward or southward.

Heceta Head Light, 205 feet above the water and visible 21 miles, is shown from a white conical tower on a beach cut in the high bluff near the western extremity. Because of the high bluff northward of the light, vessels from northward will not make out the tower or buildings until abreast the station.

Cox Rock, 100 feet high, conical in shape and usually white on top with bird droppings, is close to the southern part of the head.

For 9 miles from Heceta Head to Cape Perpetua the coast consists of high broken rocky cliffs, except for the first 2 miles which are composed of much lower sloping sandy cliffs, backed by a strip of clear land. The hills behind reach an elevation of over 800 feet in less than 0.5 mile from the beach, and are heavily wooded.

Tenmile Creek, 5 miles northward of Heceta Head, is marked by a sand beach about 0.3 mile long at its mouth.

Cape Perpetua, 9 miles northward of Heceta Head, consists of two projecting points, the northerly of which is the bolder. It reaches a height of 800 feet a short distance from the beach and 1,000 feet at a distance of 0.8 mile. The rocky cliff forming the face of the northern point is reddish. A few rocks awash at low water are close to its face.

Yachats River, navigable only for canoes, breaks through the coast hills immediately northward from Cape Perpetua.

The coast northward of Cape Perpetua for 2.5 miles consists of cliffs, 15 to 30 feet high, with a narrow strip of grassy land 0.2 to 1 mile wide behind them. Thence for 5.5 miles there are low bluffs with a broad sand beach in front and comparatively low wooded country behind them to Alsea Bay.

Table Mountain, 2,804 feet high, is about 11 miles northeastward of the mouth of Alsea Bay. It is flat-topped, covered with dead trees, and looks whitish. There is another summit, 2,752 feet high, about 0.6 mile southwestward of Table Mountain.

Alsea Bay is about 8.5 miles northward of Cape Perpetua. The northern point is low, broad, and sandy, but the southern point is an abrupt sandstone cliff about 100 feet high, covered with trees. The entrance has a shifting bar with a depth of about 6 feet. A buoy is moored about a mile off the bar. With a flood tide, the bar fills in with sand and the full effect of the tide cannot be counted on. There is considerable fishing and crabbing in the bay and river, but boats rarely cross the bar. **Waldport** is the principal settlement. A small fish cannery is located at the wharf, and gasoline, other light fuels and limited supplies are available. The Oregon Coast Highway crosses the bay on a fixed bridge.

949285—52——20

From Alsea Bay to Yaquina Bay the coast is nearly straight for 11.5 miles. For 1.5 miles northward of Alsea Bay the shore is a low sand beach backed by dunes, but then changes to bluffs which, 2.5 miles farther north, rise to heights of 70 and 100 feet.

Seal Rocks, abreast the highest part of the bluff, are low and extend parallel with the coast for 2.5 miles at a distance of 0.5 mile from the beach. The highest rock stands 20 feet above water.

Stonewall Bank, about 17 miles southwestward of Yaquina Head Light, is about 9 miles long in a northerly direction and 2.5 miles wide. There is a least depth of 13 fathoms on the bank.

Beyond Seal Rocks the bluffs are low, with a broad sand beach, until within 1.5 miles of Yaquina Bay where sand dunes extend to its entrance. The land behind is comparatively low and wooded, with areas of burnt timber.

An area of sunken rocks is reported to exist 2 to 4 miles northwestward of Seal Rocks and about 1.5 miles offshore. There is a 2½-fathom patch 8.6 miles 188° from Yaquina Head Light and 1.5 miles from the beach.

Marys Peak, a prominent mountain 4,097 feet high about 24 miles eastward of the entrance to Yaquina Bay, is wooded on its sides but its summit is covered with grass.

Chart 6058.—Yaquina Head, 32.5 miles northward of Heceta Head, is distinguished by two conical hills covered with grass. The outer one is 355 feet high and the inner 390 feet high, with a low saddle between them. The extremity to the point, which projects about a mile from the general trend of the coast, is broken and rocky, but comparatively low. One mile inland from the point, the grass-covered land changes to a dense forest and the hills rise rapidly. Two sunken ledges lie northward of the point not over 0.5 mile from the beach. There is a sunken rock and considerable kelp about a mile southward of the point.

Yaquina Head Light, 162 feet above the water and visible 19 miles, is shown from a white conical tower on the flat bench projecting at the western extremity of the head. The light is displayed one hour before sunset to one hour after sunrise. A radiobeacon is at the light. A patch of rocks, awash at high water, is about 1 mile northward from the light.

Yaquina Bay entrance is 4 miles southward of Yaquina Head Light. The bay is a tidal estuary, the harbor itself being merely the widening of the **Yaquina River** just inside the entrance.

The northern point at the entrance is a rounding sandy bluff, 120 feet high. The old lighthouse and Coast Guard lookout towers at the extremity and the hotels and cottages northward of it are prominent landmarks. The southern point is a low sand beach backed by sand dunes rising to 150 feet.

The Federal project for Yaquina Bay and harbor provides for two rubble jetties 1,000 feet apart at the outer ends, a channel of suitable width and 26 feet deep over the bar, a channel 20 feet deep and 300 feet wide from the outer ends of the jetties upstream and along the south side of the bay to McLean Point, with a turning basin 22 feet deep, 1,000 feet wide and 1,200 feet long at the upstream end; a channel 18 feet deep and 200 feet wide from the 20-foot channel along

the city docks at Newport to Yaquina; a small boat mooring basin at Newport protected by a breakwater and having a depth of 10 feet.

Controlling depths reported through September 1950 were 20 feet on the entrance range and between jetties, 18 feet from the entrance to the highway bridge, thence 20 feet to the end of the turning basin, and 15 feet in the channel around the north side of the bay.

The entrance channel is marked by a lighted range but is subject to change.

The maximum draft to which vessels are loaded in Yaquina Bay is 16½ feet. A smooth bar and favorable tide are necessary for this draft.

During the summer when the swell is roughly parallel with the coast, the bar is comparatively smooth, being partially sheltered by Yaquina Head. In winter, however, the heavy westerly swell renders it generally too rough to be crossed safely.

Yaquina Reef, a ridge of hard sand and rock, with depths of 5 to 13 feet, lies 0.5 mile off the entrance, extending parallel with the shore for a distance of 1.5 miles. **South Reef** is a southerly continuation of Yaquina Reef, the two being separated by a deep-water channel. A bell buoy marking the southern end of Yaquina Reef is the guide for this channel.

Yaquina Head Light and a lighted whistle buoy 2 miles southwestward of Yaquina Bay entrance, and the entrance range, are the guides for making the entrance.

A Coast Guard station is at Newport 400 yards northward of the highway bridge.

Anchorage.—No anchorage regulations are prescribed. Vessels anchor in the channel at points suited to the draft.

A fixed highway bridge across the channel at the entrance point has a vertical clearance of 130 feet.

The river has been improved to Toledo, 11 miles above the entrance. The channel is well marked by aids, a few of which are lighted.

A Federal project for Yaquina River provides for two half-tide dikes each about 1,100 feet long, and for a channel 10 feet deep and generally 150 feet wide in Yaquina River and 200 feet wide in Depoe Creek extending from the town of Yaquina to Toledo, about 7.8 miles.

The controlling depth in the Yaquina River to Toledo in November 1945 was 10 feet; in Depoe Creek the controlling depth was 6 feet in August 1945. No recent surveys have been made but shoaling has been reported.

Newport, just inside the northern entrance point, is the principal town on the river and is a port of entry. It is principally a summer resort, though the town has considerable fishing and several small canneries. Lumber, either brought down from upper river mills or brought in by truck, is shipped from the wharves at Newport. The principal wharf for loading lumber is along the south side of the channel just inside the highway bridge. The wharf has ample water alongside for any vessel that can cross the bar.

Directions.—Strangers desiring to enter or to ascend the river should employ a pilot or a man with local knowledge. At the entrance the buoys cannot be relied upon as indicating the best water, and in the river the depths are subject to frequent change.

Storm warnings are displayed day and night from Yaquina Head Light and from the Yaquina Bay Coast Guard Station.

Pilots and towboats.—Licensed pilots are available and can be obtained by signaling the Coast Guard or through prior arrangement by radio. The local mill company has a towboat that is available at times.

A **U. S. Public Health Service** out-patient office is at 625 Hurlbut Street. A **customs** officer is stationed at Newport.

Supplies.—Fresh water, gasoline, distillate, and provisions can be obtained.

Repairs.—Boats up to 60 feet in length and 7 feet in draft can be hauled out on the marine ways at Newport. Toledo also has a small marine ways.

Communication is by bus and air. The municipal airport is about 4 miles south of Newport. A good highway extends north and south along the coast and another highway leads to the interior. There is communication by telegraph and telephone.

Yaquina, a small settlement, is about 3.5 miles above the entrance.

Toledo, 11 miles above the entrance, ships lumber by both water and rail. Toledo has large lumber mills. The wharves have 10 to 12 feet alongside. Practically all the shipping from Yaquina Bay originates at Toledo.

From Yaquina Bay to Yaquina Head, 3.5 miles, the coast consists of broken, yellow cliffs bordered on the southern part by broad, low water, sand beaches.

CHAPTER 12

Yaquina Head to Columbia River

Chart 5902

FROM Yaquina Head to the mouth of the Columbia River, the coast is fairly straight. The headlands are Cape Foulweather, Cascade Head, Cape Lookout, Cape Meares, Cape Falcon, and Tillamook Head. The 30-fathom curve follows the general trend of the coast about 3.5 miles offshore, without indicating the several headlands. When about opposite Tillamook Head, the curve swings west and is about 7.5 miles off the end of Clatsop Spit.

From Yaquina Head for 5.5 miles to Cape Foulweather, the coast consists of yellow and white sandstone cliffs, low and broken.

Iron Mountain, about 1.5 miles northeastward of Yaquina Head Light, is a hill about 654 feet high. The highest third of the hill is bare and is composed of a red rock formation; the lower part is thickly wooded.

A low flat rock, 2 feet high, is 0.5 mile offshore about 2.9 miles northward of Yaquina Head.

Otter Rock, 11 feet high, is 3.2 miles northward of Yaquina Head and 0.6 mile offshore. **Gull Rock,** 56 feet high, is about 1.2 miles from Otter Rock and 750 yards offshore. In line between the two rocks is a kelp field with several rocks, covered or awash. Covered rocks that break are northward of Gull Rock, 0.5 mile and 1 mile distant.

Cape Foulweather is a prominent headland with about 6 miles of seaward face consisting of rocky cliffs over 60 feet high. The cape is formed by several grass-covered headlands separated by densely wooded gulches. Near the middle of the cape is a strip of flat land, 0.5 mile long and 0.2 mile wide, bare of trees. The highest point of the cape is near the southern part. A grassy patch is conspicuous on the southwestern slope. About 0.9 mile southeastward of the extreme western point of the cape is a rocky point 445 feet high, and eastward of the point the hills rise to 1,100 feet in 0.6 mile. Dangers extend for nearly 2 miles northward of the northern point of Cape Foulweather and about 600 yards offshore.

The coast highway follows the shoreline closely at Cape Foulweather.

Depoe Bay is about 1.7 miles southward from the north end of the cape. A large concrete arch bridge over the entrance and a seawall are prominent. The bridge has a vertical clearance of about 48 feet. A 500-foot hill is about 0.2 mile northeastward of Depoe Bay. Its northern slope is wooded, but its southern slope is bare except for low brush. A lighted whistle buoy is moored off the entrance

to the bay. At the southern end of the bridge is a lighted range that bears 085° 40′.

Flood lights have been installed at Depoe Bay to illuminate the entrance to the inner harbor. Strangers should not attempt to enter at night, especially in bad weather.

A Coast Guard rescue boat is stationed north of the entrance, but no lookout is maintained. Daytime **storm warnings** are displayed from a mast at the station.

Depoe Bay is considered to be one of the best all-weather shelters for small boats along this part of the coast. It may be entered in almost all weathers. There have been times when so many fishing craft were at anchor here that there was not even swinging room. Anchorage is excellent with very good holding ground.

A Federal project provides for a channel 8 feet deep and 30 feet wide to an inner basin 350 feet wide and 750 feet long, and 8 feet deep. In June 1950, the entrance was closed by an earth fill during operations of dredging and enlarging the harbor. Care must be taken in making the turn in the channel as there is some surge in and out of the bay. Gasoline and oil are available in Depoe Bay.

From Cape Foulweather for 5.5 miles to the entrance of **Siletz Bay,** the coast continues as yellow broken bluffs, 40 to 100 feet high, bordered by about 3 miles of sandy beaches. From the northern point of the bluffs to the bay entrance there are sand dunes covered with low brush.

Siletz River empties into Siletz Bay about 14 miles northward of Yaquina Head. The bay entrance is marked by a whistle buoy 0.8 mile off the bar and by an unlighted range. The range should be used only with local knowledge. The channel changes frequently, and 7 feet is considered the deepest draft that can be taken over the bar at high water. In June 1950, there was a reported depth of only 2 or 3 feet on the bar.

The northern point at the entrance is a low bluff with a narrow sand beach. The southern point is a low sandspit about 2.5 miles long and 250 yards wide. The dunes on the spit are thinly wooded near the shore but become thickly wooded inland. The bay inside the entrance is shoal.

Taft, the principal village in the bay, is on the coast highway. Regular bus and freight services are maintained the entire length of the Oregon coast. Gasoline and other light fuel oils are available by truck delivery. Several stores handle general merchandise. About 3 miles above the entrance to the river is a small boat works where craft up to 60 feet long are built. Immediately southward of Taft, a white covered bridge is prominent from seaward. At night the lights at Taft and at the town of **Delake,** about 2.5 miles northward, are very prominent.

From the northern point of Siletz Bay the coast extends 7 miles northward to the Salmon River. For 2.5 miles of this stretch, the yellow sandstone cliffs are 80 to 100 feet high. At this point they cease altogether for 0.2 mile at the outlet of **Devils Lake,** a large body of fresh water 10 feet above sea level, that empties through a narrow stream. At 0.5 mile 259° from the mouth of the stream is a covered rock that generally breaks. For 3 miles northward from the outlet of the lake, the bluffs are 20 to 60 feet high, rising to grassy hills and with a broad low-water beach and ledges of rocks along the low-water line.

Salmon River empties at the southern extremity of Cascade Head. The river is of no commercial importance, as the entrance is nearly closed by sand bars.

Immediately southward of Salmon River is a rocky cliff whose seaward face is 0.6 mile long. The summit is a dome-shaped butte 510 feet high. From here a rolling grassy plateau with a few trees extends southward and eastward to the river. A rock, 46 feet high, is 700 yards westward of this cliff, and about a mile southward is a covered rock 630 yards off the beach. Immediately southward of, and in line with Cascade Head, opposite the mouth of the river, three grayish rocks about 765 yards offshore have heights of 56 feet on the north, 25 feet in the center, and 47 feet on the south.

Cascade Head lies 16.8 miles northward of Cape Foulweather. Very jagged and heavily wooded, it is prominent to vessels close inshore. The face of the cliff is 3 miles long, in places is over 700 feet high, and is cut by several deep gorges through which the waters of three creeks are discharged in cascades 60 to 80 feet high. Several rocks are about 0.1 mile offshore.

Two Arches Rock, 30 feet high, is 0.9 mile northward of the southern point of Cascade Head. The arches are visible from northward, the inner being the larger.

From Cascade Head to Cape Kiwanda, 9.5 miles, the coast is a low sand beach with a narrow marsh behind the southern part. Rolling hilltops, occasionally wooded, rise to an elevation of 500 feet behind the beach.

Neskowin Rock, at the high-water line about 0.3 mile northward of the northern extremity of the cliffs marking Cascade Head, rises abruptly from sand beach to 113 feet in height. The rock is dark brown and wooded on top.

Neskowin is a small resort with a post office and a general store.

North of Neskowin the Oregon Coast Highway is about 0.5 mile inland. At night the headlights of automobiles traveling this road cause intermittent flashes as they make the turns and might be mistaken for lights of vessels or of lighthouses.

Nestucca River empties into **Nestucca Bay** about 5.5 miles northward of Cascade Head. The channel over the bar changes frequently in position and depth, and only vessels of light-draft with local knowledge are able to cross. The river has many snags which change the depths and shift the channel. A buoy is moored about 0.7 mile westward of the entrance. Even in a moderate sea, the bar is extremely dangerous. The point on the south side of the entrance consists of several low rolling grassy hillocks, about 400 to 500 feet high, which approach very close to the beach. The northern point is the southern extremity of the sandspit and dunes that extend to Cape Kiwanda.

Pacific City, a summer resort a mile southward of Cape Kiwanda, has a post office and a general store. Small quantities of oil and gasoline can be had. There is a hotel and telephone communication. A bus operates each day to Tillamook.

Haystack Rock, 327 feet high, 0.5 mile southwestward of Cape Kiwanda and 0.5 mile offshore, is a prominent landmark. The rock is conical in shape and dark for about half its height, and in summer the top is whitened by bird droppings.

Cape Kiwanda is a low yellow rocky point, much broken and eroded, that projects about 0.5 mile from the general trend of the coast. Behind the cape are bright sand dunes, 500 feet high, which are prominent from seaward.

From Cape Kiwanda the coast extends 7.5 miles in a general northerly direction to Cape Lookout. It is broken about halfway by the entrance to **Sand Lake,** which is shallow and not navigable. The coast consists of sand beaches and dunes until about a mile northward of Sand Lake where it changes to vertical sandstone cliffs, 50 to 100 feet high. These continue to Cape Lookout. The hills and country back of the beach as far as the ridge of Cape Lookout have been burned over except in the gulches, and numerous trunks of whitened trees are still standing.

Cape Lookout is about 17.5 miles northward of Cascade Head and nearly 40 miles northward of Yaquina Head Light. It projects westward for about 1.5 miles, forming a narrow rocky promontory 432 feet in height at its seaward extremity. The southern face is nearly straight, and its precipitous cliffs have numerous caves. The northern face is sloping and covered with a thick growth of timber. The ridge that forms the cape runs at about right angles to the coast, reaching an elevation of some 2,000 feet, 3.8 miles inland. The northern face of the cape is smooth and bold for the first mile, and then is much broken and marked by caves and several cascades. Fair shelter in northwesterly winds may be had under the southern side of the cape in depths of 6 to 8 fathoms, sandy bottom. A lighted whistle buoy is about 0.5 mile off the cape.

Northward of Cape Lookout for 4.5 miles, the land falls to a low narrow sandy peninsula, separating Netarts Bay from the ocean. The sand dunes on the peninsula are visible for 10 or 12 miles.

Netarts Bay is a shallow lagoon about 4 miles long, with an average width of 1 mile. The greater portion is bare at low tide except the channel, which has depths of 6 or 7 feet. The village of **Netarts,** on the northern shore about a mile inside the entrance, has a post office, a general store, and telephone and bus connections. Small quantities of oil and gasoline can be obtained, but the village is of no commercial importance. Only light-draft vessels with local knowledge can enter.

Northward of the entrance to Netarts Bay, for 1.5 miles to the rocks forming the southern part of Cape Meares, the coast is a sandy beach, backed by cliffs 50 to 120 feet high. These cliffs, topped by sand dunes varying in height from 150 to 200 feet, are good landmarks.

Chart 6112.—Cape Meares is high and rocky, with a seaward face about 2 miles long. The northern part is the higher, with nearly vertical cliffs 460 feet high. The western point is narrow, covered with fern and brush, and terminates seaward in a cliff about 200 feet high.

Cape Meares Light, 217 feet above the water and visible 21 miles, is shown from a white octagonal pyramidal tower on the summit of the cliff.

A pillar rock, 76 feet high, is 0.2 mile northwestward of the point, and 0.4 mile farther northwestward is **Pyramid Rock,** 109 feet high, which leans seaward.

Three Arch Rocks are the largest of a cluster extending about 350 yards off the southern point of the cape. They range in height from 204 to 275 feet. The largest arch is in the middle of the lowest rock, and is about half the height of the rock above water. These rocks are the favorite resort of sea lions, whose barking can be heard a considerable distance with a favorable wind.

From Cape Meares to Kincheloe Point, the coast is a low, partly wooded sandspit, with dunes 40 to 50 feet high. It forms the western shore of Tillamook Bay.

Tillamook Bay entrance is about 42 miles southward of the Columbia River, 22.5 miles southward of Tillamook Rock Light and 5 miles northward of Cape Meares Light. The bay is about 6 miles long and 3 miles wide, with a tidal area of about 13 square miles, most of which, at low tide, presents a succession of sand and mud flats. These are traversed by three principal channels which, although of fair depth near the entrance, gradually shoal toward the head of the bay.

Shipments from the bay are farm and dairy products, lumber, and fish. General merchandise is received by rail and truck. Local products usually are shipped by rail or truck, but logs are towed on barges to the Columbia River.

Kincheloe Point is low and sandy. The north side of the entrance is the termination of a high wooded ridge extending between the bay and Nehalem River. **Green Hill,** opposite Kincheloe Point, is a 421-foot-high spur from this ridge that terminates in a bluff, rounded point. It is bare of trees, but is covered with ferns and grass, and is prominent. Several rocks are close inshore, northwestward of the point, including a rock 7 feet deep about 360 yards west of Green Hill.

A Coast Guard station is on the northern shore at the entrance 0.6 mile northwestward of Green Hill. The lookout station is on the jetty about 200 yards from its inner end, at the foot of a steep knoll about 100 feet high. Daylight **storm warnings** are displayed at the Coast Guard station.

Sow and Pigs, a small ledge bare at half tide, lies in the entrance 0.3 mile eastward of the extremity of Kincheloe Point and about 400 yards off the northern shore. This ledge is dangerous when entering with a flood current, as the current sets toward it. The rocks of the ledge are marked by a buoy.

The Federal project provides for a 5,700-foot jetty on the north side of the entrance, and for a channel 18 feet deep and 200 feet wide to Miami Cove, thence 16 feet deep and 200 feet wide to Hobsonville. The project also calls for a small-boat basin 12 feet deep at Garibaldi and a turning basin 500 feet wide at Hobsonville.

The controlling depths were 20 feet across the bar, 15 feet in the channel west of Garibaldi, and 17 feet in Miami Cove turning basin in July 1950; and 9 feet in Hobsonville Channel in July 1946.

The entrance is marked by a lighted range and a lighted whistle buoy placed on the range 0.7 mile off the jetty end. The jetty was reconstructed in 1933, but the outer 500 feet have been beaten down by the sea. A buoy is off the covered end. The bar sometimes makes out across the range from the northward during the summer months or whenever there have been any long periods of northwesterly winds.

The three principal channels in the bay are **Bay City Channel, Main Channel,** and **South Channel.** Of the three, Bay City Channel is the only one of any commercial importance.

Hoquarten Slough, a continuation of Main Channel, is a narrow crooked waterway leading from the head of the bay to the town of Tillamook. It has ample depths for any vessel which can pass through the bay channels, but it is so tortuous that vessels over 100 feet long have difficulty rounding the bends.

Main Channel has been abandoned below the crossover at Bay City. A depth of 6 feet is available in Bay City Channel to the crossover, which is marked by a light.

Above the limits of this dredged area, Main Channel and Hoquarten Slough have been improved as far as Tillamook by the construction of dikes, the removal of snags, and by dredging in places. The resultant channel has a least width of 60 feet and a least depth of about 2½ feet. Vessels drawing 7 feet can reach Tillamook at high tide.

During freshets snags are carried into the upper part of the bay where they form a menace to navigation.

Garibaldi, on the northern shore 0.5 mile inside the entrance, is a summer resort. Two small canneries operate at times. There is a wharf built out to a depth of 3 feet. From Garibaldi northward, the beach is thickly lined with summer hotels and cottages. There is a Coast Guard boat station at the end of a long wharf.

Pilots and towboats.—A pilot, or a fisherman having local knowledge, can be obtained by making a signal to the Coast Guard station. Two commercial towboats take logs out of the bay.

Miami Cove is at the eastern end of the town of Garibaldi. The two lumber mills in the cove ship by rail.

Hobsonville, on the point that forms the southerly side of Miami Cove, has been practically abandoned.

Bay City, about midway along the eastern shore of the bay, has a small cannery. There is a controlling depth of about 4 feet to Bay City. Fishing and crabbing are carried on in this vicinity, but all shipments are made by truck or rail. There is a depth of about 6 feet alongside the wharf, and large fishing craft land easily. Some fuel and oil are available.

Tillamook, on Hoquarten Slough, is the principal town in the bay, and is noted for the production of cheese. It is the distributing center for a rich farming and dairying section and has communication by rail to Portland. There is little water-borne commerce. Tillamook is on the coast highway. Some logs are towed to Garibaldi or Miami Cove to make up rafts for towing to Aberdeen. The tall concrete stack of the shingle mill at Tillamook is prominent.

Gasoline, distillate, water, provisions, and a limited amount of ship chandlery can be obtained at Tillamook and Garibaldi. Repair facilities are limited to carpentry work and minor repairs to launch engines. Communication is by rail to Portland, and by truck and bus over the coast highway to the Columbia River or San Francisco.

Currents.—In the entrance to Tillamook Bay, the average central surface velocity of the flood or ebb stream at strength is about 3 knots.

Twin Rocks are 700 yards offshore and 2 miles northward of the entrance to Tillamook Bay. Their bases are so close together that they usually look like one rock. The southerly and larger is 88 feet high and has an arch in it; the other is 73 feet high.

Chart 5902.—From Tillamook Bay to Nehalem River, the coast is nearly straight for about 5.5 miles. Several lakes in this stretch are separated from the

beach by wooded sand dunes. The heavily wooded high hills begin to rise 0.5 mile to 0.8 mile from the beach and in 1 mile reach elevations of 1,000 to 1,600 feet.

Chart 6122.—Nehalem River is a small stream that empties about 19.5 miles northward of Cape Lookout and 17 miles southward of Tillamook Rock Light. The tidal reach extends to a point about 10 miles from the entrance, above which the river is a mountain stream full of riffles and obstructed by boulders. The river constitutes a natural outlet for an extensive area of heavily timbered country. Lumbering and fishing are the principal industries. Sawmills are located along the lower river.

Nehalem Beach, the northern point at the entrance, is a narrow sandspit, bare of trees, and with dunes of moderate elevation over the northern part. The southern side of the entrance is a low broad sand beach, backed by wooded country rising to elevations of 400 feet.

The entrance has been improved by the construction of two jetties, but the depths on the bar and within the bay are not sufficient for coastwise shipping, and all lumber is now shipped out by rail. The entrance is marked by a whistle buoy and by unlighted ranges.

The controlling depth is about 8 feet on the bar, and 7 to 8 feet to Wheeler. In winter, the river cuts a channel, usually about 12 feet deep, straight out, but in summer there is only about 8 feet. The channel is very changeable.

A highway bridge over the river just below Nehalem, and about 0.6 mile northward of **Deans Point,** has a swing span with a horizontal clearance of 92 feet and a vertical clearance of 19 feet. A highway bridge with a 9-foot vertical clearance is about 2 miles above the town on the north fork of Nehalem River.

Brighton is a small settlement on the eastern shore, a mile inside the entrance to Nehalem River. The sawmill and wharf are in ruins.

Hoevet and **Wheeler** form practically one continuous town on the southern bank of the river, 2.8 miles above Brighton. The old sawmill at Hoevet is in ruins and the wharf is dangerous. Wheeler has a shingle mill. All traffic is by rail and truck.

Nehalem is a small settlement on the western shore of the river about 1.5 miles above Wheeler.

Chart 5902.—Northward of the entrance to Nehalem River the coast is low and sandy for about 3 miles. It then increases in height and is covered with dense forest, except in the vicinity of the beach where there are grassy hillocks, 40 to 100 feet high, which rise gradually to the southern slope of Neahkahnie Mountain.

Cape Falcon, about 17 miles northward of Cape Meares and 10 miles southward of Tillamook Rock, projects about 2 miles from the general trend of the coast. The seaward face, less than 0.5 mile in extent, is very jagged, with numerous rocks under the cliffs. The southwestern point of the cape is composed of nearly vertical cliffs, 200 feet high, and is partially timbered.

Falcon Rock, 15 feet high, small in extent, and not very conspicuous, is 0.7 mile westward of the cape.

Smugglers Cove, the local name of a small bight just southward of Cape Falcon, is an excellent anchorage for small boats. The best anchorage is close to the northern shore in 4 to 5 fathoms, protected from all except southwestward winds. Care should be taken to avoid two rocks, bare at extreme low water, that are about 150 yards from the north shore of the cove and rise abruptly from deep water. A plentiful supply of fresh water empties into the cove at the sand beach at the head.

Neahkahnie Mountain, 2.8 miles eastward of Cape Falcon, is a prominent landmark. It is double-headed. The western summit is rounded and 1,900 feet high, but the eastern summit is serrated and divided into three peaks of nearly equal height. The entire southeastern slope is bare of timber but is covered with grass and fern. The seaward face terminates in rocky broken cliffs over 500 feet high, and there are a few rocks about 100 feet from the beach. The two summits are visible from southward; from northward, the western summit hides the eastern and is very conspicuous.

The coast northward from Cape Falcon consists of high cliffs until 1.5 miles southward of Arch Cape, where they change to low bluffs.

Arch Cape, rocky and precipitous, projects but little from the general trend of the coast. It is the termination of a mountain ridge rising to 2,775 feet about 3 miles eastward. The cape is bare of timber on the southern slope for a short distance from the point. A rock 120 feet high is close to the cape and connected with it at low water. A smaller rock, 25 feet high, is about 100 yards seaward of the larger. There are several other high rocks in the vicinity of the cape.

Castle Rock derives its name from its remarkable resemblence to a medieval castle with two towers, the taller of which 157 feet high, is on the seaward end. It is a little over 0.8 mile westward of the highest part of the cape, and is the outermost bare rock. The upper part of the rock is covered with bird droppings and shows up very distinctly in sunlight. A rock awash is about 0.9 mile off the cape and 0.4 mile southeast of Castle Rock; another rock, bare at lowest tides, is 0.5 mile offshore and 1 mile south of Castle Rock.

A narrow but deep passage between Falcon Rock and the shore has depths of at least 10 fathoms. Falcon Rock should be passed close by, and care should be taken to avoid the reef, bare at extreme low water, the seaward end of which is 0.4 mile 049° from Falcon Rock.

Northeastward of Cape Falcon, and 2 to 3 miles back from the shoreline, is a group of peaks, among which is **Angora Peak,** the highest and most prominent, which is 3,095 feet high. Angora Peak has a rounded summit, with a very gentle slope to the southward and a more marked and abrupt drop to the northward. It is very conspicuous from westward in clear weather.

Hug Point is a small cliff close to the beach, 1.8 miles northward of Arch Cape; the cliffs in its vicinity are about 180 feet high.

Double Peak, halfway between Cape Falcon and Tillamook Head, is the seaward end of a ridge extending eastward, which reaches a height of 1,000 feet in less than 0.7 mile from the shore. It is heavily wooded and pitches abruptly to the sea, ending in a rocky broken cliff 100 feet high and 0.2 mile long. A rock, 107 feet high, is close to and abreast of the southern end of the cliff; another, 76 feet high, is close to and abreast the northern end. A ledge, with two rocks that

bare at half tide, is about a mile west-southwestward of the highest part of the cliff.

From Double Peak, the coast extends northward for 2.7 miles to the mouth of **Elk Creek,** and then turns sharply northwestward for the same distance to the western point of Tillamook Head. The coast is high and wooded, with broken cliffs bordered by numerous rocks, except at **Cannon Beach,** at the mouth of Elk Creek.

Haystack Rock, 235 feet high, is 1.5 miles northward of Double Peak and is the largest of a cluster of rocks stretching out from the low-water line to depths of 10 fathoms. A rock awash at low water, and surrounded by a depth of about 9 fathoms, is 0.8 mile 247° from Haystack Rock.

Tillamook Head ends in two points which are 0.5 mile apart. The cliffs are 560 feet high at the southern point and 1,000 feet high at the northern point. A pinnacle rock is at the foot of the northern cliffs, and extending offshore from it for 300 yards is a cluster of rocks, 45 to 150 feet high, the outer one being the lowest. The summit of the head is 1,260 feet high, flat, and densely wooded, with slightly lower land behind it.

Tillamook Rock, nearly 1.2 miles west of the southern point of Tillamook Head, is about 100 feet high. It is marked by a light and buildings. The western face leans a little seaward. A rock awash lies between Tillamook Rock and the nearest part of Tillamook Head. Tillamook Rock Light, 133 feet above the water and visible 18 miles, is shown from a white square tower on a dwelling. A fog signal is sounded on an air siren.

North of Tillamook Head the coast is a broad sand beach extending for 17 miles to Clatsop Spit, on the south side of the entrance to Columbia River. Low sandy ridges, covered with grass, fern, and brush, extend parallel with and back of the beach. **Necanicum River,** a small stream, empties at Seaside, about 2.5 miles from the north side of Tillamook Head. Several hotels and summer resorts are along this stretch, and a sawmill, generally showing smoke, is near the southern end.

Seaside, an important summer resort in the bight 4 miles to the northward of Tillamook Head, has rail connections to Astoria.

Saddle Mountain, double-headed and 3,283 feet high, is the landfall for the approach to the Columbia River. The mountain is 14 miles east of Tillamook Rock Light and is visible 50 miles offshore. From northwestward, the mountain appears to be triple-headed; the northeastern peak appears cone-shaped, sharp, and lowest; the middle peak is irregularly cone-shaped; and the southern and highest peak is a flat-topped cone.

Blank page retained for pagination

CHAPTER 13

Columbia River

THE COLUMBIA RIVER rises in British Columbia, through which it flows for 425 statute miles. It enters the United States in northeastern Washington, flows southerly to the mouth of Snake River, thence westerly between Oregon and Washington, and empties into the Pacific Ocean in latitude 46°15′ N. The total length of the river is 1,210 statute miles. The river with its tributaries drains a large and productive territory. Below the Cascade Mountains the river flows through a canyon averaging about 5 miles in width between high cliffs on each side; of this width, the river occupies about 1 mile, the rest being marsh, low islands, and lowlands. Near the mouth, the river becomes wider, and in some places is 5 miles across.

The Columbia River and its tributaries are navigable by deep-draft ocean steamers to Portland, Vancouver, and The Dalles, 97, 92, and 164 miles, respectively, above the mouth; and by light-draft steamers to Priest Rapids, Washington, and Lewiston, Idaho, 355 and 406 miles, respectively, above the mouth.

The commerce, both foreign and domestic, is extensive. The exports are principally lumber, grain, flour, fruit, fish, and general merchandise; the imports are coal, fuel oil, cement, manufactures, and general merchandise. There are numerous settlements and landings, but Astoria, on the south bank, 12 miles inside the entrance, and Portland, on the Willamette River, 9 miles from its junction with Columbia, are the principal shipping points.

The deep channels for ocean vessels are shown on a set of seven, overlapping, large-scale charts, covering the area from the entrance to The Dalles at the head of this type of navigation. They are numbered 6151 to 6157, inclusive.

The various places and features along both banks of the river are described as the river is ascended. When two features are opposite the one on the southern bank will be described first.

Distances on the Columbia River given in this Coast Pilot as measured from the mouth are in nautical miles from the junction of the Main Channel Range and a line joining the outer ends of the north and south jetties. The distance from the Columbia River Lightship bearing 090°, distant 0.5 mile to the mouth of the river is 5.6 miles.

Rules of the Road.—The boundary line of inland waters is a line drawn from the west end of the north jetty (above water) to South Jetty Bell Buoy 2SJ.

The entrance to the Columbia River has been improved by the construction of north and south jetties and by dredging. The project depth is 40 feet between the jetties. The controlling depths are published weekly in Portland and monthly in the *Notice to Mariners*. The improvement makes it possible for the largest vessels on the Pacific to enter and leave at any normal stage of the tide, and in any weather except during the most severe storms. Bar-bound vessels, once so common here, are now rarely to be seen.

Extensive improvements have been made throughout the Columbia and Willamette Rivers from the sea to Portland. The project depth of the Columbia and Willamette Rivers from the mouth of the Columbia to the Broadway Bridge at Portland, Oregon, is 35 feet, the channel width is 500 feet. The project depth of the Columbia from the mouth of the Willamette upstream to Vancouver, Washington, is 30 feet, the channel width is 300 feet. The project depth between Vancouver and Bonneville is 27 feet. The channel between Bonneville and The Dalles is 30 feet as provided by the pool of the Bonneville Dam which extends 42 miles to Big Eddy.

Above the entrance the project is attained partly by the construction of stone and pile dikes and revetments, but chiefly by dredging on the various bars. The project depth has been obtained at various times, but on account of excessive shoaling during the annual freshets which occur during the months of May, June and July, it has been impossible to maintain that depth on all bars. Channels are restored to project depths as soon as possible thereafter. A draft of 30 feet is practicable at low tide throughout the year and at higher tide drafts of 32 to 35 feet are practicable.

Depths.—Minimum depths are given at mean lower low water from the entrance of Harrington Point, thence at Columbia River Datum above that point to Bonneville Dam on the Columbia River and Willamette Dam on the Willamette River. **Columbia River Datum** is the mean lower low water during lowest river stages.

The controlling depths are published weekly in the local *Notice to Mariners* by the U. S. Coast Guard and monthly in the Hydrographic Office *Notice to Mariners*. Additional information may be obtained from the Corps of Engineers, U. S. Army, Portland, Oregon.

Anchorage.—Anchorage areas and regulations for the Columbia River are given in Chapter 2, § 202.228.

Caution regarding aids to navigation.—During the period of high water conditions, aids to navigation in the Columbia River are subject to being destroyed, temporarily discontinued, or otherwise rendered unreliable. Mariners are warned to exercise caution in navigating the river and to obtain the latest information regarding status of aids to navigation in the Columbia River by local inquiry and

through local Notices to Mariners available upon request to the Commander, Thirteenth Coast Guard District, New World Life Building, Seattle 4, Washington. Every effort is being made to maintain the aids in operating condition and restoration of aids to normal operation will be accomplished at the earliest practicable date that conditions will permit.

Directions.—Because of the frequent changes in the position of certain portions of the dredged channel, no directions for the river can be given which would be of permanent value. These channels throughout, however, are well marked by ranges, daybeacons, and buoys, and by following the chart, vessels of less than 30 foot draft should have little difficulty in reaching Portland, provided the trip can be made in daylight. Darkness greatly increases the difficulty of navigation, not only because the unlighted aids cannot be seen, but more particularly because the lighted aids are in some cases difficult to distinguish from the numerous other lights surrounding them. Strangers should not attempt to run the river at night.

Speed.—On account of the danger to levees and other installations along the Columbia River caused by the swells from passing vessels, at high stages of the river, the following notice was issued by the Corps of Engineers, in order that such structures may be safeguarded and the possibility of breaking levees, with possible loss of life, be reduced to the minimum:

NOTICE.—When the river stage reaches 25 feet on the Weather Bureau gage at Vancouver, the speed of all oceangoing vessels and *power boats of all kinds* operating in the reaches between Skamokawa, Washington, and Fisher Island; and between mouth of Kalama River, Washington, and Portland on the Willamette and mouth of Sandy River on the Columbia, when proceeding upstream, shall be limited to 8 miles per hour *through the water* or to such lesser speed as will not cause an objectionable or destructive swell.

On downstream trips speed shall be limited to that necessary for satisfactory steerage, but shall in no case exceed 6 miles per hour *through the water.*

Freshets occur annually, the high-water stage being reached about June. The heights above normal range about 20 feet at Portland to practically nothing at Astoria. These freshets cause shoaling in the dredged cuts through the various bars, but redredging is begun as soon as the waters have partly subsided, and normal conditions are restored shortly after the end of the flood season.

Ice forms occasionally in both the Willamette and Columbia Rivers, but it is seldom heavy enough to seriously affect navigation.

Since logging is one of the main industries of the region, free floating logs and submerged deadheads or sinkers are a constant source of danger in the Columbia and Willamette Rivers. The danger is increased during spring freshets. *Deadheads* or *sinkers* are logs which have become adrift from rafts or booms. One end of a sinker settles to the bottom while the other floats just awash, rising and falling with the tide.

Salinity of river water.—The river water in the vicinity of Portland and as far downstream as Brookfield, Washington, is fresh and is used for boilers of steamers at all seasons of the year. From Brookfield to the sea the salinity increases. In the vicinity of Astoria it is brackish.

Dredges will usually be found at work in the channels of the Columbia and Willamette Rivers. These dredges should be passed with caution and reduced speed.

Regulations regarding navigation on the Columbia and Willamette Rivers are given in Chapter 2, § 207.670.

Mount St. Helens, nearly 10,000 feet high, cone-shaped and snow-capped, is about 75 miles eastward of the entrance to the river. On a clear day it is visible when looking up the valley from seaward.

Mount Hood and **Mount Adams** are also lofty, snow-covered peaks, visible from parts of the Columbia River on a clear day.

Chart 6151.—Columbia River Entrance.—Clatsop Spit, on the southern side at the entrance, is a low sand beach, extending from Point Adams a distance of 2.0 miles toward Cape Disappointment. It was formerly subject to extensive shifting, but the construction of the south jetty has fixed it in position, except that the shoal off Clatsop Spit has extended northwestward. **Point Adams,** just inside Clatsop Spit, is a low, sandy point, covered with fir and undergrowth to the edge of the sand beach and low dunes. The point usually shows well from seaward, practically if it is hazy inside.

A Coast Guard Lifeboat station is on the eastern side of Point Adams at Hammond, 0.8 mile southeast of Ft. Stevens. **Storm warnings** are displayed day and night from the Coast Guard station. The red storm warning lights are obscured from 015° to 180° to prevent possible confusion by inbound vessels between such warnings and any navigational aid.

Caution.—There is a tendency for Clatsop Spit Shoal to build up to the northwestward. Vessels are cautioned to keep informed as to conditions in this vicinity.

Cape Disappointment, the northern point at the entrance to the Columbia River, is the only headland on the low, sand beach that extends from Tillamook Head to Point Grenville, a distance of over 80 miles. It comprises a group of rounding hills covering an area 2.5 miles long and 1 mile wide, divided by a narrow valley extending north-northwestward. The seaward faces of these hills are precipitous cliffs with jagged, rocky points and small strips of sand beach. The extreme southeastern point is marked by a light.

From the southward, Cape Disappointment shows as three low knobs, separated by low flat ridges. North Head Light shows on the western slope of the western knob. Cape Disappointment Light shows on the western slope of the eastern knob. From the westward, the cape is not prominent, but in fog, haze, or smoke inside the cape, it stands out clearly. From northwestward, the cape appears as a flat-island with a slight depression in the center and a timbered knob at each end. From this direction, between the cape and high ridges eastward, appears a low, flat hill with gently sloping sides which from a distance appears as an island.

Cape Disappointment Light is shown from a 53-foot white conical tower. The light is 220 feet above water, visible 21 miles, and is obscured northward of 137½°. A radiobeacon is at the light. Coast Guard Station No. 327 is at **Fort Canby** on the eastern side of Cape Disappointment.

McKenzie Head, 0.8 mile northwestward of the light, is 190 feet high and nearly round. It is covered with grass and fern but is bare of trees.

North Head, the extreme western point of the cape, is 270 feet high, with a very jagged, precipitous cliff, backed by a narrow, grassy strip; the higher ground behind it is covered with trees.

North Head Light is shown from a white conical tower on the western point of North Head. The light is 194 feet above the water and visible 20 miles. The light is obscured east of 181°. Near the light is a United States Weather Bureau **storm warning** display station with telephone to Astoria and Portland.

Columbia River Lightship is moored on the Main Channel range for entering Columbia River, and is 8.2 miles 213° from North Head Light. It has a red hull with COLUMBIA on each side and two masts. The light, shown from the foremast, is 57 feet above the water, and visible 13 miles. A fixed white riding light is shown from the forestay. The fog signal is sounded on a two-tone air diaphone. The lightship has a radiobeacon synchronized for distance finding; the station receives and transmits emergency radio messages. **Storm warnings** are displayed at the lightship during daylight hours. The code flag signal and radio call is NNCR.

Directions, Columbia River approach.—From seaward, in clear weather, the landmarks are prominent, and the lights at the entrance, at Willapa Bay 28 miles northward, and on Tillamook Rock, 20 miles southward, are distinguishing marks for determining a vessel's position northward or southward of the entrance and the subsequent shaping of the course.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reefs and Swiftsure Bank, and velocities considerably in excess of those amounts have been reported. For detailed information regarding the conditions which may be encountered and the precautions to be observed see the statement on coastwise navigation in Chapter 2. Under such conditions, vessels should keep outside the 30-fathom curve until the lightship has been made. Care should be taken not to mistake the low sand beach northward of Cape Disappointment for that southward of Point Adams. Nearly all the vessels which have gone ashore while endeavoring to make the entrance have been wrecked northward of the mouth of the river in the vicinity of Peacock Spit.

Sailing vessels should endeavor to make the land to windward of the entrance in the summer months, in the latitude of Cape Disappointment; and in winter, well southward of the cape; and when compelled to heave-to while waiting for favorable conditions for entering, particularly during the heavy weather of the winter season, should make ample allowance for current. Vessels have been known to heave-to on making Columbia River Lightship and 24 hours later find themselves off Grays Harbor.

In clear weather, vessels should have no difficulty in entering the river as the aids to navigation are numerous. The chart is the guide, and no detailed directions are necessary. In thick weather, however, when the aids cannot be seen, strangers should not attempt to enter without a pilot.

949285—52——21

Local vessels entering in thick weather and with a flood tide, as a rule, do not attempt to pass beyond Desdemona Sands Light, because of the difficulty under such circumstances of avoiding vessels anchored in the narrow channel above the light.

Information, condition Columbia River Bar.—An estimate of bar conditions, visibility, wind, etc., may generally be obtained by radio from the United States Coast Guard Cutter at Astoria, or the Point Adams Coast Guard Lifeboat Station at Hammond.

Currents.—The currents at the Columbia River Lightship are described in the *Current Tables, Pacific Coast.*

Caution.—The Columbia River Bar is said to be very dangerous because of sudden and unpredictable changes in the currents often accompanied by breakers. It is reported that ebb currents on the northern side of the bar attain velocities of 6 to 8 knots, and that strong northwesterly winds sometimes cause currents that set northward or against the wind in the area outside the jetties.

In the entrance the currents are variable, and at times, reach a velocity of over 5 knots on the ebb; on the flood they seldom exceed a velocity of 3½ knots. The mean velocity of the tidal current is about 3½ knots at strength of either flood or ebb, but this tidal current is always modified both as to velocity and time of slack water by the river discharge. On the flood, there is a dangerous set toward Clatsop Spit, its direction being approximately east by south; on the ebb the current sets along the line of buoys. Heavy breakers have been reported as far inside the entrance as buoy 12, southward of Sand Island.

For predicted times and velocities, the *Current Tables, Pacific Coast,* should be consulted.

Pilots.—Pilotage across the Columbia River Bar is not compulsory but pilots are always available and a pilot boat will usually be found cruising off the bar. Vessels requiring a pilot should radio (Code Word) Bar Pilots Astoria, twelve hours prior to arrival, stating expected time of arrival at the Columbia River Lightship in order to be assured of a bar pilot being available.

The Bar Pilots maintain two pilot boats, one a power schooner named *Columbia,* radiotelephone call WA-3810, operating on 2738 kc., and the other a converted mine sweeper named *Peacock,* radiotelephone call WA-9403, operating on 2738 kc. One of these boats is on station at the lightship when a ship requiring a pilot is due.

Pilots are transferred from the pilot boat by means of a pulling boat and the ship should have a boat rope for the small boat to hang onto, this boat rope to be made fast on deck about 75 feet on each side of the ladder with the bight down to the water's edge.

The bar pilotage ground extends from the uppermost dock or wharf at the port of Astoria, to the open sea, at least 10 miles beyond the outermost buoy, and the river pilotage ground extends from the lowermost dock or wharf at the port of Astoria to the head of navigation on the Columbia or Willamette Rivers and their tributaries.

In July 1950 the rates for bar pilotage between sea and inside anchorage as far as Tongue Point were $1.75 per foot of deepest draft, plus 1¾ cents per registered ton, with a minimum charge of $55.00 and a maximum charge of $135.00.

The minimum rate of $55.00 also applies to vessels entering Warrenton from Astoria; or ships leaving Warrenton for Astoria. A flat charge of $15.00 is made for shifting vessels from anchorage to dock, dock to dock, or dock to anchorage.

When a vessel outward bound takes a pilot, and is thereafter prevented from going to sea on account of stress of weather, and a pilot remains on board at the request of the master, such pilot is entitled to compensation therefor at the rate of $20.00 per day, or should a pilot be carried away by a vessel, when outward bound, through his inability to board off due to weather, the same rate applies and he must be given first-class transportation back to Astoria, by the fastest means, when the vessel makes port.

In 1949 the rate for river pilotage between Astoria and Portland for steamers of 1,500 tons and over was $1.75 per foot of actual draft, plus 1¾ cents per registered ton, in each direction, with an additional charge of $30.00 for each stop, with a minimum charge of $50.00 for steamers in the coastwise lumber trade, and for sailing vessels, $40.00 to $99.00, depending upon tonnage.

For moves within Portland Harbor flat rates range from $15.00 to $40.00. Between Portland and Vancouver the rate is $40.00 per move.

Chart 6151.—Columbia River Entrance to Harrington Point.—Reaches of the channel within the limits of this chart are **Entrance Main Channel Range, Sand Island Range, Desdemona Channel, Flavel Range, Tansy Point Range, Astoria Range, Tongue Point Channel, Harrington Point Range,** and **Miller Sands Channel.**

Baker Bay is a shoal open bight, eastward of Cape Disappointment, formed by the cape and the recession of the land northward. **Sand Island**, low and flat, is in front of the bay. A channel with a project depth of 10 feet and a width of 200 feet is eastward and northward of the island. In August 1949 the controlling depth was 8 feet. This channel leads to **Ilwaco,** a small town on the northern shore. A channel westward of Sand Island with a project depth of 8 feet over a width of 150 to 200 feet extends from deep water in the river to the main channel at Ilwaco. In August 1949 it had a controlling depth of 6 feet. Ilwaco is the base for a large fishing fleet. Fuel oil, gas, and water are available; there are facilities for hoisting out 8- to 10-ton fish boats on small marine railways and for making some repairs. The remainder of the bay is covered with shoals and old abondoned fish traps, and at low tide, is not navigable even for light-draft river steamers.

Coast Guard Lifeboat station is on the southwest side of Baker Bay in a cove west of main channel range rear light.

Point Adams has been described previously.

About a mile eastward of Sand Island and the end of Clatsop Spit, the main river channel is divided by the shoal, **Desdemona Sands.**

Desdemona Sands Light is shown from a white pyramidal tower on white piles on the western end of the shoal. The light is 38 fet above water and visible 11 miles. A fog is sounded on an electrical bell. **Fort Stevens** wharf, about 1.1 miles south-southeast of Desdemona Sands Light, is marked by a light, shown from a white house on a pile dolphin which is connected to the wharf by a narrow catwalk. The light is 30 feet above the water. A fog signal at the light is sounded on a duplex diaphragm horn.

Warrenton, on the Spikanon River, has several sawmills, canneries, and fertilizer works. Two marine ways are at Warrenton, and boats up to 50 feet long can be hauled out for repairs. The **Skipanon River** has a project depth of 30 feet from deep water to and including the turning basin at Warrenton; thence 6 feet deep for a distance of 4,500 feet via the cut-off channel above the railroad bridge. In August 1949 the controlling depth was 28 feet in the channel and 17 feet in the turning basin. Ocean vessels load here regularly. Warrenton has rail connections with Astoria.

Across the Skipanon River are three bridges. A railroad bridge, about 0.7 mile above the mouth, has a swing span having a horizontal clearance of 16 feet in the east draw and 33 feet in the west draw, and a vertical clearance of 2½ feet. A highway bridge, about 0.8 mile above the mouth, has a bascule span having a horizontal clearance of 33 feet and a vertical clearance of 3 feet. A highway bridge, about 2.1 miles above the mouth, has a bascule span having a horizontal clearance of 34 feet and a vertical clearance of 4 feet. The regulations regarding these bridges are given in Chapter 2, § 203.740.
34 feet and a vertical clearance of 4 feet. The regulations regarding these bridges are given in Chapter 2, § 203.740.

Scarboro Hill, 820 feet high, is on the northern bank of the river inside the entrance, about 7 miles eastward of Cape Disappointment. It is a long, gradually rising ridge, covered with grass and fern. Formerly it was prominent, being the only grass-covered hill visible on the northern bank of the river. In recent years, however, many scattered trees have grown up on the hill, and the slopes eastward to Point Ellice have been largely denuded of their dark timber. A number of conspicuous light-colored buildings belonging to the military post of **Fort Columbia,** may be seen near the base of the hill, and alongshore to the westward lies the town of Chinook. A channel with a project depth of 8 feet deep over 150 feet wide leads from the head of Sand Island to **Chinook.** At the town is a pile and timber bulkhead. The only wharf is owned by a packing company, a portion of which is used as a public landing. In August 1949 the controlling depth was 5½ feet over a width of 150 feet.

Smith Point, on the southern bank at the junction of Young Bay and the river is the western termination of a high, wooded ridge; it is the first prominent point on the southern bank southeastward of Point Adams. The ridge culminates in **Coxcomb Hill,** 595 feet high, behind Astoria. The Astor Column on the top of the hill is prominent.

Youngs Bay, on the southern side of the river about 10 miles inside the entrance, is shoal; it receives the waters of **Youngs River** and **Lewis and Clark River.** Traffic on the two rivers is confined chiefly to towboats handling log rafts just above the two highway bridges. Small towboats operate to the town of **Olney,** on Youngs River, but only at high tide. The shipyards of Youngs Bay are no longer in operation. A powerhouse with a prominent white concrete stack is on the northern shore of the bay, just westward of the highway bridge. On the eastern side of the highway bridge at its northern end are the moorings of the Astoria Yacht Club.

The project for Youngs Bay and Youngs River provides for a channel 10 feet deep from the Columbia River to the foot of **Haven Island.** In February 1947 the

controlling depth in Youngs Bay was 9 feet. In December 1945 the controlling depth in Youngs River from the bay to Haven Island was 4 feet.

Across Youngs Bay are two bridges. A railroad bridge, about 0.4 mile above the mouth, has a swing span with a horizontal clearance of 130 feet and a vertical clearance of 10 feet. A highway bridge, about 2.1 miles above the mouth, has a bascule span with a horizontal clearance of 120 feet and a vertical clearance of 20 feet in the center of the span and 6 feet at the extremities. Across the Lewis and Clark River are three bridges. A highway bridge, about 0.9 mile above the mouth, has a bascule span with a horizontal clearance of 92 feet when open, and a vertical clearance of 15 feet. A highway bridge, about 4.3 miles above the mouth, is a swing span having a horizontal clearance of 50 feet and a vertical clearance of 4 feet. A highway bridge, about 6.1 miles above the mouth, is a fixed span with a horizontal clearance of 60 feet and a vertical clearance of 12 feet. The regulations regarding these bridges are given in Chapter 2, § 203.740.

Astoria, on the south bank of the river about 12 miles inside the entrance, extends from Youngs Bay to Tongue Point. It is the principal city on the lower portion of the river. It has connection with the interior by both rail and river steamers, and ships large quantities of grain, lumber and general merchandise to both foreign and domestic ports. Oil products are received. There are ample wharfage facilities, both municipal and private, with depths of 20 to 35 feet. Wharfage and dockage or berthage are charged at Astoria.

A mooring basin for trolling boats and others is maintained by the port of Astoria just eastward of its three piers at Smith Point. The basin is about 600 feet by 900 feet, with capacity for about 400 boats. The berths are leased to boat owners at $20.00 per year for lengths of less than 36 feet; a few larger berths are available.

Anchorage.—The anchorage areas off Astoria are given in Chapter 2, § 202.-228. There is a harbor regulation that no vessel shall anchor for more than 1 hour within an area bounded on the south by the Astoria water front and on the north by the main channel buoys.

Tides.—The mean range of tide at Astoria is about 6 feet. The range between mean lower low water and mean higher high water is about 8 feet. A range of about 12 feet may occur at the time of maximum tides. Daily tide predictions for Astoria (Tongue Point) are given in the *Tide Tables.*

Currents.—Abreast of Astoria, the ebb current has less velocity in the south channel than in the Main Ship Channel. Above Astoria the current averages 1 to 3 knots at strength except during the freshet period when the ebb is considerably increased although not enough to affect navigation seriously.

Storm warnings are displayed day and night from a steel tower back of Astoria, Point Adams Coast Guard Station, and from a tower at North Head, the northern entrance to the Columbia River. Daytime signals only are displayed from the Columbia River Lightship and Ilwaco Basin. A shield has been installed on red storm warning lights at Point Adams to prevent their being seen from 015° to 180° to prevent possible confusion by inbound vessels between such warnings and any navigational aids.

Towboats.—Towboats are always available.

Lighterage.—Barges of various sizes are available at all times.

Quarantine.—National regulations are enforced by the Public Health Service. The quarantine officer is stationed at Astoria in the Federal Building. Vessels subject to quarantine usually proceed to their docks where they are boarded by the quarantine officer for inspection. An out-patient office of the Public Health Service, in charge of service officers, is in 211 Post Office Building, Astoria.

Customs.—The river is in the Oregon collection district, of which Portland is the headquarters. The port of entry for the river is at Astoria, with offices in the Federal Building.

Immigration Service.—There is an office of the Immigration Service in the Federal Building, Astoria.

A **chart agency** of the Coast and Geodetic Survey is here.

Harbor regulations are prescribed by the Port of Astoria Commission and enforced by the harbor master. Copies of the complete regulations may be obtained from the harbor master.

Terminal facilities.—The port of Astoria, a municipal corporation embracing all of Clatsop County, owns 8,840 feet of the water front at Smith Point, and has built and operates a well equipped modern terminal of three piers.

Supplies.—Coal, fuel oils, provisions, and ship chandlery can be obtained at Astoria.

Repairs.—Marine ways having a capacity of 300 tons are available in Astoria. Vessels up to 135 feet long and with a draft of 12 feet can be hauled out for repairs. There are machine shops and foundries.

Communication between Astoria and Portland and intermediate points is by railroad, truck, and bus. Transportation is also available to points directly north and south of Astoria by bus. Astoria is on the Columbia River Highway which extends from Seaside, Oregon, to Astoria, thence along the southern bank of the Columbia to The Dalles.

Salvage.—Complete salvage equipment is available at Astoria.

A United States Coast Guard cutter is stationed at the port during the greater part of the year and is available to render assistance to vessels off the Oregon and Washington coasts.

Point Ellice, on the north bank of the river, is the termination of a spur from the mountain ridge back of Scarboro Hill; it lies about 4 miles northeastward of Point Adams. The point is rounding and rocky but not high. Two hillocks lie behind the point; one is 240 feet high and the one behind it is much higher. The shore in this vicinity is closely built up with abandoned fish traps, pile structures extending well out into the river.

Megler, a ferry landing on the northern shore opposite Astoria about 1 mile northeastward of Point Ellice, is connected by ferry with Astoria as part of the coastal highway route.

The loading wharf at **Knappton** on the northern shore 3 miles northeastward of Point Ellice, has been damaged by fire and was not in use in 1950.

Tongue Point, on the southern bank about 4 miles east-northeastward of Smith Point, is a bold, rocky peninsula, 308 feet high, covered with trees and connected with the southern bank by a low, narrow neck; it projects into the river for 0.8 mile. A buoy depot of the Coast Guard is on the western side of the peninsula near its inner end. On the eastern side of the peninsula opposite the buoy

depot is a Naval base. Eight concrete piers, each about 435 yards long, have been constructed and the adjacent area dredged to a general depth of 20 feet.

Cathlamet Bay lies eastward of Tongue Point and southward of the Main Ship Channel. There are many islands which are covered with tule in the summer, while in the winter they are almost indiscernable. The **John Day Channel** lies between Tongue Point and **John Day Point.** At the junction with the **John Day River,** just northward of the point, the name changes to **South Channel,** and it follows the shore closely to and around **Settler Point** to **Svensen.** These channels are marked and the aids are shown on the chart. The westerly portions of Prairie and Woody Island Channels cross the bay; they are marked. Strangers should obtain local information as to condition before navigating these channels.

Grays Bay extends from **Grays Point** to **Harrington Point** and northward of the Main Ship Channel. In the northeastern section of the bay are extensive mud flats. **Deep River** flows into the northern part of the bay. The channel is marked and follows the shore from Grays Point around **Portuguese Point** and **Rocky Point.** The project provides for a channel 8 feet deep and 100 feet wide through the bars at the mouth of the river and the entrance and 60 feet wide in the river up to the town of Deep River. In March 1944, the controlling depths were 4 feet for 0.8 mile thence 2½ feet to the town.

Deep River is crossed by two highway bridges. The first, about 3 miles above the mouth, has a swing span with a horizontal clearance of 60 feet in the east draw, 56 feet in the west draw, and a vertical clearance of 10 feet. The second, about 3.7 miles above the mouth, has a bascule span with a horizontal clearance of 38 feet and a vertical clearance of 11 feet. At the town of **Deep River** is one wharf for general freight. The river is used mostly by fishing vessels and log rafts.

Grays River enters the northern section of Grays Bay. The river is navigable to the town of **Grays River** about 7 miles above the mouth. The project provides for removal of snags and other obstructions between the mouth and the town of Grays River. The channel is in fair condition but shoal with an accumulation of snags and sunken logs. No recent surveys have been made. Controlling depths are reported by local interests to be 2 feet from the mouth to mile 5, and above that portion to the town of Grays River the river is practically dry in two places at low water.

Two highway bridges cross Grays River at **Rosburg** about 4 miles above the mouth. The first has a fixed span with a horizontal clearance of 60 feet and a vertical clearance of 23 feet. The second has a swing span with a horizontal clearance of 48 feet and a vertical clearance of 10 feet. Along the river are small privately owned wharves. The river is used mostly by fishing vessels and log rafts. Above the town of Grays River, the river is used for logs only.

Chart 6152.—Harrington Point to Crims Island.—Reaches of the main channel within the limits of this chart are **Miller Sands Channel, Pillar Rock Lower Range, Pillar Rock Upper Range, Skamokawa Channel, Puget Island Range, Wauna Range, Driscoll Range, Westport Channel, Eureka Channel,** and **Gull Island Channel.**

In this section of the river the main channel follows the northern bank to **Three Tree Point;** thence swings around the bend, holding to the northeastern

shore to **Hunting Islands;** thence swings southward and follows the southerly shore until off the southeastern end of **Puget Island;** thence follows the northerly bank from **Cape Horn** past **Abernethy Point** and northward of **Crims** and **Gull Islands.**

Currents.—In this section of the river the tidal current at strength has an average velocity of about 1 knot. Because of the river flow which combines with tidal current, the upstream flow is weak or nonexistent and the downstream flow attains velocities of 2 to 3 knots at strength. Much greater velocities occur under freshet conditions. Tidal current predictions may be obtained from *Current Tables, Pacific Coast.*

Local magnetic attraction.—Differences from the normal variation as much as 2° have been observed along this section of the Columbia River, between Harrington Point and Crims Island.

The easterly end of **Woody Island Channel** enters the main channel northward of **Woody Island. Prairie Channel** follows the northern shore of **Long Island** to Woody Island. **Blind Slough** and its tributary, **Grizzly Slough,** on the southern side of Long Island, are used for log raft storage. Across Blind Slough are two bridges. A railroad bridge, about 1 mile above the mouth, has a swing span having a horizontal clearance of 45 feet and a vertical clearance of 4 feet. A highway bridge, about 1.4 miles above the mouth, has a removable span having a horizontal clearance of 70 feet and a vertical clearance of 9 feet. The regulations regarding the railroad bridge are given in Chapter 2, § 203.740. **Steamboat (Skamokawa) Slough,** northeastward of **Price Island,** is used by fishing boats, tugs, and for log storage. **Skamokawa** is a small village at the western entrance to Steamboat Slough.

The **Skamokawa Creek** project provides for a channel 6½ feet deep and 75 feet wide between Steamboat and Brooks Sloughs, about 500 yards long. In June 1949 the project depth obtained. Across Skamokawa Creek are two bridges. A highway bridge, about 0.2 mile above the mouth, has a swing span having a horizontal clearance of 65 feet and a vertical clearance of 12 feet. A highway bridge, about 0.4 mile above the mouth, has a swing span having a horizontal clearance of 62 feet and a vertical clearance of 8 feet. Two wharves on the slough are above Brooks Slough.

Brooks Slough is just northward of the mouth of Steamboat Slough. Across Brooks Slough is a highway bridge, about 0.2 mile above the mouth, with a swing span having a horizontal clearance of 60 feet and a vertical clearance of 6 feet.

Elokomin Slough, on the eastern side of Hunting Islands, is used for log storage and by towboats. The project provides for a channel 10 feet deep, 100 feet wide, extending from that depth in the Columbia River near the southerly end of the slough, to terminals near the mouth of **Elokomin River,** with turning basin of same depth at the inner end. In March 1944 the slough had a controlling depth of 8 feet from the eastern end to the wood mill, now abandoned; and the western end has depths of 1 foot near the mouth.

Clifton Channel separates **Tenasillahe Island** from the western bank of the river. There is a log pond at **Bradwood** where this channel joins the main channel.

Cathlamet Channel is used by fishing boats, tugs, log rafts and barges, and for some log storage above the city of **Cathlamet;** 10 feet can be carried. A fixed

span highway bridge crosses the channel from Cathlamet to Puget Island; the central section has a horizontal clearance of 400 feet and a vertical clearance of 74 feet.

Westport Slough is used by ocean-going steamers to **Westport.** The project provides for a channel 28 feet deep and generally 200 feet wide from Columbia River to the ferry dolphin at downstream end of lumber wharf. In August 1950 a controlling depth of 28 feet could be carried to the Westport Lumber Company. East of Westport, the slough is used for log storage, and about 8 feet can be carried to **Kerry,** 1.5 miles above Westport. A ferry operates between Westport and **Pancake Point** on Puget Island.

Wallace Slough, southward of **Wallace Island,** is used at the eastern end, to the cannery at the mouth of the canal from **Clatskanie,** by cannery tenders and also by fishing boats and house floats, from there west. A depth of 4 or 5 feet can be carried through the slough. **Beaver Slough** enters Wallace Slough at the mouth of the canal and is used by fishing boats and float houses. **Clatskanie (Creek) River** is a tributary of Beaver Slough. Across Clatskanie Creek is a railroad bridge, about 0.6 mile above the mouth, with a swing span having a horizontal clearance of 61 feet and a vertical clearance of 10 feet. For regulations for this bridge see Chapter 2, § 203.740. The project provides for a channel 6 feet deep and 40 feet wide from the town of Clatskanie to the Columbia River about 3.5 miles. In November 1948 the controlling depth in Clatskanie Creek to Clatskanie was 6 feet. At Clatskanie is a wharf and warehouse. Five private wharves are on Beaver Slough.

Bradbury Slough, southwestward of Crims Island, carries the deepest water in a narrow channel along the Oregon shore with a minimum depth of 9 feet to the upper end where it shoals to 3 feet. There is extensive log storage along Crims Island shore.

Chart 6153.—Crims Island to St. Helens.—Reaches of the main channel within the limits of this chart are **Stella Range, Fisher Island Channel, Walker Island Channel, Barlow Point Channel, Slaughters Channel, Cottonwood Island Lower Range, Cottonwood Island Turn, Cottonwood Island Upper Range, Kalama Lower Range, Kalama Upper Range, Martin Island Channel, Columbia City Range,** and **St. Helens Range.**

The main channel swings southeastward, passing southward of **Fisher Island** and northward of **Walker Island;** thence, under the Longview Bridge, which has a vertical clearance of 167 feet; thence, swings westward of **Cottonwood Island,** eastward of **Sandy Island,** westward of **Martin** and **Burke Islands.** The numerous jetties, some of which are detached, have for the most part lights and daybeacons at their ends.

Currents.—Between Crims Island and St. Helens the tidal current at strength has an average velocity of ½ knot. During six days of observations taken in June and July there was a continuous downstream flow varying from ½ knot to 2 knots. Much greater velocities doubtless occur during freshets. Tidal current predictions may be obtained from the *Current Tables.*

Local magnetic attraction.—Differences from the normal variation as much as 2° have been observed along this section of the Columbia River.

Coal Creek Slough enters the river at **Stella.** The slough is used exclusively for log raft storage. A depth of 14 feet controls at the entrance, but 19 feet may

be carried to within 0.5 mile of the eastern limits, where the channel quickly shoals to a few feet.

Fisher Island Slough, northward of Fisher Island, is used as Longview Yacht Basin, and by small fishing vessels and as log storage grounds. A depth of 7 feet may be carried through the channel. An overhead cable crossing the river near Slaughters Range has a clearance of 210 feet.

The channel between Walker Island and the Oregon shore is used for log raft storage. The shoal area, northward of **Dibblee Point,** limits the maximum depth which may be carried through the entire channel to about 7 feet. This channel is used as a short cut by river boats during freshets.

Mount Coffin, formerly 248 feet high, is being quarried away. In 1950 only two small mounds remained. A large aluminum plant is on the north bank just westward of Mt. Coffin.

Rainier, on the Oregon shore, has some commerce in lumber and other wood products. A channel has been dredged along the city water front. The project provides for a channel 24 feet deep and 200 feet wide. In March 1949 the controlling depth was 24 feet. Two small boatyards have marine railways capable of hauling vessels 75 feet long and 150 tons. Gasoline is available at a marine station. Diesel oil may be obtained from a tank truck.

The **Longview Bridge** 56 miles above the mouth, between Longview and Ranier has a fixed span having a horizontal clearance of 1,085 feet and a vertical clearance of 167 feet. Fog signals are sounded on a siren at the south pier and a gong at the north pier.

Longview, just westward of the Cowlitz River and opposite Rainier, is built around the activities of an extensive lumber development. A turning basin 2,500 feet wide, 15,000 feet long, and 35 feet deep, fronts the dock at the port of Longview. The dock, parallel to the Columbia River, has 1,675 feet of berthing space. It is well equipped to handle general cargo. Ocean-going vessels load lumber and grain for export and intercoastal trade.

Complete tug and lighter services are available. Longview is a customs port of entry but marine documents are not issued. The office of the Customs Service is in the post office. Cranes at the port have capacities of 125 tons and less and include a derrick barge of 30-ton capacity. The grain elevator has a capacity of 1,000,000 bushels. Diesel and fuel oils, gasoline, and water are available in any quantity. Electric current service is available in all voltages from 11,000 V. to 110 V., 60 cycle, A.C. Complete facilities are maintained for the repair of vessels except for drydocking. The port is served by four transcontinental railroads and several intercoastal steamship lines. The large grain elevator and the stacks and tanks of the mills are conspicuous.

A Naval Reserve pier is at the west end of the port of Longview wharf and just east of the Longview Bridge.

The **Cowlitz River** flows into the Columbia River about 60 miles above the mouth and just eastward of Longview. The project provides for a channel 4 feet deep and 50 feet wide from the mouth to **Ostrander,** 7.8 miles; thence 2½ feet deep and 50 feet wide to **Castle Rock,** 15.2 miles; thence 2½ feet deep and not less than 40 feet wide to **Toledo,** 29.5. miles. The tide varies from 4 feet at the mouth to zero at Ostrander. During ordinary freshets at stage of 20 feet, and at extreme

floods a stage of 25 feet, is reached in the river at Kelso. In June 1949 the controlling depth was 4 feet to Kelso, thence 2 feet to Ostrander. Above Kelso the channel is in poor condition. No survey has been made above Ostrander since 1939.

Between the mouth and Ostrander are four bridges. A railroad bridge, about 1.3 miles above the mouth, is a bascule span having a horizontal clearance of 107 feet and a vertical clearance of 21 feet. A highway bridge, about 1.6 miles above the mouth, is a fixed span having a horizontal clearance of 215 feet and a vertical clearance of 71 feet. A highway bridge, about 4.8 miles above the mouth, is a vertical lift span having a horizontal clearance of 100 feet and a vertical clearance of 66 feet up. A railway bridge about 6.1 miles above the mouth, is a fixed span having a horizontal clearance of 227 feet and a vertical clearance of 62 feet.

At **Kelso** are several private wharves and one public landing. North of Kelso are log dumps. A considerable amount of lumber, farm and dairy products are shipped.

Carroll (Charlton) Channel, between Cottonwood Island and the Washington shore, is used for log storage and fishing boats. In 1938, 13 feet could be carried through the channel.

A State fish hatchery is on **Kalama River. Kalama,** on the eastern bank about 3 miles above Cottonwood Island, has a fish wharf with ice plant. Shingle and plywood mills are in operation here.

The channel on the western and southern sides of Sandy Island was good for 12-foot draft in 1949 and was used by towboats with log rafts and barges.

Martin Slough, between Martin Island and Burke Island and the Washington shore, is used in log rafting operations. **Burke Slough** between Burke Island and Washington shore is also used for that purpose.

Columbia City is a municipality about 72 miles above the mouth. The main channel of the Columbia River follows along the water front.

Saint Helens is 75 miles above the mouth and opposite the mouth of the Lewis River. There are paper and lumber mills, the products of which are shipped in considerable quantities.

Lewis River enters the Columbia at **Austin Point** eastward of Saint Helens. The project provides for a channel 6 feet deep and 50 feet wide to the mouth of the East Fork; 4 feet deep on the East Fork to **La Center;** 5.8 miles above the mouth, and 4 feet deep in Lewis River, North Fork, from the East Fork to **Woodland,** 5.7 miles above the mouth; and for clearing the channel to **Ariel,** 16 miles above the mouth. **Merwin Dam** at Ariel is the limit of navigation. Woodland and La Center are considered the head of navigation. The tide ranges from 3 feet at the mouth to 1½ feet at La Center and zero at Woodland. During ordinary freshets a stage of 14 feet and, at extreme floods, a stage of about 24 feet is reached in the main river at Woodland.

In October 1949 the controlling depth to Woodland was 1 foot. In June 1941 the controlling depth to La Center was 1 foot.

Across the Lewis River are three bridges. A railroad bridge, about 1.8 miles above the mouth, is a swing span having a horizontal clearance of 100 feet and a vertical clearance of 25 feet. A highway bridge, about 4.8 miles above the mouth, is a fixed span with a horizontal clearance of 215 feet and a vertical clearance of 32

feet. A highway bridge, about 6.3 miles above the mouth, is a fixed span having a horizontal clearance of 156 feet and a vertical clearance of 53 feet.

Across the East Fork Lewis River are two bridges. A highway bridge, about 0.4 mile above the mouth, is a fixed span having a horizontal clearance of 145 feet and a vertical clearance of 38 feet. A highway bridge, about 2.6 miles above the mouth, is a fixed span having a horizontal clearance of 140 feet and a vertical clearance of 32 feet at the center of arch.

Chart 6154.—Saint Helens to Willamette River.—Reaches of the main channel within the limits of this chart are **Warrior Rock Range, Henrici Range, Willow Range, Morgan Lower Range, Morgan Upper Range, Vancouver Lower Range,** and **Vancouver Upper Range.**

The main channel follows a southerly course. **Sauvie Island,** on the west bank, separates Multnomah Channel from the main channel. **Bachelor Island** is on the eastern side opposite Sauvie Island. Vessels seldom attempt to pass Warrior Rock Light in a thick fog, anchoring either above or below this point until the weather clears.

Local magnetic attraction.—There is reported to be a marked magnetic disturbance between Warrior Rock and **Duck Club Light.** This amounts to as much as 6°.

Warrior Rock Light, near the northern end of Sauvie Island, is shown from a white pyramidal structure on a stone pier. The light is 28 feet above water. A fog signal is sounded on a bell, operating continuously except that it is not sounded from June 1 to August 31, each year.

Multnomah Channel, on the western side of Sauvie Island, is about 19 miles long connecting the Columbia River near St. Helens with the Willamette River at the north boundary of the city of Portland. It is an important waterway, used by tows, and also by small river steamers during the winter months, when the main channel is discharging floe ice. The channel is also an important log raft storage grounds. The project provides for a channel at the Columbia end 300 feet wide and 25 feet deep, extending for a distance of about 5,000 feet: a channel at the Willamette end 150 feet wide and 25 feet deep, extending for a distance of about 9,500 feet; and for the removal of sunken logs throughout the waterway. In June 1946 the controlling depths were 24 feet in the ends of the channel, and the depth in the remainder varied from 8 to 50 feet.

Lake River is the outlet of **Vancouver Lake.** The stream flows northward for about 9.5 miles and enters the Columbia at the northern end of Bachelor Island. The project provides for a channel 6 feet deep and 100 feet wide to **Ridgefield** about 2.5 miles above the mouth. In June 1949 the controlling depth was 6 feet. There are four wharves at Ridgefield. The principal traffic is floated logs, which are placed in the river from a log dump connected with the railroad at **Felida.**

Bachelor Island Slough is a little used channel, being only 1 foot deep in places. It is used by boats from farms on Bachelor Island to Ridgefield.

Charts 6155, 6171.—The **Willamette River** is the largest tributary of the Columbia River below the Cascade Mountains. It empties into the Columbia at mile 88.1 above the mouth. This river has been extensively improved by Federal and

local agencies. The Federal project provides for a channel 35 feet deep and 500 feet wide from the mouth to Broadway Bridge at Portland 10.4 miles: 30 feet deep and 300 feet wide from Broadway Bridge to Ross Island to be maintained by the port of Portland: 8 feet deep and 200 feet wide to Cedar Island: 8 feet deep and 150 feet wide to Oregon City, 22 miles above the mouth: locks at Willamette Falls with usuable dimensions of 175 feet in length and 37 feet in width with a depth of 6 feet over the upper sill: 6 feet deep to the mouth of Santiam River, 94.2 miles above the mouth; 5 feet deep to Albany, 104.2 miles above the month: 2½ to 3½ feet deep to Corvallis, 114.6 miles above the mouth; and for necessary snagging between Corvallis and Harrisburg, 141 miles above the mouth. The Yamhill River is described later.

The controlling depths to Portland are given monthly in the weekly *Notice to Mariners.* In February 1949, the controlling depth to Oregon City was 8 feet, thence 6 feet over the sill at the upper lock, thence 3½ feet to Corvallis.

Regulations.—Regulations regarding navigation on the Willamette River are given in Chapter 2, § 207.670.

Chart 6155.—The **Willamette River Light** is on the end of the dike at the eastern side of the entrance to the river at **Kelley Point.** The light is shown from a house painted with black and red horizontal bands on a white pile structure, 20 feet above water. A fog signal is sounded on an electric bell; the signal is not sounded from June 1 to August 31.

Columbia Slough, a narrow back channel roughly parallel to the Columbia River, empties into the Willamette about 0.4 mile above its mouth. A dam has been constructed across the slough about 7.3 miles above the mouth and a cross channel, **Peninsula Drainage Canal,** dredged to the Columbia. Navigation consists principally of movements of log rafts to several shingle and lumber mills located on the slough.

The project provides for a channel, 10 feet deep and generally 100 feet wide, between the mouth and Union Avenue, a distance of 6.7 miles, with two turning basins 10 feet deep, 200 feet wide, including the width of the 100-foot channel, and 1,000 feet long; one basin to be located below Union Avenue, the other below Denver Avenue.

In June 1950 no work had been done on the project. In February 1947 the controlling depth was 4 feet.

Seven fixed bridges cross the project channel. The minimum clearances are horizontal 60 feet, vertical 24 feet.

There are no wharves or docks on the slough. There are, however, several booms, dolphins, and slips used for storage and handling of logs, near the shingle and lumber mills along the slough.

Post Office Bar is a shoal area on the easterly side of the channel on the Willamette River between Willamette River Light 11 and Willamette River Light 19. It has a least depth of 28 feet.

Caution in the vicinity of Post Office Bar.—It is normally unsafe for the upstream river boat traffic to use the western portion of the channel of the Willamette River in the vicinity of Post Office Bar, and therefore impractical for a stern wheel river boat while using the easterly course to pass downstream ocean-going

vessels using the dredged channel, to keep to the right. The U. S. Court of Appeals held: *It is the duty of such a downstream vessel to direct its course so as to accommodate the upstream easterly course of river boats and to pass them starboard to starboard.*

Portland, on the Willamette River about 9 miles from its mouth, is the principal city of the Columbia River valley. It has extensive commerce, both foreign and domestic, and is the port of call for many lines of coastwise, intercoastal, and trans-Pacific steamships. The port is served by four transcontinental railroads. There are 70 docks within the 25 miles of the deep water frontage on the banks of the Willamette River. The docks are well equipped to handle general cargo. Many of the docks have shipside tracks providing a direct interchange between the rail and the water carriers.

The administration of the port of Portland is vested primarily in the municipal corporation known as the **Port of Portland,** which has general jurisdiction over the physical development of the harbor and its channels, between the Broadway and Ross Island Bridges; and, in the **Commission of Public Docks,** with jurisdiction over the construction and operation of municipal water terminals. The Portland District of United States Engineers has jurisdiction over channel maintenance and improvement below the Broadway Bridge and above the Ross Island Bridge. The Port of Portland has jurisdiction, through the city, of a strip along each side of the river extending to 50 feet outside of the harbor lines. The Port of Portland was established by the State legislature, while the Commission of Public Docks is a department of the city.

Anchorages.—The generally used anchorage is from the Broadway Bridge downstream to the northern limits of the city, a short distance below municipal terminal No. 4, with depths of 30 to 35 feet.

Bridges.—Across the Willamette River in the vicinity of Portland are nine bridges. A highway bridge, 5.2 miles above the mouth, is a fixed span having a horizontal clearance of 1,207 feet and a vertical clearance of 203 feet. A railroad bridge, 6 miles above the mouth, is a swing span with a horizontal clearance of 230 feet and a vertical clearance of 53 feet. A highway bridge, 10.2 miles above the mouth, is a bascule span having a horizontal clearance of 250 feet and a vertical clearance of 88 feet. A highway and railroad bridge, 10.5 miles above the mouth, is a vertical lift span with two levels. The horizontal clearance is 205 feet. The vertical clearance of the lower level is 24 feet down and 70 feet up, and 162 feet with both levels up. A highway bridge, 10.8 miles above the mouth, is a bascule span having a horizontal clearance of 209 feet and a vertical clearance of 62 feet. A highway bridge, 11.1 miles above the mouth, is a swing span having a horizontal clearance of 157 feet and a vertical clearance of 31 feet. A highway bridge, 11.3 miles above the mouth, is a vertical lift span having a horizontal clearance of 200 feet and a vertical clearance of 48 feet down and 162 feet up. A highway bridge, 12.1 miles above the mouth, is a fixed span having a horizontal clearance of 490 feet and a vertical clearance of 118 feet. A highway bridge, 14.3 miles above the mouth, is a fixed span having a horizonal clearance of 270 feet and a vertical clearance of 72 feet.

Bridge regulations.—The regulations regarding these bridges are given in Chapter 2, § 203.750.

Prevailing winds.—During the months from November to February, inclusive, the prevailing winds in the vicinity of Portland are from the southward or southeastward; for the remainder of the year, northwesterly winds prevail.

Ice.—Ice forms occasionally, but it is seldom heavy enough to seriously affect navigation, although navigation by small vessels and river boats may be rendered difficult.

Pilots—Pilots have been discussed earlier. **Towboats** are always available.

Lighterage.—There is practically no lighterage service performed at this port. In view of the practice which prevails of moving vessels to various berths as required to load or discharge, the necessity for lighterage transfers has been minimized. There is, however, a transfer of lumber in barges from mills to vessels for oversize loading.

Quarantine.—Officials of the Public Health Service in charge of the enforcement of quarantine regulations have offices in 215 United States Courthouse at SW Main and Broadway. Vessels subject to quarantine usually proceed to their docks where they are boarded by the quarantine officer for inspection. A quarantine station is maintained below municipal terminal No. 4 at Portland. Vessels may be deratized at either Astoria or Portland.

An out-patient relief station of the Public Health Service is in Room 215, United States Courthouse at SW Main and Broadway.

Customs.—The headquarters of the Oregon Customs District is in Portland. The Customhouse is located at the corner of 8th and Davis Streets.

Immigration.—The headquarters of the Immigration Service is in the Post Office Building.

A **Coast and Geodetic Survey District Office** is in the Panama Building, 534 SW Third Avenue. 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, and tide tables are kept for sale. Mariners observing any changes affecting charts or Coast Pilots are requested to notify the supervisor in charge of the district office. A chart agency is in Portland.

A **Branch Hydrographic Office** is in the United States Courthouse. Bulletins are posted here giving information of value to mariners, who are also enabled to avail themselves of publications pertaining to navigation, to compare barometers, and to correct their charts from standards. No charge is made for this service.

Other Federal activities are given in tables in the Appendix.

Harbor regulations.—The various regulations are enforced by the harbor master, and complete copies of the regulations may be secured from his office.

Dockage.—A dockage charge is assessed for the use of berthing space when the vessel is not engaged in loading or discharging cargo. **Wharfage** is charge on all freight.

Wharves.—There are wharves capable of handling the largest ships plying the river with storage facilities of all types available.

Cranes of 2- to 150-ton capacities and two barge cranes of 2- to 125-ton capacities are available. Six grain elevators have a combined storage capacity of 4,333,000 bushels, bulk, and 1,230,000 bushels of sack grain. Fourteen steel tanks with

capacities of 33,500 barrels are available for the storage of bulk liquids other than petroleum products.

Supplies.—Fuel oil, coal, water, provisions, and ship chandlery may be had in any quantity.

Electric current is available in all voltages from 11,000 V., 60 cycle, A. C.

Repairs.—Repairs of all kinds can be made in Portland. The principal marine repair plant, maintained by the Port of Portland, a municipal authority distinct from the City of Portland, is on the east bank of the Willamette River. It is equipped with modern machinery and is served by three outfitting piers and three floating drydocks.

Number 1 dock on the east side of Willamette River, has a lifting capacity of 8,000 deadweight tons, a length of 488 feet, a width of 82 feet, and a 25-foot depth of water over the keel blocks; now restricted to nothing larger than river craft.

Number 2 dock has a lifting capacity of 15,000 deadweight tons, and a length of 492 feet, a width between the wings of 94 feet, and a depth of water over the keel blocks of 27 feet; and three outfitting piers on the east side of Willamette River.

Number 3 dock and outfitting pier are on the lower end of Swan Island. The dock has a lifting capacity of 16,000 deadweight tons, a length of 598 feet overall, including a 35-foot wing at each end, a width between wings of 87 feet and a normal depth over the keel blocks of 25 feet 7 inches, emergency depth over the keel blocks of 29 feet 11 inches.

Salvage and wreckage.—One well-equipped firm specializes in marine salvage in Portland. It has a 203-foot 3,600 horsepower converted LSM, equipped with 6 50-ton winches and other necessary gear. Several firms undertake minor salvage work but none of these specialize in such activities.

Communication.—All commercial methods of communication are available out of Portland, including several transcontinental railroads. Ship-to-shore radiotelephone service is handled through both Portland and Astoria.

Yacht clubs.—A list of larger yacht clubs on the Pacific coast is given in the Appendix.

Chart 6171.—The navigation of the Willamette River above Portland is hazardous due to the rocks, shoaling bars, and strong currents. Local knowledge and steering a mid-channel course is recommended in these waters. Freshets occur annually during the months of May, June, and July which cause some shoaling. Below the falls at Oregon City ordinary fluctuation of stage of water is 15 feet and extreme fluctuation due to flood conditions 30 to 50 feet. Above Oregon City the ordinary fluctuation is 12 to 20 feet and the extreme is 20 to 27 feet. Clearance for all bridges on the Willamette and Yamhill Rivers above Portland are given at low water.

Between Portland and Willamette Falls the terminals are privately owned mill wharves and oil-receiving stations. Above the falls are small privately owned wharves or natural landings.

Above Sellwood Bridge the river flows northwestward passing westward of **Milwaukie,** 16 miles above the mouth. A boatyard with a marine railway capable of hauling out boats of 25 tons weight and 50 feet in length is on the east bank at

Milwaukie. The channel passes westward of **Elk Rock Island. Milwaukie Heights,** on the eastern bank, is about 0.5 mile south of the island.

The Southern Pacific Railroad fixed bridge crosses the river at mile 17.8 and just northward of **Tryon Creek.** It has a horizontal clearance of 230 feet and a vertical clearance of 69 feet.

Oswego is on the west bank of the river between Tryon and **Oswego Creeks.** A prominent stack is southeastward from the center of the town.

Oswego Rock, 250 yards northeastward of Oswego Creek entrance, is 2 feet high.

The light at **Christie,** on the west bank just below **Rocky Island,** is obscured northward of 220°. Pass eastward of Rocky Island and avoid **Copleys Rock,** with a depth of 10 feet over it. The rock is about 150 yards east from the southern extremity of the island. **Bingham Landing Light** on the west bank of the river is obscured northward of 220°.

The channel is eastward of **Cedar Island** and is marked by lights on the eastern bank at **Starkweather Landing** and **Jennings Lodge.** About 0.8 mile above Jennings Lodge Light the river is divided by a low island. Clackamas Rapids Light is on the west side of the river 0.2 mile below the northern extremity of the island. The channel is on the northern side of the island. On the southern side of the island are **Clackamas Rapids.** They should be avoided because of bar shoaling and cross currents. **Clackamas River** enters from the east about 0.6 mile eastward of Clackamas Rapids Light. The river is crossed by a fixed bridge near the mouth and is unnavigable.

Oregon City, 22 miles from the mouth, is on the east bank of the river. The city is connected with **West Linn** and **Sunset** by a fixed highway bridge which has a horizontal clearance of 190 feet and a vertical clearance of 72 feet. An overhead cable crosses the river just below the bridge with a vertical clearance of 72 feet. Gasoline and oil are available at the northern limits of the city.

The **Willamette Falls Canal** is on the west bank of the river. The canal consists of five locks, and has a total lift of 50 feet. The usable lock dimensions are 175 feet in length, 37 feet in width, and 6 feet deep over the miter sills at low water. Traffic during week days is predominantly down-bound and up-bound vessels may expect delays through the locks. **Regulations** regarding the use, administration, and navigation of canal and locks at Willamette Falls are given in Chapter 2, § 207.680. A warehouse and several buildings are on the west bank alongside the canal locks. A timber wharf about 850 feet in length is on the east side of the canal lock. An overhead cable crosses the Willamette Falls Dam.

A channel 0.2 mile southeastward of Willamette Falls Light, with a depth of 7 feet, extends northeastward along the east bank to the dock at the Hawley Pulp and Paper Company buildings. The town of **Willamette,** about 1.4 miles southwestward of Sunset, is on the west bank of the river and on the north bank of the **Tualatin River** which is not navigable.

The channel westward of **Rock Island** is narrow and marked by buoys. An overhead cable crosses the river passing over the northern part of Rock Island. **Sevcik Pond** entrance is about 200 yards north of **New Era Bar Island.** The channel, between that island and **Willow Island,** runs northeastward through **Fish Eddy. Shanks Landing** is on the west bank about 4 miles from Willamette. **Buch-**

mans Landing is on the west bank at **Walnut Eddy.** Above this point the river is not charted.

Across the Willamette River between Walnut Eddy and Corvallis are seven bridges. A railroad bridge at **Wilsonville,** 33.7 miles above the mouth, is a fixed span having a horizontal clearance of 192 feet and a vertical clearance of 75 feet. A highway bridge at **Newberg,** 43.4 miles above the mouth, is a fixed span having a horizontal clearance of 105 feet and a vertical clearance of 87 feet. A railroad bridge at **Salem,** 73.6 miles above the mouth, is a vertical lift span having a horizontal clearance of 118 feet and a vertical clearance of 42 feet down and 87 feet up. A highway bridge, 73.8 miles above the mouth, is a fixed span having a horizontal clearance of 120 feet and a vertical clearance of 66 feet. A railroad bridge at **Albany,** 103.8 miles above the mouth, is a swing span having a horizontal clearance of 110 feet and a vertical clearance of 40 feet. A highway bridge, 104.2 miles above the mouth, is a fixed span having a horizontal clearance of 195 feet and a vertical clearance of 52 feet. A highway bridge at **Corvallis,** 114.4 miles above the mouth, is a swing span having a horizontal clearance of 102 feet and a vertical clearance of 35 feet. The regulations regarding these bridges are given in Chapter 2, § 203.755.

Between Corvallis and the head of navigation at mile 149.0 above the mouth are three bridges. The fixed highway bridge at **Harrisburg,** 141.4 miles above the mouth, has a horizontal clearance of 172 feet and a vertical clearance of 24 feet. The vertical lift railroad bridge at mile 142.6 has a horizontal clearance of 190 feet and vertical clearance of 25 feet down and 85 feet raised. The railroad swing bridge at mile 142.7 has a horizontal clearance of 103 feet and a vertical clearance of 25 feet.

The **Yamhill River** empties into the Willamette River 47 miles above the mouth. The project provides for a channel 4 feet deep and 60 feet wide from its mouth to **McMinnville,** 15.6 miles. **Yamhill Lock** is 6.5 miles above the mouth. The usable lock dimensions are 175 feet long and 38 feet wide. The depths on the sills at low water are 4 feet on the upper and 2 feet on the lower. The lift is 16 feet. Regulations for the lock are given in Chapter 2, § 207.690. For the Yamhill River the ordinary fluctuation of stage of water is 35 feet and the extreme fluctuation due to floods is 48 feet.

In June 1949, the available depth was 4 feet from the mouth to Yamhill Lock and 2 feet from the lock to McMinnville.

Three fixed highway bridges cross the river. The bridges at **Dayton,** 4 miles above the mouth, has a horizontal clearance of 193 feet and a vertical clearance of 60 feet. The bridge at **Lafayette,** 8 miles above the mouth, has a horizontal clearance of 148 feet and a vertical clearance of 54 feet. The bridge at McMinnville has a horizontal clearance of 80 feet and a vertical clearance of 53 feet.

Chart 6155.—Willamette River to Vancouver.—The main channel of the Columbia River is between **Hayden** and **Tomahawk Islands.** Across the main channel between Vancouver and Hayden Island are two bridges. The railroad bridge, 89.8 miles above the mouth, is a swing span having a horizontal clearance of 200 feet and a vertical clearance of 37 feet. The Interstate Highway bridge, 90.7 miles

above the mouth, is a vertical lift span having a horizontal clearance of 250 feet and a vertical clearance of 173 feet up and 37 feet down. The regulations regarding these bridges are given in Chapter 2, § 203.750.

North Portland Harbor (Oregon Slough) is that portion of the river channel between the Oregon shore and Hayden Island. A Federal project provides for a channel 10 feet deep and 300 feet wide at the upstream entrance to North Portland Harbor. No work has been done on the project (June 1949).

Between Hayden Island and the Oregon shore are two bridges; between Tomahawk Island and the Oregon shore is one bridge. The railroad bridge, 2.6 miles above the mouth, is a swing span having a horizontal clearance of 125 feet and a vertical clearance of 36 feet. The highway bridge, 3.5 miles above the mouth, is a fixed span having a horizontal clearance of 100 feet and a vertical clearance of 31 feet. The highway bridge, 4.1 miles above the mouth, is a fixed span with a horizontal clearance of 60 feet and a vertical clearance of 26 feet. The regulations regarding the railroad bridge are given in Chapter 2, § 203.750.

Vancouver is on the northern bank of the Columbia River, 92 miles above its mouth. Its importance as a port is due primarily to the fact that it constitutes a water outlet for a large lumber producing section in southwestern Washington, as well as a distributing point for a fair share of the wheat produced in the interior of Washington and Oregon. Aluminum, paper products, and canned goods are also shipped. The port has two public terminals with 30-foot depths which are maintained by the **Port of Vancouver,** and four privately owned docks. The docks are well equipped for handling general cargo in the foreign and domestic trade. The total berthing space at the public terminals is 2,185 feet and outside storage space 500,000 feet. The covered storage space is 120,800 feet. A bulk grain elevator at the foot of West Thirteenth Street has a capacity of 2,674,000 bushels. Rail service to the water front is served by the Spokane, Portland, and Seattle Railway which connects with four transcontinental lines. The channel as far as the Interstate Highway Bridge has a project depth of 30 feet, with two turning basins of the same depth. Controlling depths were 30 feet to lower turning basin in November 1949, 30 feet in each turning basin with 29 feet between them in October 1949.

Anchorage.—No defined areas have been specially designated as anchorage ground. Anchorage may be obtained near the channel if the fairway is not obstructed.

For **quarantine, customs,** and **immigration,** see Portland.

Dockage and **wharfage** are assessed.

No **regulations** have been prescribed by official authorities of the city of Vancouver, or of the State of Washington, to govern the movement of vessels or similar harbor activities within the port.

Supplies.—Fresh water and supplies are available. There are no fueling facilities for large vessels, but gasoline and Diesel oil may be obtained.

Repairs.—A privately owned, small general boat repair yard is about 1.0 mile above the Interstate bridge on the north bank. A marine railway capable of hauling out craft of 10 tons or less in weight and 35 feet in length is available.

Chart 6156.—Vancouver to Bonneville.—Between Vancouver and Bonneville the river is being improved by dredging where necessary to provide a channel 27

949285—52——22

feet deep at low water; it is well marked. There are 38 dike dolphins along this section of the river; some of them are marked with lights at the ends. All of the dikes are completely submerged at the higher states of the river but are exposed approximately 6 feet at datum level. No bridges cross this section of the river. In June 1949 the controlling depth between Vancouver and Bonneville was 14 feet at low water. During the average summer freshet the controlling depths are increased to a range of 33 to 38 fet.

Measured course.—At **Leiser Point,** 3.6 miles above Interstate Bridge at Vancouver, is the beginning of a measured nautical mile on course **107°** and **287°**. The markers are on the Washington shore at Leiser Point and Leiser Point Channel Light 21.

Local magnetic attraction.—Differences from the normal variation of as much as 5° have been observed along this section of the Columbia River.

The secondary channel south of **Government Island** is extensively used by pleasure boats and some commercial shipping.

Camas, on the northern bank 12 miles eastward of Vancouver, has a large paper mill which maintains a private wharf on Camas Slough. **Camas Slough,** north of **Lady Island,** is extensively used for bringing supplies to, and taking away the products of the paper mill at Camas. The eastern entrance to Camas Slough is foul and bares at low water. At high flood stages of the river a current of as much as five knots prevails in the slough. The paper is shipped to Portland by barge for reshipment.

Washougal is on the northern bank just eastward of Camas. The Port of Camas-Washougal has constructed a wharf 528 feet in length at Washougal, which will be available for ocean vessels when an adequate channel is provided.

The entrance to **Sandy River,** opposite Washougal, bares at low water. The projecting shoal, Sandy River bar, is dangerous to vessels making the turn south of **Ione Reef.** Grounding of a vessel has occurred here. At higher flood stages of the Columbia River, passage up Sandy River as far as **Troutdale** is possible.

Difficulties attending navigation.—The principal difficulties and hazards to ship navigation are due to strong currents, rocky banks, rocks, winds and accumulation of ice.

Wind.—Above **Corbett,** 15.6 miles above Vancouver, the river emerges from the **Columbia River Gorge.** Above this point the river, for the greater part of the distance to The Dalles, flows between high, bold mountains of the **Cascade Range.** In this stretch, winds of material force prevail during much of the time, generally upstream in summer months and downstream in winter. The daily peak velocities vary from 7 to 48 miles per hour.

Currents.—In general, currents run fair with the main channels with considerable intensity, increasing in regions upstream toward Bonneville. Exceptions are the turn in the channel at Washougal Light, where a northwesterly set prevails; southwestward of **Cape Horn,** where a westward set is experienced; and the region between Fashion Reef Light and Multnomah Falls Light, where a southward set is experienced.

Between **Dodson** and **Warrendale,** about 30 miles above Vancouver, the river becomes restricted and continues so to the entrance of the channel leading to the locks, at the lower end of **Bradford Island.** Along this reach of the river, the upper

part of which is called **Garrison Rapids,** the currents are so strong that constant piloting is necessary. See description of Bonneville Dam.

Ice.—Records of the now drowned out Cascade Locks show stoppage of, or interference with, navigation for an average of two weeks per year, with the river closed by ice conditions for a period of 50 days in 1885, and 40 days in 1930. It is anticipated that the effect of the Bonneville Dam will further extend the period of closed navigation. The lock and approach channels at Bonneville are available as an ice harbor whenever danger from ice is imminent.

Bonneville, on the southern bank of the river, 33.9 miles above Vancouver, is the headquarters of the United States Engineers in charge of operating and maintenance of the Bonneville Dam and Ship Lock. Fresh water, supplied through a small pipe, may be obtained here.

Bonneville Dam, 126.1 miles above the mouth, is in two parts. The spillway is between the Washington shore and Bradford Island. The powerhouse and lock are between Bradford Island and the Oregon shore. The usable dimensions of the lock are 500 feet long by 76 feet wide, and 24 feet over the sills at Adopted Low Water. The lift is 66 feet at extreme low water and normal pool level, 59 feet at normal river level, and 30 feet at extreme high water. The normal pool level is 72 feet above mean sea level. Rules and regulations pertaining to the lock and approach channels are given in Chapter 2, § 207.700.

Radio communication with the superintendent of the lock is possible on 2738 kc. when within a few miles of the lock.

Approaching Bonneville Lock from downstream, difficulties are presented to vessels in turning out of the swift water into the channel leading to the lock, as the current from the powerhouse spillway sets in strongly across the western entrance to the lock approach.

Approaching Bonneville Lock from upstream, due to the strong current toward the powerhouse from the upstream lock approach, it is difficult to approach the lock at an angle and execute a turn in time to avoid an accident. Therefore, all craft approaching the lock from the east and pushing one or more barges should steer as close to the Oregon mainland shore as safety will permit, and should be in line with the lock, upon reaching the east end of the guide wall and should continue at a steady but reduced speed, if the lock is prepared for entrance and the signal for entrance has been given.

Chart 6157.—Bonneville to The Dalles.—The channel from Bonneville to The Dalles is provided by the pool which extends 42.5 miles to **Big Eddy.** This provides a channel with a project depth of 30 feet to The Dalles.

Tugboats make use of the eddy in the mouth of Eagle Creek, 0.6 mile above the lock, for mooring and shifting barges and log rafts. Small boats may find refuge in the mouth of Eagle Creek, Rock Creek, Government Cove, Wind River, Drano Lake, Ruthton, White Salmon River, and Hood River. Entrance to these places should be made with caution. Access to all but two is under railroad and highway bridges. At present log rafts are made up or stored in all these places except the moorage at Hood River. Alertness to movement of rafts is necessary.

The **Cascade Locks,** just above the Bridge of the Gods, have been drowned out. At normal stages of pool level the sides of the old chamber of the lock

bare about 3 feet. This section of the lock makes a good moorage, except for small boats in easterly weather. A strong current flows through the lock, which strikes the flooded and closed lock gates, downstream from the upper chamber, and produces strong upward currents that may cause a small boat to sheer to either side.

Across the river between Bonneville and The Dalles are two bridges. The **Bridge of the Gods,** 2.6 miles above Bonneville, is a fixed span having a horizontal clearance of 655 feet between pier cribbings and a vertical clearance of 139 feet at normal pool level. The highway bridge at Hood River, 21.7 miles above Bonneville, is a vertical lift span having a horizontal clearance in the center span of 255 feet and a vertical clearance of 69 feet with span down and 149 feet with span up at normal pool level. The regulations regarding this bridge are given in Chapter 2, § 203.759.

Two overhead cables cross the river between Bonneville and The Dalles. The one just above the Bridge of the Gods has a clearance of 138 feet. The overhead cable at Stanley Rock has a clearancce of 120 feet. Two ferries cross the river; one between **Rowena,** Oregon, and **Lyle,** Washington, 6.9 miles below The Dalles; the second between The Dalles and **Dallesport.**

Shoaling on the **Mitchell Point Range** has reduced the depth at normal pool level to 24 feet, 0.6 mile eastward of Mitchell Point Front Range. To carry 30 feet past this section in ascending the river, proceed from a point 300 yards north of Mitchell Point Range and make good a course of 067½° for a distance of 1 mile, then make good a course of 090° for 0.36 mile to intersect the Mitchell Point Range. To carry 30 feet past **Eighteen Mile Island,** follow the general contour of the south shore from the small island 300 yards northwest of **Wasco Light.** Keep clear of the 14-foot spot bearing 022½°, 421 yards from Wasco Light, keeping 200 yards offshore to a point 400 yards west of Eighteen Mile Island, then midway between the island and the south shore; from the eastern end of the island remain about 200 yards offshore for a distance of 0.5 mile, thence to a point 0.3 mile south of **Straights Point Light,** and from this point favor the Oregon side of a mid-channel course for a distance of 1 mile.

Currents.—From the lock at Bonneville, through Cascade Rapids, constant piloting is necessary because of the strong currents. From Cascade Rapids eastward, a set of one to three degrees may be experienced depending on the angle that the course makes with the general direction of the river, the strength of the current, and direction and strength of the wind.

At the mouth of **Eagle Creek,** Oregon small boats may find refuge on either side of bridges if the creek is not in flood. The clearance of the railroad bridge is 18 feet, the highway bridge, approximately 30 feet.

Rock Creek at **Stevenson,** Washington, 4.2 miles above Bonneville Dam, affords refuge for small boats between railroad and highway bridges or in pool north of highway bridge. The clearance of the railroad bridge is 139 feet horizontal and 25 feet vertical; of the highway bridge 67 feet horizontal and 20½ feet vertical.

Government Cove (local name), Oregon, 5.6 miles above the Bonneville Dam and 1.6 miles east of Rock Creek, is a refuge for small boats. There are no bridges but log rafts may block the entrance.

Wind River at Home Valley, Washington, 7.8 miles above Bonneville Dam, is a refuge for small boats on either north or south of bridges. The bridge clearances are railroad, horizontal 192 feet, vertical 27 feet; highway, horizontal 275 feet; vertical west pier, 25 feet; east pier, 21 feet.

Drano Lake is at the mouth of **Little White Salmon River** near **Cook,** Washington, 14.5 miles above Bonneville Dam. The bridge clearances are railroad, horizontal 139 feet, vertical 27 feet; highway, 274 feet horizontal and 26 feet vertical.

Small boats may find refuge at **Ruthton,** Oregon, 17.8 miles above Bonneville Dam. There are no bridges.

Hood River, Oregon, has a small-boat moorage situated just west of the fill to highway bridge across the Columbia River. Here is a small marine railway with 2 feet of water over the carriage at normal pool level. Fishing boats weighing 5 tons and 28 feet in length have been hauled out. Gasoline is available and Diesel oil can be procured by arrangement. No fresh water is available. Emergency repairs can be made by various shops in town.

White Salmon River at Underwood, Washington, 20 miles above Bonneville Dam, is a small boat refuge. The bridge clearances are railroad, horizonal 145 feet, vertical 30 feet; highway, horizontal 184 feet, vertical 28 feet.

The Dalles, on the southern bank of the river 72 miles above Vancouver, has a wharf 125 feet by 1,100 feet for the use of ocean vessels and river boats. On the wharf are 2 one-story warehouses, each 92 feet by 461 feet; the warehouses are equipped with marine elevators. The port also has an oil wharf 27 feet by 193 feet. There are also privately owned facilities for handling petroleum products and bulk grain from river boats. River traffic between Vancouver and The Dalles consists mainly of petroleum products and general freight bound upstream, and wheat, wool, and rafted logs bound downstream.

The Federal project for improvement provides for a small-boat mooring basin 400 feet in width and 800 feet in length, with a depth of 8 feet below normal pool level. The mooring basin is just eastward of the city wharf and is protected by a breakwater and sheer boom.

A privately maintained machine shop and drydock are capable of taking vessels of 1,000 tons and 13-foot draft. The facilities are available to the general public. Gasoline and fuel oil may be obtained by tank wagon. Fresh water is available at the basin. A small seaplane base is maintained between the wharf and the boat basin.

Columbia River above The Dalles and Snake River.—Above The Dalles, some navigation is carried on by river boats, tugs, and barges. Traffic is mostly wheat and petroleum. High power light-draft vessels navigate the Columbia to Priest Rapids, about 355 miles above the mouth. This section of the river is divided into six parts, namely: The Dalles-Celilo Canal, Celilo to McNary Dam, McNary Dam to Rock Island, Snake River, and Franklin D. Roosevelt Lake.

Buoys in the Columbia River from The Dalles to Pasco consist of oil drums and are painted white with a red or black band. Buoys with a red band and even number are used to mark the starboard side and those with a black band and odd number are used to mark the port side of the channel proceeding from

seaward, respectively. The color white is used to increase the visibility of the buoys and should not be regarded as a color characteristic. These buoys are maintained when the Umatilla water gage shows 6 feet or less. The channel from The Dalles to McNary Dam and Lock is well marked with ranges and other navigational aids.

Between The Dalles and Celilo about 10.4 miles the river has been improved by a channel and the Dalles-Celilo Canal. The open river improvement extends from the foot of **Threemile Rapids,** 165.8 miles above the mouth to the foot of **The Dalles (Fivemile) Rapids,** about 1.3 miles. **The Dalles-Celilo Canal** is a continuous canal on the Oregon shore from the foot of The Dalles Rapids to the head of **Celilo Falls** 174.6 miles above the mouth. The canal has a project depth of 8 feet and a bottom width of 65 feet. The length is 7.5 miles with four locks. The usable dimensions of the locks are 265 feet long, 45 feet wide, and 7.8 feet deep on the lower sill. The lift varies from 44½ feet at the lower lock at low water to 6 feet at the upper lock at high water.

The highest flood has raised the lower pool level 41½ feet above normal. At the upper end of the canal the normal freshets are about 18 feet and the maximum rise 33 feet. The canal was designed to operate to a stage of 18 feet at the upper pool and is then *drowned out* until the river receded to a stage of 18 feet. The controlling depth in the canal is 7 feet the entire year and 8 feet 85 percent of the year.

Regulations relative to the use, administration, and navigation of The Dalles-Celilo Canal are given in Chapter 2, § 207.710.

Across the canal at Celilo Falls is a railroad bridge. It is a swing span having a horizontal clearance of 65 feet and a vertical clearance of 56 feet above canal level.

Between Celilo Falls and the McNary Dam at Umatilla the project provides for a channel 7 feet deep and 150 feet wide. The summer freshets occur from May to August and the ordinary freshets reach a stage of 21 feet on Umatilla gage. The highest flood (1894) reached a stage of 34½ feet at Umatilla. Freshets due to rains sometimes occur in the early winter, but rarely exceed a 9-foot stage. Ice conditions, usually occurring in January or February, sometimes suspend navigation for 2 weeks or more. In 1950 the project depth obtained.

Four ferries cross this section of the river, distances are given above Celilo as follows **Biggs-Maryhill,** 7.8 miles; Arlington-**Roosevelt,** 34.7 miles; **Paterson-Irrigon,** 66.8 miles; and Umatilla-**Plymouth,** 77.2 miles.

A channel with a project depth of 6 feet has been dredged from the navigational channel in the Columbia River to the site of port development at **Arlington,** Oregon.

At **Umatilla Harbor** a project provides for the improvement of existing, but hazardous harbor and entrance channel by removal of boulders, rocky reefs and gravel bars to provide a project depth of 7 feet at low water. No work has been done on the project.

No wharves are along this stretch of the river. A 40,000-bushel grain elevator at **Blalock,** Washington, 28 miles above Celilo, has facilities for handling bulk grain from truck to river craft, but without rail connections. **Umatilla** has a 340,000-bushel grain elevator and storage facilities for 6,300,000 gallons of petro-

leum products with truck and water connections, and 8,155,825 gallons of storage for petroleum products with rail connections.

McNary Lock and Dam are on the Columbia River 253.5 miles above the mouth, near Umatilla, Oregon, and 2.6 miles above the mouth of the **Umatilla River.**

The project includes a dam, power plant, navigation lock, and appurtenant facilities for purposes of navigation, power development, and incidental irrigation. The improvement provides principally for the improvement of navigation, creating a pool extending approximately 55.6 miles upstream to a point about 23.4 miles above Pasco, Washington. The dam, which will raise the normal water surface approximately 85 feet to elevation 340 mean sea level, will be approximately 7,600 feet long and will consist of an earth dam at Oregon (south) abutment, a powerhouse, a spillway dam, a navigation lock, and an earth dam at the Washington (north) abutment. The single-lift navigation lock has usable dimensions of 86 feet wide by 675 feet long. The depth over the miter sill at low water is 12 feet and over the upper sill at normal pool is 20 feet. The lift varies from 72 to 92 feet.

The pool created by McNary Dam will provide a navigable channel with depths of 12 feet and over, between the dam and the confluence of the **Yakima River,** a distance of approximately 37 miles. A controlling depth of 9 feet will be provided on Snake River, from its mouth to a point approximately 8.8 miles above.

A project provides for an approach channel 6 feet deep from the Columbia River channel to the site of terminal developments at **Kennewick,** 284.8 miles above the mouth. In 1950 no work had been done on this project.

Between McNary Dam and Rock Island Dam, the head of navigation, are five bridges. A railroad bridge 280 miles above the mouth is a swing span; a railroad bridge, 294 miles above the mouth, is a swing span; a highway bridge, 295 miles above the mouth, is a fixed span; a railroad bridge, 368 miles above the mouth, is a fixed span; a highway bridge, 375 miles above the mouth, is a fixed span.

At **Port Kelly,** 96 miles above Celilo Falls, are two private elevators with capacities of 40,000 and 44,000 bushels. They have facilities for handling bulk grain from truck to river craft. At **Attalia,** 102 miles above Celilo, are storage facilities for 5,000,000 gallons of petroleum products. **Pasco,** 110.5 miles above Celilo, has a public wharf, a grain elevator of 500,000-bushel capacity, petroleum storage for 5,000,000 gallons, all with rail, truck, and water connections.

Priest Rapids Dam is a project power dam and navigational lock to be constructed on the Columbia River at a point 355 miles above the mouth. The navigation lock is to be 86 feet wide.

Rock Island Dam, a private power project on the Columbia River, 404.8 miles above the mouth, marks the head of navigation on the river.

The **Snake River,** which is the largest tributary of the Columbia River, rises in Yellowstone National Park, in the western part of Wyoming, flows in a general westerly direction for about 868 miles and empties into Columbia River near Pasco, Washington, 281 miles from the Pacific Ocean.

A project provides for the construction of such dams as are necessary and open channel improvement for purposes of providing slack water navigation and irrigation between the mouth of Snake River and Lewiston, 121 miles upstream. The

pool formed by McNary Dam will provide slack water from the mouth of Snake River to mile 8.4. For maintenance purposes the project also provides for any necessary work on the river between Lewiston and **Johnsons Bar**, 201.5 miles above the mouth. No channel dimensions are specified above Lewiston. A system of four dams between the mouth of Snake River and Lewiston has been approved.

In 1947 the controlling depth of the existing project was less than 1 foot between the mouth of Snake River and Lewiston, and about 2½ feet between Lewiston and Johnsons Bar. The channel below Lewiston is from 150 to 700 feet wide in the pools between rapids and from 30 to 150 feet wide through the rapids. Because of crooked and shoal channels through rapids, commercial navigation has been limited to periods when river stages are above 3 feet as shown on the Lewiston gage, which permits operation of boats having a draft of 4 feet. The river is above the 3-foot stage about 54 percent of the time. The channels above Lewiston are from 30 to 100 feet wide at low water, and high powered launches operate most of the year between Lewiston and Johnsons Bar.

Six bridges cross the navigable section of the Snake River. The railroad bridge at **Burbank**, 0.4 mile above the mouth, has a swing span with a horizontal clearance of 150 feet and a vertical clearance of 36 feet. The fixed highway bridge 1.8 miles above the mouth has a horizontal clearance of 172 feet and a vertical clearance of 72 feet. A fixed railroad bridge at mile 52 has a horizontal clearance of 235 feet and a vertical clearance of 210 feet. The railroad bridge 59 miles above the mouth is a swing span having a horizontal clearance of 158 feet and a vertical clearance of 31 feet. The bridge at **Central Ferry** 73 miles above the mouth is fixed with a horizontal clearance of 250 feet and a vertical clearance of 70 feet. The highway bridge at Lewiston has a vertical lift span with a horizontal clearance of 160 feet and a vertical clearance of 73 feet. Regulations for these bridges are given in Chapter 2, § 203.762.

From the mouth of the Snake River to **Riparia**, 58 miles, there are no wharves or warehouses on the river banks. From Riparia to Lewiston, Idaho, 63 miles, there are no wharves, but there are public and privately owned warehouses and grain elevators located at **Penawawa**, mile 79.4, **Lewiston**, mile 121.6, **Asotin**, mile 126.8, and between Asotin and 10 miles above. Just above Lewiston is a privately owned 40- by 60-foot wharf. On the left bank between Riparia and Lewiston are several wheat warehouses formerly used for the storage of wheat to be transferred to the railroad on the right bank.

Franklin D. Roosevelt Lake is in the north central part of the State of Washington and is the longest artificial lake in the world. It is formed by the waters impounded by the **Grand Coulee Dam.** The lake extends about 151 miles along the Columbia River Canyon upstream from the dam to the International Boundary. In addition, the reservoir extends 32 miles up the **Spokane River,** 14 miles up the **Sanpoil River,** and 8 miles up the **Kettle River.** In river navigation, shoal areas, sand bars, submerged rocks, and other dangers are known or suspected. They are particularly noticed upstream from Northport to the Canadian line, as well as in the Little Dalles area. Extreme caution should be exercised in navigating the Little

Dalles area and upstream from Northport. The lake is well marked by lights and daybeacons.

Very little traffic is encountered on the lake. It consists chiefly of lumber barges and log rafts towed by tugboats. Pleasure craft are seen occasionally. Daily passenger service is maintained during the summer season on the lake between Miles, Washington, and Coulee Dam.

Minor repairs and limited marine supplies may be obtained by prior arrangement at the Bureau of Reclamation's Anchorage at Coulee Dam. Fuel oil, gasoline, fresh water, and provisions are available at Coulee Dam, Grand Coulee, Wilbur, Lincoln, Miles, Hunters, Gifford, Kettle Falls, and Northport.

Hospital facilities are available at Coulee Dam, Wilbur, and Colville. The U. S. Immigration Office is in Northport and that of the Canadian Government is at Waneta, British Columbia.

Blank page retained for pagination

CHAPTER 14

Columbia River to Destruction Island

Chart 6002

FROM Cape Disappointment, the coast extends northward for 22 miles to Willapa Bay, as a low, sandy beach, with sandy ridges about 20 feet high parallel with the shore. Back of the beach, the country is heavily wooded. Numerous summer resorts and cottages are along the beach. The former Klipsan Beach Coast Guard Station is on the beach about 10 miles northward of North Head.

Chart 6185.—Leadbetter Point, the southern point at the entrance to Willapa Bay, is low and sandy, with no distinctive feature to mark its extremity nearer than the limit of the trees, 2.8 miles southward.

Cape Shoalwater, the northern point at the entrance, terminates in a low bluff about 50 feet high. It is sandy, and the northern portion is covered with trees to within 300 yards of the point.

Willapa Bay Light is shown from a black skeleton tower near the southern extremity of the point, clear of the trees, on a sand ridge about 50 feet high. The light is 138 feet above the water and visible 18 miles. A radiobeacon is at the light.

Willapa Bay, formerly known as **Shoalwater Bay,** has its entrance 22 miles northward of Cape Disappointment. The bay, with its various tributaries, furnishes an outlet to an extensive area of valuable timber. Oyster beds cover much of the shoaler areas of the bay. Lumber and lumber products are the principal exports; fish and sea foods are also shipped. The imports consist of general merchandise, mill machinery, and farming implements. The port of entry is at South Bend, on the Willapa River.

Willapa Bay entrance.—The northern shore of the entrance to this bay is distinctive in appearance with respect to the southern shore, being marked by timbered bluffs and ridges, several hundred feet high. In the daytime, scars on the cliffs can often be seen before the light is visible. The termination of the tree line on Leadbetter Point is sharply defined.

The entrance is in the northern part of the bay, which consists of two arms; the southern, 16 miles, and the eastern, 10 miles long. Both arms are filled with

extensive shoals, large areas of which bare at low water. The southern arm is separated from the ocean by a strip of low sand and sand dunes, averaging 1.5 miles in width and covered with trees until within 2.8 miles of Leadbetter Point. Numerous cottages and summer resorts are along the seaward face of the narrow peninsula. The shores of the bay elsewhere are composed of low, rolling hills, 100 to 200 feet high, covered with a dense growth of timber.

Willapa Bar at the entrance lies about 3 miles outside of the line joining Willapa Bay Light and Leadbetter Point. It has been improved by dredging; however, the channel over it is continually shifting. Experience shows that this channel works to the southward until it is parallel with the shore, then breaks out to the westward, the cycle consuming 20 to 30 years.

The depth over the bar varies from season to season. The Federal project provides for a channel over the bar 26 feet deep with a minimum width of 500 feet. It has been dredged annually and depths between 20 feet and 32 feet have been maintained. In November 1948 the controlling depth over the bar was 22 feet. The bar buoys and those inside the bar have been moved from time to time because of the shifting sands and changing channel. The temporary entrance range lights are sometimes established for dredging purposes and these do not necessarily mark the best water. Due to the changeable character of this entrance vessels should always employ a pilot.

Willapa Bay Light on Cape Shoalwater, the northern point at the entrance, is the most prominent feature in the approaches.

A Coast Guard Lifeboat station is at North Cove, 1.2 miles eastward of Willapa Bay Light on the inlet at the southeast end of the cape. There is a telephone line to South Bend and vessels off the bar are reported.

Willapa Bar lighted whistle buoy is moored about 4.5 miles westward of the light. This buoy is moved occasionally to follow changes in the channel over the bar. The channel across the bar is marked by buoys.

Willapa River enters at the head of the eastern arm and has been improved by dredging. Ranges, buoys, beacons, and lights mark the channel through the eastern arm of the bay and the Willapa River to South Bend and Raymond.

A Federal project provides for the river channel at the Narrows 24 feet deep, 200 feet wide, and 3,100 feet long; and for a channel 24 feet deep and 200 feet wide from deep water in Willapa Bay to the forks of the river at Raymond; 24 feet deep and 150 feet wide up the South Fork as far as the deep basin at Cram (Hanify) Lumber Mill, and up the North Fork to a point opposite Twelfth Street, with a turning basin 250 feet wide, 350 feet long, and 24 feet deep at the latter point. The channel has been dredged to project depth in the north fork to the Riverdale Bridge, and in the south fork to the site of the old Cram (Hanify) Lumber Mill. At high tide vessels drawing 12 feet can ascend to **Willapa,** 11 miles above the mouth.

The controlling depths in the channel were 24½ feet for a width of 150 feet from deep water in Willapa Bay to Willapa River Range 37 in June 1949; Willapa River Range 37, 24 feet in October 1949; thence 22 feet in middle half of channel to Light 33 in October 1949; thence 21½ feet in middle half of channel to deep water piers at South Bend in June 1950; thence 23 feet in middle half of channel to Forks at Raymond in June 1950; thence 22 feet in middle half of channel

North Fork to 700 feet below highway bridge in June 1950; 18 feet in South Fork middle half of channel in June 1950.

Cedar River winds across the flats from Toke Point for 2 miles to the head of the flats. Small towboats can ascend the river at half tide to a log raft 0.3 mile northward of the mouth of the river.

North River enters the eastern arm of the bay 3 miles westward of the mouth of Willapa River; it is navigated by small logging launches. The river has been improved by the removal of snags and log jams. The channel is marked by privately maintained daybeacons, and is navigable at high tide to **Eaton's Ranch,** a distance of about 3 miles above the last daybeacon.

Mailboat Slough, one of the interconnecting waterways of the Willapa River, is closed off by a dike at the southeast end.

South Bend is on the southern bank of Willapa River, 3 miles above the mouth. The principal industries are lumbering, oystering, and fishing. It has a large sawmill, shingle mills, and two canneries. The depths at the wharves vary from 15 to 20 feet, depending on the locality. Willapa Harbor Airport is on the north bank of the river about 2.5 miles northwestward of South Bend.

Raymond, the principal town, is on the southern bank of the Willapa River, at the junction of the south fork, 3 miles above South Bend. It has sawmills and shingle mills, and under normal conditions ships large quantities of lumber. The depths at the wharves range from 20 to 28 feet.

Anchorage may be had at almost any point inside the bay; the holding ground is good. The anchorage generally used is off Toke Point in 30 to 55 feet.

The main turning basin at the junction of the North and South Forks, is used by ships up to 500 feet long and 24-foot draft. Ships turning usually head up the South Fork, back with aid of a small tug into the North Fork, then straighten out down the main river.

Bridges.—The South Fork is crossed by two drawbridges at Raymond. A railroad swing bridge, 0.3 mile above the junction of the forks, has a horizontal clearance of 125 feet and a vertical clearance of 7 feet. A highway swing bridge 0.7 mile above the junction has a horizontal clearance of 125 feet in the north draw and a vertical clearance of 5 feet. The highway fixed bridge about 3 miles above the junction has a horizontal clearance of 80 feet and a vertical clearance of 7 feet.

A fixed railroad bridge crosses the mouth of **Ellis Slough** with a horizontal clearance of 90 feet and a vertical clearance of 20 feet.

Near the mouth of **Wilson Creek** is a fixed highway bridge with a horizontal clearance of 95 feet and a vertical clearance of 9 feet.

The North Fork is crossed by one drawbridge at Raymond and two fixed bridges at Willapa. The highway swing bridge 0.5 mile above the junction of the forks has a horizontal clearance of 125 feet and a vertical clearance of 5 feet. The two bridges at Willapa 4.8 miles above the junction limit navigation above that point.

For regulations regarding these bridges see Chapter 2, § 203.770.

Directions, Willapa Bay.—From northward or southward, the course should be shaped to make the lighted whistle buoy. From seaward in clear weather, the lights at the entrance at Grays Harbor, 14 miles northward, and at North Head,

22 miles southward, are distinguishing marks for fixing a vessel's position and the subsequent shaping of the course.

Approaching from any direction in thick weather great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reef and the Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. Under such conditions vessels should not shoal the water to less than 20 fathoms until the lighted whistle buoy off the entrance has been made. For detailed information regarding the conditions which may be encountered, and the precautions to be observed, see the statement on coastwise navigation in Chapter 2.

Strangers should not attempt to navigate the bay in thick weather. At any time, however, when the aids to navigation can be seen, vessels of 20 feet or less draft should have little difficulty in reaching the wharves at Raymond or South Bend, as the channel throughout is well marked by ranges, beacons, and buoys. Vessels of a deeper draft should secure the services of a pilot.

Tides.—The mean range of tide at South Bend is 8 feet. The range between mean lower low water and mean higher high water is 10 feet. A range of about 14 feet may occur at the time of maximum tides.

Currents.—In the entrance the average velocity of the flood or ebb stream is about 2½ knots at strength. Currents of 4 to 6 knots occur at times, the velocity being greatest on the ebb, particularly with a southerly wind.

In the channel at South Bend, Willapa River, the average velocity at strength of flood is about 1 knot and at strength of ebb 1½ knots. Daily current predictions for both the entrance and South Bend may be obtained from the *Current Tables, Pacific Coast.* On the bar, the current changes at about the time of high and low waters.

Storm warnings are displayed day and night at South Bend and at Willapa Bay Coast Guard Station on North Cove.

Pilots.—Pilots may be obtained from South Bend. Vessels desiring a pilot should call the Grays Harbor-Willapa Harbor Pilots Association, Aberdeen, and state time of arrival off the bar. Pilot charges are $1.75 per foot of draft and 1¾ cents per net ton each way, in or out. The minimum charge is $120.00 for one round trip. Deep-draft vessels should not attempt to enter without a pilot.

Towboats.—Vessels desiring a towboat should make Grays Harbor, signal the Coast Guard station there, and await the towboat. Small power boats are available.

Quarantine.—Quarantine regulations are enforced by an officer stationed at South Bend. Vessels subject to quarantine usually proceed to their dock where they are boarded for inspection. There are arrangements for fumigation by sulphur only. A medical relief station in charge of a public health officer is at South Bend. An out-patient office is in the Raymond Bank Building, Raymond, Washington.

Customs.—The customs office is at the port of Willapa Terminal. South Bend is a subport in the Washington customs district.

Regulations relative to logging on Willapa Bay and tributaries are given in Chapter 2, § 207.720.

Port terminal.—The port of Willapa Harbor maintains a terminal with a 600-foot wharf on the southern bank of the river between South Bend and Raymond; the depth along the face of the wharf is 24 feet. The offices of the port manager are on the wharf.

Supplies.—Provisions and water may be obtained at South Bend, Raymond, and the Port of Willapa Bay Terminal. Fuel oil may be had at South Bend or Raymond and coal may be obtained by prior arrangement.

Repairs.—Marine ways in Raymond can haul out boats up to 65 feet long and 7-foot draft. There are machine shops and foundries.

Communication may be had by rail and bus; there is regular bus service to the north, south, and east; telegraph and telephone facilities are available.

Tokeland, on **Toke Point,** about 2 miles eastward of Cape Shoalwater, is a summer resort. There is a wharf with about 6½ feet alongside, mostly used by crab and oyster men, at Toke Point which is maintained by the port of Willapa Harbor. A daily bus runs to Aberdeen.

The channel leading to Nahcotta has sufficient depth for any vessel that can cross the bar and is well marked by lights and buoys. This section of the bay is used by local light-draft craft only.

The channel to Bay Center is marked by lights, buoys, and the Goose Point Lighted Range. The range should be used only with local knowledge as the channel is subject to change and the range will not always mark the best water.

Bay Center is a small village on **Goose Point** on the eastern shore of the southern arm near its entrance; oyster culture is the main industry, but fish and crabs are also important products. A channel 12 feet deep and 100 feet wide leads to the boat basin in the slough. The basin was dredged to 12 feet in 1949.

Bone River enters the bay about 2 miles northeastward of Goose Point. The entrance channel across the flats is tortuous and shoal; passage at high tide only is possible for very small boats. A fixed highway bridge, crossing the river at its mouth, has a horizontal clearance of 30 feet and a vertical clearance of 15 feet.

Niawiakum River enters the bay about a mile eastward of Goose Point. It is shoal and cannot be navigated except at high tide. A fixed highway bridge, crossing the river about 0.5 mile above the mouth, has a horizontal clearance of 60 feet and a vertical clearance of 14 feet. An oyster plant is in operation at the north end of the bridge.

Palix River is the second largest river on the eastern side of the bay. It is navigable for small logging towboats and fishboats for about a mile up each of the three forks above their junction. A Federal project provides for a channel from deep water in the Palix River to Bay Center dock, 10 feet deep, 40 feet wide, and about 2,800 feet long, widened at the shoreward end to provide a small mooring basin. A fixed highway bridge, crossing the river about a mile below the forks, has a horizontal clearance of 65 feet and a vertical clearance of 15 feet.

The channel to **North Nemah River** is marked by privately maintained daybeacons for a distance of 3 miles across the flats. In 1950 the controlling depth was about 5 feet in this section of the channel. The channel divides at the last daybeacon; the eastern channel leads to North Nemah River and is practically dry at low water; the western channel leads to **South Nemah River**, and had a controlling depth of about 3 feet in 1950. Logs and oysters are shipped from these rivers.

Nahcotta is a small village about 9 miles southward of Leadbetter Point. Oyster culture and processing are the principal industries; several large oyster packing plants operate here. A wharf maintained by the **Port of Peninsula,** has a face approximately 70 feet long with depths of 28 feet.

Stanley Channel leads from **Nahcotta Channel** at Long Island Shoal Light, black house on pile dolphin, eastward of Long Island and **Stanley Peninsula** to Long Island Slough and to the mouth of the Naselle River. Shoal-draft boats with local knowledge can cross **Long Island Shoal.**

Long Island, 5.5 miles long in a northwesterly direction and of irregular width, wooded, and rising to over 100 feet in elevation, lies in the southern arm of the bay near the head, and nearly fills it.

Naselle River is the largest of the rivers entering on the eastern side of the bay. It is navigable by boats of 5 feet or less draft to the bridge at the village of **Naselle,** 10 miles above the mouth. This bridge marks the head of tide water at ordinary high tides. A highway drawbridge, crossing the river about 2.2 miles above the mouth, has a horizontal clearance of 115 feet and a vertical clearance of 10 feet; the whistle signal is 4 long blasts. Between the bridges, the river has numerous snags and submerged logs, and passage should not be attempted without local knowledge. Small logging and fishing boats operate on the river.

Bear River enters at the southeastern corner at the head of the bay. A long tortuous, unmarked channel across the flats makes entrance to the river difficult. Vessels of 5-foot draft or less can make the fixed bridge about 1.5 miles above the mouth at half tide. The bridge has a horizontal clearance of 25 feet and a vertical clearance of 15 feet.

Chart 6002.—From Cape Shoalwater to Point Chehalis, the southern point at the entrance to Grays Harbor, the coast extends for 12 miles as a low sand beach, backed by a heavy growth of timber.

Chart 6195.—Grays Harbor has its entrance about 40 miles northward of Cape Disappointment and 93 miles southward of Cape Flattery. The bay and its tributaries furnish an outlet to an extensive area of valuable timber. Grays Harbor is one of the leading lumber ports in the United States and its shipments inclue both coastwise and foreign. Oil is brought in by large tankers. The port of entry is at Aberdeen.

The bay at the entrance is about 2 miles in width, but shoals extending southward from Point Brown contract the navigable channel to a width of 0.4 mile. From the entrance the bay extends eastward for 15 miles to the mouth of the Chehalis River. The bay is filled by shoals and flats. They are bare at low water and cut by numerous channels.

Point Chehalis is low and sandy and for 1.5 miles southward of the extremity, is bare of trees. A jetty extends seaward from the end of the point.

Grays Harbor Light is shown from a white octagonal pyramidal tower, 107 feet high, situated on the seaward side of Point Chehalis. The light is 123 feet above water and visible 17 miles. A fog signal is sounded on an air diaphone. The radiobeacon is synchronized for distance finding.

Grays Harbor Coast Guard Lifeboat Station is at Westhaven, 200 yards southwest of Point Chehalis Range Rear Light. The lookout tower is at the shore end of the south jetty. **Storm warnings** are displayed day and night at the Coast Guard station. The former station is just southward of the light; the buildings are still standing but are not used.

Point Brown, the northern point at the entrance to Grays Harbor, is 2.5 miles northward of Point Chehalis; it is low, rounding, and sandy, with shoals extending southward and westward, forming with those extending westward from Point Chehalis the bar at the entrance. The point is wooded to within 0.5 mile of the extremity near which is a lone tree. A jetty extends southwestward from the point.

Westport is a village on Point Chehalis in South Bay, just inside the entrance to Grays Harbor; it is a summer resort, and the headquarters for several hundred fish boats. The old wharf is in ruins but a new wharf known as the Port of Grays Harbor Wharf has been built at **Westhaven,** about 1 mile northward of Westport; there is 13 feet alongside. The fish pack is all shipped out by truck. In 1950 the fish basin at Westhaven was improved by dredging and the construction of jetties. Lights are shown at the north end and the south end of the outer breakwater, and from the south end of the inner breakwater.

Bay City, on the eastern shore of South Bay, was formerly the site of a whaling station. A fertilizer factory operates here when fish are available. The wharf, built out to 10 feet, is in good condition, and is used by fish boats.

Ocosta, on the eastern shore of South Bay 2 miles northward of Bay City, is a small settlement of no commercial importance.

Markham, on the southern shore of the bay 2 miles northeastward of Ocosta, has a shingle mill, whose product is shipped by rail. Logs are towed to the mill by way of the channel southward of **Whitcomb Flats.** It is the terminus of a railway which follows the southern shore of the bay from South Aberdeen.

Hoquiam is on the northern shore at the mouth of Hoquiam River, 2.5 miles from the entrance to the harbor. There are large lumber and shingle mills, and wharves with from 10 to 30 feet alongside, according to locality.

Aberdeen is the largest city on the bay. It adjoins Hoquiam on the east and includes South Aberdeen on the southern side of the Chehalis River. The depth alongside the wharves varies from 10 to 30 feet, according to locality.

Aberdeen and Hoquiam are both served by the Northern Pacific, Union Pacific, and Chicago, Milwaukee, St. Paul and Pacific Railroads.

Cosmopolis is a small town on the southern side of the Chehalis River, a short distance above South Aberdeen. A sawmill operates here.

Montesano is on the northern bank, about 14 miles above Aberdeen. Shingle mills are located here. Shipments are generally by barges to Aberdeen for loading, although coastwise vessels drawing up to 18 feet can reach Montesano at high tide.

Prominent features.—The country about Grays Harbor is flat and featureless, with few conspicuous objects. **Saddle Hill,** about 310 feet high, 8 miles northward of the entrance and 2 miles inshore, is the most conspicuous feature.

Grays Harbor Light shows prominently on a closer approach to the entrance. In clear weather, **Brackenridge Bluff,** on the northern shore of the bay, 6 miles in-

side the entrance, is quite prominent. It is a reddish cliff about a mile long, rising in two places to a height of 80 feet; from seaward it is visible only through the entrance.

In clear weather **Neds Rock** shows prominently from inside the entrance; it is reddish in color.

The entrance is marked by lighted ranges and by buoys which are shifted to mark the best water as determined by frequent surveys of the bar. Due to the changeable conditions here, vessels should not attempt the entrance without a pilot or local knowledge.

The entrance to Grays Harbor is between two jetties extending outward from Point Chehalis and Point Brown. About 400 yards of the outer end of the south jetty is submerged at high water. The channel project depths are 30 feet deep and 350 feet wide from the entrance to the Port of Grays Harbor terminal, just west of slip No. 2, a distance of 15 miles; thence 26 feet deep and 200 to 350 feet wide to the Union Pacific Railroad bridge at Aberdeen, a distance of 2.3 miles; thence 18 feet deep and 200 feet wide to Cosmopolis, a distance of 2.5 miles; thence 16 feet deep and 150 feet wide to Montesano, a distance of 9.0 miles; thence Montesano turning basin of same depth, 1,500 feet long and 200 to 500 feet wide; a channel 14 feet deep and 100 feet wide in South Bay to Bay City.

The controlling depths were: On the bar entrance, 31 feet in May 1949; entrance of North Channel to Aberdeen slip No. 2, 27 feet in June 1950; Aberdeen slip No. 2 to Union Pacific Railroad bridge at Aberdeen, 25½ feet in June 1950; 18 feet to Cosmopolis and 9 feet to Montesano in May 1949. In August 1950 the controlling depth in Bay City Channel was 14 feet from entrance to highway bridge, thence 11½ feet to inner limits of improved channel.

Experience has been that the bar shoals considerably during the winter months. However, it is dredged sufficiently deep every summer so that it seldom shoals to less than 25 feet. Deep-draft vessels must wait for favorable bar conditions before passing out, and are subject to delay on this account.

North Bay, on the northern shore immediately eastward of Point Brown, is a shallow bight about 4 miles long at the entrance and 4 miles wide. It is filled with shoals and flats, bare at low water. The **Humptulips River** enters in the northern part of the bight, and several narrow channels wind through the flats to the main channel of the bay. There is some oyster culture in the bay and it is considerably used by small oyster boats.

South Bay, on the southern shore, immediately eastward of Point Chehalis, is about 2 miles long and 2 miles wide. It is full of shoals, bare at low water, with a narrow channel leading through them to the mouth of the **Elk River**, which empties at the head of the bay. Cedar logs are towed out of Elk River. The single leaf bascule bridge over the Elk River at Bay City has a horizontal clearance of 100 feet and a vertical clearance of 5½ feet.

The Port of Grays Harbor maintains three ranges in South Bay approaches to Bay City. The front daymarks are a white square with vertical red stripe and the rear daymarks are a white diamond with vertical red stripe. The bearings of the ranges are 166°, 142°, and 294°.

South Channel is a buoyed channel with a controlling depth of 12 feet and follows the southern shore. This channel is used quite often by small tugs with log

rafts. A log dump is about 3 miles eastward of **South Arbor,** at which timber is dumped from trucks hauling it from the surrounding logging camps.

Johns River enters South Channel at Markham. It is a shallow stream crossed by two fixed bridges. The highway bridge at Markham has a horizontal clearance of 76 feet and a vertical clearance of 31 feet. The railroad bridge 3.2 miles farther upstream has a horizontal clearance of 36 feet and a vertical clearance of 5 feet.

Chehalis River enters at the eastern end of Grays Harbor. It is navigable by small boats to **Elma,** 24 miles above the mouth, and the upper portion of the river, for a distance of approximately 45 miles above Elma, is used for floating saw logs.

Eight bridges cross the Chehalis River between the mouth and South Elma. The Union Pacific Railroad bridge at Aberdeen has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 8 feet. The Wests bridge is a swing highway bridge at Aberdeen with a horizontal clearance of 130 feet and a vertical clearance of 14 feet. The Northern Pacific Railroad bridge at Aberdeen has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 9 feet. At **South Montesano,** 13 miles above the mouth, is a swing bridge of the Union Pacific Railroad with a horizontal clearance of 100 feet and a vertical clearance of 8 feet. A swing highway bridge 0.2 mile above has the same clearances. See Chapter 2, § 203.775 for regulations relative to these bridges. At **Fuller,** 20.4 miles above the mouth, is a fixed highway bridge with a horizontal clearance of 194 feet and a vertical clearance of 30 feet above low water. The fixed highway bridge at Elma has a horizontal clearance of 260 feet and a vertical clearance of 30 feet at low water. The fixed railroad bridge at Elma has a horizontal clearance of 80 feet and a vertical clearance of 32 feet at low water.

Hoquiam River empties into Grays Harbor about 2 miles westward of the mouth of the Chehalis. The river is practically a tidal slough 11 miles long. It has been improved for a distance of 2 miles above the entrance by dredging a channel 100 feet wide and 18 feet deep. In April 1950 the depth at the entrance of the channel was 15 feet.

Three bridges cross the river in Hoquiam. The Northern Pacific Railroad bridge has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 8 feet. The Simpson Avenue bridge has a bascule span with a horizontal clearance of 125 feet and a vertical clearance of 36 feet. The Eighth Street bridge has a swing span with a horizontal clearance of 124 feet and a vertical clearance of 9 feet. At 2.2 miles above the mouth is the Northern Pacific Railroad swing bridge with a horizontal clearance of 105 feet and a vertical clearance of 3 feet. The vertical lift bridge over the **East Fork** has a horizontal clearance of 80 feet and a vertical clearance of 3 feet feet when closed. See Chapter 2, § 203.775 for regulations for these bridges.

The **Wishkah River** flows through the eastern part of Aberdeen. It is crossed by four drawbridges in the city. The Northern Pacific Railroad bridge has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 8 feet. The Heron Street Bridge has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 7 feet. The Wishkah Street Bridge has a bascule span with a horizontal clearance of 125 feet and a vertical clearance of 4½ feet. The Second Street Bridge is a swing span with a horizontal clearance of 100 feet and a vertical clearance of 6 feet. See Chapter 2, § 203.775 for regulations for these

949285—52——23

bridges. At **Aberdeen Gardens,** about 7 miles above the mouth, is a fixed bridge with a horizontal clearance of 115 feet and a vertical clearance of 24 feet.

Anchorage.—The best anchorage is southward of **Sand Island Shoal,** in depths of 35 to 40 feet. Here the holding ground is good, and there is more swinging room than elsewhere in the harbor. Outward-bound vessels, waiting opportunity to cross the bar, frequently anchor in the channel abreast Westport.

Directions, Grays Harbor.—From northward or southward, the course should be shaped to make the entrance buoy. From seaward in clear weather, Saddle Hill, 8 miles northward of the entrance, and the light on Point Chehalis will be seen.

Approaching from any direction in thick weather great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reef and Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. Under such conditions vessels should not shoal the depths to less than 20 fathoms unless sure of the position. For detailed information regarding the conditions which may be encountered and the precautions to be observed see the statement on coastwise navigation in Chapter 2.

Strangers are advised to take a pilot, and they should in no case attempt to cross the bar when it is breaking.

At any time when the aids to navigation can be seen, vessels of 20 feet or less draft, having crossed the bar, should have no difficulty in reaching the wharves at Hoquiam or Aberdeen. The channels should not be attempted in thick weather. Due to the changeable character of the channels and the necessary shifting of the aids to navigation, no directions of a permanent value can be given.

Tides.—The mean range of tide at Aberdeen is 8 feet. The range between mean lower low water and mean higher high water is 10 feet. A range of about 14 feet may occur at the time of maximum tides. Daily tide predictions for Aberdeen are given in the *Tide Tables.*

Currents.—In the entrance, the average surface velocity of the flood or ebb streams at strength is about 2½ knots, but velocities up to 5 knots may occur. In the channels through the bay the velocities seldom exceed 3 knots. Under normal conditions, the current at the bar changes at about the time of high and low water. The master of the dredge working on the bar states that the currents are very erratic. He usually experienced a northerly set close inshore and a southerly set offshore. The *Pacific Coast Current Tables* contain daily current predictions for a location in Grays Harbor Entrance, together with information for obtaining similar predictions for a number of other locations in the vicinity.

Storm warnings are displayed day and night from the Coast Guard station at Westport and Port of Grays Harbor dock.

Pilots.—Pilots may be obtained by calling the Grays Harbor-Willapa Harbor Pilots Association, Aberdeen, through Olympic Radio Company, and stating time of arrival off the bar. Pilots also may be obtained off the entrance by signals which are relayed by the Coast Guard lookout station on Point Chehalis.

The office of the **Grays Harbor-Willapa Harbor Pilots Association** is at the foot of Myrtle Street, Aberdeen.

Pilot charges are $1.75 per foot of draft and 1¾ cents per net ton each way, in or out. Minimum pilotage charge, in or out, is $120.00. The inward charge is to

the first berth of the ship; shifting charge is $20.00, plus tug hire if required. Vessels must have full steam for shifting, and it is the general custom to shift berth at a time when the current will be against the progress of the ship. Vessels proceeding to Grays Harbor from the Columbia River, Willapa Bay, or Puget Sound ports can usually make arrangements with the pilot association to send a pilot to the port of departure, thereby avoiding delay at the entrance due to fog or stormy weather. Information relative to conditions on the bar can be obtained by radio from the pilot association. It is advisable to notify the stevedoring companies as far in advance as possible as to the time of arrival off the bar and the nature of the cargo to be handled.

Towboats are available for use inside the harbor.

Lighterage.—Open barges are available. Generally the lighterage charge is paid by the shipper unless lighterage is for the ship's convenience.

Quarantine.—Regulations of the Public Health Service are enforced. Vessels subject to quarantine inspection are boarded abreast of Hoquiam or at their first loading berth. Fumigation, when necessary, is done by one of the stevedoring companies under the supervision of the Public Health Service. Only sulphur fumigation is available. Vessels may be shifted to a designated anchorage if necessary. A relief station of the Public Health Service, in charge of an Acting Assistant Surgeon, is in the Becker Building, Aberdeen.

Customs.—Aberdeen is a subport in the Washington customs district and is in charge of a deputy collector of customs. The customhouse is at the corner of Second and G Streets.

Immigration.—The Immigration Service maintains an office at the Federal Building, Second and G Streets, Aberdeen, Washington.

The **United States Coast Guard office** is in the Federal Building at Hoquiam. A **chart agency** of the Coast and Geodetic survey is here.

A commission, **Port of Grays Harbor,** directs the affairs of the port district, which is coextensive with Grays Harbor County, and of the port facilities under its control. All rates of wharfage, dockage, warehousing, and other port and terminal charges in connection with improvements owned and operated directly by the port district, are fixed by the commission. Dockage or berthage and wharfage are charged. The office of the Port of Grays Harbor is at the foot of Myrtle Street, Aberdeen.

Regulations relative to logging in Grays Harbor and tributaries are given in Chapter 2, § 207.730.

Port terminals.—Midway between Hoquiam and Aberdeen, the Port of Grays Harbor has constructed and operates a modern freight terminal with two slips which are maintained by dredging to 30 feet. The terminal has rail connections and is equipped with modern improvements for handling lumber and other cargo. Fuel oil may be obtained from pipeline connections on the dock. Storage space for lumber and lumber products is available. The character of the water-borne commerce at this port has not rendered necessary the construction of terminal warehouses or grain elevators. The general warehouses are some distance from the water front.

Supplies.—Fuel oils, water, provisions, and ship chandler's stores can be obtained. A limited amount of coal is kept on hand and any amount can be obtained

on short notice, but the facilities for handling it are inadequate.

Repairs.—There are marine railways capable of taking vessels under 130 feet in length; also machine shops and foundries capable of making ordinary repairs.

Communication.—Grays Harbor is served by three lines of transcontinental railroads, and a large number of ships operating in foreign, intercoastal, and coastwise trade call at the various ports on the bay. There is a good highway to Olympia and also a good State highway (U. S. 101) running to northern and southern points. Radio, telephone, and telegraph facilities are available.

Grays Harbor County Airport is on the extensive filled area just westward of Hoquiam.

Chart 6002.—From Point Brown the coast extends northward for about 22 miles to Point Greenville as a low, sandy beach, broken occasionally by small streams and in some places by bluffs. A few small settlements, connected by roads or trails, are scattered along this stretch.

Copalis Head, 12 miles northward of Point Brown, is a bright yellow bluff, about 2 miles long and 140 to 200 feet high. It is 1.8 miles northward of **Copalis River. Copalis Rocks,** two small rocks the larger 34 feet high, lie 500 yards off the head, and a rock awash is about 0.5 mile west-southwestward of the head.

Two small bluffs mark the mouth of **Joe Creek,** about 3.5 miles northward of Copalis Head.

Moclips River enters about 6 miles northward of Copalis Head. The southern point at the mouth is bare and sandy; on the northern bank is a bright yellowish bluff 50 feet high. **Moclips,** a watering place near the mouth of this river, is connected by a branch of the Northern Pacific Railroad with Hoquiam on Grays Harbor. The red tanks and stacks are prominent from seaward; a shingle mill is at Moclips. Some logs and considerable shingles are shipped by rail. A triangular-shaped, yellowish bluff about 110 feet high on the south bank of **Wreck Creek,** which empties about 2.5 miles northward of Moclips, is prominent from offshore.

Point Grenville is a broken, rocky promontory with nearly vertical, whitish cliffs over 100 feet high. A triangular-shaped radio tower, 300 feet high with a flashing red light at the top and two fixed red lights at levels 100 feet and 200 feet below the top, is on the point. Numerous rocks extend for some distance off the point. **Grenville Arch,** dark in color, 83 feet high, is the outer and more prominent of two rocks lying westward of the point; it is over 0.5 mile 237° from the inner extremity of the point. The arch lies east and west. A rock awash at high water lies 400 yards 316° from Grenville Arch. The western rock, off the western end of the point, is 200 yards off the cliff and 92 feet high. There are a number of rocks inside of it but none outside. Two rocks over 90 feet high lie 400 yards southward of the southern extremity of the point.

An indifferent anchorage in northwesterly weather may be had under Point Grenville by vessels of moderate draft, but the depths compel anchoring at such a distance from the beach that little shelter is afforded. The anchorage is in 4 fathoms, sandy bottom, with the inner extremity of the point bearing 338°, and Grenville Arch bearing 293°. This anchorage is not recommended for ordinary use.

Northward of Point Grenville is a series of cliffs, the upper part appearing light gray, the lower part dark, separated by a well-defined line of demarcation.

This formation disappears near the southern end of the cliffs, where they are much broken up, and present a stratified appearance, the strata having a downward slope to the northward. Northward of the cliffs is a shingle beach followed by irregular bluffs and cliffs terminating near Taholah in white cliffs of uniform height, which from offshore do not present the stratified appearance noticeable to the southward.

Quinault River breaks through the cliffs about a mile southward of Cape Elizabeth.

Taholah is an Indian village on the banks of the Quinault River. The shoreline in this section is low. The Quinault is navigable only by skiffs and outboard motor boats. Some gasoline and supplies are available. A piling dike has been built along the spit in front of the village; a large amount of driftwood and logs has collected in front of this dike, partially hiding the village; however, the tops of the houses are prominent. In the background is a ridge with three long, flat summits. A road runs from Moclips to Taholah.

From Taholah to Cape Elizabeth the cliffs present an almost unbroken face seaward, and in places are about 200 feet high. They appear either white or bright yellow in color, and from offshore present a very noticeable stratification, sloping downward to the southward, an important difference from the direction of slope around Point Grenville.

Sonora Reef extends south-southeastward from Cape Elizabeth for over 2 miles, its southern end lying 1.1 miles offshore. The reef lies out of the usual course of vessels.

Cape Elizabeth projects about a mile from the general trend of the coast, and when seen from seaward appears as a bright yellow, rocky cliff reaching in places a height of 200 feet. There are no high or large rocks off the cape. A little less than a mile south-southeastward and south-southwestward, respectively, lie two rocks awash at low water, and inside of these, less than 0.5 mile from the extremity of the cape, are some small visible rocks and breaks. The houses of the **Quinault Indian Reservation** are at the eastern end of the cliffs.

From Cape Elizabeth to Destruction Island, a distance of about 20 miles, the coast is nearly straight, with low shores and rocky cliffs heavily wooded to the edges. Numerous rocks lie offshore, but out of the usual track of vessels.

Flat Rock, low and black, lies 1.6 miles 322° from Cape Elizabeth and 0.9 mile offshore. A sunken rock which breaks in ordinary weather lies 400 yards southward of it. A small low rock lies halfway between Flat Rock and Cape Elizabeth, with a smaller one inside halfway to the beach.

Pratt Cliff, 3 miles northward of Cape Elizabeth, is a sharp point backed by cliffs, 139 feet high.

Split Rock, 70 feet high, is 3.5 miles 330° from Cape Elizabeth and 1 mile offshore, abreast of the northern end of Pratt Cliff. It is split in two, the division showing when seen from westward to northwestward. A small, low, black rock lies 0.5 mile southward of it, and another, somewhat larger, lies 0.4 mile 170° from Split Rock.

Willoughby Rock, 120 feet high, lies 0.4 mile 057° from Split Rock. It is nearly round with an abrupt seaward face. A cluster of rocks lies between Will-

oughby and Split Rocks and a little southward of them; one is black and conical with a rock awash 200 yards southwestward from it.

Sealion Rock, 8 feet high, small and black, is 3 miles 324° from Split Rock and 2.8 miles offshore.

From Pratt Cliff to **Raft River,** 3.5 miles, the coast consists of broken cliffs over 100 feet high bordered by rocks extending over 0.5 mile offshore. Midway between them are three rocky heads projecting beyond, and almost detached from, the cliffs and like them, covered with trees to the edges.

Arch Island lies in the entrance to Raft River, and at low water is connected with the southern point of the river. It is 157 feet high and 300 yards long. A vertical pillar, 108 feet high, stands 150 yards north-northwestward of the rocks, and a cluster of rocks lies close-to under its southeastern point.

From Raft River to Queets River, 4.5 miles, the coast consists of cliffs about 80 feet high, broken occasionally by small streams.

Queets River is the largest stream between Grays Harbor and Cape Flattery. The southern point is a low, sandy spit about 0.1 mile long, projecting from an abrupt cliff, 80 feet high, and densely wooded. The northern point is 1.3 miles long, low, and sandy, with some trees at the mouth of the river, and a narrow lagoon between it and the bluff.

From Queets River to abreast Destruction Island, about 10 miles, the coast is rather low, and is broken by cliffs about 50 feet high with broad, low-water beaches. **Kalaloch Rocks** lie about 4.5 miles northward ofthe river, close inshore.

Destruction Island, 90 feet high, lies about 20 miles northward of Cape Elizabeth and 3 miles offshore. It is flat-topped and covered with brush, with a few clumps of trees. The island is 0.5 mile long and, at its southern part, 300 yards wide. From the northern end rocks and ledges extend about a mile from the cliffs; these are bordered by a line of kelp on the inshore side.

Destruction Island Light, shown from a white conical 94-foot tower on the southwestern part of the island, is 147 feet above the water and visible 18 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. The fog signal is sounded on an air diaphone. The fog signal and radiobeacon are synchronized for distance finding. **Storm warnings** are displayed day and night at the light station.

An indifferent anchorage, affording shelter from northwesterly winds, may be had off the southeastern face of the island in 12 fathoms, sandy bottom, with the light bearing between 293° and 315°. Vessels must leave if the wind hauls westward or southward. During the fishing season many small fishing boats anchor for the night under Destruction Island; it is the only shelter from offshore winds between Grays Harbor and Cape Flattery.

CHAPTER 15

Destruction Island to Amphitrite Point

Chart 6102

THIS chapter describes the coast of the United States from Destruction Island to Cape Flattery, the coast of Vancouver Island from Carmanah Point to Cape Beale, the islands between the cape and Amphitrite Point, the offlying banks, and directions for approaching the Strait of Juan de Fuca.

From abreast Destruction Island at the mouth of **Steamboat Creek** to Hoh Head, about 6.5 miles, the coast trends in a general northwesterly direction. The cliffs are 50 to 100 feet high, and many rocks and ledges extend in some cases 1.2 miles offshore.

Abbey Islet, 3.5 miles northeastward of Destruction Island, is over 100 feet high and covered with trees. It is 200 yards off the cliffs. Many rocks lie close southward of it, the most distant of which is **South Rock,** 46 feet high, 1 mile southward and 0.5 mile offshore.

At the mouth of **Hoh River,** 2 miles eastward of Hoh Head, is a broad sand beach; the absence of cliffs for 0.5 mile is noticeable for a considerable distance offshore. In smooth weather the river can be entered by canoes, but the channel shifts. An Indian village is on the southern bank at its mouth.

Hoh Head, 200 feet high, is a bright yellow cliff covered with a dense forest. It projects a little over 0.5 mile from the general trend of the coast. Sunken rocks extend about a mile south by southwest from the head, and between it and North Rock, and a large cluster of rocks is off the southern cliff of the head. A rock with 2¼ fathoms over it has been reported about 1.8 miles westward of Hoh Head.

Middle Rock, 65 feet high, black with vertical sides, is 0.8 mile off the mouth of the Hoh River and about 1 mile eastward of North Rock. A rock awash is 0.7 mile from Middle Rock on a line between it and Destruction Island. Numerous low flat rocks are between it and the shore.

North Rock, 107 feet high, grayish, with nearly vertical sides, is a little over a mile southward of Hoh Head. In the afternoon sun the rock shows white, making it a very distinct landmark.

Perkins Reef is a long, bold, and jagged islet, 1.1 miles westward of Hoh Head. Between it and the shore is a small visible rock, and two sunken rocks are near it.

From Hoh Head to Toleak Point, 5 miles, the coast forms two shallow bights, the southern being the longer. The cliffs are from 100 to 120 feet high and are broken by two small streams, one 2 miles northward of Hoh Head and the other 1 mile southward of Toleak Point. Several rocky islets, 25 to 120 feet high, are in some cases 1.5 miles offshore, and numerous rocks and sunken ledges, extending over 2 miles offshore, border this stretch.

Alexander Island, 121 feet high, is 2 miles northward of Hoh Head and a mile offshore. It is 0.3 mile long and 0.1 mile wide, covered with low vegetation, and is flat-topped with steep sides. A lone bushy tree is on each end of the flat top. The island is prominent in hazy or smoky weather. A sunken rock, 1.8 miles 282° from Alexander Island, is the outermost known danger in this vicinity. A cluster of three sunken rocks lies nearly 0.5 mile southward of the island. A rock awash at low water is 1.1 miles 274° from the island, and a small bare rock 25 feet high is halfway between them. Between the rock awash and the beach are two small rocks, 44 and 68 feet high.

Toleak Point, nearly 5 miles northwest of Hoh Head, is a narrow point terminating in a small knob with an abrupt seaward face. A high wooded islet lies 400 yards westward of the point, to which it is connected by an extensive bare reef.

Rounded Islet, a round grassy rock 130 feet high with steep sides, is 0.3 mile seaward of Toleak Point. A low black rock is 0.7 mile southward of the islet.

From Toleak Point to Teahwhit Head, 3.5 miles, the coast is irregular and much broken with numerous outlying rocks and sunken ledges extending, in some cases, a mile offshore.

The **Giants Graveyard** is an irregular group of rocks, some of which are wooded. The larger ones range in height from 88 to 210 feet. They are 1.5 miles northward of Toleak Point and extend 0.5 mile offshore, the farthest outlying danger being 0.8 mile from the beach.

Teahwhit Head is an irregular, jagged, double point, 100 feet high and heavily wooded, behind the dead trees at the edge of the cliff.

From Teahwhit Head to the Quillayute River the coast extends for 1.5 miles in high rocky cliffs, changing to a low sand beach 1 mile southward of the mouth of the river.

Huntington Rock, 113 feet high, is the largest of a group of islands and rocks 0.5 mile off the cliffs and 1 mile westward of Teahwhit Head. It is flat-topped and bare with vertical sides. One of the inner islets is 195 feet high, and another is 182 feet high and wooded. One sunken and five low black rocks extend northward for 0.3 mile from Huntington Rock.

Quillayute Needle, 81 feet high, a little over 0.3 mile southeastward of Huntington Rock, is 35 feet in diameter and nearly vertical. It is the southeasternmost of a line of rocks from Huntington Rock, one of which is 47 feet and another 73 feet high.

James Island, 183 feet high, is 15 miles northwestward of Destruction Island. It marks the mouth of the Quillayute River. The island is bold, wooded, and connected with the beach at low water. Numerous smaller wooded island, immediately northward, are prominent because the beach northward and southward of them is low, bare, and sandy, and the low heavily wooded valley of the Quillayute River is behind them. An indifferent anchorage affording some shelter from northwesterly

winds may be had close southward of James Island, in 5 to 6 fathoms, sandy bottom, about 600 yards from the beach. Any swell makes the anchorage unsafe.

A light, 150 feet above the water, is shown from a white house on the southern side of the island. An air-diaphragm horn fog signal is at the light. Quillayute whistle buoy is moored 1.3 miles 241° from the light.

Lapush, a town abreast James Island at the entrance to Quillayute River, has stores, a hotel, and a daily mail and bus connection with Port Angeles. An oil wharf, with 12 feet at the end, is just inside the mouth of the river. Gasoline, oil, and water are available; Diesel oil may be obtained in drums. There is a road to **Forks,** which is on the railroad.

A **Coast Guard** station is at Lapush. **Storm warnings** are displayed daytime only.

Quillayute River entrance is at the northern end of the sand beach, and a basin is just inside. The channel has been improved by the construction of a jetty on the easterly side of the entrance and by a dike on the westerly side. The Federal project provides for a channel 6 feet deep from the ocean to within the river mouth.

Neither the dike nor the jetty showed at high water in 1950. The channel, which passes close to the southeastern shore of James Island, is tortuous and dangerous. It is especially bad in southerly weather, and when there are breakers of any size making across the entrance it should not be attempted except at better than half tide and with a full-powered boat. Strangers should never attempt it, but should approach the buoy off the jetty and lay-to until a Coast Guard boat puts out to pilot them.

In April 1950 the controlling depth in the entrance channel was 6 feet over a width of 120 feet.

Many fishing boats make their headquarters here during the fishing season. Fishing boats can enter and leave the river at any time during the year except in southerly weather. A boat carries mail to Destruction Island throughout the year.

Mora, at the mouth of **Dickey River**, has stores, a post office, and daily mail connections. There is a road to Forks.

From the Quillayute River to Cape Johnson the coast extends northward for about 3 miles; it has steep, wooded bluffs and a narrow beach.

Cake Rock, 116 feet high, is 2 miles 315° from James Island and about 1.5 miles offshore. It is about 200 yards long by 100 yards wide, with steep sides and a flat grassy top in the middle of which is a small round mound about 20 feet high. Halfway between Cake Rock and the beach is a jagged rock 136 feet high. A large low black rock is 1.1 miles 351° from Cake Rock and about 1 mile offshore, and two other rocks are 0.3 mile inside of it.

Cape Johnson is small and not particularly prominent. It projects less than 0.5 mile from the general trend of the coast, terminating in a vertical cliff about 100 feet high, with a mass of rocks at its base. Several high rocks extend 0.5 mile west-northwestward of the cape, the highest being 103 and 127 feet. Three rocky pillars, from 0.5 to 1 mile south-southeastward of the cape, reach elevations of 130, 226, and 125 feet.

From Cape Johnson to Cape Alava the coast extends in a general north-northwesterly direction for 12.5 miles. The cliffs are not continuous, and they show pro-

minently in but few places. The slopes are densely timbered. Back from the coast for 10 or 15 miles, the country rises gradually to the wooded, snow-capped mountains of the Olympic Range.

Jagged Islet, 78 feet high, is nearly 2.8 miles 307° from Cape Johnson. It is large, bare, brown, covered with guano, and irregular in outline. A low black rock lies 200 yards northward.

Carroll Islet, 225 feet high, is 3 miles 322° from Cape Johnson and 0.8 mile 011° from Jagged Islet. About 0.1 mile in diameter, it has vertical whitish sides and wooded top. A pillar rock, 134 feet high, lies 200 yards westward, and a small low black rock lies 200 yards off the southeastern side. Carroll Islet and the pillar rock are quite prominent, especially when in sunlight.

Bald Islets are two high, bare rocks inside of Jagged and Carroll Islets about 0.8 mile offshore. The outer and larger one is 320 feet high with steep sides, and the smaller is 183 feet high. They are 200 yards apart and between them are two pinnacle rocks, close together. A cluster of small low black rocks lies 0.7 mile south-southeastward of the larger islets, and five small black rocks are between the larger islets and the beach. Several low black rocks lie about 1 mile northwestward.

Hand Rock, 33 feet high, is 1.5 miles 007° from Carroll Islet and 1.5 miles offshore. So named from its shape, the rock is black with a white cap of guano on top. A large rock, 53 feet high, lies halfway between it and the beach, and many rocks are closer inshore.

White Rock, 161 feet high, is about 1.7 miles south of Cape Alava and about 0.8 mile offshore. The rock is 100 yards in extent and has nearly vertical sides and a rounded top; it is whitish, and in the sunlight shows for a long distance. A group of large low black rocks lies 0.8 mile south-southeastward of White Rock and 0.8 mile offshore. A small black rock lies in the same direction, distant 1.5 miles. A rock 6 fathoms deep has been reported 2.2 miles 264°30′ from White Rock.

Chart 6265.—Cape Alava is about 13.5 miles southward of Cape Flattery and nearly as far northward of Cape Johnson. The seaward face is about 0.6 mile in extend. A steep rocky islet, 142 feet high and with trees on top, is off its northwestern extremity. The shore is bordered by numerous rocks and sunken ledges. The **Ozette Indian Village,** practically abandoned, is here. Cape Alava is the westernmost point of continental United States.

Flattery Rocks and Umatilla Reef are rocks and islets extending westward from Cape Alava for a little over 2.3 miles. **Ozette Island,** 236 feet high, is 0.8 mile southwestward of the cape. The island, 0.5 mile long and a little over 0.1 mile wide, is flat-topped and has steep sides. About 0.3 mile off the southern and southeastern sides are low black rocks. **Bodelteh Islets,** about 1.2 miles west-northwest of the northerly end of Cape Alava, have high bold seaward faces. The outer one is 198 feet high and the inner one, 189 feet high. A bare rock, 141 feet high, lies close under the southwestern face of the outer islet, and a whitish rock 132 feet high, with steep sides and sloping flat top, is 200 yards westward of the outer islet.

During the fishing season a few fish boats find shelter in an anchorage just southeastward of and close-to Ozette Island. The area is small and requires local knowledge to enter. It affords fair protection from the prevailing northwesterly wind.

Umatilla Reef, 0.7 mile westward of the outer Bodelteh Islet, extends for 200 yards in a westerly direction and is about 75 yards wide. It consists of several small low black rocks and some breakers. There is a reported breaker 1.1 mile 034° from this reef, and a rock awash 0.3 mile east of the reef. This rock, awash at low tide, endangers the passage, sometimes used by small boats, inside Umatilla Reef. Umatilla Reef is difficult to make out, especially in thick weather, and is the greatest danger to navigation off the northern part of the coast.

Umatilla Reef Lightship is moored in 25 fathoms about 2.5 miles southwestward of the reef. It has a red hull with the word UMATILLA on each side, and two masts each with a circular gallery at the masthead. The light is 67 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is sounded on a two-tone air-diaphragm horn. Difficulty has been reported in hearing the signal during a dense fog. The radiobeacon at the lightship is synchronized for distance finding; emergency radio messages will be received and transmitted. The code-flag signal and radio call is NNCL. **Storm warnings** are displayed in the daytime.

From Cape Alava the coast extends for about 8 miles in two shallow bights. It then bends eastward, forming Mukkaw Bay, 2.5 miles wide, from the northern point of which it trends northwestward for 3 miles to Cape Flattery. The coast is irregular, with alternate stretches of wooded bluffs and rough rocky cliffs, 100 to 200 feet high. The country immediately back of the beach is not high, but is densely wooded.

Point of the Arches is about 5 miles northward of Cape Alava, and is the northern point of the cliffs that extend 1.5 miles southward. Numerous rocks and ledges border the cliffs and extend in some cases 0.8 mile offshore.

Father and Son, two rocks connected by a low reef, lie 0.6 mile offshore abreast the southern end of the cliffs. The outer rock is 167 feet high, and the inner one 65 feet. A rock, 38 feet high, is 1 mile northward of Father and Son and 0.5 mile offshore, with several rocks between it and the beach.

Spike Rock, 35 feet high, sharp and bare, is 0.8 mile northwestward of the Point of the Arches. It is the outermost of a chain of rocks the three largest of which range in height from 152 to 185 feet; there are three arches in these rocks. A rock awash, 0.4 mile 245° from Spike Rock, is inside the usual course of vessels.

Portage Head, 2.5 miles northward of Point of the Arches, has a seaward face about a mile in length of bold rocky irregular cliffs, over 410 feet high. A reef extends from the point toward Cape Flattery for 1.5 miles, showing several low black rocks, awash at low water, and one small rock 45 feet high.

Mukkaw Bay is a shallow bight included between Portage Head and Waatch Point, a distance of 3 miles. It affords indifferent shelter in northerly and easterly weather and a smooth sea, but is little used as an anchorage. During the salmon runs it is used by many native pulling boats, which are beached at night. The shores are low and sandy. The southern half of the bay is shoal, with reefs and

rocks extending about 1.5 miles from Portage Head. The **Sooes River** enters about the middle of the bight. **Waatch River** enters in the northern part of the bight immediately eastward of Waatch Point. It is a tidal slough, and the valley through which it runs extends about 2 miles to Neah Bay on the Strait of Juan de Fuca. This low depression is one of the features for recognizing Cape Flattery.

Waatch Point, 3 miles southeastward of Cape Flattery, is the southeastern extremity of the cliffs extending to the cape. This stretch is bordered by numerous rocks and ledges.

Fuca Pillar stands 0.2 mile 181° from the western point of Cape Flattery. It is a rocky column 157 feet high and 60 feet in diameter, leaning slightly northwestward. It is 150 yards off the face of the cliffs and is more prominent from northward than from southward.

Cape Flattery is a bold rocky head, with cliffs 120 feet high, rising to an elevation of nearly 1,500 feet 1 to 2 miles back from the beach. From southward it looks like an island because of the low land in the valley of Waatch River. Numerous rocks and reefs border the cliffs eastward and southward of the cape. About 0.8 mile southward of Cape Flattery are four rocky masses extending 0.4 mile offshore and ranging in height from 41to 88 feet. A rock that breaks at low water is about 5 miles southward of Cape Flattery and 1.3 miles 278° from the northernmost point on Portage Head. There is a depth of about 2 fathoms on the rock at low tide. Tide rips are particularly heavy off Cape Flattery.

Tatoosh Island is 0.4 mile northwestward of Cape Flattery. The main island of the group here is about 0.2 mile in diameter, with three smaller ones and several reefs awash close-to on its northwestern face. The main island is 108 feet high, flat-topped, and bare. A reef, the outer rock of which is usually awash, extends 0.2 mile westward. The passage between the island and the cape is dangerous; it is restricted by two rocks awash near the center of it and, although used by small boats, it should not be attempted without local knowledge. The currents are strong and treacherous.

Cape Flattery Light, 165 feet above the water and visible 19 miles, is shown from a white conical tower on a gray sandstone dwelling on the western end of Tatoosh Island. The fog signal is sounded on an air diaphone; the radiobeacon is synchronized for distance finding. A sector from 164° to 171° covers Duncan and Duntze Rocks. The light is obscured from 271° to 007½°.

Storm warnings are displayed day and night at the light station. Telegraphic communications are available for reporting vessels or sending messages.

A rocky patch 7½ fathoms deep, on which the sea breaks occasionally in a westerly swell, is 1.4 miles 231° from the light.

Duncan Rock, small, low, and black, is 1 mile 347° from the light. A ledge 4 fathoms deep is 0.4 mile 131° from Duncan Rock, and a covered rock between them is 250 yards off on the same bearing. Another covered rock lies 250 yards from Duncan Rock in the direction toward the light. These dangers constrict the passage between Duncan Rock and Tatoosh Island to less than 0.5 mile. Although narrow, this passage is used by many large vessels which favor Tatoosh Island in passing. However, strong curents and tide rips are encountered here which, added to the narrowness of the passage, make its use inadvisable.

Duntze Rock, 3¼ fathoms deep, is 0.2 mile 346° from Duncan Rock and almost in line with it and the light. A lighted whistle buoy is 0.3 mile northwestward of the rock.

Chart 6102.—Swiftsure Bank, about 3.5 miles in extent within the 30-fathom curve, lies off the mouth of Strait of Juan de Fuca, northwestward of the submarine valley making into the strait. The least depth found upon it is 19 fathoms.

Swiftsure Bank Lightship is moored in about 33 fathoms of water 13.8 miles 311° from Cape Flattery Light, and 10.5 miles 247° from Carmanah Light. The light is 65 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is sounded on an air diaphone. A bell will be struck when the diaphone is inoperative. A radiobeacon is synchronized for distance finding; emergency radio messages will be received and transmitted. The code flag signal and radio call is NNCD. **Storm warnings** are displayed daytime only when the lightship is on station. In heavy weather the lightship occasionally drags anchor and sometimes is obliged to leave her station.

Caution.—All vessels approaching Swiftsure Bank Lightship during fog should observe extreme caution as numerous small fishing vessels anchor nightly within a radius of 8 miles of the lightship during the fishing season, June 1 to November 1.

The coast from Carmanah Point to Cape Beale is very dangerous and, except during fine weather and offshore winds, should be given a wide berth.

Carmanah Point is on the Vancouver Island shore, about 13 miles northward of Tatoosh Island. A light, 175 feet above water and visible 19 miles, is shown from a white octagonal concrete tower with a red lantern, on the point. A fog signal is sounded on an air diaphone.

Clo-oose, a small village and mission is about 5.5 miles westward of Carmanah Point in the small cove at the mouth of the Chuckwear River, eastward of the entrance to Nitinat Lake. The village is connected with the Government telegraph line to Victoria, and by telephone with Carmanah Light. Shelter and assistance can be obtained here.

A reef 0.8 mile long in a northwesterly direction, with a rock awash in its center, is off this cove. It is marked by a lighted whistle buoy moored 0.8 mile southwestward of the rock.

Nitinat Lake, 11 miles long and about 0.5 mile wide, enters the strait about 1.5 miles westward of Clo-oose. The depths at the entrance vary from 1 to 2 fathoms, and in bad weather the sea breaks entirely across it. The entrance is dangerous and should not be attempted except at slack water by those having local knowledge.

Tsusiat Lake is 3 miles westward of Nitinat Lake. At the seaward end of the lake is a conspicuous waterfall which may be seen at a considerable distance even in hazy weather, and may be used to help fix a vessel's position as it is the only waterfall on this part of the coast. Behind Tsusiat Lake the mountains rise to more than 2,000 feet.

Pachena Point is about 25 miles northwestward of Cape Flattery and has depths of 15 fathoms fairly close in. A light, 200 feet above the water and visible 20 miles, is shown from a white pyramidal wood tower with a red cylindrical

lantern on the point. A fog signal is sounded on an air diaphone and is synchronized with the radiobeacon.

Pachena Bay, between Pachena Point and Cape Beale, is about 2 miles long and 0.5 mile wide, with depths of 5 to 6 fathoms. There is usually a heavy swell entering the bay and vessels should not attempt to anchor. At the head of the bay, on the western side, is a small stream into which boats can go and find shelter in rough weather.

Seabird Rocks are off the entrance to Pachena Bay. The largest is about 48 feet high, bare, and of small extent. Two rocks lie off it, one 0.5 mile 132° and the other 0.5 mile 219° from it, the latter being awash at high water. There is no safe passage between Seabird Rocks and the shores northeastward, and the rocks should not be approached closer than 1.5 miles.

Cape Beale is a bold rocky point, 120 feet high, or 300 feet to the tops of the trees. A reef with rocks above and below water extends about 0.8 mile southwestward from it. A rescue station, a depot for provisions, and necessities for shipwrecked mariners are maintained on the cape.

A light, 170 feet above the water and visible 19 miles, is shown from a white square structure attached to a dwelling near the western extremity of the cape which is about 20 miles westward of the entrance to the strait. A red sector is from 097° to 182°. The fog signal is sounded on an air diaphone on a white building midway between the light and the water. A signal station connected to Victoria by telegraph is maintained at the light.

Barkley Sound, an extensive arm of the sea about 31 miles northwestward of Cape Flattery, lies between Cape Beale and Amphitrite Point. It is 15 miles wide at its entrance, and though encumbered by numerous islands and rocks, it maintains a breadth of 13 miles for 8 miles inland, above which it separates into several narrow inlets. The shores are low, except in the northern part and among the inlets, where they become high, rugged, and mountainous.

In the western part of the sound are innumerable rocks and islands with navigable channels between them. Entrance should not be attempted without local knowledge or a pilot. Imperial Eagle Channel is the easiest of access.

The principal channels in the sound are as follows: **Trevor Channel,** the easternmost, is 12 miles long in a northeasterly direction, and its breadth varies from 0.5 to 1.5 miles; its rugged shores are low except in the northeastern part where they are high. **Imperial Eagle Channel,** the largest passage into Barkley Sound, is about 12 miles long, 3 miles wide in the narrowest part, and bounded on either side by numerous small islands, rocks, and part of the mainland. **Deer Islands** are on the east and **Broken Group Islands** on the west. **Loudoun Channel,** leading into the sound westward of Broken Group, and between it and **Sargison Bank,** is from 1 to 2 miles wide.

Amphitrite Point is the western entrance point of Barkley Sound. A light 58 feet above water and visible 13 miles, is shown from a white rectangular concrete building with a rounded front, surmounted by a red octagonal lantern on the end of the point. A fog signal is sounded on an air-diaphragm horn. A radiobeacon at Amphitrite Point is synchronized with the fog signal for distance finding. A whistle buoy is moored about 1,050 yards southward of the point.

A more detailed description of Barkley Sound will be found in the publication *Sailing Directions for British Columbia, Volume I*, which is Hydrographic Office Publication 175.

Directions, approaching and entering the Strait of Juan de Fuca.—In clear weather no difficulty will be experienced in approaching the entrance of the Strait of Juan de Fuca from any direction, as the land on both sides is high, and Cape Flattery, the southern point at the entrance, is readily distinguished, particularly from southward, on account of the low land between Mukkaw and Neah Bays. Cape Beale, the eastern point at the entrance to Barkley Sound, on the Vancouver Island shore about 20 miles westward of the entrance to the strait, is marked by a light and fog signal. Pachena Light, Carmanah Light, Cape Flattery Light, Umatilla Reef Lightship, and Swiftsure Bank Lightship mark the approaches and have fog signals and all except Carmanah Light have distance-finding signals. In thick weather the soundings also will assist in estimately approximately the distance from shore.

Depths.—The depths in the approaches to the Strait of Juan de Fuca are very irregular, especially outside the 50-fathom curve. There is a deep submarine valley with depths of over 100 fathoms and a width of 2 to 4 miles, between the 100-fathom curves, which leads from about 37 miles south-southwestward of Cape Flattery, rounds this cape at a distance of 2 miles, and extends about 32 miles into the strait. The 100-fathom curve on the western side of this submarine valley is very irregular, but on the eastern side it is more regular. Within the strait this curve is regular on both sides of the valley.

The southern extremity of this valley is about 26 miles offshore, and from the western side of this extremity, the seaward 100-fathom curve extends in a northwesterly direction and lies about 40 miles southwestward of Cape Flattery and 35 miles southwestward of Cape Beale.

On the eastern side of this valley the 100-fathom curve is about 20 miles southwestward of Destruction Island, and trends in a northwesterly direction for about 40 miles. It then runs northeastward toward the Umatilla Lightship for about 12 miles and then northward for about 20 miles, passing about 5 miles westward of the lightship. It next turns north-northeastward and passes close outside of Duntze Rock, and then sharply eastward into the strait for about 32 miles. The 100-fathom curve on the western side of the valley is too irregular for description, and the chart must be consulted for details.

In thick weather, therefore, if the 100-fathom curve is followed for 20 miles or more in a northwesterly direction and is found to change to the eastward, a vessel is probably in the valley about 15 to 20 miles southwestward of Umatilla Reef Lightship; but if the direction of the curve changes to the westward she may be on the outside of the bank about 40 miles west-southwestward of Cape Flattery Light.

The 50-fathom curve is less complicated southward of the strait. From about 25 miles southward of Cape Flattery, it runs in a general northerly direction and passes 3.5 miles westward of Umatilla Reef Lightship. It then curves gradually northeasterly toward Cape Flattery and passes close to Duntze Rock. Vessels from southward, following this curve in thick weather, ought to hear the fog signal,

both at Umatilla Reef Lightship and at Cape Flattery, and thereby verify their position.

Currents.—The currents at Swiftsure Bank and Umatilla Reef Lightships are described in the *Current Tables, Pacific Coast.* Off the entrance of the Strait of Juan de Fuca the coastal current is influenced by the flow into and out of the strait. On the flood there is a set into all the sounds on the Vancouver Island shore, and this, combined with the prevailing northwesterly current and light southerly winds, with possibly some swell from the same direction, makes the coast in the vicinity and westward of Carmanah Light dangerous, especially for small vessels.

The flood current entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel there is a continued set toward the Vancouver Island shore, which is experienced as far as Race Rocks. The flood current also has more velocity on the northern shore of the strait than on the southern.

The ebb current is felt most along the southern shore of the strait, and between New Dungeness Light and Crescent Bay there is a decided set southward and westward, especially during large tides. With wind and swell against the current, short choppy sea is raised near the entrance to the strait. For additional information on currents in the Strait of Juan de Fuca, see Chapter 16.

A general description of the conditions which may be encountered and of the precautions which should be observed, including directions for approaching from southward, is given in the section on *Coastwise Navigation* in Chapter 2.

From seaward, vessels should pick up the 100-fathom curve and be guided by the soundings. The relation between the 100- and the 50-fathom curves is the best indication for fixing the position, and vessels should not get inside the latter depth until a fix has been obtained. From seaward the mountain peaks in the interior sometimes can be seen when the coast is obscured by fog.

On this portion of the coast the tendency toward a northerly set inshore is much more pronounced than farther southward. The great majority of the strandings which have occurred have been on the Vancouver Island shore and allowance should be made accordingly.

Sailing vessels approaching the strait should keep well off the mainland coast southward of Cape Flattery, unless working to windward against a fine northerly wind, which is frequently found during the summer. In this case the coast may be approached to within 3 miles. At other times there is no inducement to hug the coast, on which a long rolling swell frequently sets, and this swell, meeting the southeasterly gales of winter, causes a confused sea. The cape and its offlying dangers should be given a berth of at least 3 miles, as the tidal current sometimes sets with great velocity toward Duncan and Duntze Rocks. It is equally necessary when entering or leaving the strait to avoid the coast of Vancouver Island between Port San Juan and Bonilla Point, when there is any appearance of bad weather.

Sailing vessels making the strait during the winter months, especially during November and December, and experiencing the easterly and southeasterly winds prevalent at that season, should endeavor to hold a position southward or southwestward of Cape Flattery, and should on no account open the entrance of the strait

until an opportunity offers of getting well inside. It is also important to remember that, though it may be blowing strongly from the southward or south-southwestward outside, on rounding Cape Flattery, an easterly wind may be found blowing out of the strait, and a vessel would then find the Vancouver Island coast a dangerous lee shore.

Coming from the westward with a heavy westerly or northwesterly gale and thick weather, vessels uncertain of their position, should lie-to on soundings at not less than 30 miles from the entrance or on the edge of the bank. These gales seldom last more than 12 hours, and if they veer toward the southwest the weather will clear and vessels may bear up for the strait.

Courses from the south are given in Chapter 3.

Fog.—The fogs are generally heavier near the entrance, decreasing in density and frequency up the strait. Near the entrance the fog sometimes stands like a wall, and vessels entering the strait run out of it into clear bright weather, even before passing Tatoosh Island. These fogs frequently extend a long distance seaward, and, when combined with the smoke from forest fires, become exceptionally dense. Th e wind gradually works the fog into the strait, and it will follow the northern shore past Port San Juan to the Sombrio River; occasionally it will reach as far as Sooke Inlet and at times to Race Rocks. As a rule, however, the fog follows farther into the strait along the southern shore, at times reaching Port Townsend; frequently the northern shore is clear when the southern shore is enveloped in fog. See fog signal Race Rocks Light, Chapter 16.

During the spring, fogs are frequent in the strait. With a westerly wind they often stop at the headland between Crescent and Freshwater Bays, the fog then extending westward while it is clear to eastward. When fogs extend past Freshwater Bay the small area about the western bight will often be clear.

Wind and rain.—In summer the prevailing northwesterly winds draw into the strait, increasing toward evening and at times blowing a 10-knot breeze before midnight. This occurs, however, only when the winds are strong outside. In light winds sailing vessels may be a week from Cape Flattery to Admiralty Inlet, and vice versa.

In winter southeasterly winds draw out of the strait, causing a confused cross-sea off the entrance, the heavy southwesterly swell meeting that coming out. Under these conditions outward-bound vessels, especially sail, often make Neah or Clellam Bays and await more favorable weather. The weather off the entrance as a rule is exceptionally severe, and wrecks are of frequent occurrence. The heavy broken seas are probably due to the shoaling off the entrance, the irregularity and velocity of the currents, and the conflict between the wind drawing out of the strait and that along the outer coast.

The rainfall in the vicinity of the entrance is considerable, even during the summer months; the heaviest rains occur during December, January, February, and March.

For meteorological data for Tatoosh Island, see the meteorological tables in the Appendix.

Blank page retained for pagination

CHAPTER 16

Strait of Juan de Fuca and Georgia Strait

Chart 6300

STRAIT OF JUAN DE FUCA separates the southern shore of Vancouver Island from the northern coast of the State of Washington. The entrance to the strait lies between parallels 48°23′ N., and 48°36′ N., on the meridian of 124°45′ W. This important body of water is the connecting channel between the ocean and the island passages extending southward to Puget Sound and northward to the inland waters of British Columbia and southeastern Alaska.

The commerce of this region is extensive, both foreign and domestic. Vast quantities of lumber and fish, also grain, coal, and general merchandise are exported, while the manufacturing and shipbuilding industries are important. Several transcontinental railroads have their western terminals on Puget Sound and Georgia Strait, and there are several lines of steamers, foreign and domestic, operating across the Pacific or through the Panama Canal, in addition to the coasting and local steamers, and sailing vessels.

At its entrance and for 50 miles eastward to Race Rocks, the strait has a width of about 12 miles, and thence it has a width of about 16 miles for 30 miles, eastward to Whidbey Island, its eastern boundary. The waters as a rule, are deep to within a short distance of the shore, with but few outlying dangers, most of which are in the eastern part. The shores on both sides are heavily wooded, rising rapidly to elevations of considerable height, and except in a few places, are bold and rugged.

The northern shore should be avoided as it is the lee shore for most gales, and, with the exception of Esquimalt Harbor, there are no anchorages for strangers that afford shelter from all winds.

The navigation of these waters is simple in clear weather. The aids to navigation are numerous and the chart is a good guide. In thick weather, because of strong and irregular currents, extreme caution and vigilance must be exercised. Strangers should take a pilot.

Radiobeacons on Swiftsure Bank Lightship, Umatilla Reef Lightship, and at Cape Flattery Light Station afford the navigator an excellent opportunity for frequently fixing his position in approaching the Strait of Juan de Fuca.

Boundary Line.—Inland Rules of the Road must be observed eastward of a line drawn from the northernmost point of Angeles Point to Hein Bank lighted

bell buoy; thence to Lime Kiln Light; thence to Kellett Bluff Light; thence to Turn Point Light on Stuart Island; thence to the westermost extremity of Skipjack Island; thence to Patos Island Light; thence to Point Roberts Light.

Pilotage.—All vessels are subject to pilotage eastward of Port Angeles, inside the international boundary line extending southward to and including Olympia, except vessels under enrollment and vessels engaged exclusively in the coasting trade on the west coast of continental United States, including Alaska, and/or British Columbia.

Port Angeles has been designated as the pilotage station for all vessels en route to or from the sea. On vessels en route to or from British Columbia ports, pilotage will apply at the international boundary line. Pilotage dues as fixed are $1.35 per nautical mile with a minimum fee of $30.00 for any pilotage service, except that the charge of shifting a vessel from one dock to another in the same port is $25.00. *Rules and Regulations,* and complete rates may be obtained from the Board of Pilots Commissioners, Seattle.

Pilots may be obtained at Port Angeles, or upon request, at the Puget Sound Pilots office, Seattle.

Vessels desiring a pilot should proceed to a point 500 yards east of Ediz Hook where pilot will board the vessel. In clear weather vessels should indicate their desire for a pilot by hoisting the International Code Flag G and blow the whistle signal of one long, one short, and one long. In fog or thick weather the blowing of this whistle signal will attract the attention of the Pilot Station and repetition of this signal will assist the pilot boat in locating the vessel. The Pilot Station is 1,200 yards 277° from Ediz Hook Light. At night the station will show from a mast 3 vertical lights, the highest and lowest being red and the middle one white to indicate that the pilot boat is en route to the ship.

Communications.—Vessels may insure prompt dispatch by advising their ETA Ediz Hook 24 hours in advance, via radio to station KLB addressed Puget Sound Pilots, Seattle, Washington, code word *PILOTS*. A vessel may also communicate direct with the Pilot Station, Port Angeles Washington, code word *EDIZ,* to advise their ETA and amended ETA when subsequent conditions make it desirable. The message is transmitted immediately from KLB to Port Angeles via teletype transmitter.

In an emergency vessels equipped with radiotelephone may call the U. S. Coast Guard Air Station on Ediz Hook, call letters NOW, frequency 2670 kc., who will transmit the message to the Pilot Station. The Pilot Station is equipped with a signal searchlight for signalling via flashing light.

In British Columbia pilots may be obtained on application at Vancouver or Victoria. A boarding station has been established within a radius of 7 miles of Race Rocks.

Towboats will be found in Port Angeles and can be had by signaling the lighthouse on Tatoosh Island.

Towage rates for the Strait of Juan de Fuca and adjacent waters are published by the Northwest Towboats Association, Seattle, from which they may be obtained upon request.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded for inspection.

Currents, Cape Flattery to Race Rocks.—The currents attain velocities of 2 to 4 knots, varying with the range of tide, and are influenced by strong winds. Eastward of Race Rocks, in the wider portion of the strait, the velocity is considerably less. At Race Rocks and Discovery Island the velocity is 3 to 6 knots or more. Along the Vancouver Island shore the currents turn about 1½ hours earlier than on the Washington shore of the strait, and advantage is frequently taken of this by vessels having an adverse current in the strait.

The **flood current** entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel, there is a continued set toward the Vancouver Island shore which is experienced as far as Race Rocks. The flood current has also more velocity on the northern shore of the strait than on the southern.

The **ebb current** is felt most along the southern shore of the strait, and between New Dungeness Light and Crescent Bay there is a decided set southward and westward, especially during large tides. With the wind and swell against the current, a short choppy sea is raised near the entrance to the strait.

The current movement is complicated by a large daily inequality, and the *Pacific Coast Current Tables,* published annually in advance by the United States Coast and Geodetic Survey should be consulted for times and velocities.

Tide rips occur off the prominent points and in the vicinity of the banks. These are particulary heavy off Cape Flattery, Race Rocks, Dungeness Spit, and Point Wilson, at times becoming dangerous to small vessels.

Directions.—Courses for the Strait of Juan de Fuca are given in Chapter 3.

Strait of Juan de Fuca, Northern Shore.—Carmanah Point is described in Chapter 15. **Bonilla Point,** the northern entrance point at the western end of the strait, is about 1.8 miles east-southeastward from Carmanah Light. Inland of Bonilla Point, which slopes gradually to the sea, the mountains attain heights up to 3,515 feet and are heavily wooded. A conspicuous house is about 0.5 mile eastward of the point. A reef extends 0.5 mile off the point and the shores should be given a berth of at least 1.5 miles.

From Bonilla Point the coast trends in an easterly direction for 9.5 miles to Owen Point. It is nearly straight, rocky, and bluff, with high mountains rising immediately behind it, all heavily wooded. Vessels are apt to lose the wind near the shore.

Port San Juan offers the first anchorage on the northern shore within the entrance to the Strait of Juan de Fuca. The port is conspicuous from seaward, appearing as a deep gap between two mountain ranges.

The entrance, between **Owen Point** and **San Juan Point,** 2 miles wide and 3.5 miles long, is 13 miles northeastward of Cape Flattery Light. It is marked by a lighted whistle buoy which is in mid-channel and may be passed close-to on either side.

The port is open to southwesterly winds, and a heavy sea rolls in when a moderate gale is blowing from that direction. Though it is possible that a vessel with good ground tackle could ride out a gale if anchored in the most sheltered part, it is recommended that, with any indication of southwesterly gales, a vessel should weigh anchor imediately, and if outward bound, seek shelter in Neah Bay.

Anchorage may be had in depths of 6 to 9 fathoms anywhere in Port San Juan; a good position is in a depth of 6 to 8 fathoms about 1.5 miles from the beach at the head of the port.

Cerantes (Observatory) Rock is one of a group, some of which are high pinnacle rocks with a few trees growing on them, on shoal ground which extends about 300 yards southwestward from San Juan Point. About 800 yards northward of these rocks and 300 yards from shore is another reef partly out of water.

Port Renfrew is a settlement with telephone facilities and a post office, on the southeastern side of Port San Juan, about 2 miles northeastward of San Juan Point. A substantial wharf is available; it has a length of 900 feet and a depth alongside of 15 feet. A light is shown from the wharf.

From Port San Juan the coast trends eastward for 23.5 miles to Sheringham Point. This stretch of coast presents no prominent features. The country is thickly wooded and the land rises to a considerable elevation. The points, some of which are bare on their extremities, are not prominent nor are they easily identified, except from close inland.

From Port San Juan to Race Rocks, fish traps and broken piles are reported to extend, in places, 0.5 mile offshore.

Chart 6382.—Sheringham Point is marked by a light on a white hexagonal concrete tower having a white dwelling with a red roof attached. Sheringham Point Light is 72 feet above the water and visible 14 miles. The fog signal is an air diaphone sounded from a white square wooden building close southward of the light.

From Sheringham Point the coast continues in an easterly direction for 16.5 miles to Race Rocks, and consists of a number of bays or inlets including **Sooke Bay, Sooke Inlet,** and **Becher Bay,** none of which are of more than local importance.

Beechey Head, about 11.5 miles southeastward of Sheringham Point, is bold, wooded, and steep-to. Vessels bound up the strait and passing outside Race Rocks should give Beechey Head a berth of 2 miles.

A submerged target with a minimum depth of 65 feet over it has been established about 2 miles southward of Beechey Head in latitude 48°16.′7 N., longitude 123°39.′7 W. Anchoring or fishing is prohibited within ¼ mile of this position.

Race Rocks, a cluster of low, bare islets or rocks, the outermost lying about 1 mile southeastward of Bentinck Island, occupy a space of about 0.5 mile in extent. With the exception of Great Race Rock, which is 200 yards long and 30 feet high, they are small, a few feet above water or awash at low water. For a distance of about 0.5 mile southeastward of the group the bottom is foul and during bad weather, heavy, dangerous overfalls and races occur. In light winds, sailing vessels should give this group a good berth, especially when to the eastward of them, as the ebb sets in their direction.

Race Rocks Light on Great Race Rock is shown from a circular stone tower painted in alternate black and white horizontal bands with a dwelling attached. The light is 118 feet above the water and visible 18 miles. The fog signal is sounded on an air diaphone. *Four short blasts,* in answer to the fog signal of a ves-

sel in the strait, will indicate that the northern portion of the strait is clear of fog. A radiobeacon is maintained here.

Foul ground, due to dumping of heavy steel wire mesh material, exists 3.2 miles 259° from Race Point Light.

Rosedale Rock, with a least depth of 3 feet, lies 0.4 mile southeastward of Race Rocks Light. Rocky, uneven bottom, with depths of 5 to 8 fathoms, extends 0.5 mile eastward of the rock. A buoy is moored 200 yards southward of the rock, which should be given a berth of not less than 1 mile to avoid the tide rips and currents in its vicinity, which set toward it and the reefs near it with great velocity.

Eastward of Race Rocks the Strait of Juan de Fuca expands to a width of about 16 miles, and extends for 30 miles east-northeastward to the entrance to Admiralty Inlet on the south, and Rosario Strait on the north. San Juan Archipelago, comprising the numerous channels and islands northward of its eastern end, is described later in this chapter.

A 25-fathom bank is about 8.5 miles southeastward of Race Rocks along the steamer track from Race Rocks Light to Point Wilson Light. The western edge of this bank is sometimes sharply defined by a line of ripples with glassy calm water to the eastward.

Race Passage with a width of about 0.5 mile, leads between the dangers off Bentinck Island and those of Race Rocks. Because of the strong tidal currents and the races caused by the irregular nature of the rocky bottom this passage is not recommended.

Bentinck Island, about 150 feet high and 1,200 yards long, lies off the shore between **Christopher Point** and **Edye Point,** about 1 mile northeastward. The island is fringed with kelp on its southern and eastern sides, and like the adjacent land, covered with pine trees. An islet 7 feet high lies close off **George Point,** the southeastern extremity. The Government leper station is on Bentinck Island. **Pedder Bay, Parry Bay,** and **Royal Roads,** separated by William Head and **Albert Head,** form the coast between Bentinck Island and the western entrance to Esquimalt Harbor.

A **measured nautical mile,** on a 027°43′ course, has been established in Parry Bay. The northeastern beacon is located on **Goat Islet,** southwestward of Albert Head. The beacons, except the rear beacon of the south range, are white diamond-shaped superstructures with black vertical stripe down the center, on a post. The rear beacon of the south range is a white triangular-shaped structure with black vertical stripe down the center, with the base at ground level. Each pair of beacons marking the course is in line bearing 297°43′. Mariners are warned to keep clear of any vessels running full power trials in this area.

William Head is a comparatively low promontory extending about 0.5 mile northeastward of **Ned Point.** The southeastern side of this promontory is foul for a distance of about 200 yards offshore.

The quarantine station for Victoria and other ports is on William Head. All vessels from foreign ports are required to contact this station, where they may be granted permission to proceed to their docks for inspection. Vessels should notify the quarantine station by radio of their expected time of arrival. Reciprocal quarantine inspection has been arranged between Canada and the United States;

vessels from foreign ports destined for both Canadian and continental United States ports (including Alaska), shall undergo inspection at the primary port of arrival, such inspection ordinarily being sufficient for entry at the port of the other Government.

Anchorage may be had northward of William Head; a good position is in a depth of 7 fathoms about 0.5 mile northward of William Head and about 1,200 yards from the mainland.

William Head Light is shown from black pyramidal steel frame work on the northeastern extremity of the head. The light is 37 feet above water and visible 10 miles. A fog signal is sounded on an air whistle.

Constance Bank, with general depths of 10 to 13 fathoms, about 2 miles long and 1 mile wide, is within the 20-fathom curve. The least depth of 9 fathoms lies near the northern end of the bank at about 6.8 miles eastward of William Head Light. The bottom is rocky and tide rips are formed in this vicinity. Vessels should not attempt to anchor on the bank.

Albert Head Light, on the southeastern extremity of the headland, is shown from a structure consisting of a black, square steel tower surmounted by a white, slatted daymark. The light is 88 feet above the water and visible 14 miles. The fog signal is sounded on an air diaphone. A rock with a depth of 48 feet of water over it is about 0.68 mile 089° from the light.

Fisgard Island Light, on the western side of the entrance to Esquimalt Harbor, is shown from a white circular black tower attached to a red brick dwelling. The light is 67 feet above the water and visible 12 miles. There is a red sector from 195° to 332°. To clear **Scroggs Rocks** off the eastern entrance point of Esquimalt Harbor the light must show white in approaching from the eastward.

Chart 6380.—Esquimalt Harbor affords safe and commodious anchorage, and with the light on Fisgard Island, can be entered at any time. The entrance channel with general depths of 8 fathoms leads between Duntze Head and the dangers off **Fisgard Island,** and has a width of 400 yards. Immediately within the entrance the harbor is broadened to a width of 1 mile by **Constance Cove** and farther northward **Plumper Bay** also widens the harbor. Depths within the entrance gradually decrease for 1.5 miles northward to **Cole Island,** above which the head of the harbor dries. Constance Cove is reserved for British naval vessels eastward of a line from Duntze Head to **Ashe Head.** Plumper Bay lies northward of **Inskip Island;** in the southeastern part of the bay is a cannery off which are two mooring buoys.

Safe anchorage, in not less than 4 fathoms, may be had in any part of Esquimalt Harbor as far northward as Dyke Point, the northern entrance point of **Thetis Cove,** in the northeastern part of Plumper Bay. This cove offers suitable anchorage for small craft. Some parts of the harbor are open to direct southerly winds but they seldom blow and there is never sufficient swell to render anchorage inconvenient. If intending to make a lengthy stay vessels should moor for the winds are variable.

Victoria Harbor, which is landlocked and well protected, is about 2 miles east-southeastward of Esquimalt Harbor, and can accommodate the largest vessels.

A United States Immigration station is in Victoria.

Victoria Harbor is entered between **Macaulay (Sailor) Point** on the west, and the breakwater extending from **Ogden Point** on the east. The harbor extends for more than 0.5 mile northward to **Shoal Point** on the eastern side, and thence trends eastward to **James Bay.** From the northern extremity of James Bay, the upper harbor which is crossed by three bridges, extends about 0.8 mile north-northwestward to **Selkirk Water,** the western extremity of which is connected to **Portage Inlet.** Between Macauley Point and the breakwater the depths are 35 to 80 feet, decreasing northward, and off Shoal Point they are 18 to 22 feet. In James Bay and between Shoal Point and the upper harbor the depths vary from 18 to 27 feet; in the southern part of the upper harbor, the depths are 15 to 21 feet, and in the northern part, they are from 10 to 13 feet. In Selkirk Water the depths in the channel are from 6 to 10 feet.

Brotchie Ledge, the only outlying danger, about 200 yards in extent within the 5-fathom curve, is about 900 yards southwestward of **Holland Point** which is on the eastern side about 750 yards southeastward of Ogden Point; the ledge has a least depth of 12 feet. Brotchie Ledge Light is shown from a black conical base with a black square framework top. The light is 22 feet above the water and visible 9 miles. This light must not be depended on. A fog signal is sounded on a bell.

Ogden Point Breakwater Light, on the outer end of the Breakwater, is shown from a white pyramidal concrete tower. The light is 40 feet above the water and visible 11 miles. The fog signal is sounded on an air diaphone.

Clover Point, about 2 miles southeastward of the entrance to Victoria Harbor, is low, bare of trees, and steep-to. Strong tide rips which are formed off the point are dangerous to boats.

Trial Islands, about 4 miles eastward of Victoria Harbor, are bare and rocky; from most directions the two island appear as one. The southern and larger island is 80 feet high, and from **Ripple Point,** its southern extremity, a rocky ledge which uncovers 2 feet at low water extends about 100 yards. The northern island is 25 feet high and from it foul ground extends halfway toward **Bold Point** and about 400 yards toward the middle of **McNeil Bay.** Severe tide rips are formed off Ripple Point, especially on the flood tidal current, which attains a velocity of 3 to 6 knots during large tides. The point should be given a wide berth.

Trial Islands Light, near the southern extremity of the islands, is shown from a white square wooden dwelling having a red roof, surmounted by a red cylindrical lantern. The light is 85 feet above the water and visible 15 miles.

Discovery Island, about 2 miles northward of **Gonzales Point,** lies at the junction of Haro Strait and the Strait of Juan de Fuca. The island is wooded, and near its southeastern extremity **Pandora Hill,** attains a height of about 125 feet. On all sides of the island the shores are fringed with rocks in some places extending as far as 600 yards offshore. The eastern end of the island is fringed with rocks, the outermost of which uncovers 9 feet at low water and lies about 350 yards north-northeastward of **Seabird Point,** the eastern extremity of the island.

Discovery Island Light is shown from a white square wooden tower with a dwelling attached on the eastern extremity of the island. The light is 91 feet above the water and visible 15 miles. The light is obscured from 054° to 161°. The fog

signal is an air diaphone sounded from a white square wooden structure close eastward of the lighthouse.

A bank with depth of 15 to 20 fathoms extends about 1.5 miles in a northeasterly direction and its shoalest part is about 7.8 miles southward of Discovery Island.

Hein Bank, with a least depth of 2¼ fathoms, lies about 8 miles 283° from Smith Island Light; it is about 2 miles long in a northerly direction, within the 10-fathom curve, and 0.8 mile wide. The shoalest part of the bank is covered with thick kelp in summer. On the north, east, and western sides of the bank the water deepens quickly; at its southern end the bank is continued for over 2 miles within the 20-fathom curve with a width of 1 mile. It is marked by a lighted bell buoy moored close northward of the shoalest part of the bank.

Caution.—A Naval operations area for target practice is established in the vicinity of Hein Bank. For regulations regarding this area see Chapter 2, § 204.221.

Smith Island is 5 miles westward of Whidbey Island and 6.5 miles north-northwestward of Point Partridge. It is irregular in shape and about 0.5 mile in extent. The eastern end is low, but rises abruptly to an elevation of 55 feet at its western end, terminating in a white perpendicular cliff composed of sand and gravel. The light is near the western extremity of the island.

Smith Island Light is shown from a white conical tower on dwelling. It is 96 feet above water and visible 16 miles. A radiobeacon is at the light.

Minor Island, marked by a light, small, low, and rocky, lies 1 mile northeastward of Smith Island, and at lowest tide is connected with it by a gravel and boulder spit. An echo board is also maintained here. A field of kelp extends about 1.5 miles westward of Smith Island, with a width of 1 mile and depths of 4½ to 5 fathoms. A sunken rock, bare at lowest tides, is reported 0.3 mile 261° from the light.

Minor Island Light, 16 feet above the water, is shown from a white cylindrical house with a black band at the top on a white square house. A fog signal is sounded on an air horn at the light.

Whidbey Island, northward of Admiralty Head, forms the eastern side of the Strait of Juan de Fuca. This part of the island has uniformly sandy shore backed by low and rolling upland, about evenly divided between farm and cut-over timber land.

Restricted area.—An area off the westerly shore of Whidbey Island is designated as a Naval restricted area. For regulations regarding this area see Chapter 2, § 207.750.

Chart 6265.—Strait of Juan de Fuca, Southern Shore.—Cape Flattery, the southern point at the entrance, has been described in Chapter 15.

From Cape Flattery the coast trends east-northeastward for 4 miles to **Koitlah Point,** the western point at the entrance of Neah Bay. The shores are rugged and the country is heavily timbered.

Chart 6266.—Neah Bay, about 5 miles eastward of Cape Flattery, is used extensively by vessels as a harbor of refuge, when the weather is too severe to venture outside. Its proximity to the entrance to the strait and ease of access at all

times makes this anchorage very valuable. A rubblestone breakwater approximately 8,000 feet long extends from the western side of the bay to about the middle of Waada Island. Anchorage is in depths varying from 4 to 6 fathoms, sandy bottom. **Waada Island,** about 0.5 mile long by 250 yards in width, forms the northeastern side of the bay; it is 0.3 mile northward of Baada Point and is high and wooded, with a reef and foul ground extending 0.2 mile from its southwestern side. A wharf is on the southwestern side of the island just southward of the foul ground.

Waada Island Light is shown from a concrete tower on the northern end of the island. The light is 63 feet above water and visible 13 miles. A red sector from 098° to 107° covers Duntze and Duncan Rocks. A fog signal is sounded on an air-diaphragm horn.

The western shore of Neah Bay is high, precipitous, and bordered by craggy outcropping rocks. A reef, bare at low tide and marked by kelp, extends in places a distance of 0.2 mile from the beach. From the town, the character of the shore changes to a low, sand beach, which continues to Baada Point.

Between Waada Island and the mainland southeastward is the entrance channel, having a depth of 20 feet over a width of 400 feet in February 1948. **Neah Bay Light,** on the southeastern end of Waada Island, marks this channel. The light is 46 feet above water and visible 8 miles; it is obscured from 114° to 196°. The fog signal is sounded on an air horn.

Baada Point, the southeastern entrance point of this channel, is rocky and grass-covered for some distance back from the shores. The buildings of the Coast Guard station, 0.4 mile southwestward of the point, are the prominent features on the point. A T-head pier, 470 feet long, is 500 feet eastward of the Coast Guard launching ways. A group of small white houses are between the pier and the point.

Storm warnings are displayed day and night at the Coast Guard station.

A reef, bare at low tide, extends 500 yards northwestward from **Dtokoah Point,** the point 500 yards eastward of Baada Point. The end of the reef is marked by a buoy.

Neah Bay, in the southwestern part of the bay, is a large Indian village with a post office and daily mail service. Fishing and logging are the principal industries. Logs are trucked to a boom on the breakwater, 900 yards from the western end, where rafts are made up.

Directions.—To enter Neah Bay, pass 100 yards north of the lighted bell buoy, then steer 240° to pass 100 yards north of the outermost wharf in the entrance channel until past buoy 2.

Pilots and **towboats** are stationed in Port Angeles.

Customs.—There is a deputy collector of customs at Neah Bay.

Supplies.—Fresh water, Diesel oil, fuel oil, and gasoline can be obtained in limited quantities. Gasoline, Diesel oil, and water are piped to the fish wharves; a limited amount of provisions may be obtained.

A cooperative fish wharf, built out to 18 feet from the middle of the south shore of the bay, has facilities for icing and supplying fishing boats. About 400 yards westward is another fish wharf extending out to 18 feet. A third wharf, in the southwest part of the bay, has about 8 feet at its outer end.

Communication.—Telephone service may be had to both Port Angeles and Tatoosh Island via the Coast Guard lines. There is daily bus service to Port Angeles.

Dtokoah Point and **Klachopis Point** are 0.3 and 0.6 mile respectively eastward of Baada Point. Two bights, **First Beach** and **Second Beach,** separate the three points.

Chart 6300.—From Neah Bay to Clallam Bay, the coast trends eastward for about 14 miles. The shores are rugged and the country is high and heavily wooded.

Seal Rock and **Sail Rock,** 660 and 560 yards offshore, respectively, lie about 2 miles eastward from Neah Bay Light. Seal Rock, the western one, is 100 feet high, and has a flat top, sloping eastward; it is light in color. Sail Rock is 0.2 mile eastward of Seal Rock; it is lower and more pointed than Seal Rock. Both are prominent landmarks. A line of sunken rocks extends from Seal Rock to the point 1.2 miles 130° from it. There are patches of kelp between Seal Rock and the shore and along the line of sunken rocks.

The wreck of the steamer *Andalucia,* beached with a fire aboard in November 1949, is just off Seal Rock and Sail Rock. The wreck is now in two parts, with a mast and some superstructure showing on each part. Kelp and some rocks extend over 400 yards off a point 5 miles eastward from Seal Rock.

Sail River empties near Seal and Sail Rocks. **Sekiu River,** about 6.5 miles eastward, has some logging operations. The railroad trestle over Sekin River shows prominently through the trees.

Hoko River enters the strait at **Kydaka Point** about 11 miles eastward of Waada Island Light.

Clallam Bay, about 15 miles eastward of Neah Bay, is a broad and open bight about 2 miles long and 1 mile wide. It affords anchorage in 9 to 10 fathoms, sandy bottom, and is used to some extent in southerly or thick weather.

Slip Point, the eastern point of the bight, is high and wooded; there is a light-colored streak like a landslip down its face, which is visible for a long distance. A reef extends about 0.2 mile westward of the point. A bell buoy is moored off the end of the reef.

Slip Point Light is shown from a white square tower with a dwelling attached on a narrow shelf at the western extremity of the point. It is 48 feet above the water and visible 12 miles. A fog signal is sounded on an air diaphone.

Sekiu is a town on the western end of Clallam Bay and southward of Sekiu Point. There is telephone, truck, and bus service with Port Angeles and Neah Bay. The logging company's tugs, tankers, and steamers call occasionally; there is no regular freight service by water. The logging wharf has a depth of 15 feet. Log rafts are made up here for shipment.

Clallam Bay is a small town on the eastern side of Clallam Bay. Pleasure boats are launched from the beach by means of an overhead cable extending out past the breaker line. A limited amount of general merchandise may be had here.

No directions are necessary for entering other than to give Slip Point a berth of not less than 0.2 mile to avoid the reef projecting westward of it, which is marked by a bell buoy. Storm-bound vessels generally anchor abreast the rocky

point near the middle of the long semicircular beach on the southern shore of Clallam Bay.

From Slip Point the coast trends eastward for 6.5 miles to Pillar Point and then east-northeastward for 15.5 miles to Crescent Bay.

Pillar Point is a bold point 700 feet high, wooded to the summit, and with a dark pillar-shaped rock over 100 feet high, lying close under its eastern face. The rock shows prominently from westward.

Pysht River discharges into a small bight a mile southward of Pillar Point. The water shoals rather suddenly off the mouth of the river, but good anchorage may be had in 9 to 12 fathoms, sticky bottom, about 0.8 mile southeastward of Pillar Point. This anchorage offers good shelter from the heavy westerly swell, but has no shelter from the brisk easterly and northeasterly winds which prevail in the winter.

Pysht, near the mouth of the Pysht River, is a village with a post office, and has telephone and bus connections. Log rafts are made up for shipment to sound ports.

Chart 6382.—Twin Rivers, about 7 miles eastward of Pillar Point, is a small cove protected by shoal spits on either side of it, upon which the sea breaks in rough weather. This cove is about 600 feet wide and indents the shore about the same distance. Both spits are heavily covered with kelp, especially the eastern one. There are depths of 4 fathoms abreast the ends of the spits, and 2 fathoms can be carried close to shore. The cove is an excellent landing place, but offers little protection as an anchorage. Entry can be made between the spits by heading midway between the rivers which are easily identified, on bearing 180°.

Twin is a small settlement. There are motor bus and rail connections with Port Angeles.

Gettysburg, a hamlet at the mouth of **Lyre River,** is 11.5 miles eastward of Pillar Point. Shoal water makes out a considerable distance from **Low Point,** the eastern entrance point of Lyre River, and vessels should not approach this point closer than 0.8 miles. There are many boulders, bare at low tide, westward of the point.

Agate Bay, about 3.5 miles eastward of Gettysburg, is clear and deep; 10 fathoms can be carried to within 0.2 mile of the shore.

Crescent Bay, 15 miles eastward of Pillar Point, is a small semicircular bight 1 mile in diameter. The eastern part is shoal and near the western shore the remains of a wharf should be avoided. This is not a good landing place in northerly weather. The anchorage is of limited extent and suitable only for small vessels. The town of **Port Crescent** has been abandoned, and all buildings and the wharf, which extended from the western shore, have been destroyed by fire.

The wreck of the *Diamond Knot* is at the entrance to Crescent Bay in latitude 48°10′.3 N., longitude 123°42′.2 W. A 12-foot log, 2 feet in diameter, has been secured to the wreck by the salvage company.

Crescent Rock, with a least depth of ¼ fathom, is 0.4 mile northward of the western entrance point of Crescent Bay. It extends 0.4 mile in an easterly direction, with a narrow channel between it and the point. The channel, with a reported depth of 10 fathoms, is used by the small coasting steamers with local knowledge,

but is not recommended for those without local knowledge. The rock is marked by a lighted bell buoy, moored about 50 yards northward of the shoalest part. A reef extends about 400 yards northwestward from **Tongue Point,** the eastern entrance point of Crescent Bay. A shoal, with a least depth of 1¼ fathoms, lies about 0.3 mile westward of Tongue Point.

Observatory Point is about 3 miles eastward of Tongue Point. Between them is a wooded ridge which, because of the lower land behind it, appears as an island when raised from eastward or westward. The ridge attains an elevation of 1,135 feet. On its north face is a conspicuous landslide and the hill is known as **Striped Peak.** A rock, 20 feet high and having a single tree on its summit, lies close off Observatory Point; the rock and the point are almost joined at low water.

Freshwater Bay, about 5 miles eastward of Crescent Bay, is a broad, open bight, affording anchorage in 6 to 10 fathoms. It is little used, on account of the lack of shelter and its proximity to Port Angeles. There is an old log dump in about the center of the bay, and at the mouth of **Covill Creek.** Shingles are shipped at times by rail or truck from the bay.

Emergency explosives anchorage.—Freshwater Bay and adjacent waters are designated as an emergency explosives anchorage. For regulations regarding this anchorage see Chapter 2, § 202.230.

Angeles Point, on the eastern side of Freshwater Bay, is low, sandy, and covered with alders. The **Elwha River** empties into the strait at this point. Small boats can enter the mouth under favorable conditions.

Chart 6303.—Port Angeles is about 6.5 miles eastward of Freshwater Bay and 56 miles from Cape Flattery; the entrance is about 11 miles southeastward of Race Rocks Light and is included between **Ediz Hook,** a low, narrow and bare sandspit, 3 miles long, and the main shore to the southward. The harbor is about 2.5 miles long with a width of 1.2 miles at the entrance, decreasing to half that width at the head. The harbor is easy of access by the largest vessels and is frequently used by them when weather-bound, awaiting orders, or a tug.

The harbor is protected from all but easterly winds which occasionally blow during the winter months. During southeasterly gales in winter, the wind is not usually felt but some swells roll into the harbor. The depths are greatest on the northern shore, and decrease from 30 to 15 fathoms in the middle of the harbor; from the middle, the depths decrease regularly to the southern shore, where the 3-fathom curve in some places in the eastern part is nearly 0.2 mile from the beach. A depth of 25 feet is north of the southeasternmost dock. The best anchorage is off the wharves, in 7 to 12 fathoms, sticky bottom.

Ediz Hook Light, 85 feet above the water and visible 15 miles, is shown from the top of the Port Angeles Air Station control tower, about 660 yards westward of the eastern extremity of Ediz Hook. The fog signal, sounded on an air-diaphragm horn sounding simultaneously, and a radiobeacon of low power synchronized for distance finding, are located near the eastern extremity of the point.

Port Angeles is on the southern shore, and is a port of entry; a deputy collector is stationed here. Lumber, logs, pulpwood, and plywood constitute the greater part of the traffic, although considerable oil is brought in by tankers. There are three wharves for general cargo, one for loading gravel, and one for fuel. The port

of Port Angeles maintains a wharf, 147 by 552 feet, with a depth of 34 feet alongside, equipped with transit sheds and modern loading facilities. There is a large crane on the wharf which is used occasionally to lift out small fishing craft of 10 to 12 tons, for repairs. The sawmills and forest products companies have their own exporting wharves with depths ranging from 24 to 34 feet.

A Federal project provides for deepening to 30 feet of the easterly 150 feet more or less of the shoal between deep water in Port Angeles Harbor and the pierhead line in vicinity of the plant of Rayonier, Inc. No work has been done on this project.

Shoal.—A least depth of 4 fathoms is 233 yards 350° from the northwestern corner of the wharf projecting from the southern shore of the port, eastward of the town, near **Ennis Creek.** This shoal is marked by a buoy.

Directions.—No directions are necessary. Vessels may round Ediz Hook at a distance of over 200 yards and proceed to the wharves or select anchorages as desired.

Storm warning displays, day and night signals, are shown from a steel tower on Laurel Street, and are plainly visible to vessels in the harbor and strait.

Pilots.—Pilots for Puget Sound and Alaska may be had at Port Angeles. The Pilot Station is 1,200 yards westward from Ediz Hook Light. A dock for moorage of the pilot boat is on the south side of Ediz Hook, adjacent to the pilot station.

Vessels desiring a pilot should proceed to a point approximately 1,000 yards east of Ediz Hook, where a pilot will come aboard. In clear weather vessels should indicate their desire for a pilot by hoisting the International Code Flag **G,** and by blowing one long blast, one short blast, and one long blast on the whistle. In fog or thick weather the whistle signal will attract the attention of the pilot station, and the pilot boat will answer with a like signal to indicate that the pilot is en route to the vessel.

Vessels may insure prompt dispatch of a pilot by notifying Ediz Hook their estimated time of arrival 24 hours in advance, supplementing same with amended arrival time, if necessary, via radio to Puget Sound Pilots, Seattle, Washington; code word PILOTS.

Towboats.—Small towboats are always available, and others can be obtained on short notice.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded by quarantine officers for inspection. Vessels from foreign ports which expect to enter both Canadian and United States ports may receive their inspection either at William Head, Canada, or at a United States port, no further inspection being required.

Marine hospital.—The Public Health Service maintains a medical relief station and contract hospital at Port Angeles. The Public Health Service Office is in the First National Bank Building.

Immigration.—Port Angeles is a port of entry for aliens.

The offices of the **Customs, Immigration,** and **Coast Guard Communications Office** are in the Federal Building at First and Oak Streets.

A **chart agency** of the U. S. Coast and Geodetic Survey is here.

The Port of Angeles Commission Office is at the Port Docks.

Harbor regulations.—Complete copies of the harbor regulations may be obtained from the harbor master of the city of Port Angeles.

Supplies.—Water, provisions, and ship chandler's stores may be obtained; coal is not kept on hand, but can be arranged for. A limited amount of fuel oil may be had from the local mills which have supplies for their own use. Gasoline, Diesel oil, and lubricating oils for motor ships and small boats may be obtained at the oil wharf.

Repairs.—There are no drydocks at Port Angeles, but it has two or three small marine railways suitable for ordinary fishing craft. Minor repairs to hulls and machinery may be made at several machine shops and iron works in the city.

Communication may be had by rail with Port Townsend and with Puget Sound and British Columbia ports by regular steamer and telegraph. There are bus and airplane services to Seattle, and an automobile ferry to Victoria, British Columbia. A submarine cable crosses the Strait of Juan de Fuca from Port Angeles to Victoria. It is landed about 1 mile westward of Ediz Hook Light and vessels should not anchor near this cable.

Yacht harbor.—There is a harbor for small boats just westward of the port of Port Angeles wharf. Protection is afforded by a pile jetty 530 feet long.

Chart 6382.—From Port Angeles the coast trends eastward for 5 miles to **Green Point,** and thence northeastward for 8 miles to the end of **Dungeness Spit.**

Dungeness Bay is about 12 miles eastward of Port Angeles. It affords shelter in westerly winds, but is open eastward, and in northerly weather the protection afforded is only fair. It is a dangerous place in winter gales, especially from the southeast. The bay is formed by a sandspit extending northeastward 4 miles, and forming, in addition to Dungeness Bay, a small lagoon at the head of the harbor, which can be entered by light-draft vessels with local knowledge.

New Dungeness Light is shown from a conical tower on a dwelling, upper part black, lower part white; near the end of the spit. The light is 67 feet above the water and visible 14 miles. A fog signal is sounded on an air siren. A radiobeacon synchronized for distance finding, is maintained at the light.

Storm warnings are displayed day and night at the light station.

From the end of the spit a shoal extends northeastward for 0.8 mile from the light. This has been reported as extending farther northward and it should be passed with caution. A buoy marks the shoal; vessels should not pass between the buoy and the light. From the southern side of the bay a shoal makes out about a mile, and in the vicinity of the wharf ruins this shore is bordered by mud flats.

The best anchorage is in 5 to 9 fathoms, sticky bottom, about one mile southward of the light. A submarine power cable extends from Dungeness to New Dungeness Light station. It is marked by cable crossing signs; vessels should not anchor between these signs.

Dungeness is a small town on the southern shore of the bay. Farm produce is the principal shipment. The ruins of a former wharf extend 4,000 feet out across the flats. Communication with Puget Sound ports is by bus.

No directions are considered necessary further than to caution vessels not to pass between the light and the buoy marking the extremity of the shoal making off from the spit.

Chart 6403.—Sequim Bay (Washington Harbor), is a landlocked bay, 3.8 miles long and 1 mile wide. From the eastern entrance point a sandspit extends westward almost to the western shore and terminates in **Kiapot Point,** leaving only a narrow, winding channel, through which 11 feet can be taken at low water with local knowledge. Northward of this point a shoal extends about 800 yards eastward from the western shore, and, southward of the point, a bar extends across the fairway. Once inside, there is good anchorage anywhere in 6 to 20 fathoms, muddy bottom. The harbor is but little used and can be approached only by those with local knowledge. A cannery with conspicuous white buildings is on the western side of the entrance to the harbor, abreast the sandspit. A wharf with incline leading to a clam shipping plant is on the east side of the bay. Some log rafts are made up in the bay. **Sequim Bay State Park** is at the southwestern end of the bay.

Blyn, of little commercial importance, is in the southeastern part of the bay.

To enter Sequim Bay proceed close in along the sandspit about 100 yards or less from shore. When rounding Kiapot Point, pass to the western side of the channel and continue southward close to shore (not over 100 yards off) until past a rather prominent whitewashed rock, maintained locally as an aid. Then steer **150°,** clearing **Pitship Point** by 500 to 600 yards, into deep water. The least depth in this channel is 11 to 12 feet.

Protection Island is a prominent feature in approaching Port Discovery. The island, 200 feet high near its western extremity, is 1.5 miles long and 0.5 mile wide; it is sparsely wooded and the northern shore consists of bare, light bluffs. The eastern end and southern shore are clear of dangers, but off **Kanem Point,** its southwestern extremity, a shoal extends southwestward for over 0.2 mile, and depths of 5 fathoms and less are found 0.5 mile westward of the point. This shoal is marked by a buoy about 0.8 mile west-southwestward of Kanem Point. **Dallas Bank** extends northward from Protection Island; the 10-fathom curve lies about 2.5 miles from the northern point. Northward of the 10-fathom curve the bank drops off abruptly to depths of over 20 fathoms.

Port Discovery, where George Vancouver the English explorer, anchored and refitted his ships and from whence he commenced his exploration of these regions in 1792, is about 2 miles south-southeastward of Protection Island. The bay trends in a southeasterly direction for about 8 miles and has an average width of 1.2 miles. The entrance is masked from seaward by Protection Island, which also protects it from northwesterly winds. There are no outlying dangers, and the depths in mid-channel range from 30 fathoms at the entrance, to 10 and 12 fathoms, 1.5 miles from the head; good anchorage may be had in 8 to 10 fathoms, muddy bottom. The flats rise abruptly from depths of 3 and 4 fathoms, and at high water care should be taken to avoid anchoring too close to them. This harbor is but little used as it is out of the usual lines of travel.

A submarine cable crosses the inlet at **Carr Point** on the western shore about 3.2 miles southeastward of Diamond Point.

Diamond Point (Clallam Point) the western point at the entrance to Port Discovery, is the site of the former national quarantine station. The station is now in private ownership; the building remains but the wharf is in ruins.

Gardiner is 2 miles southward of the former national quarantine station. The

rafting of logs and the operation of two small sawmills at the head of the bay comprise the present commercial activities at Port Discovery.

No directions are considered necessary for entering and a mid-channel course is clear to the anchorage. Entrance may be made either eastward or westward of Protection Island.

The shore from **Cape George,** the eastern entrance point of Port Discovery, to Middle Point, a distance of about 3 miles, consists of high, bare, clay bluffs, sparsely wooded on top, attaining a height of 400 feet near **Middle Point.**

A shoal with 2 fathoms over it lies 0.6 mile northwestward of Middle Point; it is marked by a buoy. A sunken rock has been found southward and eastward of the shoal and vessels are cautioned not to pass between the buoy and the point.

Chart 6450.—From Middle Point the shore trends northeastward for 3.5 miles to Point Wilson, the western point at the entrance to Admiralty Inlet, and consists of high, bare, clay bluffs, sparsely wooded on top, decreasing in height near Middle Point, and ending abruptly close westward of Point Wilson.

Point Wilson is a low point and is marked by a light. Point Wilson Light, shown from a white octagonal tower on fog signal building, is on the eastern extremity of the point. The light is 51 feet above water and visible 13 miles. The fog signal is sounded on a chime-diaphragm horn. The former siren was reported to be difficult to hear from certain directions. The radiobeacon is synchronized for distance finding.

Shoals extend 0.5 mile northwestward of Point Wilson to the 5-fathom curve, over irregular bottom; these are generally indicated by kelp. The eastern edge of the shoals rises rather abruptly from deep water. Heavy tide rips extend northward of these shoals, being especially heavy with a westerly wind and ebb current. A buoy is moored northward of these shoals about 0.7 mile northwestward of Point Wilson Light. The area in the vicinity of the buoy was examined by the wire drag in 1925 and no obstructions other than charted were found.

In approaching Point Wilson in thick or foggy weather, especially if the fog signal is not heard, vessels should obtain soundings constantly.

Admiralty Inlet is described in Chapter 17.

The western shore of Whidbey Island, between Admiralty Head and Point Partridge, is mostly a sandy beach rising sharply to bluffs 100 to 250 feet high, backed by pine trees. The shoreline is generally heavily strewn with logs.

Restricted area.—An area off the westerly shore of Whidbey Island is designated as a Naval restricted area. For regulations regarding this area see Chapter 2, § 207.750.

Admiralty Head, 80 feet high, on Whidbey Island, the eastern entrance point of Admiralty Inlet, is the southeastern extremity of a succession of light bare bluffs which extend well northward of Point Partridge, where they attain their highest elevation. About 0.5 mile northward of Admiralty Head an abandoned tower 39 feet high stands on top of a bluff.

Point Partridge, the westernmost point of Whidbey Island, has a yellow face and is prominent from the northward or southward; being rounding, is not easily identified from the westward. Point Partridge Light, unwatched, is shown from a white house on piles off the extremity of the point. The light is 30 feet above wa-

ter and visible 11 miles. A fog signal is sounded on an air-diaphragm horn.

A rocky ledge extends 0.5 mile westward from the point and in summer is usually marked by kelp.

From Point Partridge the northwestern coast of Whidbey Island extends north-northeastward 11.5 miles to Deception Pass. It is free of off-lying dangers, but should not be approached within about 0.8 mile.

Eastern Bank lies about 4.5 miles west-southwestward of Smith Island. The general depths on the bank are from 11 to 19 fathoms, with two spots having a least depth of 10 fathoms, sand and gravel bottom.

Partridge Bank, within the 10-fathom curve, is about 3 miles long, 1.5 miles wide, and the southeastern extremity reached within 2 miles of Point Partridge. The northern and eastern sides fall off abruptly to 20 and 30 fathoms. The shoalest part has a depth of 2¼ fathoms and lies near the northern side about midway between the southeastern and northwestern ends of the bank; it is marked close northward by a buoy. A lighted bell buoy is moored about 0.6 mile south-southeastward of the 2¼-fathom spot. Depths of 4 and 5 fathoms extend 1 mile west-northwestward of the 2¼-fathom patch. A considerable part of the bank is covered with kelp which is usually drawn under by currents. The kelp generally extends to the 7-fathom curve, except toward the eastern end where the shoal narrows, and no kelp exists beyond a depth of 4 fathoms.

Chart 6380.—The waters of **San Juan Archipelago** embrace the passages and bays northward of the eastern end of the Strait of Juan de Fuca. These passages are used extensively by vessels bound for British Columbia and Alaska ports and by local steamers.

The directions which follow are intended for use only in clear weather; in thick weather or at night strangers should take a pilot. Sailing vessels should not attempt the passages against the current unless the wind is fair and fresh. The tidal currents have great velocity in places causing heavy tide rips that are dangerous for boats. Owing to the variable direction and velocity of the currents compass courses are of little value, and where followed, allowance must be made for the set of the currents.

Haro Strait, the westernmost of the three main channels leading from the eastern end of the Strait of Juan de Fuca to the southeastern end of Georgia Strait, is the one most generally used. Vessels bound from the westward to ports in Alaska or British Columbia should use Haro Strait, as it is the widest and best provided with aids to navigation. Vessels bound northward from Puget Sound may use Haro Strait, San Juan Channel, or Rosario Strait.

From between Discovery Island and the southern part of San Juan Island, Haro Strait extends northward for about 16 miles to Turn Point Light on the western end of Stuart Island, and then bends sharply northeastward for 11 miles to its junction with Georgia Strait, between East Point, the eastern end of Saturna Island, Canada, and Patos Island, both of which are marked by lights. The width varies from 2 to 6 miles, and the depths are generally great.

No difficulty will be experienced in navigating the strait in clear weather; in thick weather strangers should have a pilot.

The eastern shore of the strait will be described in detail, followed by a more general description of the western shore. For a more complete detail of the western shore see *Sailing Directions for British Columbia, Volume I,* published by the United States Hydrographic Office.

Caution.—The International Boundary between the United States and Canada passes through Haro Strait. The position of the boundary is shown on the charts by a dotted line. The International Pilot Rules are used in Canadian waters and in Georgia Strait; the Inland Pilot Rules are in effect in United States waters south of Georgia Strait.

Tidal currents.—In Haro Strait the flood current sets northward through the strait, and the ebb in the opposite direction. On the average the ebb runs longer and has a greater velocity than the flood. At its northern entrance the flood sets eastward on both sides of Sucia Islands and eastward across Alden Bank. The velocity of the current in the strait is 2 to 5 knots at strength. Off Turn Point the ebb may attain a velocity of 6 knots during large tides. The current has moderate velocity between Sucia Islands and Orcas Island. There is a large daily inequality in the current and for times and velocities the *Current Tables, Pacific Coast* should be consulted. These tables contain full daily current predictions for a location off Turn Point. Heavy tide rips occur on Middle Bank and northward of it and around Discovery Island. Tide rips also occur between Henry Island and Turn Point on the ebb and around Turn Point. Heavy dangerous tide rips occur between East Point and Patos Island and for 2 miles northward in Georgia Strait. The flood current sets eastward from Discovery Island across the southern end of Haro Strait until close to San Juan Island. This eastward set is especially noticeable during the first half of the flood.

Middle Bank, which is rocky and has a least depth of 11 fathoms, lies in the southern approach to Haro Strait. The bank is about 3.5 miles in extent and the least depth is near the northeastern extremity of the bank and about 5.5 miles eastward of Discovery Island Light. In the vicinity of this bank heavy tide rips, which are dangerous to boats and small craft, are formed in bad weather.

Two small banks with depths of 7 and 8 fathoms lie, respectively, about 3.2 miles 031° and 2.5 miles 045° from Discovery Island Light. In bad weather heavy tide rips are formed over both of these banks. A small detached bank with a depth of 13 fathoms is 4 miles 071° from Discovery Island Light.

San Juan Island, the largest of the group, is about 13 miles long, with a greatest width of 6 miles. The island is rugged and partly wooded. **Mount Dallas,** the highest of several hills on the island, rises abruptly from the middle of the western side to a height of 1,036 feet. In most places the shores are free of outlying dangers. The northern end of the island is indented by several small bays which, with the exception of Roche Harbor, are shoal and of no commercial importance.

From **Eagle Point,** the western shore of San Juan Island trends northwestward and forms the eastern side of the southern part of Haro Strait. This shore is steep-to and rocky, and beyond 400 yards offshore it is free of danger; however, the depths off this shore are too great for anchoring.

False Bay, 5 miles westward of Cattle Point, the southeastern extremity of the island, dries at low water and has a line of rocks across its entrance.

Kanaka Bay, a small cove much used by fishing boats, is between False Bay and **Pile Point.**

Lime Kiln Light is shown from a white octagonal tower attached to a fog-signal building; two dwellings are about 150 yards southeastward. The light is 55 feet above water and visible 13 miles. The fog signal is sounded on twin-diaphragm air horns.

Rocks awash at mean lower low water lie close inshore about 1 mile 148° from the light.

Andrews Bay is a small indentation about 2 miles northward of Lime Kiln Light. A submarine cable crosses Haro Strait from Andrews Bay to Telegraph Cove, Vancouver Island.

Chart 6381.—Hanbury Point is about 1.8 miles northward of Andrews Bay. It is the northern entrance point of **Mitchell Bay,** in which the charted depths are less than 2 fathoms.

Mosquito Pass, which is available only to vessels of light draft and with local knowledge, is entered westward of Hanbury Point. About 0.7 mile northward of Hanbury Point a channel leads northeastward of Mosquito Pass to **Westcott Bay,** in the southern part of which is **Garrison Bay.** These bays are available only to small craft with local knowledge.

Henry Island is close westward of the northern point of San Juan Island, from which it is separated by Mosquito Pass and Roche Harbor.

Kellett Bluff, at the southern end of Henry Island, is steep and rocky and prominent from either southward or northward. A light, 80 feet above water and visible 9 miles, is shown from a small white building on the western side of Kellett Bluff.

Roche Harbor has its main entrance on the eastern side of the northern end of Henry Island, between it and **Pearl Island.** The harbor, which is landlocked, is about 0.5 mile in extent and has depths of 5 to 8 fathoms. It affords good anchorage and in the summer season is used extensively by yachts. Regular communication by launches and highways is maintained with neighboring ports; there are telephone connections. Gasoline and a small amount of provisions may be obtained. Water can be had at the wharves. The depths at the outer end of the main wharf is 13 feet. Lime, the principal product, is shipped out on barges. Minor repairs to small craft can be made.

Battleship Island, small, 30 feet high, with several trees on it, is about 0.2 mile west-northwestward of **McCracken Point,** the northern extremity of Henry Island, and is the western point in the approaches to Roche Harbor.

Danger Shoal, with a least depth of 1 fathom, is in the fairway to Spieden Channel about midway between Battleship Island and Spieden Bluff. A lighted obstruction bell buoy is moored close southwestward of the shoal which is marked by kelp at slack water.

A rock, marked by kelp with 2 fathoms over it, is about 200 yards northwestward of **Barren Island;** it is marked by a buoy moored close northwestward of the rock. Another rock, marked by kelp with 1 fathom over it, is about 350 yards eastward of the one marked by the buoy.

949285—52——25

The main entrance to Roche Harbor is between the northeastern extremity of Henry Island and the western extremity of Pearl Island, about 400 yards southeastward. From either entrance point spits with depths of 16 to 17 feet extend into this entrance channel, which, therefore, should not be attempted by vessels of deep draft.

Directions.—To enter Roche Harbor from westward, pass 0.2 to 0.5 mile northward of Battleship Island on a 115° course until the middle of the entrance bears **199°**. Stand in on this bearing, keeping the entrance points of **Nelson Bay,** at the head of the harbor just open, so as to see across the low neck of land at its head. Steer nothing eastward of mid-channel in rounding the southwestern point of Pearl Island. Anchor in 5 to 7 fathoms, soft bottom.

From eastward, steer so as to pass 250 yards northward of Roche Harbor buoy, marking the 2-fathom rock northward of Barren Island; and, when up with this buoy, head for Battleship Island until the middle of the entrance bears 199° and thence proceed as directed in the preceding paragraph.

Spieden Channel leads eastward between Spieden Island on the north and Battleship, Henry, and San Juan Islands on the south; the channel leads from Haro Strait to President Channel and San Juan Channel. The eastern entrance, the narrowest part, is 0.6 mile wide, and for 2 miles westward of it the channel is free of danger. However, in the western entrance which has an irregular bottom are several dangers, but the fairway is deep throughout. The meeting of the flood currents, which flow eastward from Haro Strait and westward from San Juan Channel, causes heavy tide rips and eddies. This channel is not recommended for sailing vessels.

Spieden Island lies with **Spieden Bluff,** its northwestern extremity, about 1.5 miles north-northeastward of Battleship Island. The island is 2.5 miles long in an easterly direction with an extreme width of 0.5 mile. The eastern end is low and grassy; there are a few trees on the southern side of the island but the northern face is well wooded.

Sentinel Island, steep, wooded, and of small extent, lies about 300 yards off the southern shore of Spieden Island and near its western end. **Sentinel Rock,** low and bare, is about 400 yards westward of Sentinel Island; a sunken rock marked by kelp with ½ fathom over it is about midway between them. **Center Reef,** marked by kelp and bare at low water, is nearly 0.4 mile 210° from Sentinel Rock.

Chart 6380.—Stuart Island, westward of Spieden Island, is wooded and has two rather prominent hills 640 feet high, near the middle of it. **Turn Point** is the western extremity which is bold and steep-to.

Turn Point Light, on a white concrete tower, is 44 feet above the water and visible 12 miles, the light is obscured from 260½° to 357°. A fog signal is sounded on an air-diaphragm horn.

Reid Harbor indents the southeastern shore of Stuart Island and trends northwestward about 1.5 miles. The harbor, which is landlocked and 400 yards wide, affords good anchorage in depths of 4 to 4½ fathoms, soft bottom. The harbor is free of danger, but from the eastern entrance point foul ground is charted as extending about halfway across the entrance. Enter in mid-channel and anchor anywhere in the middle of the wider portion of the harbor.

Prevost Harbor, on the northern shore about 1.5 miles eastward of Turn Point, affords good shelter and anchorage. The village of **Prevost,** with 7 feet at the wharf, is on the western shore; it has a post office and a mail boat operates between the village and Anacortes.

Satellite Island lies between the two entrance points, with reefs and shoals extending off the southeastern extremity. Vessels should not pass eastward of Satellite Island. Enter in mid-channel westward of Satellite Island and anchor in 6 to 7 fathoms, muddy bottom, in the middle of the wider portion just within the entrance, keeping clear of a rock that bares about 8 feet, about 200 yards off the southern shore.

Johns Island is close eastward of Stuart Island and is separated from it by **Johns Pass,** which should not be attempted without local knowledge.

Ripple Island, Cactus Islands, and a number of small islets and rocks lie southward and eastward of the eastern point of Johns Island, and between it and Spieden Island.

Waldron Island, steep and rocky on the eastern side, but flat with sandy beaches on the northern and western sides, is about 6.5 miles eastward of Turn Point. It is irregular in shape, 3 miles in length, with an extreme width of 2 miles. The highest point, 580 feet, is near **Point Disney,** its southern extremity. On the northern and eastern sides of the island there is a high, yellow sand bluff, terminating abruptly in **Point Hammond.**

Cowlitz Bay, which indents the southwestern shore of Waldron Island, is a broad, open bight affording anchorage in fair weather. Shoal water extends about 0.5 mile southward of **Sandy Point,** the western extremity of the island. **Mouatt Reef,** which has a least depth of 1¾ fathoms and is marked by kelp, lies 600 yards offshore and 0.5 mile northward of Point Disney. The village of **Waldron,** with a wharf built out to 7 feet, is on the shore northeastward of Mouatt Reef. Waldron has a post office and a small general store.

San Juan Channel is described later in this chapter.

Bare Island, small, grassy, and bare of trees, is about 0.5 mile northwestward of Point Hammond, and **Skipjack Island,** 120 feet high and wooded, is about 1.2 miles westward. The passages between them should be avoided on account of the velocity of the currents in their vicinity. A small, bare rock lies off the eastern end of Skipjack Island and another, awash, lies about midway between it and Bare Island. A rock with ½ fathom over it lies about 0.5 miles northeastward of Point Hammond; it is usually marked by kelp.

Skipjack Island Light, 55 feet above the water, is shown from a white battery house on the northwestern part of Skipjack Island. The light is obscured from 212° to 075°.

Patos Island is about 4 miles north-northeastward of Point Hammond. The island is about 60 feet high and is wooded except at its western end toward which it gradually decreases in height. Patos Island Light is shown from a white square frame tower on fog-signal house on **Alden Point,** the western extremity of the island. The light is 52 feet above water and visible 13 miles. The fog signal is sounded on an air diaphone. A radiobeacon synchronized for distance finding is at the light.

Sucia Islands, a group consisting of one large and several smaller islands, are southeastward of Patos Island. The large island, 60 to 160 feet high and heavily wooded, is horseshoe-shaped; its western side is a series of steep, wooded cliffs. **Echo Bay** indents the eastern side of the island between **Johnson Point,** the southeastern extremity of the island, and **Ewing Island,** about a mile north-northeastward. In westerly weather small vessels with local knowledge can find good anchorage in depths of 4 to 5 fathoms near the head of the bay. **Fossil Bay,** on the southern side of Sucia Islands, is used as an anchorage by pleasure craft during the summer season.

West Bank, about 1.5 miles southward of Patos Island, is about 1 mile in extent within the 10-fathom curve. The least depth of 1¾ fathoms is 1 mile 261° from the western extremity of the westernmost of the Sucia Islands. Depths of 3½ and 3¾ fathoms lie within 0.5 mile eastward and southeastward of the shoalest spot. The channel between the bank and Sucia Island is not recommended.

Clements Reef, about 0.5 mile northward of Sucia Island, is about 1.2 miles long and 0.3 mile wide. It is marked by a buoy at its northern end. The channel between this reef and Sucia Island should not be attempted without local knowledge.

Boundary Pass, the channel between Patos and Saturna Island, is the widest and at present the most used passage from Haro Strait to Georgia Strait; at times, however, the passage between Patos and Sucia Islands is preferable, especially for vessels from San Juan Channel, or for sailing vessels with a northwesterly wind.

The **tidal currents** are particularly heavy and dangerous between Patos Island and East Point and for 2 miles northward in Georgia Strait.

The passage between Patos Island and Sucia Islands is almost free of tide rips, and the tidal currents set more fairly through it and are less strong and more regular than in Boundary Pass.

Haro Strait, southwestern approach.—The various channels and passages leading between the islands and dangers off the coast from Gonzales Point to **Cadboro Point,** 2.8 miles north-northeastward, constitute the southwestern approach to Haro Strait. These passages and channels should be used only by vessels with local knowledge.

Baynes Channel leads to the southern end of Haro Strait from the northern ends of **Mayor Channel** and **Hecate** and **Plumper Passages.**

Discovery Island has been described previously.

Chatham Islands, northward of Discovery Island, and separated from it by a narrow boat channel, are low, wooded, and almost joined at low water.

Oak Bay, southward of Cattle Point, except during southeasterly gales, affords fair anchorage to small craft with local knowledge.

Cadboro Bay indents the shore of Vancouver Island between Cattle Point and Cadboro Point. The bay is open to the southeastward, but is not subject to heavy seas, and vessels with local knowledge may obtain good anchorage in depths of 4½ fathoms near the entrance to the bay.

Haro Strait, western side.—Discovery Island and Chatham Islands are on the western side of the southern end of Haro Strait. Farther northward on the western side are the eastern coast of Vancouver Island and several islands and dangers.

Johnstone Reef is about 1.5 miles northward of Cadboro Point at about 1,400

yards offshore. The shoal is marked by a buoy moored about 300 yards north-northeastward of the 1¾-fathom spot.

Zero Rock is about 1.8 miles north-northeastward of **Gordon Head.** The rock is of small extent and bares 10 feet. It is marked by a daybeacon —a pole surmounted by a triangular topmark, 25 feet high.

Gordon Rock, which bares at low water, is about 275 yards north of Gordon Head.

Little D'Arcy Island, 120 feet high, is the largest of several rocks and islets lying within 700 yards of the eastern and northeastern sides of **D'Arcy Island.**

Unit Rocks, of which the southernmost and highest dries 6 feet, are about 0.5 mile southeastward of the southern point of Little D'Arcy Island. Foul ground lies between these rocks and D'Arcy Island and also extends almost 800 yards northeastward from the rocks.

Kelp Reefs, on the western side but near the middle of Haro Strait, are about 2.2 miles northeastward of Zero Rock and about 7 miles northward of Discovery Island. The southernmost reef is awash; foul ground is between Kelp Reefs and D'Arcy Island. Kelp Reefs Light is shown from a black, cylindrical tank on a conical stone base, surmounted by a pyramidal steel frame. The light is 32 feet above water and is visible 10 miles.

Sidney Channel leads between **James Island** and Zero Rock on the west, and **Sidney Island,** D'Arcy Island, and Kelp Reefs on the east. It is a good, deep, navigable channel and is about 0.8 mile wide in its narrowest part.

A lighted buoy is moored about 1.4 miles east-northeastward from James Island Light.

D'Arcy Shoals, with a least depth of 2¾ fathoms, are in the fairway about 0.8 mile westward of the western extremity of D'Arcy Island. A buoy is moored on the southeastern edge of the shoal.

Hughes Passage, about 600 yards wide, leads between the rocks northward of D'Arcy Island and **Sallas Rocks.**

Halibut Island, 100 feet high, is small and wooded, and lies about 1 mile northward of the eastern extremity of Sidney Island. A detached shoal with a depth of 2¾ fathoms is 900 yards southeastward of the southeastern end of Halibut Island.

Mandarte Island, 95 feet high, is about 1,400 yards northwestward of Halibut Island. Except for a few low trees on its northwestern end this island is bare. A rocky ridge, drying 12 feet on its highest part, is about 0.5 mile southeastward of Mandarte Island and extends about 400 yards southeastward.

Gooch Island, wooded and 240 feet high to the tops of the trees, is about 1.5 miles northward of Mandarte Island. **Tom Point** is the eastern extremity of a small islet, 145 feet high, which lies close eastward of the eastern end of Gooch Island. About 200 yards eastward of Tom Point is a rock that dries 1 foot and another with a depth of less than 6 feet.

Cooper Reef dries 7 feet and lies about 0.5 mile northward of Tom Point. A rock with a depth of 1 foot is about 400 yards westward of the reef, and between the two, the depth is less than 5 fathoms.

Arachne Reef is 1.5 miles 336° from Tom Point, and consists of three small drying heads, the highest of which dries 5 feet. A 6-fathom patch is about 0.5 mile northeastward of the reef.

Moresby Island is on the western side of Haro Strait, at its northern end. The island is thickly wooded except for a large clearing on its northwestern side; near the middle of its southern side is a fairly conspicuous hill that attains a height of 575 feet to the tops of the trees. **Fairfax Point** is the southern extremity of Moresby Island. A rock 14 feet high lies close off Fairfax Point. **Pelorus Point,** about a mile north-northeastward of Fairfax Point, is the eastern extremity of the island.

Wallace Point, the southeastern extremity of **North Pender Island,** is about 3 miles northward of Turn Point.

South Pender Island, close eastward of the southern end of North Pender Island, is rocky and mountainous, but to a large extent is wooded. Near the western extremity of South Pender Island is **Mount Norman,** whose summit attains a height of 890 feet to the tops of the trees, and near its southern side is **Curtis Peak,** which attains an elevation of 645 feet.

Bedwell Harbor, formed between North and South Pender Islands with an average width of 600 to 800 yards, extends about 2 miles northwestward from between Wallace and Tilly Points. The harbor affords anchorage protected from the southerly winds that sometimes blow with great force. Sunken rocks lie close off **Tilly Point,** the southern extremity of South Pender Island, and off the southern shore between Tilly Point and **Gowlland Point,** about 0.8 mile eastward.

Blunden Island, grassy and 64 feet high, lies close off the eastern extremity of South Pender Island. The narrow passage between these islands is foul and foul ground extends about 0.2 mile eastward from Blunden Island. Because of tide rips Blunden Island should be given a berth of at least 0.5 mile.

Saturna Island, on the western side of Boundary Pass, is the highest island in this vicinity, reaching a height of 1,425 feet near the middle of its southern side. **Taylor Point,** the southeastern point of Saturna Island, lies nearly 2 miles northeastward of Blunden Island. **Java Islets,** with heights of 10 to 16 feet, lie about 600 yards off the shore, midway between Taylor Point and Monarch Head, about 1.5 miles eastward. **Monarch Head,** about 800 feet high, is bold and rocky and faced with cliffs almost 400 feet high. The coast between Monarch Head and Taylor Point consists of steep, rocky cliffs. **East Point,** 3 miles 263° from Patos Island Light, forms the eastern extremity of Saturna Island.

Saturna Island Light is shown from a steel skeleten tower on the extremity of East Point. The main light, shown from a drum-shaped rotating beacon surmounting the tower, is 121 feet above the water and visible 17 miles. This light is obscured between 060° and 149°. An auxiliary light shown from the same structure is 102 feet above the water and visible 16 miles. This light shows a red sector between 149° and 211½°. Saturna Island Light should not be approached from the northward or westward within 1.5 miles. The fog signal is an air diaphone sounded from a small square wooden building close northward of the light.

Boiling Reef, about 1 foot high on its outer part, extends about 800 yards north-northeastward from East Point and should be given a wide berth.

Rosenfelt Rock, on the western side of Boundary Pass, is about 0.8 mile northeastward of **Tumbo Point,** the eastern extremity of Tumbo Island. It has a depth of 1 fathom over it and is generally marked by kelp; depths of 5 fathoms are about 800 yards southeastward and 400 yards south-southeastward of the rock. A buoy is moored about 400 yards eastward of Rosenfelt Rock and it should be given a wide berth. Close eastward of the rock overfalls and dangerous tide rips are formed.

Plumper Sound is entered from Haro Strait between Blunden Island and Taylor Point, and extends northwestward between Saturna Island on the northeast and North Pender and South Pender Islands on the southwest. Plumper Sound offers no difficulties to navigation, for the few dangers lie close to the shore and are easily avoided; moreover, the velocity of the tidal current in the fairway does not exceed 2 knots, and most of the rocky shoal patches are marked by kelp in summer and fall. It is recommended as an anchorage because it is safe, convenient, and easy of access. For the first 2 miles inside the entrance the depths are too great for anchoring except within 0.2 mile of the southern shore where there are depths of 10 to 12 fathoms. Beyond the first 2 miles inside the entrance the depths decrease rather suddenly to 10 fathoms, and excellent anchorage may be obtained. The most convenient position is in a depth of 8 fathoms off the entrance to **Port Browning,** an arm entering between the western end of South Pender Island and **Razor Point,** on North Pender Island, at about 0.5 mile offshore. However, the cable area from Port Browning to a point close southward of **Elliot Bluff** on Saturna Island should be given sufficient clearance.

Narvaez Bay is between Monarch Head and East Point. The bay is open eastward and with easterly winds a heavy swell rolls in; consequently, the bay is not recommended as an anchorage except in fine weather.

Tumbo Island is about 700 yards northward of the eastern end of Saturna Island and is separated from it by **Tumbo Channel.** This channel, though deep, is useless for general navigation, being obstructed at either end by many dangers. Tumbo Island is wooded and reaches a height of 285 feet to the tops of the trees; steep cliffs, 20 to 50 feet high, extend along the whole of its southern side. **Tumbo Reef,** on which are several rocks with depths less than 6 feet, extends almost a mile east-northeastward from the eastern side of the island.

Swanson Channel, the southern part of which lies between Moresby Island and North Pender Island, leads westward from Haro Strait, connects Trincomali Channel and Active Pass, and thus leads to Georgia Strait. Vessels bound for Alaska use Swanson Channel and Active Pass as an alternate route.

Parkin Point forms the northeastern extremity of Morsesby Island and lies 1.3 miles northwestward of Pelorus Point. Depths of less than 5 fathoms are within 250 yards of the northern side of Moresby Island, between Parkin Point and Reynard Point.

Canoe Rock is on the southwestern side of Swanson Channel at about 800 yards west-northwestward of **Reynard Point,** the northwestern extremity of Moresby Island. There is foul ground between the rock and the point. Canoe Rock Light is shown from a red cylindrical beacon on a gray hexagonal concrete base surmounted by a red pyramidal steel frame. The light is 25 feet above the water and visible 10 miles.

Mouat Point, on North Pender Island, is fairly steep-to and lies about 4.5 miles northwestward of Wallace Point. Between Wallace and Mouat Points the southwestern shore of the island is bold and steep-to and is composed of cliffs that on the southern part are 300 to 400 feet high, but near Mouat Point are only 30 to 40 feet high. There are rocks awash about 300 yards off the shore along the coast southeastward of Mouat Point.

Portland Island, about 1 mile westward of Moresby Island, is wooded and near its southwestern side reaches a height of 325 feet to the tops of the trees. **Moresby Passage** enters Swanson Channel between Portland and Moresby Islands. **Chads Island,** 149 feet high, lies close westward of the northern extremity of Portland Island, with rocks and shoal water between the two islands.

Chesil Bank, with a least depth of 5½ fathoms, lies about 800 yards northward of the northern point of Portland Island.

Saltspring Island, on the western side of Swanson Channel, is the largest and most important of the Gulf Islands. The southern part of the island is wooded and mountainous, but the hills in the northern part are not more than 1,000 feet high. **Mount Bruce,** 2,330 feet high, is the summit of the island and lies about 3.2 miles northward of its southern extremity; from a distance Mount Bruce can be identified by its flat summit.

Beaver Point, the eastern extremity of Saltspring Island, lies on the western side of Swanson Channel opposite Mouat Point, and about 2.2 miles northward of Portland Island.

James Point, on the eastern side of Swanson Channel, lies about 1.8 miles northward of Mouat Point. Good temporary anchorage may be had in 8 fathoms in **Otter Bay** which is on the southern side of James Point; however, the head and southern side of this bay are foul. A rock, 75 feet high, lies close southward of James Point, and another rock, 14 feet high, is about 0.2 miles northeastward of the point.

Stanley Point, the northwestern point of North Pender Island, lies 0.7 mile northward of James Point, and between these two points the shore is indented by **Port Washington,** a small cove which is visited regularly by costal steamers. Stanley Point and the shore for 0.2 mile northeastward of it are foul for a distance of about 100 yards offshore.

Prevost Island, thickly wooded and 434 feet high near its southeastern side, lies on the western side of Swanson Channel; **Liddell Point,** the southern extremity of the island, lies about 2 miles northward of Beaver Point. A reef which dries 3 feet at its outer extremity extends about 400 yards southeastward from Liddell Point. A buoy is moored close off the outer end of the reef.

Portlock Point, the northeastern extremity of Prevost Island, lies about 1.3 miles northward of Liddell Point. The shore of the island for a distance of 0.5 mile south of the point is fronted by a shoal. Portlock Point Light is shown on the northeastern extremity of Prevost Island from a white square wooden tower with a red octagonal lantern. The light is 51 feet above water and is visible 10 miles. The fog signal is a bell sounded from a small white wooden tower 300 yards southeastward of the light.

Active Pass leads northward from Swanson Channel to Georgia Strait; it lies between Galiano Island and Mayne Island. The pass is deep but tortuous and in its

narrowest part is about 600 yards wide. The dangers do not extend over 200 yards from shore.

Vessels should enter Active Pass at slack water, if possible, but a vessel with a speed of 10 knots can always get through. A vessel with local knowledge can take advantage of the eddies and variations of the tidal currents, but others should keep in mid-channel. Active Pass is not suitable for sailing vessels due to strong tidal currents and the absence of steady winds. Daily current predictions for Active Pass are contained in the *Current Tables, Pacific Coast.*

Caution.—At all times great care should be taken in order to avoid the shoals on either side of the northern entrance of Active Pass.

Enterprise Reef lies in the southern approach to Active Pass at about 1,800 yards northward of Portlock Point Light. The reef consists of two rocky heads with depths of less than 6 feet and lying about 400 yards apart; foul ground extends between the heads and 200 yards westward of the western head. Enterprise Reef Light is shown on the western head of the reef from a concrete daybeacon surmounted by a daymark carrying a white ball and lantern. The light is 15 feet above water and visible 9 miles. The red sector Portlock Point Light, bearing between 188° and 212°, covers Enterprise Reef.

Helen Point, the western extremity of **Mayne Island,** forms the eastern point of the southern entrance to Active Pass. The thickly wooded land within the point rises gradually and attains a height of 842 feet at **Mount Parke,** the summit of Mayne Island. Helen Point Light, unwatched, is shown from a white pyramidal steel frame on a white cylindrical tank with a concrete base. The light is 28 feet above water and visible 6 miles. The fog signal is a bell sounded from a white square open frame near the light.

Collinson Point, the western point of the southern entrance of Active Pass, is steep-to, rugged, and rocky. The point is easily identified and lies at the foot of a steep summit 1,090 feet high about 0.5 mile northwestward of the point.

Mathews Point, with some drying rocks close off it, is on the northern side of Active Pass 1 mile east-northeastward of Collinson Point.

A rocky ledge which dries 8 feet lies on a shoal about 400 yards northeastward of Collinson Point. A rocky patch, well marked by kelp and having several heads with depths of 5 feet, is within about 250 yards of the shore and about 800 yards northeastward of Collinson Point.

Mary Anne Point, around which Active Pass turns sharply to the northward, lies about 1,200 yards eastward of Mathews Point, and between these points is a bight whose shores are foul. Mary Anne Point Light is shown from a white pyramidal steel frame on a white steel cylindical tank with a concrete base. The light is 30 feet above water and visible 3 miles.

Miners Bay indents the southeastern side of Active Pass between **Reserve Point,** about 1.5 miles eastward of Helen Point, and **Laura Point,** about 0.7 mile farther northward. A prominent church is near the shore of the bay about 0.5 mile southeastward of Laura Point. The north-flowing tidal current sets strongly into the bay along its northern shore; the south-flowing tidal current sets strongly into the bay along its southern shore. If necessary, anchorage may be obtained in Miners Bay, but a vessel must go close in to get 12 fathoms. Even then a vessel is barely out of the whirl of the tidal currents and caution must be exercised. **Mayne**

is a small settlement at the head of the bay where there is a wharf with a depth of 12 feet at its head. Supplies and water can be obtained in small quantities and there is local steamer service.

Burrill Point, on the western side of Active Pass, lies about 1,200 yards northward of Mary Anne Point, and between these points the shore is indented by two bights, the shores of which are foul. **Rip Point** lies about 1,000 yards northward of Burrill Point.

Georgina Point, the northern extremity of Mayne Island, forms the eastern point of the northern entrance to Active Pass. The point is fronted by rocks, sunken and above water, up to a distance of almost 200 yards.

Active Pass Light is shown from a white square wooden tower with a dwelling attached on Georgina Point. The light is 55 feet above the water and visible 12 miles. The fog signal is an air-diaphone horn, sounded from a white house with brown roof, near the light.

Fairway Bank, with a least depth of 5 fathoms, lies in mid-channel about midway between Georgina and Rip Points. The bank is not marked by kelp but its position is indicated by tide rips except at slack water.

Georgina Shoals are about 300 yards off the northern shore of Mayne Island and extend, with the 10-fathom curve, for about 1,300 yards in an easterly direction. The sea breaks occasionally on the western part of the shoals, which has a least depth of 5 feet, lying about 0.3 mile northeastward of the light. Patches with depths of 2 and 3 fathoms lie on the eastern part of the shoal.

Gossip Island, with the southeastern extremity about 800 yards northward of Rip Point, lies on the western side of the northern entrance to Active Pass. **Gossip Shoals,** on which are several drying rocks with depths less than 6 feet, extend from the eastern side of Gossip Island almost 0.3 mile both southeastward and northwestward of the southeastern point of the island. There is a lighted bell buoy off the eastern end of the shoals about 600 yards east-northeastward of the southeastern point of the island.

San Juan Channel is the middle one of the three principal channels leading from the eastern part of the Strait of Juan de Fuca to the southeastern end of Georgia Strait; it separates San Juan Island from the islands eastward. It is 13 miles long from its southern end to its junction with President Channel at the northern end; the width varies from 0.5 to 3 miles. San Juan Channel is deep throughout and, except near its southern entrance, has few off-lying dangers.

Currents.—In the south end of San Juan Channel, between Goose Island and Deadman Island, the current attains a velocity of 5 knots or more and severe rips and eddies occur during flood. Current predictions for this location may be obtained from the *Current Tables, Pacific Coast.*

McArthur Bank, with a least depth of 14 fathoms, lies about midway between Smith Island and the southern entrance of San Juan Channel.

Cattle Point, the southeastern extremity of San Juan Island, forms the western point at the southern entrance to San Juan Channel. Cattle Point Light is shown from a white concrete tower on the extremity of the point. The light is 94 feet above water but is of low power.

Salmon Bank, on the western side of **Middle Channel,** is an extensive shoal lying southward of Cattle Point, with depths ranging from 1½ to 3 fathoms; it is marked by kelp. A bell buoy is moored off the southern end of the shoal about 1.5 miles southward of Cattle Point.

Lopez Island is the southeasternmost one of the San Juan Archipelago; **Lopez Hill,** 480 feet high, is near the middle of the island.

Iceberg Point, about 3.3 miles east-southeastward of Cattle Point, is on the western extremity of the southern part of Lopez Island. Iceberg Point Light is shown from a white, square house on the western extremity of the point; the light is 33 feet above water and visible 9 miles.

Long Island, about 1.5 miles northwestward of Iceberg Point, is the largest of a group of islands and rocks lying off the southwestern part of Lopez Island.

Whale Rocks, two dark rocks about 5 feet high, are on the eastern side of the Middle Channel about 0.6 mile westward of Long Island. A sunken rock in 2¼ fathoms of water, marked by kelp, is about 400 yards southward of Whale Rocks, and a reef with 2¼ fathoms over it lies 600 yards southward of them.

Richardson is a village with a post office on the northern shore of the cove northward of Iceberg Point, and close northward of Charles Island. A group of six fuel tanks are a prominent landmark from seaward. A wharf directly below the fuel tanks has a face 120 feet long and extends over rocks to a depth of 17 feet. Diesel oil and gasoline are available.

Richardson Light, shown about 200 yards northward of Charles Island from a white arm on an iron post, is 20 feet above water, on a ledge extending from the shore of Lopez Island.

Mackaye Harbor, northward of Iceberg Point, affords good shelter in 5 to 6 fathoms, soft mud, and small craft with local knowledge, can obtain excellent shelter in **Barlow Bay,** on the southern side of the harbor. Vessels approaching Mackaye Harbor or Richardson should pass at least 0.3 mile southward and eastward of the off-lying islands and islets. Local vessels by keeping close to the northern shore to avoid rocks near mid-channel, use a small channel between Lopez and Charles Islands, but this channel should not be attempted without local knowledge. **Twin Rocks,** in mid-channel, are marked by a daybeacon.

Davis Point, the southwestern extremity of Lopez Island, is on the eastern side of the south entrance to San Juan Channel. **Deadman Islet** is close off the eastern side of the entrance and several rocks lie within 600 yards northward of the islet.

Goose Island, small and low, lies about 0.5 mile northward of Cattle Point and close off the western side of the entrance to San Juan Channel.

Shark Reef, awash at low water, is about 1.2 miles northward of Deadman Islet and close off some white cliffs on the eastern side of San Juan Channel.

Griffin Bay indents the eastern shore of San Juan Island immediately within the entrance and on the western side of San Juan Channel. Many rocks and shoals are in this bight and the shore should not be approached closer than 0.5 mile.

North Bay comprises the northwestern part of Griffin Bay and is entered between **Pear Point** and **Dinner Island.** The village of **Argyle** is on the shores of North Bay. **Little Island,** at the head of North Bay, is connected to the mainland by a narrow spit. A small cannery is on Little Island and the shores of the island

have been bulkheaded. The cove affords fair anchorage in 7 to 10 fathoms, about 800 yards northward of Dinner Island. In the approaches to the cove are two dangers, **Argyle Shoal,** with a depth of 1¾ fathoms and marked by kelp, is about 1,200 yards eastward of Dinner Island; and a rocky shoal with 1 fathom over it and marked by kelp, is about 700 yards southeastward of Dinner Island. Rocks and shoals, some of which bare at low water, extend southward and southeastward of Dinner Island for a distance of about 600 yards. The passage westward of Dinner Island should not be attempted.

Fisherman Bay, on the eastern side of San Juan Channel abreast North Bay, is a shallow lagoon entered by a narrow, tortuous channel. Good anchorage with shelter from all winds may be had in 10 to 12 feet, soft bottom, for small, light-draft vessels with local knowledge. The tidal currents have considerable velocity. **Lopez** is a small village with a post office at the entrance. About 2 miles northward of Lopez is the southern entrance to Upright Channel.

At **Turn Island,** San Juan Channel turns northwestward for about 9 miles, and connects at its northern end with Haro Strait and President Channel.

Turn Rock, about 0.2 mile eastward of Turn Island, is a ledge bare at half tide, and should be given a berth of not less than 100 yards.

Turn Rock Light is shown from a white square house with a black cylindrical base on Turn Rock. The light is 18 feet above the water and of low power.

Reid Rock, about 1.3 miles northwestward of Turn Rock, lies in mid-channel off the entrance to Friday Harbor. The rock has a depth of 2¼ fathoms over it, rising abruptly from deep water. It is marked by a buoy on the eastern side of the rock.

Friday Harbor, on the eastern shore of San Juan Island, about 1 mile westward of Turn Rock, is a small cove about 1 mile long and nearly as wide. **Brown Island,** which is wooded, occupies the middle of the harbor. Shoals extend about 200 yards off both its eastern and southern shores; a shoal, with 2½ fathoms over it, extends nearly into mid-channel from the western shore of the island. The harbor may be entered either eastward or westward of Brown Island, but in both cases the San Juan Island shore should be favored to avoid the shoals off Brown Island. Anchorage may be had off the wharves in 6 to 7 fathoms and city floats provide berthing space for pleasure craft.

Friday Harbor, on the western shore of the cove, is a county seat, port of entry, and the most important town in the San Juan Archipelago. It is the center of a prosperous agricultural district and the headquarters for the fishing fleet operating through the western part of the archipelago. Produce and fish are shipped and a salmon cannery, a creamery, and log booms are here. Provisions may be obtained here. A **chart agency** of the United States Coast and Geodetic Survey is here also.

The **University of Washington** maintains a station, about 0.8 mile northward of the town of Friday Harbor, for oceanographical and marine biological research. The pier makes a prominent landmark in entering Friday Harbor. The wharf resembles a half section of a cantilever bridge, supported near the middle and at the shore end; the free end extends about 35 feet beyond the support. There is a substantial landing wharf near the main building. The wharf extends 204 feet from

shore. The face is 32 feet long with depths of 11 to 13 feet. The wharf is exposed to winds from the northeast, but is easily approached.

Friday Harbor is a customs port of entry but marine documents are not issued. The customs office is on the wharf at the ferry slip.

There are a number of wharves built out to deep water at which water and fuel oils can be obtained. The city wharf has a depth alongside of 16 feet. The wharves eastward of the city wharf have more water alongside and those westward of it have less than at the city wharf. The city maintains berthing space at the Standard Oil Company dock west of the cannery.

A shipyard of sufficient size to handle small boats up to 90 feet is at the south end of the harbor.

Communication is maintained by ferry, freight boats, and seaplane with other ports in the islands and the mainland; there are telephone connections. A seaplane taxi service operates from a float landing.

Point Caution, about 2.2 miles northwestward of Turn Island, is on the southwestern side of San Juan Channel. The point is steep-to, and between it and the head of Rocky Bay, about 4 miles northwestward, the southwestern shore of the channel is free from off-lying dangers.

Hicks Bay, on the opposite side of the channel on the southern side of Shaw Island, has a small, private landing.

Parks Bay is immediately northward of **Point George** on Shaw Island and about 2 miles northward of Turn Rock. It affords a good anchorage for small vessels in 6 to 8 fathoms, soft bottom. The harbor is clear, but a shoal extends 300 yards from its head.

Wasp Islands lie in the western approach to West Sound between **Neck Point,** the northwestern extremity of Shaw Island and **Steep Point,** the southwestern extremity of Orcas Island. Several narrow channels lead between the islands; the channels in general use are the North and Pole Passes, close under the Orcas Island shore. The tidal currents have considerable velocity in the channels, which should be attempted only by vessels with local knowledge.

North Pass, between Steep Point and Wasp Islands, leads eastward from San Juan Channel to Deer Harbor and Pole Pass. The pass is about 0.2 mile wide between Steep Point and **Reef Island,** and is free of outlying dangers, except for a rock with a depth of 1¾ fathoms about 0.3 mile eastward of the northern end of Reef Island.

Deer Harbor, at the eastern end of North Pass, is eastward of Steep Point. Good anchorage may be had in 6 to 7 fathoms about 0.2 mile from the head of the harbor. **Fawn Island** lies near the entrance of the harbor and about 200 yards from the western shore; vessels may pass on either side of the island.

A mid-channel course leads through North Pass and to the anchorage north of Fawn Island. The eastern shore of Deer Harbor should be given a berth of at least 300 yards because of a shoal which in some places extends more than 200 yards.

Deer Harbor is a small village with a post office on the eastern shore near the head of the harbor. A cannery is on a point opposite the village, and a small wharf extends to a depth of 12 feet. Small quantities of provisions and gasoline may be obtained.

A rock with a depth of 4 feet over it is about 100 yards north-northwestward of the wharf and constitutes a danger to steamers pulling away from the wharf.

Crane Island is off the entrance to Deer Harbor and almost a mile southeastward of Steep Point. The northern shore of the island is foul, and in places shoals extend 250 yards off it; a rock with a depth of 5 feet lies 250 yards off the northern shore and about 750 yards west-northwestward of Pole Pass Light. Foul ground extends about 300 yards eastward from the eastern extremity of the island. There is a small private landing on the eastern side of the island.

Pole Pass leads from Deer Harbor to West Sound, and separates Crane from Orcas Island; in its narrowest part the fairway is 75 yards wide. Pole Pass should not be attempted without local knowledge.

Pole Pass Light is shown from a small white house on Orcas Island, at the western end of Pole Pass; the light is 15 feet above water and visible 5 miles.

Wasp Passage leads from San Juan Channel to West Sound and separates Crane Island from the northern shore of Shaw Island. This passage should not be attempted without local knowledge.

Wasp Passage Light is shown from a white house surmounting a concrete pier on the rock 300 yards eastward of Bell Island. The light is 15 feet above the water.

Local vessels, bound from Friday Harbor to Deer Harbor, use a clear, deep channel, about 70 yards wide through the rocks and shoals lying between Cliff Island and Low Island about 600 yards westward.

Bell Island, small and wooded, is about 0.3 mile eastward of Crane Island. A rock which bares at extreme low water, is about 300 yards eastward of the island, and about 300 yards northward of this rock a 1-fathom shoal lies almost in mid-channel. Vessels using Pole Pass keep the northern shore of Bell Island close-to in order to avoid reefs and shoals extending from the opposite side of the pass.

Cliff Island, the southernmost of the Wasp Islands, is about 300 yards northward of Neck Point. **Low Island,** small and 10 feet high, is about 600 yards westward of Cliff Island. **Nob Island,** 40 feet high, is close-to and northwestward of Cliff Island.

Cliff Island Light is shown from a small square white house on a concrete pier; the light is 15 feet above the water.

Yellow Island, the westernmost of the Wasp Islands, lies about 0.8 mile west-northwestward of Neck Point; the island is small, grassy, and nearly bare of trees. A shoal extends 300 yards westward of the island and terminates in a rock, marked by kelp, with a depth of 1 fathom over it. This island should be given a berth of not less than 0.5 mile. **McConnell Island,** northeastward of Yellow Island, is the largest of the group. **Coon Island** lies close to and southeastward of McConnell Island. **Bird Rock,** awash at high tide, lies between McConnell and Crane Islands.

Jones Island is on the eastern side of the northern entrance to San Juan Channel; the island is wooded.

Spring Passage separates Jones Island from the southwestern extremity of Orcas Island. With the exception of a shoal that fringes the eastern side of

Jones Island and in places extends as far as 250 yards offshore, the passage is free of danger.

Rocky Bay, on the southwestern side of San Juan Channel, is a small open bight. **O'Neal Islet,** surrounded by a shoal, lies almost in the middle of the bay, and a reef that is usually marked by a breaker is near the head of the bay. 5

Limestone Point, about 1.2 miles north-northwestward of O'Neal Islet, forms the western point of the northern entrance to San Juan Channel; the point is the northeastern extremity of San Juan Island. Heavy tide rips and eddies are formed off Limestone Point and **Green Point,** lying 0.7 mile northward, and forming the eastern end of Spieden Island. 10

Flattop Island, prominent in the northern approaches to San Juan Channel, is about 1.2 miles northeastward of the eastern end of Spieden Island. It is about 130 feet high, flat on top, and sparsely covered with underbrush and trees. **Gull Rock,** 30 feet high, of small extent and bare, is about 0.3 mile northwestward of the island. 15

White Rock, 35 feet high, is in the northern part of San Juan Channel, about midway between Flattop and Waldron Island. Waldron Island has been described previously. Rocks, bare at low water and marked by kelp, extend nearly 600 yards northwestward from White Rock.

Danger Rock, with 2 feet over it and marked by kelp, lies 600 yards southeastward of White Rock. 20

The northwestern approach to San Juan Channel, from Haro Strait and Boundary Pass, is between Waldron Island on the east and Johns Island and the dangers southeastward of it on the west.

President Channel, separating Waldron and Orcas Islands, is about 5 miles in length, and has a least width of 1.2 miles. The depths are generally great and the passage is free of dangers. The tidal currents have a velocity of 2 to 5 knots, and off the northern point of Waldron Island, and between Waldron and Patos Islands are heavy swirls and tide rips, especially with an adverse wind. The rips are generally heaviest with the ebb current. Rips and swirls are also heavy off Limestone Point and the eastern end of Spieden Island. 25 30

Orcas Island is wooded and mountainous. **Mount Constitution,** 2,409 feet high, in the eastern part of the island and marked by a stone lookout tower, the top of which is at elevation of 2,454 feet; **Turtle Back Range,** 1,497 feet high; and **Orcas Knob,** 1,050 feet high, conical, and bare on the summit, in the western part of the island, are prominent and easily recognized from northward and southward. 35

Point Doughty, the northwestern extremity of Orcas Island, is bare and terminates in a small knob on its outer end. **Freeman Island** is a small islet in the broad open bight southward of Point Doughty. Foul ground, marked by kelp, extends about 350 yards westward from the southern point of this bight, which lies about 1.2 miles southward of Point Doughty. A 3-fathom shoal is about 400 yards offshore at about 1.2 miles eastward of Point Doughty. A mooring buoy is near the shore southward of this shoal. 40

Parker Reef, consisting of two rocky patches bare at low water, is about 0.7 mile off the northern shore of Orcas Island and about a mile northwestward of Point Thompson. Kelp covers the reef and the area between it and the shore. 45

Parker Reef Light, 15 feet above water, is shown from a battery house painted white with a red triangle.

Point Thompson is about 3 miles eastward of Point Doughty. **North Beach** lies just westward of Point Thompson.

A passage between Sucia Island on the north and Orcas Island on the south connects the northern end of President Channel with the junction of Georgia and Rosario Straits.

Minor Passages, San Juan Archipelago.—Upright Channel, between Lopez and **Shaw Islands,** is about 3 miles long and has an average width of about 0.8 mile; **Canoe Island,** off **Flat Point,** contracts the passage to a width of 600 yards. A rock with a depth of ¼ fathom is about 300 yards southward of the southern point of Canoe Island. A sunken rock marked by kelp is on the northwestern side of the channel and about 300 yards eastward of the southern point of Shaw Island. The depths in the channel range from 20 to 35 fathoms and, with the exception of the above mentioned dangers, is free of danger. Anchorage for small vessels may be had in **Indian Cove,** westward of Canoe Island, in 6 to 7 fathoms, soft bottom.

Upright Head, the northern extremity of Lopez Island, is a narrow peninsula which attains an elevation of 260 feet. An automobile ferry slip is in the small cove at the northeastern extremity of the peninsula. There is daily ferry service with the other islands and the mainland.

Harney Channel, between the northern shore of Shaw Island, and Orcas Island, is the widest approach to West Sound from the eastward, but small vessels with local knowledge may approach from the westward by Pole Pass or Wasp Passage. Harney Channel has depths of 10 to 25 fathoms and there are no off-lying dangers.

Orcas, on the northern shore in a cove at the western end of Harney Channel, is a small settlement and summer resort, and has a post office and telephone service. A wharf with a depth of 10 feet at its head is here; water and gasoline are available from pipe lines on the wharf. An automobile ferry slip is just eastward of the wharf. Orcas is a port of entry; the customs office is on the ferry slip. There is daily communication by mail boat and ferry to the other islands and the mainland.

A rock with 15 feet over it lies about 125 yards southward of the wharf; there is deep water between the rock and the beach.

Blind Bay, a small cove on the southern shore of Harney Channel, is shoal and in it are several reefs. **Blind Island** lies in the entrance to the bay, and a reef bare at low water, extends 200 yards from the western entrance point of the cove. A rock, partly bare at low water, is reported to lie about 100 yards 132° from Blind Island at the entrance to the bay. Several rocks, awash, are within about 600 yards northwestward of the island.

Shaw Island, a village at the eastern entrance point of Blind Bay, has a post office and telephone service; local steamers call regularly. It has a store, warehouse, a wharf built out to 12 feet, and a ferry slip; provisions and gasoline may be obtained. A private wharf with boat shed is conspicuous about 500 yards eastward of the ferry slip.

Broken Point, about 1.2 miles westward of Blind Island, extends about 0.3 mile northward from the northern side of Shaw Island.

North Pass, Pole Pass, and Wasp Passage have been described previously.

West Sound indents the western part of the southern shore of Orcas Island, and with an average width of about 0.8 mile, trends northwestward for about 2.8 miles. The depths range from 7 fathoms to over 20 fathoms. Anchorage in 7 to 12 fathoms may be had anywhere in the sound northward of Double Island.

Double Island consists of two small islands connected at low water; it is close to the western shore near the entrance. **Victim Island** is close to the western shore about 0.2 mile northward of Double Island.

Westsound, a settlement with a post office, is in a cove on the eastern shore of the inlet about 2 miles above the entrance. There is a wharf with a depth of 12 feet of water; only a few piles remain of an old sawmill wharf. Care should be taken when leaving the wharf to avoid some submerged piling about 100 feet southwestward of the wharf. Provisions in small quantities are available.

Sheep Island, a low islet in the southern part of the cove, is connected to the shore at low water; a shoal extends about 150 yards westward from the island.

Harbor Rock, with a depth of ¾ fathoms, lies in mid-channel about 0.8 mile from the head of West Sound; the rocky patch is of small extent and is surrounded by depths of 4 to 10 fathoms.

East Sound, on the southern shore of Orcas Island, extends northwestward for about 6 miles. The depths vary from 15 fathoms at the entrance to 9 fathoms at less than 0.2 mile from the head. There are no outlying dangers and the shores may be approached to within 0.2 mile; however, a bank with depths less than 5 fathoms extends about 700 yards off the western shore about 0.8 mile within the entrance. Anchorage may be obtained anywhere in the sound.

Shag Rock, marked by a daybeacon—white barrel on iron spindle, is about 300 yards offshore and about 0.6 mile eastward of **Foster Point.** The rock bares at high water and a ledge extends about 150 feet northward from the rock.

Olga, a summer resort with a post office, is on the western shore of **Buck Bay,** a small cove on the eastern shore of the sound, just within the entrance. There is a wharf with 20 feet at its head; provisions may be obtained in small amounts. Telephone facilities are available.

Rosario, a settlement with a post office, is on the shores of **Cascade Bay,** a small cove on the eastern side of the sound about 3 miles within the entrance. There is a landing wharf with a depth of 12 feet at its head; fresh water is piped to the wharf. A large private residence on the western point to the bay is prominent.

Eastsound, a summer resort with a post office, is in the western of two small coves at the head of East Sound. It is the second largest village in San Juan Archipelago. Gasoline, water, and lubricating oil may be obtained at the wharf, which is built out to 10 feet. Communication with other islands and the mainland is maintained by telephone.

Obstruction Pass, about 350 yards wide at its narrowest part, separates Obstruction Island from the southeastern part of Orcas Island, and leads westward from Rosario Strait to the inner passages and sounds of the San Juan Archipelago. A submerged rock, marked by kelp, has been reported in mid-channel near its nar-

rowest part. A ferry slip in ruins extends from the northern shore of the pass. Three dolphins, in poor condition, lie off the slip.

Obstruction Island is marked on its eastern and southern ends by lights. Obstruction Pass Light is shown from a small white house on the eastern side of the island; the light is 23 feet above water and visible 9 miles.

Deer Point, on the northern side of the eastern approach to Obstruction Pass, forms the southeastern extremity of Orcas Island.

Peavine Pass separates the northern extremity of **Blakely Island** from the southern shore of Obstruction Island. The pass is a little over 200 yards wide at its narrowest part and in mid-channel the least depth is 6 fathoms. Peavine Pass is both safer and straigher than Obstruction Pass. A daybeacon, white barrel on iron spindle, marks a group of bare rocks which lie about 0.2 mile offshore on the southern side of the entrance. Peavine Pass Light, shown from a small white house on the southern point of Obstruction Island, is 22 feet above water and visible 5 miles.

The currents through the passes have estimated velocities of 5½ to 6½ knots at times. Heavy tide rips occur eastward of Obstruction Island.

A rock with a depth of 1¾ fathoms is about 0.5 mile westward of the northern part of Blakely Island and 1.3 miles 219° from the light on the southern point of Obstruction Island.

Thatcher Pass, between the southern extremity of Blakely Island and the northern shore of **Decatur Island,** is about 0.5 mile wide in its narrowest part. With the exception of Lawson Rock, Thatcher Pass is deep and free of danger. **Lawson Rock,** which dries, is in mid-channel about 700 yards northward of Fauntleroy Point; it is marked on its southern edge by a buoy. **Fauntleroy Point,** the northeastern extremity of Decatur Island, is marked by a light shown from a small white house; the light is 40 feet above the water and visible 8 miles. The fog signal at Fauntleroy Point Light is sounded on an electric diaphragm horn. With a southerly wind and the ebb current heavy rips will be encountered off the eastern entrance to Thatcher Pass.

Lopez Sound, on the eastern side of Lopez Island, may be entered from Rosario Strait by Thatcher Pass or Peavine Pass. The depths in the greater part of the sound are from 3 to 5 fathoms, mud, but along the eastern shore, a narrow and deeper channel extends as far southward as **Center Island.** The sound is of little commercial importance at present.

Thatcher, a small village, is in the shallow cove on the western side of Blakely Island. At the village is a small wharf and a sawmill dock in ruins.

Port Stanley is a small village on the shores of **Swifts Bay** on the northeastern side of Lopez Island.

There is a yacht club with landing at the head of **Shoal Bay** on the north side of Lopez Island.

Leo Reef, awash at high tide, is in the entrance to Swifts Bay and is marked by a light. Leo Reef Light is shown from a small white cylindrical structure with a concrete base on the eastern end of the reef; the light is 15 feet above water and visible 9 miles.

Decatur, a small village with a post office, is on the western side of Decatur Island, about 1 mile eastward of **Trump Island.** A wharf with 8 feet of water at its head is at the village.

Lopez Pass, at the southern extremity of Decatur Island, leads from Rosario Strait into Lopez Sound at a point about 2 miles from its head. The pass has depths of 9 to 12 fathoms, but is very narrow and little used.

Lopez Pass Light is shown from a small white house at the southern point of Decatur Island; the light is 21 feet above water and visible 9 miles.

Rosario Strait is the easternmost of the three main channels leading from the Strait of Juan de Fuca to Georgia Strait. It is about 20 miles long and from 1.5 to 5 miles wide. The water is deep and the most important dangers are marked.

The strait is in constant use by vessels bound to Bellingham, Anacortes, or the various ports in the San Juan Islands. Vessels bound for British Columbia or Alaska also frequently use it in preference to the passages farther westward when by so doing greater advantage can be taken of the tidal currents.

Currents.—For times and velocities of current in Rosario Strait and vicinity, the *Current Tables, Pacific Coast* should be consulted. The currents in Lopez, Thatcher, and Obstruction Passes are reported to attain velocities at strength of 3 to 7 knots, which fact should be taken into account when proceeding through Rosario Strait, particularly at night or in thick weather. On the ebb of a large tide, a southerly wind causes tide rips, dangerous to small craft, off the entrance to the passes.

Point Colville, the southeastern extremity of Lopez Island, forms the western point of the southern entrance to Rosario Strait.

Colville Island, 64 feet high, small, and bare of trees, is about 0.5 mile southwestward of Point Colville; the island should be given a berth of not less than a mile.

Davidson Rock, which bares at extreme low water, is about 600 yards eastward of Colville Island. The rock is marked by a light shown from a white house on a concrete pier. Davidson Rock Light is 25 feet above the water and visible 10 miles. The fog signal is sounded on a bell. Heavy kelp extends westward of Colville Island.

A shoal with a least depth of 3¾ fathoms and marked by a lighted buoy, is about 1.9 miles 101° from Davidson Rock Light. The ship passage is between Davidson Rock Light and the buoy.

Aleck Bay is the westernmost and largest of three small bays on the southern shore of Lopez Island. It affords good anchorage for small vessels in 4 to 7 fathoms, mud bottom; good protection is afforded except from heavy southeasterly winds. **Hughes and McArdle Bays,** adjacent, are smaller, with less protection, and are not used. An irregular, dark brown rock 40 feet high is about 0.3 mile offshore on the western side of the entrance to Aleck Bay; from this rock a reef and detached rocks, awash, extend more than 200 yards eastward. Two shoals with least known depths of 4 and 4¾ fathoms lie, respectively, about 700 yards 278° and 1,050 yards 318° from the western point of Colville Island. Except for these dangers, the passage inside Colville Island is clear and is used by small boats.

949285—52——26

Chart 6376.—Lawson Reef is about 1.7 miles 260° from the western extremity of Deception Island. It is of small extent, with a least depth of 1¾ fathoms, and is marked by a buoy on the eastern edge of the reef. Depths of less than 10 fathoms extend about 700 yards northward and 1,000 yards southwestward from the reef.

A bank with depths of 11 to 20 fathoms extends about 1.5 miles southwestward and thence 2.2 miles northwestward and terminates in the 3¾-fathom shoal, marked by a lighted buoy, and described in a preceding paragraph.

Deception Pass, between Whidbey Island and **Fidalgo Island,** is about 2 miles long and connects the northern end of Skagit Bay with the southern end of Rosario Strait. Near the middle of the pass the navigable channel leads southward of **Pass Island,** which reduces the width of the channel to about 200 yards.

Deception Pass is commonly used by local vessels bound from Seattle to Anacortes, Bellingham, and ports in the San Juan Islands. Vessels plan to make the pass at the time of slack water, as the velocity of the stream at other times makes it unavailable to most vessels. Some fast vessels run it at all stages of the tide. The pass is also frequently used by tows of logs from the northward, bound to Everett or Seattle, which take this route to avoid the rough weather westward of Whidbey Island.

The currents in the narrows of Deception Pass attain velocities of 5 to 8 knots or more at strength at which times strong eddies are formed along the shores. Daily predictions of the times of slack water and the times and velocities of strength of current for Deception Pass are given in the *Pacific Coast Current Tables.*

Canoe Pass is between the northern shore of Pass Island and Fidalgo Island. At this point Deception Pass is crossed by a fixed highway bridge with vertical clearance of 146 feet over Deception Pass and 156 feet over Canoe Pass. This pass is not recommended except for small craft with local knowledge.

Deception Island is about 0.4 mile northwestward of **West Point,** the northwestern extremity of Whidbey Island. Foul ground exists between West Point and Deception Island. Vessels should not attempt to pass between them.

Deception Pass Light, on **Lighthouse Point,** the southwestern extremity of Fidalgo Island, is shown from a white cylindrical house on a skeleton tower; the light is 60 feet above the water and visible 8 miles.

Ben Ure Island Light, 25 feet above water and visible 8 miles, is shown from a white conical house on a skeleton tower at the eastern extremity of Ben Ure Island on the southern side of Deception Pass, about 1 mile southwestward of Hoypus Point, which is on the southern shore at the eastern entrance to the pass.

Strawberry Island is about 400 yards northward of Ben Ure Island. A reef, marked by kelp, extends from the southern side of the island.

In approaching Deception Pass from the westward, the best water will be found 0.2 mile westward of **Rosario Head,** a point about 0.5 mile northeast of Deception Island. Steer a southeasterly course to pass about 100 yards southwestward of Deception Pass Light; then follow an easterly course through the middle of the pass, being careful to guard against sets from the current when running partly across it. After passing under the bridge favor slightly the northern shore so as to avoid the pinnacle rocks and ledges making out from the southern shore. After

leaving Pass Island, steer to pass about midway between Ben Ure and Strawberry Islands. Strawberry Island should not be approached within 125 yards because a reef, marked by kelp, extends southward of the island. From a position off Ben Ure Island Light steer a northeasterly course to pass about midway between Hoypus and **Yokeko Points.** North and west of Strawberry Island the flood current sets northeastward and this set should be guarded against.

Reservation Bay, a small bight between **Reservation Head** and Rosario Head, offers anchorage for small craft in 2¼ fathoms, mud bottom.

Sares Head, about a mile northward of Deception Island, is steep-to and attains a height of 480 feet.

Northwest Island, 28 feet high and grass-covered, is between Rosario and Sares Heads.

Langley Point is about 2.1 miles northward of Deception Island.

Burrows Bay indents the western shore of Fidalgo Island between Langley Point and **Fidalgo Head.** It is a broad, open bight, affording anchorage in the northern part in 15 or 16 fathoms, soft bottom. Protection from westward and northward is afforded by **Burrows** and **Allan Islands,** 630 and 270 feet high, respectively, but the bay is exposed in southerly weather. In the southeastern part of the bay the depths are less than 6 fathoms, and in places, shoals extend almost 0.4 mile off the eastern and southern shores of the bay. **Young Island** is southeast of and close to Burrows Island. Eastward of the passage between Allan and Burrows Islands is a middle ground with a least depth of 5 fathoms. Vessels using Deception Pass, bound to or from ports in the islands or from Bellingham Bay, pass through Burrows Bay and the passage northward of Burrows Island.

Burrows Island Light is shown from a white square wooden tower on a building at the western end of Burrows Island; the light is 57 feet high and visible 13 miles. A fog signal is sounded on a reed horn.

Williamson Rocks, a group of small, grass-covered islets, close together, and several small rocks extending westward thereof, lie about 0.5 mile southward of Allan Island. **Dennis Shoal,** which bares at low water, is about 500 yards off the southern shore of Allan Island and 0.6 mile 328° from Williamson Rocks. A small bare rock is 700 yards 058° from Langley Point and about 500 yards offshore. A rock awash is about 0.9 mile 032° from Langley Point, and 650 yards off the southern point of a small cove on the eastern shore of Burrows Bay.

Flounder Bay, a shallow lagoon at the northern end of Burrows Bay, has been improved and is now used as a log pond and lumber yard. There is a wharf with 30 feet alongside its western end. A sawmill with a prominent brick stack is here.

Chart 6380.—Bird Rocks, consisting of three rocks close together, are almost in the middle of Rosario Strait, about 2 miles 284° from Burrows Island Light; the southernmost and largest is 30 feet high. There is deep water close-to and passage may be made on either side of the rocks.

Belle Rock, bare at extreme low water, is about 0.5 mile 039° from Bird Rocks. **Tide Point,** the western extremity of Cypress Island, and **Lawrence Point,** the eastern extremity of Orcas Island, in range, bearing about 359°, lead about 1,200 yards eastward of Belle Rock.

Belle Rock Light is shown from a white square house with a cylindrical base; the light is 20 feet above water and is visible 9 miles.

Kellett Ledge, about 2 miles northward of Point Colville, is 700 yards off **Cape St. Mary.** The ledge is of small extent, marked by kelp, and bares at lowest tides.

Lopez Pass and Light have been described previously.

Dot Rock, about 2.8 miles northward of Cape St. Mary, is close under a white cliff on the southeastern side of Decatur Island.

Decatur Head, the eastern extremity of Decatur Island, is a small peninsula having a height of 125 feet and lying about a mile north-northeastward of Dot Rock.

James Island is close off Decatur Head, and between them is a deep but narrow passage; on the island are two hills with heights of 260 and 219 feet.

Thatcher Pass has been described previously; Guemes Channel and Bellingham Channel will be described later.

Pointer Island, locally known as **White Rock,** is 16 feet high and is about 600 yards off the southeastern shore of Blakely Island on the northern side of the entrance to Thatcher Pass.

Black Rock, 4 feet high, is about 0.8 mile 058° from Pointer Island and 0.5 mile from the Blakely Island shore; it is marked by a spindle surmounted by a barrel. There is a passage between Blakely Island on the west and Black Rock and Pointer Island on the east, but it is not recommended.

Cypress Island, 1,530 feet high, steep on the lower slopes and gently rounding at the top, is northward of the entrance to Guemes Channel, and from southward the island appears to lie in the middle of Rosario Strait.

Reef Point, the southwestern extremity of Cypress Island, has a shoal extending about 500 yards southward; the outer end of the shoal is marked by a buoy. Vessels rounding the point should give the buoy a berth of 400 to 500 yards to avoid submerged piles that may be in this vicinity.

Strawberry Island, small and low, is about 400 yards from the western shore of Cypress Island. There is a passage eastward of it but it is not recommended. An indifferent anchorage may be had in **Strawberry Bay** in 7 fathoms; it is seldom used.

Towhead Island, small, round, and wooded, is about 400 yards northward of the northern extremity of Cypress Island. The passage between them is used by local vessels, especially those plying between Bellingham Bay and Obstruction Pass.

Cypress Reef is a dangerous, rocky patch westward of Towhead Island. The southern end, bare at low water, is 550 yards 289° from Towhead Island, and from this point it extends northward for 650 yards with depths of 1½ to 2½ fathoms. It is well marked by kelp.

Lydia Shoal, of small extent and with a least depth of 3¾ fathoms, is about a mile northeastward of the light on the eastern end of Obstruction Island.

Obstruction Island Passes have been described previously.

Buckeye Shoal, with a least depth of 4 fathoms, is about 1 mile 320° from Towhead Island; it is marked by a buoy.

Peapod Rocks are a group of small rocks extending about a mile in a general north-northeasterly direction, parallel with and a little over 0.5 mile from the Or-

cas Island shore. They are bare of trees; the northernmost rock is the highest and largest and is marked by an unwatched light shown from a sound reflector board on a white octagonal concrete house. Peapod Rocks Light is 35 feet above water; the fog signal is sounded on a bell. A rock with a depth of 2 fathoms is off Doe Bay, about 0.7 mile 283° from the southern Peapod. Vessels using the passage westward of the Peapods must favor the southern Peapod to avoid this rock; otherwise this passage is clear. Vessels must not pass between the rocks forming the Peapod group.

Doe Bay indents the southeastern shore of Orcas Island abreast Peapod Rocks. **Doebay,** a village with a post office, is on the shore of the bay. There is a wharf with 12 feet at its head; during strong southerly winds the wharf should not be approached.

Sinclair Island, northward of Cypress Island, is wooded and comparatively low in places, reefs extend off the northern shore for nearly 0.5 mile. Sinclair Island Light, 32 feet above the water, is shown from a white house on the southeastern extremity of the island.

Boulder Reef is a dangerous shoal which extends over 0.5 mile from the northwestern shore of Sinclair Island; portions of the reef uncover at half tide and a large boulder is at the inner part of the reef. It is well marked by kelp but this is frequently drawn under by the current. The outer end of the reef is marked by a buoy.

Urban is a village with a post office at the southwestern end of Sinclair Island. There is a wharf with 12 feet of water at its head.

Lummi Island, which is wooded and about 8 miles long, forms the eastern side of the northern end of Rosario Strait, opposite Orcas Island. The northern part is low, but in the southern part **Lummi Peak** attains an elevation of 1,740 feet. Lummi Island has automobile ferry service with the mainland.

Lummi Rocks, a group of rocks and islets are off the southwestern shore of Lummi Island, about 3 miles northwestward of the southern extremity.

Shoals extend over 0.5 mile from **Point Migley,** the northwestern extremity of Lummi Island; the northwestern edge of the shoals is marked by a buoy. Sinclair Island, open westward of **Village Point,** leads westward of this shoal.

Clark Island and **Barnes Island,** with a small number of islets adjacent, form a group lying almost in the middle of Rosario Strait, about 2.5 miles northwestward of Lawrence Point, the eastern extremity of Orcas Island. These islands may be passed on either side but they should be given a berth of 0.5 mile.

Matia Island, 120 feet high and wooded, is about 1.5 miles eastward of Sucia Islands. **Puffin Island,** with a reef extending about 400 yards eastward from the southern extremity, is close eastward of Matia Island, from which it is separated by a narrow channel with a least charted depth of 5½ fathoms.

Puffin Island Shoal Light is shown from a small white house on a black cylindrical structure on the outer extremity of the reef extending eastward from Puffin Island; the light is 20 feet above water.

Sucia Islands, Ewing Island, and Patos Island have been described previously.

Alden Bank, within the 10-fathom curve, is about 3 miles long in a southeasterly direction, with a greatest width of 1.5 miles. The shoalest part, on which are patches of 2¾ and 3 fathoms, covering a considerable area, is near the southeast-

ern part of the bank and is approximately 3.2 miles 013° from the middle of Matia Island and 5 miles 305° from Point Migley, the northwestern point of Lummi Island. A lighted buoy is moored at the southern extremity and another buoy marks the eastern edge of the bank.

Directions for Rosario Strait are given in Chapter 3.

Skagit Bay is between the northern part of Whidbey Island and the mainland. The bay is entered from the north through Deception Pass, from the south the approach is through Saratoga Passage. Skagit River, described in Chapter 17, empties in the southeastern part of the Bay.

The greater portion of Skagit Bay is filled with flats, bare at low water. Shoals extend about 100 to 300 yards from the Whidbey Island shore. Along the shore of Whidbey Island, between it and the edge of the flats, is a narrow channel varying in width from 0.2 to 0.5 mile. This channel is about 6.5 miles long from its southern end to Hope Island, where it narrows to 150 yards. The channel is marked with navigation aids from Deception Pass to the jettied entrance of Swinomish Slough. The main channel from Deception Pass southward through Skagit Bay has a controlling depth of 6½ fathoms. Current velocities up to 2 knots have been observed in the channel. The *Current Tables, Pacific Coast* should be consulted for current predictions.

Skagit Island, 113 feet high and steep-to on its southern extremity, and **Kiket Island,** 194 feet high and steep-to along its northwestern side, are eastward of Hoypus Point, on the eastern side of Skagit Bay.

Similk Bay is in the northeastern end of Skagit Bay. The northeasterly portion of Similk Bay is used extensively for log rafting operations and is unsafe for other navigation.

Hope Island is in the northern part of Skagit Bay. Hope Island Light, shown from a white conical house on a skeleton tower at the southwestern extremity of Hope Island, is 23 feet above the water and visible 8 miles. The eastern shore of the island is fringed with off-lying rocks.

Ala Spit, abreast the western end of Hope Island, is a low, projecting point; a shoal extends about 350 yards from the point. In the small cove westward of the spit are fish stakes and a wharf in poor condition which bares at low water.

Good anchorage may be had northward of Hope Island, and vessels at times make use of this anchorage area while waiting for slack water in Deception Pass.

The narrow channel eastward of Hope Island is used by small craft with local knowledge. This channel with a controlling depth of 5 fathoms, passes about 130 yards off the Hope Island shore. The bottom is rocky and very irregular, and numerous dangers marked by heavy kelp, are between the channel and the Fidalgo Island shore. Southward of **Hunot Point** is an anchorage for pleasure craft during the summer months.

Seal Rocks are about 1.4 miles southward of Hope Island, on the eastern side of the main channel in Skagit Bay. They are marked by a light shown from a small white house; the light is 20 feet above the water and visible 5 miles.

Chart 6376.—Swinomish Slough connects the waters of Skagit Bay with those of Padilla Bay, 5 miles northward. The slough and its southern approach have

been improved by the Government by dredging and by the construction of dikes. From deep water in Skagit Bay, the dredged channel leads northeastward along the northern side of **Goat Island,** which is rocky, steep, and timber covered; then continues past the southern point of Fidalgo Island and the western end of **McGlinn Island. Hole in the Wall** is the name used locally to refer to the narrow opening between McGlinn and Fidalgo Islands, through which the dredged channel connects with Swinomish Slough. The channel is marked by a number of lights and daybeacons, including lights at the western end of each of the entrance jetties. The channel has a project depth of 12 feet for a width of 100 feet from Skagit Bay to deep water in Padilla Bay; in March 1950 the controlling depth in the channel was 8 feet. Swinomish Slough is crossed by a swing bridge at La Conner with a horizontal clearance of 97 feet and a vertical clearance of 6½ feet. The channel is through the east opening of the bridge. At the entrance to Padilla Bay are two bridges. The highway bridge has a vertical lift span with a horizontal clearance of 100 feet and vertical clearances of 12 feet down and 75 feet raised. The railroad bridge has a swing span with a horizontal clearance of 94 feet and a vertical clearance of 4 feet. The signal for opening all of these bridges is 4 long blasts. Most of the yachts going between Bellingham and Seattle use Swinomish Slough in preference to Deception Pass because of the weaker currents and shorter run. The slough is used extensively for towing logs.

La Conner, near the southern end of Swinomish Slough, is the center of a rich agricultural district. It has wharves with depths of 4 to 14 feet. A limited amount of provisions can be obtained. There is a small marine railway capable of handling boats up to 65 feet in length.

Ika Island, 410 feet high, 0.6 mile eastward of Goat Island, is heavily wooded, and on its southern and eastern sides, is characterized by weathered cliffs rising from the high-water line. Shifting channels of 1- to 2-foot depths exist across the mud flats from Skagit Bay to North Fork Skagit River and to **Sullivan Slough.**

Guemes Channel, separating Guemes Island on the north and Fidalgo Island on the south, leads eastward from Rosario to Padilla Bay. The channel, which is about 3 miles long and 0.5 mile wide at its narrowest point, has depths of 7 to 18 fathoms.

Shannon Point, the southern point at the western entrance to Guemes Channel, is low and rounding; a rocky shoal, marked by a lighted buoy at its northern extremity, extends 200 yards northward from the point.

In Guemes Channel the current velocity extends 5 knots, at times. It is reported that the flood (eastward current) is accompanied by an eddy between the eastern end of Guemes Island and Capsante, with a westward counter current extending about 200 yards from the shore along the north side of Fidalgo Island.

Current predictions for Guemes Channel may be obtained from data given in the *Pacific Coast Current Tables.* During periods of strong currents, vessels anchoring in the channel should guard against dragging anchor, as the holding ground is poor.

Ship Harbor is a bight close eastward of Shannon Point, at the western entrance to Guemes Channel. The former large wharves have been removed.

City of Seattle Rock, with 1½ fathoms over it, is 200 yards offshore on the southern side of the channel, about 2 miles eastward of Shannon Point.

Anacortes, on the southern shore of Guemes Channel, is a thriving town and a port of entry. It is the center of an extensive salmon-canning industry, and canneries with wharves built out to depths of 12 to 20 feet line the southern shore of the channel. A large fertilizer factory and several large sawmills are in Anacortes. The commerce of the port includes logs, lumber products, wood pulp, salmon, fertilizer, and farm produce.

The port is incorporated as the **Port of Anacortes.** There are two wharves that can accommodate deep-sea vessels; the port wharf at the foot of Commercial Street, and a lumber wharf 200 yards to the eastward. Both these wharves have a depth of 30 feet alongside. There is an electric fog siren on the port wharf.

Capsante Waterway, leading to the eastern water front of Anacortes, is marked by a lighted range and four buoys maintained by the port.

A Federal project provides for a channel in Capsante Waterway 150 to 250 feet wide and 12 feet deep between the east side of G Avenue and deep water in Fidalgo Bay, a distance of 250 feet.

In June 1948 the controlling depth in the channel was 9½ feet except the portion west of R Avenue. At the inner end of Capsante Waterway is a small-boat harbor with a capacity of about 70 boats. The depths in the boat basin range from 8 to 14 feet.

Anchorage may be had off the wharves in 6 to 12 fathoms. During periods of strong current vessels at anchor in the channel should guard against dragging as the holding ground is poor.

Tides.—The mean range of the tide at Anacortes is about 5 feet while the range between mean lower low water and mean higher high water is about 8 feet.

Pilots may be obtained through the Puget Sound Pilots, Seatte.

Towboats.—Several local towboats are available.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded for inspection. If vessels require fumigation after discharging cargo at Anacortes, this service is performed at the port. Advance notice should be given the senior surgeon of the Public Health Service of Seattle.

Marine hospital.—The Public Health Service maintains a medical relief station in the Medical-Dental Building and a contract hospital.

Customs.—Anacortes is a port of entry in charge of a deputy collector. The customs office is in the Post Office on Commercial Street. A sub-office is at the International Ferry Landing at the west end of Sixth Street.

Immigration.—The immigration office is in the Post Office. A sub-office is at the International Ferry Landing.

A **chart agency** of the U. S. Coast and Geodetic Survey is here.

No harbor regulations are prescribed. The port manager has an office at the foot of Commercial Street.

Supplies and repairs.—Fuel oils, water, coal, provisions, and ship chandler's stores can be obtained. A shipyard with a marine railway having a capacity of 300 tons and capable of hauling out vessels up to 120 feet in length and 14-foot draft is in Anacortes. There are machine shops.

Communication is by daily steamers or rail and by telegraph and telephone. Ferry service is maintained to Guemes Island and San Juan Archipelago, and during the summer months, to Sidney, Vancouver Island.

Fidalgo Bay, a shallow arm of Padilla Bay, extends southward from the eastern end of Guemes Channel. A shallow channel leads through the flat toward the head of the bay.

Padilla Bay is between the mainland and the northern part of Fidalgo Island. The bay is largely occupied by drying flats, but deep water lies eastward of Capsante and Guemes Island. Entrance to the bay may be had from Rosario Strait through Guemes Channel; a passage eastward of Guemes Island leads into Padilla Bay from the northward.

Chart 6380.—William Point about 100 feet high, is the western point of **Samish Island,** which forms the northern side of Padilla Bay. The point is wooded and, because of the low land eastward of it, appears as an island. The western extremity of the point is marked by William Point Light, shown from a small white house; the light is 30 feet above water and visible 7 miles.

Jack Island, on the western side of the bay, is about 1.4 miles east-southeastward of Clark Point, the northern extremity of Guemes Island.

South-southwestward of Jack Island a shoal with depths less than 3 fathoms extends about 700 yards off the northeastern side of Guemes Island. From William Point, flats and shoals extend southward to **Saddlebag, Dot,** and **Hat Islands,** which lie eastward of Guemes Island, and on the edge of the flat extending from the eastern side of Padilla Bay.

Huckleberry Island, small and low, is nearly in mid-channel between Guemes and Saddlebag Islands.

March Point, low and wooded, is on the southern shore of the bay. March Point Light, shown from a black pile dolphin, serves as a leading mark for the channel eastward of Guemes Island. The light is 18 feet above the water and visible 7 miles. There is a dredged channel, marked by lights and daybeacons, across the flats eastward of March Point, which leads to Swinomish Slough.

Chart 6378.—Bellingham Channel, between Cypress and Guemes Islands, is the most direct and the one generally used by vessels proceeding to Bellingham Bay from the southward. The depths vary from 17 to 60 fathoms in mid-channel. Between Cypress and Guemes and Sinclair Islands, the tidal currents have considerable velocity, but between Sinclair and Vendovi Islands, the velocity of the current is considerably less.

A shoal marked by a buoy fringes the yellow bluff forming the southwestern side of Guemes Island.

Cypress Island Light is shown on the western side of Bellingham Channel from a white house on the eastern extremity of the island which forms the northeastern side of **Deepwater Bay.** The light is 16 feet above water and visible 8 miles.

Cone Islands, a group of five islets on the western side of Bellingham Channel, are off the northeastern side of Cypress Island just northward of **Eagle Harbor.** The easternmost, 70 feet high, is the largest of the Cone Islands. Foul ground extends about 300 yards westward of the northernmost islet.

Clark Point, on the eastern side of Bellingham Channel, is a steep bluff forming the northern point of Guemes Island. A reef extends about 300 yards northward from the point.

Vendovi Island, about 1.8 miles northeastward of Clark Point, is on the southeastern side of the southern approach to Bellingham Bay.

A shoal with a least depth of 4¼ fathoms is about 700 yards southwestward of Vendovi Island and is marked on its western side by a buoy.

Deep-draft vessels approaching Bellingham Bay from the northward use the channel between Lummi and Sinclair Islands. With the exception of Viti Rocks and the dangers northward of Sinclair Island, this channel is free of danger. The fairway is deep and has a width of 1,200 yards at its narrowest part, between Viti Rocks and **Carter Point,** the southern extremity of Lummi Island.

Viti Rocks are about 0.7 mile southwestward of Carter Point and extend 500 yards northwestward. The northwesternmost rock is 35 feet high, 200 yards long, and 70 yards wide, and is marked by a light on its highest point. Viti Rocks Light, unwatched, is shown from a white framework on a square wooden house. The light is 45 feet above water and visible 9 miles.

Hale Passage, separating Lummi Island from the mainland northeastward, is about 6 miles long and has an average width of about 0.8 mile. The depths vary from 2½ fathoms on the bar near the northwestern end to 20 fathoms in the southeastern end of the channel.

Lummi Point, on the western side of Hale Passage, about 1.5 miles southeastward of Point Migley, the northwestern extremity of Lummi Island, is marked by Lummi Point Light, unwatched, shown from a small white square structure. The light is 17 feet above the water and visible 9 miles. There is a large building on Lummi Point northwestward of the light.

Lummi Bay, northward of the northwestern end of Hale Passage, indents the mainland between **Sandy Point,** about 2.2 miles northward of Point Migley and a point about 3.5 miles south-southeastward. The bay is almost completely filled with a drying flat.

Lummi Island Beach, a village with a post office, is on the western side of Hale Passage, about a mile southward of Lummi Point. At the village is a landing wharf built out to 10 feet. Ferry service is maintained between Lummi Island and **Gooseberry Point** on **Lummi Indian Reservation.**

From **Point Frances,** the northern point at the southeastern entrance of Hale Passage, a bank extends to Eliza Island. The depths range from 4½ fathoms to 1½ fathoms about midway between the point and the island. A buoy is moored close southward of the shoal. The end of the spit making southeastward from Point Frances is marked by buoys.

Bellingham Bay, from William Point to the head, is about 12 miles long and 3 miles wide. Anchorage may be obtained almost anywhere in the bay; the depths, over the greater portion vary from 6 to 15 fathoms, mud bottom; however, due to the nature of the mud bottom, vessels are apt to drag anchor in heavy weather.

Samish Bay, separated from Padilla Bay by Samish Island, with flats bare for a considerable distance at low water, constitutes the southeastern part of Bellingham Bay. Extensive oyster culture is carried on in the eastern portion of the bay.

Chuckanut Bay, which indents the eastern shore, is a cove affording shelter to small vessels. A cannery with wharf and an old stone quarry are on the east shore, opposite Chuckanut Bay. **Chuckanut Island** and **Chuckanut Rock** lie close within the entrance.

The villages of **Lummi** and **Marietta** are near the mouth of the **Nooksack River** which empties in the northwestern part of Bellingham Bay. Extensive mud flats fill this corner of the bay.

Eliza Island, low and partially wooded, is 1 mile northeastward of Carter Point. On the northwestern side of the island is a storage yard where fishboats and scows are hauled out for the winter. The island is fringed by a shoal, and in most places the shores should not be approached within about 400 yards. A rock with a depth of 1 fathom is about 500 yards northward of the western extremity of the island.

Eliza Rock, off the southern end of Eliza Island, is marked by a light. Eliza Rock Light is shown from a white pyramidal house. The light is 21 feet above the water and visible 9 miles. An electrical bell operates continuously at the light.

Bellingham, a customs port of entry, is at the head of the bay on the eastern shore. The principal products are lumber, wood pulp, canned fish, and agricultural produce. A chain foundry, cannery, and a shipyard are in South Bellingham. A number of wharves are built out from the northern and eastern shores with depths alongside of 18 to 35 feet.

The flats extending from the northern shore have been improved by dredging channels from the deep water in the bay to the pierhead line at the mouths of **Whatcom** and **Squalicum Creeks.**

Prominent objects.—The local newspaper building bears the lighted sign HERALD which is particularly noticeable at night. During the day the Bellingham Museum, a red brick building with a clock tower shows prominently. The triple stacks at the cement plant 1.8 miles northwestward of Whatcom Waterway are prominent and easily identified.

Whatcom Creek Waterway is marked by Whatcom Waterway Light shown from the roof of the warehouse at the outer corner at the southwest end of the municipal wharf. The light is 37 feet above water; the fog signal is sounded on a diaphragm horn. A red sector covers the shoreline on the southeast side of the bay and Starr Rock.

Squalicum Creek Waterway is marked by three lights. Squalicum Creek Entrance Light is shown from a white house at the west end of the east-west breakwater. Bellingham Breakwater Entrance Light is shown from a white house on a dolphin off the southeasterly breakwater. Squalicum Creek Waterway Light is shown from a white house on a dock inside the breakwater.

A Federal project provides for dredging Whatcom Creek Waterway 363 feet wide, 26 feet deep for the outer 3,800 feet, and 18 feet deep for the inner 1,300 feet; for an entrance channel in Squalicum Creek Waterway 200 feet wide from deep water in the bay to the main pierhead line.

In June 1950 the inner 1,300 feet of Whatcom Creek Waterway had a controlling depth of 13½ feet except at the head of the waterway, and a depth of 26 feet over a width of 200 feet in the next 3,000 feet; the outer 800 feet were 26 feet deep

over a 300-foot width in May 1949. In September 1947 the Squalicum Creek Waterway entrance channel was 25½ feet deep over a width of 200 feet, and the basin was 23½ feet deep except near the edges.

Anchorage.—Bellingham Bay is mostly mud bottom but the mud is a thin accumulation over hardpan and is not good holding ground in heavy weather.

A haven for a large number of small boats is adjacent to, and eastward of, Squalicum Waterway. Ice, fuel, provisions, and repair facilities are available.

Post Point, on the eastern side of Bellingham Bay, is about 1.5 miles north-northwestward of the northern entrance point of Chuckanut Bay. A sandy spit, marked by a lighted buoy, extends about 450 yards from the point.

Starr Rock, with a depth of 1¼ fathoms, is about 300 yards offshore, 0.7 mile southwestward of Whatcom Waterway Light; it is marked by a buoy. Vessels should not pass inside the rock.

Chart 6380.—Directions.—To enter Bellingham Bay from southward through Bellingham Channel, the principal entrance, follow the directions for Rosario Strait, given in Chapter 3, and continue the 028° course for 0.65 mile past Burrows Island Light to a position with Fidalgo Head abeam, distant 0.8 mile. Then steer 033° for 4 miles, passing a little over 0.3 mile off the point on the western side to a position in the middle of the strait, with Cypress Island Light in range with the easternmost Cone Island. Change to Chart 6378.

Then steer 004° for 2.2 miles, passing 0.2 mile eastward of Cypress Island Light to a position with the easternmost Cone Island abeam, distant 0.5 mile. From here steer 044° for 1.9 miles to a position 0.6 mile 270° from the western extremity of Vendovi Island, and then steer 058° for 3.3 miles to a position of 0.8 mile 090° from Eliza Rock Light.

From here a 014° course for 4.3 miles will lead to a position 0.2 mile off Post Point bell buoy, an 036° course for 2.2 miles additional will then lead westward of Starr Rock buoy and to the entrance of the dredged channel leading to Bellingham.

Tides.—The mean range of the tide at Bellingham is about 5 feet; the range between mean lower low water and mean higher high water is about 8½ feet. A range of about 14 feet may occur at the time of maximum tides.

Storm warnings are displayed day and night by the Weather Bureau, from a skeleton steel tower southeast of the municipal dock and inshore from a prominent lone brick stack.

Pilots may be obtained from the Puget Sound Pilots, Seattle.

Towboats up to 1,000 horsepower are available in Bellingham.

Quarantine.—Vessels destined for Bellingham, which require quarantine inspection usually proceed to their docks where they are boarded by quarantine officers. Fumigation may be had at Bellingham by giving advance notice to the senior surgeon of the Public Health Service at Seattle.

Marine hospital.—The Public Health Service maintains a medical relief station at 512 Herald Building and a contract hospital at Bellingham.

Customs.—The customs office is in the Federal Building, corner of Cromwell and Magnolia Streets.

Immigration.—The United States Immigration Service has an office in the Federal Building.

A **chart agency** of the U. S. Coast and Geodetic Survey is in Bellingham.

Harbor regulations are prescribed for Bellingham Harbor, and are enforced by a harbor master. The limit of speed for vessels within 2,000 feet of the wharves is 6 miles an hour, and from 2,000 feet to 1 mile from the wharves it is 8 miles per hour. The discharging of ballast is prohibited in water less than 20 fathoms deep, and the discharging of garbage is prohibited within a mile of the outer harbor line. The Port of Bellingham office is on the municipal wharf.

Facilities.—The hoisting facilities for heavy lifts are not generally available for public use. There is one grain elevator and several storage warehouses; the warehouse with cold storage facilities is about a mile from the water front at Squalicum Creek Waterway. An ice plant is on the Squalicum Creek Waterway.

Supplies.—Provisions and ship chandler's stores may be obtained. Water can be had at the wharves and fuel oil at the oil docks.

Repairs.—Minor repairs to vessels can be effected. Marine railways are available for vessels up to 140 feet in length.

Communication is by rail or bus, and by telegraph and telephone. The airport is about 1.5 miles northwestward of the city. Bellingham is on the Pacific Highway, U. S. Highway 99.

Chart 6300.—Georgia Strait, between the southeastern end of Vancouver Island and the mainland northeastward, extends about 115 miles northwestward from the convergence of Rosario Strait and the continuations of Haro Strait and San Juan Channel. In Georgia Strait, the general depths are great and in many places exceed 200 fathoms. Rosario Strait, Haro Strait, and San Juan Channel have all been described previously.

Vessels bound to Georgia Strait from Puget Sound should give the southern shore between Boundary and Active Passes a berth of at least 2 miles, because it is fringed with dangers. Point Roberts, on the northern shore, affords an excellent landmark.

Tidal currents.—In Georgia Strait, the tidal currents are not nearly as strong as those in the channels leading to it from the Strait of Juan de Fuca. The currents in Georgia Strait attain a velocity of 3 knots at times, particularly during the freshets of summer, when the Fraser River discharges a large volume of fresh water. This fresh water, which has a peculiar milky color, flows across the banks at the mouth of the river and almost directly toward Active Pass. Frequently this water extends entirely across the strait and at times reaches into the inner channels along the shore of Vancouver Island; at other times, it reaches only to the middle of the strait and forms a striking contrast with the deep blue water of Georgia Strait.

In the middle of the strait northward of Patos and Saturna Islands, the velocity of the current varies from 1 to 3 knots, seldom exceeding the latter. The velocity is still less northwestward of the mouth of the Fraser River, where the width of the strait is about 15 miles. Southeastward of the mouth of this river the tidal currents are slightly stronger off the southern shore than off the northern one; within a line joining Point Roberts and Sandy Point, the currents are scarcely felt

and vessels can take advantage of this, especially since good anchorage can be obtained in this vicinity.

The tidal currents are stronger close to the southern shore which is swept by the rapid currents out of Active, Porlier, and Gabriola Passes. The south-going tidal current in Georgia Strait sets strongly southwestward into Active Pass.

Chart 6380.—Between Sandy Point previously described and **Cherry Point,** about 4.5 miles north-northwestward, the shore of the mainland forms a bight in which there are no off-lying dangers.

Point Whitehorn, about 2.8 miles northwestward of Cherry Point, is a conspicuous, bold bluff about 150 feet high; its seaward face is a steep cliff of white clay.

Chart 6300.—Birch Bay, on the eastern side of Georgia Strait, is between Point Whitehorn and **Birch Point,** about 3 miles northwestward; it is an open bight, affording anchorage in 4 to 5 fathoms. It is open southward and westward, but affords some protection from northward. The bay is circular in shape and about 2 miles in extent. Flats, bare at low water, occupy a considerable area at the head of the bay. A number of resorts are along the shores of the bay.

The **International Boundary** between the United States and Canada is marked, where it crosses Boundary and Semiahmoo Bays, by range lights on skeleton steel towers with square slatted daymarks. These lights are not intended for navigation. **The Peace Monument** on the boundary is a masonry arch, facing north and south, about 28 feet above the ground, and painted white. It is a distinctive landmark as it stands alone and shows offshore against a background of dark trees.

Caution.—The attention of all mariners, especially those frequenting Puget Sound or Canadian waters, is called to the fact that the International Rules govern in Canadian waters.

Point Roberts is the prominent feature in approaching from either northward or southward. The eastern face is about 180 feet high and is composed of white, vertical bluffs. The point is well wooded, and owing to the low land behind it, is usually made as an island, especially from southward. The southwestern extremity of the point is marked by Point Roberts Light, shown from a white skeleton tower. The light is 30 feet above water and visible 11 miles.

Temporary anchorage may be obtained westward of Point Roberts in a depth of 8 fathoms, good holding ground, about 1 mile 321° from Point Roberts Light. The position is about 0.3 mile from the edge of Roberts Bank and vessels should anchor no farther northward.

Chart 6399.—Semiahmoo Bay has its entrance between Birch Point and Kwomais Point, about 5 miles north-northwestward. It is funnel-shaped and is connected, at its eastern end, by a narrow channel with Drayton Harbor. The eastern part of the bay is shoal. Anchorage may be had in the bay in 5 to 9 fathoms, but is exposed southward and westward.

Drayton Harbor is a small basin-like cove formed by **Semiahmoo Spit,** the extension of a sandpit northward of Birch Point. It is about 2 miles in extent, but flats bare at low water, occupy a large area in the eastern and southern parts of

the harbor. Anchorage within the 18-foot curve is limited to a small area just within the entrance; farther in there is ample anchorage space for small craft in depths of 9 to 18 feet. The harbor is not a good anchorage in stormy weather.

Semiahmoo Harbor Light, shown from a white pyramidal house with red triangle on piles, is near the northern extremity of the extensive sand flats that extend off the northwestern side of Semiahmoo Spit. The light is 28 feet above water and visible 10 miles from 024° to 294°. A fog signal is sounded on an air-diaphragm horn.

A buoy marking the western edge of the sand flats is moored about 700 yards southwestward of the light. Another buoy, marking the northwestern side of the channel leading into Drayton Harbor, is about 550 yards northeastward of the light.

The channel from Semiahmoo Bay into Drayton Harbor has a controllling depth of 28 feet. There is a 16-foot spot about 200 yards northward of the cannery wharf on Semiahmoo Spit; in entering Drayton Harbor, vessels should favor the southern side of the channel.

California Creek, entering the southeastern part of the harbor, has its entrance barred by a fixed highway bridge having a horizontal clearance of 10 feet and a vertical clearance of 5 feet; the entrance to this creek may be reached only at high water with shallow-draft boats.

Dakota Creek may be entered at high water by boats drawing not more than 3 feet as far as the bridge which is 0.5 mile above the mouth and at the head of navigation.

In the harbor is a large low water area which is to be avoided even at high tide. Numerous piles, wreckage, and dumps make high water navigation hazardous even with a shallow-draft boat. There are many boulders between the low water and high water lines.

Blaine is near the entrance on the northern shore of Drayton Harbor. Blaine City wharf, with a depth of 24 feet along its face, has a service station where launch fuels and water are available. A protected boat basin is on the south side of the city wharf. Several buildings, an elevated tank, and a cannery, constituting the town of **Semiahmoo,** are at the northern end of the sandspit. A depth of 30 feet has been reported at the large cannery wharf. Lumbering and fishing are the principal industries. Provisions are obtainable but only a small quantity of coal is available. Waters may be obtained at the cannery wharves.

To enter Drayton Harbor from Semiahmoo Bay pass about 300 yards northward of Semiahmoo Harbor Light, and steer a course about midway between the cannery wharves and the boat basin. After reaching the cannery wharves favor the northern side of the channel to avoid the spit east-southeastward of the cannery, and anchor as convenient.

The depths in Drayton Harbor and its entrance are subject to change hence the charted data should be verified.

Tides.—The mean range of the tide at Blaine is about 6 feet while the range between mean lower low water and mean higher high water is about 9½ feet.

Storm warnings are displayed day and night from a steel tower near the water front in Blaine.

Pilotage is compulsory for all vessels except under coasting trade on the west coast of the United States, including Alaska and British Columbia. Pilots may be obtained from the Puget Sound Pilots, Seattle, on short notice.

Communication may be had by rail and there are telephone and telegraph facilities. The United States-Canadian boundary line passes through the northern edge of Blaine; the Pacific Highway, providing freight and bus service, passes through the town. A small passenger and freight vessel operates between Blaine and the San Juan Islands.

Chart 6300.—Boundary Bay indents the mainland between **Kwomais Point,** the northern entrance point of Semiahmoo Bay, and Point Roberts. The greater portion of the bay is filled with flats, bare at low water; in the northeastern part of the bay the flats are intersected by narrow, shallow channels leading to the **Nicomekl** and **Serpentine Rivers.**

Except for **English Bluff,** about 1.5 miles northward of **Boundary Bluff,** the coast northward to Point Grey is low, featureless, and barely discernible from Georgia Strait.

Roberts Bank and **Sturgeon Bank** are formed by the alluvial deposits of the Fraser River. The former, extending northwestward of Point Roberts, is southward of the river channel and the latter, extending southwestward of Point Grey, northward of it. These banks dry in patches and in places extend 4.5 miles offshore. They are steep-to; soundings of 50 fathoms will be found very close to the edge of the bank. Vessels working along the edge of Roberts Bank should not bring the southern extremity of Point Roberts or the edge of the high trees immediately within it to bear more than 114°. A buoy marks the entrance to the channel leading through Roberts Bank to Canoe Pass.

The cooperation of ships' masters is requested in not navigating their vessels, wherever practicable, within 2 miles of Sturgeon Bank. This is in the interest of the fishing industry and the reduction of damage to nets and fishing vessels by ships passing in close proximity to the fishing ground. It is understood that mutual agreement has been reached on this point between the shipping and fishing interests and the Department of Transport urges mutual cooperation.

The **Fraser River** enters Georgia Strait about 10 miles northwestward of Point Roberts. The river is joined by the **Coquitlan** and **Pitt Rivers** about 3.5 miles, respectively, above New Westminster. The **Harrison River** joins the Fraser River about 60 miles above the mouth.

The least depth in the channel from the Strait of Georgia to New Westminster, on the northern bank about 20 miles up the river, was 21 feet in 1938; between New Westminster and **Port Mann,** about 3 miles eastward, the least depth was 23 feet. In 1950 by operating on the tides, vessels drawing 28 feet were using the river to New Westminster.

The river is at its lowest level during January, February, and March. It begins to rise in April with a more rapid rise in May and reaches its highest level about the end of June. The river begins to subside between the middle and end of August, and in September the current is not inconveniently strong. September, October, and November are favorable for the navigation of the river as the water

is then sufficienlty high for vessels to reach **Hope,** 80 miles above the mouth, and the strength of the current has considerably abated.

Caution.—The channels in the Fraser River are constantly changing and the aids to navigation which mark them are moved accordingly.

Pilotage is compulsory between Sand Heads and the mouth of the Pitt River. Elsewhere in Fraser River local knowledge is advisable. Pilots can be obtained from New Westminster, and they usually meet vessels about a mile seaward of Sand Heads Lightship.

Towboats are available at New Westminster.

The harbor commissioner's office is at 713 Columbia Avenue.

The main entrance to the Fraser River is between Sand Heads Lightship and the lighted whistle buoy about 1.5 miles southward; thence this entrance leads between Sturgeon Bank on the north and Roberts Bank on the south.

The channel entrance is protected on its northern side by **Steveston Jetty,** built along the southern edge of Sturgeon Bank, extending about 1.2 miles west-northwestward and thence 3.5 miles west-southwestward from Garry Point. The western end of the jetty is marked by a light.

Sand Heads Lightship has a red hull with Lightship No. 16 in white on sides, 1 mast. The light is 40 feet above water and visible 11 miles. A fog signal is sounded on an air-diaphragm horn. A lighted whistle buoy is moored on the southern side of the entrance channel about 1.5 miles southward of the lightship.

Steveston on **Lulu Island,** about 0.5 mile eastward of **Garry Point,** the northern entrance point to Fraser River, extends along the bank of the river about 1 mile. Several canneries and wharves are here; large fishing boats can lie alongside the wharves at all stages of tide. Small quantities of gasoline and Diesel oil are available.

A number of islands are in the mouth of the Fraser River.

Canoe Pass is a narrow channel about 3 miles southeastward of **Pelly Point,** the southern entrance point of Fraser River. Light-draft vessels with local knowledge use the narrow and intricate channel from Canoe Pass through Roberts Bank to Georgia Strait. A swing bridge crosses the northeastern end of Canoe Pass.

The tidal currents in the Fraser River are affected by the weather in Georgia Strait, the rains, and the amount of water in the river. In the channel above Garry Point during the freshets, the flow, which may be checked by the rise of the tide, is almost continuously toward the mouth of the river. During the freshets the greatest velocity occurs 2 to 3 hours before low water and may amount to 5½ knots. After the freshets are over, the greatest velocity occurs on the average about 1½ hours before low water and is reduced to 3 or 4 knots. During the low stage of the river there is a flood and ebb on all the larger tides; the flood begins soon after high water and commences first along the bottom.

At New Westminster the flood current is unable to reverse the river current except in the autumn months. The river is very seldom frozen over here; loose pieces of ice, which do no damage to shipping, occasionally come down the river.

New Westminster is on the northern bank about 20 miles above the entrance. Several canneries and sawmills are here and a conspicuous grain elevator stands about a mile below the town. A large cold storage plant is available. The wharves

have depths of 27 to 34 feet alongside; most of the wharves have warehouses and sheds and many have railroad tracks. Extensive engine repairs and minor hull repairs can be effected. Supplies of all kinds are available; small quantities of coal, Diesel oil, and fuel oil are available.

A railroad car ferry operates between Port Mann and Victoria, Vancouver Island.

North Arm is entered by a channel, dredged for a width of 300 feet and a depth of 10 feet, heading from Georgia Strait about 0.5 mile southwestward of Point Grey. North Arm, under the name of **North Fraser Harbor,** has been developed for sawmilling and other purposes. It is spanned by several swing bridges.

A jetty, which forms the southern side of the western entrance channel to North Arm, extends about 3 miles northwestward of **Iona Island,** which is on the southern side of the entrance proper of North Arm. Navigational aids mark this channel.

Middle Arm is a branch of North Arm and is separated from the western end of North Arm by **Sea Island.**

Point Grey, the southern entrance point of **Burrard Inlet,** is a rounded bluff forming the western termination of a wooded promontory. The point is very conspicuous from southward. On the high land above the point are the conspicuous buildings of the University of British Columbia.

The 6-fathom curve is about a mile offshore, and depths of 3 fathoms are about 0.5 mile northwestward of Point Grey. A lighted bell buoy is moored about 1.2 miles northward of Point Grey.

Point Atkinson, the northern entrance point of Burrard Inlet, is comparatively steep-to; however, a rock which dries 5 feet is 100 yards off shore about 700 yards northeastward of the point and a rock awash is about 500 yards northeastward of the point. Point Atkinson Light is shown from a white hexagonal tower with six buttresses, surmounted by a red cylindrical lantern. The light is 108 feet above water and visible 16 miles. The fog signal is sounded on an air diaphone. There is a radiobeacon synchronized for distance finding.

Tide rips occur frequently off Point Atkinson, caused by the meeting of the tidal currents from Burrard Inlet and Howe Sound.

Spanish Bank extends about 1,200 yards northward from the western half of the promontory terminating in Point Grey. The bank, which dries, is composed of hard sand, is steep-to, and its position is indicated by a ripple during strong westerly winds at or near low water. On its northern edge, about 1.5 miles northeastward of Point Grey, is a heap of boulders which dries 6 feet. The bank is steep-to and its position is indicated only by a ripple during strong westerly winds and then only at or near low water.

Measured distance.—Two pairs of daybeacons, consisting of large triangles on posts are on Spanish Bank and mark a measured distance of 6,077 feet; the courses for this distance are 090° and 270°.

English Bay, on the southern shore of Burrard Islet, is immediately within the entrance eastward of Point Grey. The depths in the bay decrease regularly from the 10-fathom curve, but northward of the bay a deep channel has been scoured by the discharge through First Narrows from the upper portion of Vancouver Island. A rocky shoal fringes the western side of Stanley Park Peninsula. **False Creek**

is an inlet leading southeastward from the eastern extremity of the bay. The inlet is crossed by four bridges. The vertical clearance of the first bridge when raised is 90 feet. False Creek Range Front Light is on the center span of the first bridge. False Creek Range Rear Light is on the west end of the second bridge 134° from the front light. An **echo board** consisting of a T-shaped white slatwork structure is on the southern entrance point of False Creek.

From Point Atkinson to **Reardon Point**, about 4 miles eastward, the northern shore of Burrard Inlet is indented by **Caulfield, Claymore, Ettershank,** and **Patterson Coves.**

Vancouver Harbor includes all the tidal waters in Burrard Inlet eastward of a line drawn from Point Grey to Point Atkinson. A secure harbor, available to the largest vessels afloat, is formed between First and Second Narrows, and on its southern shore is the city of **Vancouver,** the third largest city of Canada and the commercial metropolis of British Columbia. A United States Immigration station is in Vancouver.

The three principal anchorages in Vancouver Harbor are English Bay, the outer anchorage; Vancouver within First Narrows; and **Port Moody,** at the head of the eastern arm of Burrard Inlet.

The general depths in First Narrows are 5¼ to 12 fathoms; the fairway has been swept to a depth of 32 feet.

In First Narrows the average velocity of the tidal current at strength is nearly 4 knots and velocities of 6 knots or more occur at times. Daily current predictions for First Narrows and data from which similar predictions may be made for Second Narrows are published in the *Current Tables Pacific Coast.*

First Narrows is formed between the northern part of the **Stanley Park Peninsula** and a flat extending 200 to 600 yards off the mouth of the **Capilano River.** Off Prospect Point, the northern extremity of the Stanley Park Peninsula, the channel is not more than 300 yards wide.

From a distance seaward, the entrance to First Narrows is difficult to identify without local knowledge. The twin spires of a church about 1.8 miles southeastward of Reardon Point are prominent.

Prospect Point is a high bluff on the southern side of First Narrows.

A **signal station** is on the suspension bridge crossing the First Narrows. The station is at the middle point of the bridge and vessels may communicate with the station by any form of visual signaling. Signals to warn mariners of the presence of other vessels in First Narrows are displayed from the yardarms of the signal mast. From seaward the signals are not visible until Prospect Point is cleared; the signals are visible to out-bound vessels immediately after they round Brockton Point. One black ball, on the southern yardarm, indicates one or more in-bound vessels; two black balls, horizontally placed, indicate one or more in-bound vessels with tows. At night the balls are replaced by white lights. One red cone with the point up, on the northern yardarm, indicates one or more out-bound vessels; two red cones, points up, placed horizontally, indicates one or more out-bound vessels with tows. At night the cones are replaced by red lights. A cone, point down, over a cone, point up, indicates the fairway is obstructed; at night a red flare indicates the fairway is obstructed.

949285—52——27

Prospect Point Light is shown from a white square wooden tower with a red roof located under the bluff. The light is 35 feet above the water and visible 10 miles. The fog signal at the light consists of two electric tyfon horns which are synchronized. One horn points in a westerly direction and the other easterly.

The flat delta at the mouth of Capilano River on the northern side of First Narrows, is steep-to and dries about 12 feet; it is composed of shingle and boulders. Two lighted beacons are on the northern side of the channel. The **First Narrows Beacon** which is near the edge of the flat on the northern side of the channel, is shown from a white rectangular wooden building on concrete base with a dwelling attached on pile foundation. The light is 25 feet above water and visible 10 miles; the fog signal is an air diaphone. The **First Narrows Inner Beacon** is shown from a lantern and tank on pile dolphin. The light is 21 feet above the water and visible 7 miles; the fog signal is an air horn.

Between Prospect and Brockton Points the southern shore of the channel is fringed with drying ledges that extend as far as 150 yards offshore.

A suspension bridge, with a vertical clearance of 200 feet, crosses First Narrows close eastward of Prospect Point.

Pilotage is not compulsory, but pilots are available.

Chart 6380.—The coast between East Point and Active Pass should be given a berth of at least 2 miles as it is fringed with dangers. At night the lights on Georgina and East Points are obscured over these dangers. East Point, Rosenfelt Rock, and Tumbo Island have all been described previously.

Belle Chain Islets, a narrow rocky ridge lying parallel with several islets and drying rocks along the northern shore of **Samuel Island,** extend about 2 miles northwestward from about 1,300 yards northwestward of **Winter Point,** the northern point of Saturna Island. The largest islet, 34 feet high with a few trees on it, is near the southeastern extremity of the ridge. About 800 yards within the northwestern extremity of the ridge is a rock 3 feet high.

Edith Point, the northeastern extremity of Mayne Island, is almost 3.5 miles northwestward of Winter Point. Foul ground, with a depth of 5 fathoms at its outer end, extends about 0.3 mile southeastward from Edith Point.

A rocky patch with two heads, each of which has a depth of 4 feet, is about midway between Edith Point and the northwestern end of Belle Chain Islets. Between this patch and the northwestern end of Belle Chain Islets are some 5-fathom patches.

Campbell Bay, on the eastern side of Mayne Island, is between Edith Point and **Campbell Point.** A rock which dries 11 feet is about 100 yards offshore and 0.2 mile within Edith Point, but elsewhere the bay is free of danger. A good temporary anchorage, open to the southeastward, can be had in 12 fathoms, mud bottom, about 800 yards from the head of the bay and about 100 yards southward of an islet, 3 feet high. Vessels entering the bay should round Edith Point at a distance of about 800 yards by steering for Campbell Point bearing 217°, thus passing between the foul ground off Edith Point and the rocky patch with two heads farther southward.

Chart 6300.—Active Pass has been described previously.

Salamanca Point, on the southeastern side of **Galiano Island,** is conspicuous from both southeastward and northwestward. The point is rocky and the trees on it grow down nearly to the high water mark.

Between Salamanca Point and the entrance to Porlier Pass, about 12 miles northwestward, the southern shore of the Georgia Strait is formed by the northeastern shore of Galiano Island, which may be approached safely to a distance of 0.5 mile.

Porlier Pass separates Galiano and **Valdes Islands** and connects **Trincomali Channel** to Georgia Strait. The pass has a minimum width of about 800 yards, but the navigable channel is narrow and the tidal currents attain velocities up to 8 knots. Current predictions may be obtained from data given in the *Current Tables, Pacific Coast.* It is advisable to employ a pilot on the first visit to this pass.

Porlier Pass Range Front Light on **Race Point,** Galiano Island, is shown from a white square wooden tower with a red, octagonal lantern. The light is 21 feet above water and visible 9 miles.

Porlier Pass Range Rear Light on **Virago Point,** is shown from a white square wooden tower with red lantern, about 400 yards 196° from the front light. The light is 32 feet above water and visible 10 miles.

Porlier Pass bell buoy is moored close eastward of the shoals and rocks on the western side of the northern approach to Porlier Pass.

Gabriola Pass is between the northwestern end of Valdes Island and Gabriola Island, connecting the northwestern end of **Pylades Channel** to Georgia Strait. This pass, being narrow and intricate and having many dangers on its eastern approach, is not recommended for general navigation and should be used only by those with local knowledge.

Gabriola Reefs, a dangerous group of rocks, extend from about a mile east-northeastward to about 2 miles northeastward of the southern point of **Breakwater Island,** which is at the entrance to Gabriola Pass. On the reef are some rocks that dry 3 to 7 feet, but the northernmost and southernmost dangers have depths of 3 fathoms.

Thrasher Rock, a detached steep-to rock that dries 1½ feet, is about 400 yards eastward of the northern end of Gabriola Reefs and about 2 miles northeastward of the southern extremity of Breakwater Island. A rocky 5-fathom patch is about 400 yards northeastward of the rock.

Gabriola Reefs Light on Thrasher Rock, is shown from a black pyramidal skeleton tower on cylindrical tank with a square stone base. The light is 34 feet above water and visible 10 miles.

Nanoose Hill, bearing less than 287° and open northward of Berry Point, clears Gabriola Reefs and leads northward of Gabriola Reefs and Thrasher Rock.

Flat Top Islands, northward of Breakwater Island, are close off the eastern point of Gabriola Island.

Berry Point is the northeastern point of Gabriola Island. The northern shore of the island is thickly wooded and apparently bold; it has not been thoroughly surveyed and should not be approached within 0.8 mile.

Entrance Island, about 0.5 mile northeastward of Berry Point, is a sandstone rock 30 feet high, bare of trees, but some vegetation grows on it. Entrance Is-

land is shown from a white square wooden tower with a dwelling atached. The light is 65 feet above water and visible 14 miles. The fog signal is sounded on an air diaphone. **Storm signals** (Canadian System) are shown from the light. Rocky patches, with depths of 7 to 8 fathoms, lie within 1.8 miles eastward of the island; the patches are surrounded by deep water. Vessels without local knowledge should pass outside Entrance Island and not through **Forwood Channel** between the island and Berry Point which is used by local steamers.

Sailing vessels working through Georgia Strait at night should keep Entrance Island Light in sight; the light is obscured when bearing more than 301°.

Tinson Point, about 1.5 miles westward of Berry Point, is the northeastern extremity of a small peninsula at the northwestern end of Gabriola Island. From the western end of the peninsula kelp-covered reefs with depths of 1 to 5 fathoms extend about 600 yards northwestward.

Snake Island, a smooth-topped, grassy island 35 feet high, is about 1.8 miles northwestward of Tinson Point. Several rocks above water and others that dry are on reefs extending about 200 yards northward, eastward, and southward and about 100 yards westward. A rocky ledge, marked by a bell buoy and usually by kelp, extends about 400 yards southward from about 0.2 mile southeastward of the southern point of Snake Island. A rock with a least depth of 6 feet is on this ledge.

Fairway Channel, the easternmost of the channels in the northern approach to Nanaimo, leads between Snake Island and Tinson Point. The channel is deep and has a navigable width of 0.8 mile.

Five Finger Island, 40 feet high, a bare, rugged island with five hummocks resembling the knuckles of a closed hand, is about 1.2 miles northwestward of Snake Island. Foul ground fringes the island on all sides and extends about 250 yards southward of it. A detached 3-fathom patch is about 0.3 miles westward of the island.

Hudson Rocks, five small islets 4 to 37 feet high, lie between 800 and 1,200 yards southwestward of Five Finger Island. Reefs surround Hudson Rocks and in places extend about 200 yards from them. Hudson Rocks Light is shown from a red lantern and white cone on a mast on a square concrete base on the summit of the southwestern islet. The light is 25 feet above water is visible 10 miles. A detached 3-fathom patch is about 350 yards east-northeastward of the southernmost of the Hudson Rocks.

Rainbow Channel leads between Snake Island on the east and Five Finger Island and Hudson Rocks on the west; this channel is deep and over a mile wide.

Horswell Channel, the westernmost of the channels in the northern approach at Nanaimo, leads between Hudson Rocks and the Vancouver Island shore; the fairway is deep and almost 0.5 mile wide.

Clarke Rock lies on the western side of Horswell Channel. The rock dries 4 feet and is marked by a white daybeacon 15 feet high.

Horswell Bluff forms the southern point of the western side of Horswell Point. Foul ground extends about 600 yards east-southeastward from the bluff. A buoy is moored about 200 yards east-southeastward of the extremity of the foul ground.

Newcastle Island, 377 feet high, is on the western side of the northern approach of Nanaimo and about a mile southward of Horswell Bluff. The shores of the island are rocky. The area has been swept to a depth of 29 feet at low water.

Protection Island lies with **Batchelor Point,** its northeastward extremity, about a mile south-southeastward of McKay Point. With the exception of its northern and southern extremities, the island is thickly wooded with the tops of the trees on its summit reaching a height of about 200 feet; on the southern part of the island are some buildings connected with a coal mine.

Nanaimo Harbor is entered between **Gallows Point** and the drying mud flats westward of **Jack Point;** the flats form the southern side of the harbor. Good anchorage can be had in 5½ fathoms.

Nanaimo is the coal mining center of Vancouver Island and is a port of entry. Pilots are available and will meet vessels outside by arrangement. Wharves have depths up to 31 feet alongside. Supplies of all kinds are available. Foundry and machine shops are available for hull and engine repairs.

Neck Point, about 2 miles westward of Five Fingers Island, at the northwestern entrance point of **Hammond Bay,** is fringed with foul ground that extends almost 200 yards offshore; on this foul ground are three islets, of which the highest, 19 feet, is the southernmost.

A submerged target is 4 miles eastward of Maude Island Light. Anchoring and fishing are prohibited within 0.25 mile of the light.

The coast of Vancouver Island from Neck Point trends westward for 3 miles to **Icarus Point,** with **Blunden Point** 2 miles beyond and on the southern side of the entrance to Nanoose Harbor. The coast is fairly steep-to, the 10-fathom curve being charted 500 yards offshore; it has not been closely surveyed.

Nanoose Harbor, about 8 miles northwestward of Nanaimo, is easily recognized by Nanoose Hill on the northern side of the harbor. The hill appears as a double or notched peak from the southward; the northeastern peak has an elevation of 799 feet, but the trees on it increase the height to 854 feet. The southwestern peak has an elevation of 716 feet. The trend of the harbor is east and west and it is about 2 miles long with an average width of about 1,500 yards; the head is low and swampy. It is available for all classes of vessels; there are depths of 12 to 16 fathoms in the entrance.

Between **Wallis Point,** the northern entrance point of Nanoose Harbor, and **Dorcas Point,** about 4 miles northwestward, the shore is fronted by several islands and numerous islets, rocks, and shoals lying in the northern approach to Nanoose Harbor. No vessel without local knowledge should attempt to pass between them or between any of them and the shore.

Maude Island, about 0.8 mile eastward of Wallis Point, forms the northern side of the approach to Nanoose Harbor. The island is wooded and 119 feet high to the tops of the trees. Maude Island Light is shown from a white pole with a concrete base on the southern side of the island. The light is 25 feet above water and visible 7 miles. A detached bare islet, 11 feet high, is 75 yards off the western extremity of Maude Island and a rock drying 2 feet is 125 yards southward of the same extremity; foul ground extends 75 yards eastward and westward of the latter rock. The eastern point of the island is foul for 100 yards southward.

Edgell Banks are 1,500 yards eastward of Maude Island, and consist of four separate shoals, the three eastern of which have least depths of 8, 9, and 10 fathoms, respectively; the western one has a least depth of 4½ fathoms. The latter shoal is 1,200 yards east-northeastward of the eastern extremity of Maude Island.

Winchelsea Islands, the outermost of those to the northward of Nanoose Harbor, are five islands lying close together about 1.3 miles northward of Maude Island. The westernmost of the group, 84 feet high, is the highest, but the easternmost island, 79 feet high, is the largest. All these islands are covered with grass and on them are a few stunted trees.

Gray Rock, 2 feet high, is a small, gray rock about 0.2 mile eastward of the southern end of the Winchelsea Islands. **Rudder Rock,** about 400 yards southeastward of Gray Rock, having a depth of 6 feet, is the head of a shoal which has depths of less than 10 fathoms and is not marked by kelp.

Yeo, Douglas, and **Gerald Islands,** with **Amelia Island** between them and the shore, lie between 2 and 3 miles northwestward of Winchelsea Islands. In the vicinity of these islands there is much foul ground, and no vessel without local knowledge should attempt to pass between them, or between any of them and the shore.

Ballenas Islands, two islands on the southern side of Georgia Strait, are located with their southern extremity about 2 miles northeastward of Dorcas Point. The northern island is about 250 feet high and has only two or three trees on it; its summit terminates in a sharp, bare nipple on which stands an old lighthouse, 33 feet high, consisting of a white square wooden tower with a red lantern. The southern island is wooded and 175 feet high. They have the appearance of being one island when seen from any direction, being separated only by a narrow passage which, at the eastern entrance, is less than 200 yards wide. The western end of this channel is almost closed and there is no passage into it from that direction.

The islands are steep-to and bold on all seaward sides, except for a rocky shoal with a depth of 4 fathoms, about 450 yards off the southeastern extremity of the southern island.

Ballenas Islands Light is shown from a white octagonal concrete tower with a red octagonal lantern on the northern point of North Ballenas Island. The light is 70 feet above water and visible 14 miles. The light is visible from 040° to 307°. A fog signal is sounded on an air diaphone.

Ballenas Channel is not less than 0.7 mile wide in the fairway. Steamers and coasting vessels may take this channel but it should not be used without local knowledge.

Halibut Bank, about 18 miles easterly of Ballenas Island Light, consists of two parts; the southeastern and small part has a least depth of 15 fathoms, and the northwestern part has a least depth of 12 fathoms, hard sand and stones.

CHAPTER 17

Puget Sound, Admiralty Inlet to Seattle

Chart 6450

PUGET SOUND (CHART 6401) extends about 53 miles in a general southerly direction from Point Wilson and then turns southwestward for about 30 miles, expanding into numerous inlets and passages, the majority of which are navigable by deep-draft vessels. Admiralty Inlet is the northern portion of the sound from Point Wilson to Foulweather Bluff.

Navigation of this area is easy in clear weather and the chart is an excellent guide. The outlying dangers are few and marked by aids, and generally a mid-channel course can be followed with safety. The currents follow the general direction of the channels and have considerable velocity; see also Currents, following. In thick weather, vessels with local knowledge depend upon the echo from the whistle in navigating these waters, but owing to the uncertainty of the currents and the great depth which render the lead useless in many places, strangers are advised to obtain a pilot.

Anchorages in the area covered by this chapter are described and the regulations governing their use are given in Chapter 2, § 202.230. The restricted areas and the regulations concerning their navigation are given in Chapter 2, § 207.750.

The large tides of Puget Sound are very complex and variable, and the use of the tide tables published annually in advance by the United States Coast and Geodetic Survey is advised.

Currents.—Daily predictions of the the times of slack water and the times and velocities of strength of current in Admiralty Inlet off Bush Point, together with factors and differences for obtaining the times and velocities of the current for other points in the northern part of Puget Sound are given in the *Current Tables, Pacific Coast.* The *Tidal Current Charts, Puget Sound, Northern Part,* show the direction and velocity of the tidal current for each hour of its cycle in the waterways of Puget Sound from Admiralty Inlet to Seattle. They are designed for use with the current predictions for Admiralty Inlet contained in the *Current Tables, Pacific Coast.* A similar publication entitled *Tidal Current Charts, Puget Sound, Southern Part,* covers the sound from Seattle to Olympia. For a general description of tidal current charts see Chapter 1.

In Admiralty Inlet and Puget Sound, the tidal currents are subjected to daily inequalities similar to those of the tides. Velocities of 2 to 5 knots at strength occur from Point Wilson to Point No Point. In the more open waters of the sound southward of Point No Point the velocities are much less.

At Point Wilson and at Marrowstone Point, slack water occurs from one-half to one hour earlier near shore than in mid-channel.

In the winter when southerly winds prevail, there is generally a northerly surface drift which increases the ebb current and decreases the flood current. This effect is about ½ knot between Nodule and Bush Points.

The tidal currents in the southern entrance of Possession Sound are weak and variable.

Between Foulweather Bluff and Misery Point, the tidal currents have an average velocity of about ¾ knot at strength, while in the southern part of Hood Canal, the average velocity at strength is only about ½ knot; at times of tropic tides, however, the greater ebbs may attain velocities more than double these average values.

The tidal currents have velocities up to 6 knots or more at strength in Agate Passage.

Directions for Puget Sound and Admiralty Inlet are given in Chapter 3.

Chart 6405.—Port Townsend lies immediately southward of Point Wilson and has its entrance between Point Hudson and Marrowstone Point. It extends in a general south-southwesterly direction for 2.5 miles, with a width of 1.5 miles, and then turns southeastward for 3 miles, with a reduced width, to its head. Inside Port Hudson the depths range from 15 to 8 fathoms to Hadlock at the head of the bay. It is an excellent harbor with good anchorage throughout and easily entered. The prevailing winds in summer are from west to southwest, and in winter generally in the southeastern quadrant. Southeasterly gales, sweeping up the long expanse of Hood Canal and across the low land at the head of the bay and at the ends of Kilisut Harbor into Port Townsend, are at times severe.

Point Hudson, on the western shore about 1.7 miles south-southeastward of Point Wilson, is low and sandy. Its extremity is marked by Point Hudson Light, unwatched, shown from a white iron post on a white fog-signal house. The light is 24 feet above water and visible 10 miles. The fog signal is sounded on a diaphragm-air horn. A government wharf is 0.2 mile southwestward of Point Wilson. There is a depth of 20 feet at the wharf. Northward of Point Hudson shoals make out for nearly 0.2 mile, the outer limits being marked by a buoy.

Marrowstone Point, the eastern point at the entrance to Port Townsend, is low at its extremity but rises abruptly to a bluff about 120 feet high. The eastern extremity of the point is marked by a light. There are wharves on both sides of the point about 0.5 mile from the light. The northern wharf is abandoned and in bad repair. The southern wharf has 20 feet of water alongside at MLLW. Submarine telegraph cables are laid northwestward and southeastward from locations near the point.

Marrowstone Point Light is shown from a small white square structure.

The light is 28 feet above water and visible 11 miles. The fog signal is sounded on a reed horn.

Midchannel Bank extends northwestward from Marrowstone Point about 2 miles toward Point Wilson with depths varying from 5 to 10 fathoms.

Port Townsend, the principal town, is on the western shore immediately southward and westward of Point Hudson. It is a port of entry for Puget Sound. The depths at the wharves are ample.

Anchorage.—The usual anchorage is about 0.5 to 0.75 mile southward of the railroad ferry landing in 8 to 10 fathoms, muddy bottom, or off the wharves in town. In southerly gales better anchorage is afforded closer inshore off the northern end of Marrowstone Island or near the head of the bay in moderate depths, muddy bottom.

A haven for small boats, with a depth of 10 feet, has been built by the port of Port Townsend 1 mile southwestward of Point Hudson. There are lights at the entrance and a light on the southern corner.

Tides.—The mean range of tide at Port Townsend is 5.1 feet. The range between mean lower low water and higher high water is 8.3 feet. Because of the large diurnal inequality in this vicinity there may be only one high water and one low water a day. Reference should be made to the *Tide Tables* which give daily tide predictions for Port Townsend.

Storm warnings, day and night, are displayed by the Weather Bureau from a steel tower in front of the former marine hospital, now unused.

Pilots for Puget Sound and Alaska are stationed at Port Angeles.

Towboats.—There are no large towboats stationed at Port Townsend, but they may be obtained from Seattle or other sound ports.

Quarantine services and medical attentions as are necessary, are performed under the direction of the Coast Guard. There is no regularly assigned quarantine or relief station at Port Townsend.

Customs.—The United States Customs Service maintains a station in the Federal Building in charge of a deputy collector of customs. The deputy collector also handles immigration matters.

Supplies.—Provisions and ship chandler's stores can be obtained. Water may be had at the wharves. A limited amount of coal is on hand, but any amount may be supplied on short notice. Fuel oil may be obtained in limited quantities; gasoline and Diesel oil may be obtained at several small oil wharves.

Repairs.—There are no drydocks, and minor repairs only can be made. There are facilities for hauling out launches and fishing boats up to 85 feet in length, 8-foot draft, and 300 tons deadweight.

Communication.—A passenger and automobile ferry operates during the summer months between Port Townsend and Keystone Landing, just eastward of Admiralty Head, Whidbey Island. There are rail and bus connections with Port Angeles. Port Townsend is on the Olympic Loop Highway, which encircles the Olympic Peninsula and connects with Seattle through Olympia. There are telephone and telegraph facilities.

Glen Cove is about 2.2 miles southwestward of Port Hudson. A large paper mill with a wharf for ocean-going vessels is situated at the northern end of the cove. It is the principal industry of the area. An area surrounding the

wharf and extending to deep water has been dredged to a depth of 30 feet at mean low water and the northern edge of the dredged area is buoyed. A lighted range for approaching the wharf is maintained by the mill. The front light, 30 feet above the water, is on the outer or northeastern corner of the pier. The rear light, 70 feet above the water, is on a dock 160 yards 268° from the front light. A fog signal horn is on the outer mill building. The large white building and tall stacks of this plant are prominent.

Irondale, on the western shore about a mile from the head of the bay, is the site of a former iron foundry. Shoal water extends 0.2 mile from the shore at Irondale. Log booms extend northward 0.8 mile to **Kala Point** which is marked by a light. The mouth of **Chimacum Creek** lies just north of Irondale.

Hadlock, a village with a post office at the head of the harbor, formerly exported a considerable amount of lumber but the mill there was burned. There is a landing wharf but a few submerged pilings near it make local knowledge necessary to avoid them.

Oak Bay is connected with the head of Port Townsend by **Port Townsend Canal,** dredged 75 feet wide and 15 feet deep, with jetties at the south end which are almost submerged at high water. The canal is subject to considerable shoaling. In January 1949 the controlling depth was 15 feet. There is a light at each entrance on the western side of the canal. Both lights are shown from pile dolphins; the one at the southern entrance is at the end of the jetty. The currents through this canal are strong at times and should be watched. There is no particular danger from them as the channel is wide and straight, but there are strong eddies at the south end on the ebb current. A ferry crosses the northern end of the canal at frequent intervals. The ferry slips are not prominent but are well out of the routes through the canal. There are two overhead wire crossings with sufficient clearance to accommodate the general traffic. Rules and regulations for the waterway connecting Port Townsend and Oak Bay are prescribed by the Secretary of the Army and are given in Chapter 2, § 207.750.

Kilisut Harbor, separating **Indian Island** on the west and **Marrowstone Island** on the east, is a narrow inlet extending about 4 miles in a south-southeasterly direction, with an average width of 0.5 mile; the entrance is about 2.5 miles southwestward of Marrowstone Point. The entrance channel is winding, with a least depth of about 11 feet; inside good anchorage is afforded in 4 to 5 fathoms. At the southern end of the harbor the two islands are connected by an earth-filled causeway. This inlet is little used and local knowledge is necessary to enter.

A 300-foot pier at **Fort Flagler,** northeasterly of the entrance to Kilisut Harbor, is parallel to and approximately 300 feet northeasterly of the line of piling that was the south terminus of the submarine net formerly across the entrance to Port Townsend.

Chart 6450.—Admiralty Inlet extends from the Strait of Juan de Fuca to Foulweather Bluff.

Admiralty Bay, eastward of Admiralty Head described in Chapter 16, is used only occasionally as an anchorage as it is exposed to southwesters and has

hard bottom and strong currents. A mooring basin is in **Crockett Lake,** just northeastward of Admiralty Head, connected with Admiralty Bay by a 150-foot wide channel. Within the basin is a passenger and automobile ferry landing which is open for public use. The army has a temporary landing ramp within the basin and a wharf just outside the basin. This project provides for a channel 18 feet deep over a width of 150 feet, protected by a breakwater from Admiralty Inlet, to the basin, also 18 feet in depth and about 6 acres in area. In March 1950 the project depths obtained in both the channel and basin.

Marrowstone Point has been described previously.

Bush Point is marked by a light 25 feet above the water, on a white pyramidal building, at the end of a low sandspit. A fog signal is sounded on an air horn. Back of the spit the land shows as a low timbered point from northward or southward. The flood current is reported to set strongly toward Bush Point. *Tidal Current Charts* for this area should be consulted. A rock lies 250 yards offshore and 1.1 miles 144° from Bush Point Light.

Oak Bay is a cove on the western side of Admiralty Inlet, westward of the southern ends of Marrowstone and Indian Islands. A shoal extends southward of the eastern entrance point and is marked by a buoy.

Mutiny Bay, northwestward of Double Bluff, affords temporary anchorage near the center in 10 to 20 fathoms, which may be used if overtaken by fog. The shores are partly bluff and otherwise low. **Austin,** a village with a post office, is just northeastward of the middle of the bight. A sport-fishing resort is on the bay, but there is no wharf. Gasoline is available. Strong tide rips, at times dangerous for small boats, occur off Double Bluff, particularly on the ebb with strong northwesterly winds. There is frequently an eddy in Mutiny Bay; tidal current charts should be consulted.

Double Bluff consists of bare, white cliffs, 300 to 400 feet high on its eastern face, but much lower on its southwesterly face. Shoals extend nearly 600 yards westward from Double Bluff and are usually marked by kelp. A lighted trumpet buoy is moored off the edge of the shoal.

Chart 6421.—Foulweather Bluff, immediately westward of which lies the entrance to Hood Canal, is one of the most prominent cliffs in Puget Sound. The northern face, which is bare, is 0.5 mile broad and consists of vertical, grayish sand and clay bluffs, 225 feet high, sloping off on the eastern side to a bluff 40 feet high, but on the Hood Canal side the point is steep and high. At the top of the bluff is a growth of fir and underbrush. The 20-fathom curve is about 0.8 mile off the bluff; depths of less than 6 fathoms are charted nearly 0.5 mile northward of the head. There are several boulders which bare at low tide within 100 yards northward of the highest part of the bluff, and a shoal with depths of 2 to 18 feet extends 200 yards eastward from the extremity and in line with the face of the bluff. If overtaken by fog, temporary anchorage may be had 0.5 mile northward of Foulweather Bluff, in not less than 10 fathoms. A lighted bell buoy in 50 feet of water marks the shoal off Foulweather Bluff.

At times there are tide rips northward of and around Foulweather Bluff sufficiently heavy to be dangerous to small craft and to break up log rafts. This is most dangerous when the ebb current from the main body of Puget

Sound meets that of Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind.

The entrance to **Port Ludlow**, in the western part of Admiralty Inlet, lies 9 miles southward of Marrowstone Point and on the west side at the entrance to Hood Canal. From the entrance, which is broad, the bay extends in a general southerly direction 2.5 miles, terminating in a basin 0.5 mile in diameter. The basin affords good anchorage in 7 to 8 fathoms, soft bottom; the shores are fairly steep.

Tala Point, the eastern point at the entrance, is bluff and wooded, and about 310 feet high. **Colvos Rocks**, three in number, are 1.2 miles northwestward of Tala Point and about 0.3 mile off the western shore; the westernmost rock is 25 feet high and of small extent, with deep water around it. There is a light shown from a small white structure on this rock. From the other two a bank with 7 to 29 feet extends to Tala Point. The passage between the rocks and Tala Point is described under channels.

Snake Rock is 0.4 mile 231° from the western Colvos Rock and 300 yards offshore; it is 150 yards in extent and shows slightly above high water. The rock is marked by a light on an iron post at an elevation of 15 feet above water.

Klas Rock is 0.6 mile 356° from the western Colvos Rock and 0.2 mile from the western shore abreast the narrow entrance to **Mats Mats**, a small lagoon; it is of small extent and is awash at high water. The rock is marked by kelp and is surrounded by deep water with 16 fathoms between it and the shore.

The entrance to Mats Mats is approximately 100 yards wide at high water. A sunken rock which uncovers at low tide lies slightly northward of mid-channel about 200 yards inside the entrance. A rock quarry is in the small cove on the east side of the lagoon at Mats Mats, from which barges of rock and gravel are towed to Puget Sound ports. Small vessels and pleasure craft use Mats Mats as an anchorage which is practically landlocked and protected from wind. Entrance to the cove should not be attempted except with local knowledge and preferably at high tide, favoring the south shore of the entrance and making the turn toward the south with extreme caution.

Port Ludlow is on the northern side of the basin. Only the tall stack remains of a former sawmill; the piers of that mill are in ruins with only the piling and some decking remaining. Considerable quantities of logs are rafted out of the bay; there are log dumps and log booms at the head of the bay. Towboats can be obtained by telephoning to Seattle. The ferry wharf is in good condition, but ferry service has been discontinued.

At the extreme southwestern portion of Port Ludlow are two islands known as **The Twins.** The channel between The Twins is spanned by overhead telephone wires with a vertical clearance of 50 feet at high water. The small bay south of The Twins is used as an anchorage for small craft in rough weather.

Channels.—The deepest channel on entering is eastward of Klas Rock and between Snake Rock and the western Colvos Rock; the width between the 5-fathom curves is 500 yards, with depths of 11 to 16 fathoms in mid-channel. This channel has been dragged to a depth of 40 feet, and, except for a 22-foot rock lying 225 yards southeastward from **Basalt Point** and about 0.6 mile northward of Snake Rock, a 1-foot shoal extending 175 yards from the western shore

0.4 mile southward from Basalt Point, and a 28-foot spot 200 yards southeastward of Klas Rock, it is clear to within 125 yards of Colvos Rock Light and 50 yards of Snake Rock. The channel between Colvos Rocks and Tala Point is 800 yards wide between the 18-foot curves. An unlighted range for entering is composed of the northeastern gable of the community house, a large rectangular gray house with three tiers of windows near the beach, for a front mark and a high, 186 feet, water tank for a rear mark. The channel depth ranges from 21 to 27 feet, with 24 feet on the range.

Directions, Port Ludlow.—From northward, the course should be shaped to pass 0.2 mile eastward of Klas Rock; pass to the westward of Colvos Rock Light at a distance of 200 yards, and midway between it and Snake Rock Light. Then steer 182°, giving the western shore a berth of about 0.2 mile; haul southward and westward into the port, favoring the northern point when rounding into the basin, and anchor as desired.

If entering by the eastern channel, steer the range, 230°, across the bank between Colvos Rocks and Tala Point until abeam of the latter, and then steer southwestward to the wharves or anchorage.

Chart 6450.—Useless Bay, to the eastward of Double Bluff, is open to the southwestward. The shores are in part bluff and in part low, with a fringe of marsh nearly around the bay. Flats and shoal water extend well off the shore, with a maximum distance of 0.5 mile at the head of the bay. **Deer Lagoon,** large and shallow, extends inland from the head of the bay.

Hansville, about 2.5 miles eastward of Foulweather Bluff, is a small village with a post office. The wharf is in ruins. The village is connected with the highway system of Bainbridge Island. A large group of houses and a tourist camp extend along the shore to the eastward. **Norwegian Point,** low and rounding, lies about 0.2 mile northwestward of Hansville. The bight between Foulweather Bluff and Norwegian Point is known locally as **Skunk Bay.**

Point No Point, on the western shore of the sound about 3.5 miles eastward of Foulweather Bluff, is a low sandspit marked with a light and fog signal station. The Point No Point Light is shown from a white square tower. The light is 23 feet above water and visible 10 miles. The fog signal is sounded on a reed horn. Boulders extend about 200 yards from **Pilot Point** about 2.2 miles southward of Point No Point.

Scatchet Head and **Possession Point,** at the southern end of Whidbey Island, are both prominent, especially from southward, the white bluffs being visible for a considerable distance. The white appearance of the bluff on Possession Point is accentuated by the removal of growth resulting from a recent landslide. Shoals extend 0.5 mile off shore immediately westward of Scatchet Head and over 0.2 mile off shore from the head to Possession Point; those off Possession Point are marked by a lighted bell buoy.

Possession Sound and tributaries are described later.

Eglon is a small village with a post office about 3 miles southward of Point No Point.

Chart 6445.—Apple Cove Point is a low sandspit projecting 220 yards from the high, wooded land about 6 miles southward of Point No Point. There are some houses on the point. The point is steep-to but a shoal makes out nearly 0.5 mile southeastward from it. Just off the point is a light on a pile dolphin. Heavy tide rips caused by strong northwesterly winds and a strong ebb current are encountered in the vicinity of the light.

Appletree Cove is the open bight on the western side of the sound about 1.5 miles southward of Apple Cove Point. It affords anchorage in 5 to 10 fathoms inside the line of the entrance points, with some shelter from winds drawing in or out of the sound, but not from northward and southeastward.

Kingston is a town with a post office, situated on the northern side of the cove. It has a combination landing wharf and ferry slip built out to 6 feet. A small freight vessel stops here and there are several daily trips of an automobile ferry from Edmonds.

There is an electric power plant with a prominent lighted sign about 3.2 miles southward from Apple Cove Point and just southward of **President Point.** From here a submarine cable crosses to Richmond Beach on the eastern shore. Shoal water extends nearly 0.2 mile from high water off the power plant.

Edwards Point is a high, wooded point on the eastern side of Puget Sound about 8.5 miles east-southeastward of Point No Point. It is a turning point for the steamers running from Seattle northward into Possession Sound and adjoining waters. A large oil storage and distributing plant is on Edwards Point. With its many large tanks on and below the bluff, the point is prominent from seaward. A wharf with a 256-foot berthing face extends to deep water. Dock lights, a lighted sign, and an electric fog siren are maintained by private interests on the wharf. Petroleum products in any quantity may be obtained.

A radio telephone station of the Pacific Telephone and Telegraph Company is on Edwards Point. Between Edwards Point and Edmonds are three mooring buoys about 275 yards from shore. A hawser is run at times from the middle buoy to the adjacent pier.

Edmonds is about a mile northeastward of Edwards Point. It is the center of an agricultural community and has a shingle mill. There is a town wharf combined with a ferry slip from which ferry service is maintained to Kingston, on the west side of the sound. Marine ways, capable of handling boats up to 40 feet long, are available. Gasoline is available at the boat works. A sunken barge, placed as a breakwater on the north side of the ferry slip, must be avoided in approaching the boat landing off the north side of the wharf. The barge bares at about ⅓ tide.

Point Wells is a low, sandy point projecting 450 yards from the high land about 1.2 miles southward of Edwards Point. It is distinguished by prominent oil tanks. It is a water terminal and storage plant for two large oil companies. There is berthing space for several large vessels, and ample depths of water alongside both wharves. Northward and southward of these wharves shoals extend well offshore and care should be taken to avoid the shoal water when coming alongside or leaving the wharves at Point Wells.

A fog signal consisting of an electric siren is maintained on the Standard Oil Company wharf. A lighted range for clearing the shoals northward of the

wharves is maintained by private interests.

Richmond Beach is a town about 0.5 mile southward of Point Wells. Submarine cables have been laid from Richmond Beach across Puget Sound to President Point. Vessels should not anchor in this vicinity.

Port Madison is on the western shore of Puget Sound, 12 miles southward of Point No Point between the northern end of Bainbridge Island and **Point Jefferson.** It is about 2.5 miles long in a westerly direction, with an average width of 2 miles. The depths range from over 80 fathoms at the entrance to 20 fathoms less than 0.5 mile from the beach, but the port affords anchorage closer inshore in 15 to 16 fathoms, sticky bottom. In the southwestern part it connects with Port Orchard through Agate Passage.

The northern shore is formed by broken white bluffs, with low beaches between, and bordered by sand and shingle beaches which bare at low water, in some cases for a distance of nearly 0.2 mile. The bluffs on the western shore are moderately low; the buildings of the Indian reservation near the entrance to Agate Passage are prominent. The town of **Suquamish** is on the western shore about 0.6 mile northward of Agate Point, the northern extremity of Bainbridge Island. There is a wharf built out to 14 feet where an automobile ferry from Seattle makes several daily stops. **Indianola (Kitsap Post Office)** is a village on the northern shore of Port Madison. It has a store, a service station, and a ferry slip. Care must be taken in going to or from the wharf at Indianola because of the shallow water just eastward of the outer end of the wharf. The southern shore of Port Madison is composed of broken bluffs, except where it is indented by the narrow arm extending southward about 1 mile, on which is the town of Port Madison.

Miller Bay, in the northwestern part of Port Madison, is used by shallow-draft pleasure craft. The channel, marked by private buoys, should not be used at low tide on account of the very irregular bottom. Anchorage in a depth of 6 to 7 feet, sticky mud bottom, may be had north of the second buoy. The controlling depth in this anchorage is about 1½ feet.

Point Monroe, the southern point at the entrance to Port Madison, is a low, narrow sandspit, curving westward and southward and marked by a light. Point Monroe Light, on a white house on a crib, is 20 feet above water and visible 5 miles. The fog signal is a bell. Several shallow draft boats anchor in about 4 feet in the small cove between the sandspit and the shore to the southward. The entrance dries at low water.

The entrance to the inlet leading to the town of **Port Madison** is about 0.8 mile westward of Point Monroe Light. The town is a popular summer resort and many cottages are along the shores of the inlet. There are moorings for visiting yachts, but no facilities for fueling. The channel in entering, with a least depth of 14 feet, is narrow, and local knowledge is necessary to keep in the best water. An old ballast dump, nearly bare at low water, lies about 75 yards offshore about 400 yards in from the eastern entrance point. Care should be taken to avoid the cluster of sunken rocks about 100 yards off the eastern entrance point. There are several landings for launches in the inlet. Sheltered anchorage for small craft may be had in depths up to 21 feet, mud bottom.

The approaches to Port Madison have been examined with the wire drag and found free from obstructions.

Meadow Point, on the eastern shore, nearly opposite Point Monroe, is a low, grassy point, with a marshy lagoon within, and higher ground behind it. The city of Seattle maintains a bathing beach just southward of the point.

Chart 6446.—Murden Cove is an open bight on the western side of the sound about 3 miles southward of Point Monroe. An extensive flat which bares at low tide extends almost 0.5 mile from the head of the cove and outside of it the depth increases rapidly to 15 fathoms. **Skiff Point,** the northern entrance point, has low, yellow bluffs to the southward. A shoal extends about 250 yards from Skiff Point; this shoal is reported to be building out and should, therefore, be given a wide berth. **Yeomalt Point,** the southern entrance point, is a low, grassy sandspit, 150 yards wide, rising gradually to the general level of the high land. **Rollingbay** is a community of summer homes on the northern shore of Murden Cove. Puget Sound Naval Academy, with prominent buildings, is on the northern side of Skiff Point. The academy's training vessel moors just northwestward of Skiff Point. Summer cottages extend along the shore northwestward from Skiff Point.

Ferncliff and **Yeomalt** are communities of summer homes 1 mile and 0.4 mile, respectively, northwestward of Yeomalt Point. The wharves are in ruins.

Wing Point, on the northern side of the entrance to Eagle Harbor, is a narrow, bluff point 30 feet high, covered with trees to the edge. **Wing Point Reef** extends southeastward for 0.5 mile from Wing Point and is generally marked by kelp. The extremity of the reef is marked by a buoy. **Tyee Shoal,** 0.6 mile southeastward of Wing Point, with a least depth of 15 feet, is marked by a lighted bell buoy.

A spit, bare at low water, extends 300 yards northward from the southern point at the entrance to Eagle Harbor, and is marked by a lighted bell buoy off its northeastern edge. The spit also extends nearly 500 yards northwestward from the point with depths of 3 feet and less. A buoy is moored off the end of the spit.

Eagle Harbor indents the eastern shore of Bainbridge Island, 5 miles southward of Point Monroe and opposite Elliott Bay. It is about 1 mile long with a width of 0.5 mile and affords excellent anchorage in 30 to 36 feet, muddy bottom. It narrows at the head to 300 yards and winds westward for 0.8 mile over flats which bare at low tide.

The entrance is deep but only 200 yards wide between Wing Point Reef and the sunken spit on the west side of the channel, and caution is necessary in entering. The channel is marked by range lights.

To enter give Wing Point a berth of not less than 0.9 mile and round Tyee Shoal bell buoy about 0.2 mile. Steer the lighted range course 341°. Eagle Harbor Range Front Light, 15 feet above water, is shown from a white arm and two circular daymarks with vertical stripes on a black pile dolphin. Eagle Harbor Range Rear Light, 38 feet above the water, is shown from a white arm and a square daymark with red vertical stripes on a post on the bank westward of Wing Point. Pass about 75 yards eastward of the lighted buoy and steer 299°

to clear the northwestern end of the spit on the south side. When past the buoy marking its northwestern extremity, haul southwestward into the harbor, following the northern side at a distance of 350 yards and anchor as desired.

Wing Point is a small community on the northern shore of Eagle Harbor just inside of Wing Point.

A shipbuilding plant is on the northern side of the harbor about 0.8 mile from the entrance. It has marine ways capable of handling vessels of 3,000-ton displacement. The steel cradle is 325 feet long and can take a draft of 17 feet forward and 21 feet aft. There are wharf facilities. The ferry slip is just eastward of the shipyard.

Hawley is a small community of summer homes, 0.4 mile eastward of the shipyard. The wharf is in ruins.

Winslow is the largest town on Eagle Harbor. It is on the northern shore and has a landing wharf near the head with 8 feet alongside. Gasoline and fresh water may be obtained from the oil wharf, adjacent to the landing wharf, and with the same depth alongside. There are daily steamers to Seattle and other Puget Sound ports; telephone and telegraph communications are available.

Creosote, a town on the southern side of Eagle Harbor at the entrance, has a large creosoting plant. The main wharf has depths of 14 to 33 feet along the southern face. Fresh water is available. A long landing wharf for local traffic, built out to 11 feet, extends eastward from the point, and just northward of it is a railway-car ferry slip. A light and a fog horn are maintained at the end of the wharf. Large quantities of prepared piles and paving blocks are shipped from Creosote to foreign and domestic ports. **Eagledale,** a small hamlet on the southern shore about 0.5 mile westward of Creosote, has a landing wharf built out to 10 feet. It has a post office and limited supplies are available.

Blakely Rock, the highest of four rocks, is prominent in approaching Blakely Harbor; it lies 0.8 mile northward of Restoration Point, and at high water shows about 15 feet at its highest point. It is 300 yards in extent, with shoal water, well marked by kelp, extending over 250 yards northward. It is marked by a light shown from a white house. Blakely Rock Light is 20 feet above water and visible 6 miles.

Blakely Harbor is a small inlet on the eastern shore of Bainbridge Island near its southern end. It is about 1 mile in length and at the entrance nearly 0.5 mile wide, narrowing to the head. The depths range from 108 feet at the entrance to 21 feet near the head. The usual anchorage is near the entrance in 54 to 96 feet, sticky bottom, slightly favoring the southern shore. There are many old pilings and dolphins in the shoal waters near the shores.

Port Blakely, formerly an important lumber town, is on the northern shore near the head of the Blakely Harbor. There are no usable wharves in Blakely Harbor.

Directions are not needed for entering Blakely Harbor. Blakely Rock may be passed on either side but, if passing northward, it should be given a berth of not less than 0.3 mile.

Restoration Point is flat and about 10 feet above high water for 300 yards, beyond which it rises abruptly to a wooded knoll about 100 feet high, on which

a number of large buildings are prominent. A submarine cable extends from Restoration Point eastward to Alki Point.

Decatur Reef, partly bare at low water, extends 300 yards eastward of Restoration Point. The reef is marked by a lighted bell buoy off its outer end.

Chart 6449.—Shilshole Bay is between Meadow Point and West Point. The entrance to the Lake Washington Ship Canal is about midway between the two entrance points. A lighted bell buoy is moored off the entrance to the canal. Southeastward of the canal entrance are clay cliffs for a distance of about 0.5 mile. Lake Washington Ship Canal is described later.

West Point, at the northern entrance to Elliott Bay, is a low, sandy point which rises abruptly to an elevation of over 300 feet about 0.4 mile from its extremity, which is marked by a light. The edge of the shoal extending southwestward from the point is marked by a buoy.

West Point Light is shown from a white square tower. The light is 23 feet above water and visible 10 miles. The fog signal is sounded on an air-diaphragm horn. A low-power radiobeacon has been established at the light. The fog signal and radiobeacon have been synchronized for distance finding.

Alki Point, the western extremity at the southern entrance to Elliott Bay, is a low point with a small prominent wooded knoll about 80 feet high, immediately behind it; eastward of the knoll low land extends for nearly 0.4 mile before rising to the high land extending southward from Duwamish Head.

Alki Point Light is shown from a white octagonal tower attached to a building on the extremity of the point. The light is 39 feet above water and visible 12 miles. The fog signal is sounded on a duplex-diaphragm horn.

A special radio direction finder calibration station is at Alki Point Light. Directions for its operation are contained in Chapter 1.

Elliott Bay indents the eastern shore of Puget Sound about 35 miles south-southeastward of Marrowstone Point. The entrance is between West Point on the north and Alki Point about 5 miles southward. The bay proper, lying east of a line between Magnolia Bluff and Duwamish Head, has a width of nearly 2 miles and extends east-southeastward for nearly the same distance. The bay is deep and free from dangers throughout. It constitutes the major portion of the outer harbor of the Port of Seattle.

Magnolia Bluff, largely bare, light-colored, and rising in places to nearly 300 feet, extends along the northern shore from West Point to Smith Cove.

Fourmile Rock is 60 yards offshore, 1.7 miles southeastward of West Point Light. Fourmile Rock Light is shown from a white square house. The light is 15 feet above water and visible 9 miles. A fog signal is sounded on an air-diaphragm horn.

Duwamish Head, 300 feet high, about 1.8 miles northeastward of Alki Point, is bluff and steep on its northern face. A shoal extends about 60 yards northwestward from the head. Duwamish Head Light is shown from a white house on piles about 450 yards northwestward of the point. The light is 32 feet above water and visible 11 miles. The fog signal is a diaphragm horn.

Seattle is the largest and most important city in the Pacific Northwest. Its east and west limits extend from Elliott Bay to Lake Washington. North

and south it extends approximately from the latitude of Meadow Point to the southern end of Fauntleroy Cove. It includes **Ballard** which, until early in this century, was an independent city and **West Seattle,** which takes in the area south of Elliott Bay and west of the Duwamish River. Thickly populated suburban developments lie north and south of the city limits and along the eastern shore of Lake Washington. The Seattle Metropolitan Area includes all of King County.

The **Port of Seattle** includes an outer and an inner harbor. The outer salt water harbor includes Elliott Bay; East, West, and Duwamish Waterways; Shilshole Bay, and the portions of Puget Sound adjacent to Ballard on the north and West Seattle to the south of the entrance to Elliott Bay. Seattle's fresh water inner harbor consists of Lakes Union and Washington which are connected with each other and with Puget Sound by the Lake Washington Ship Canal.

Seattle is second only to San Francisco on the Pacific coast in the volume of both foreign and domestic commerce which flows through its port. In recent years it has also developed into an important industrial center. It handles, almost exclusively, the commerce with Alaska. It is the terminus of several steamship lines operating to Alaska, across the Pacific, or through the Panama Canal, and it has railroad connections with all parts of the United States.

The city covers several low hills rimming Elliott Bay and affords numerous excellent landmarks for vessels approaching through the entrance to the bay. Most prominent among those along the lower skyline are, from north to south, the Northern Life Building with its brownstone construction and modern architecture; the Exchange Building, lower but massive, with its conspicuous flag tower; the Smith Building, 42 stories tall with its distinctive pyramidal cap; and the clock tower on the King Street railroad station. When approaching at night the light, alternately flashing red, white, and blue on top of the Smith Building, and the large neon sign, PORT OF SEATTLE at the Bell Street Terminal, afford good marks.

The **Duwamish River** empties into the head of Elliott Bay through the East and West Waterways and is navigable for approximately 4.5 miles above its juncture with the West Waterway. These waterways were developed as an extensive Federal project and the material dredged to form their channels was deposited between them to form **Harbor Island,** the center of a highly developed commercial and industrial area.

East Waterway.—The entrance to the East Waterway is marked by a light on the outer end of the wharf on the western side of the entrance. A fog signal is sounded on an electric bell. The waterway serves a number of modern terminals including grain elevators, cold storage plants, fuel- and vegetable-oil storage, and general cargo docks. Large vessels in foreign and intercoastal trades berth and load in this waterway.

West Waterway.—The entrance is marked by a light on a white house on the wharf on the eastern side of the entrance to the waterway. A fog signal is sounded on an air-diaphragm horn. There are a number of terminals an docks in West Waterway, most of which are used in the private business of their operators and are not open to the public. At the northwestern corner of Harbor Island is a large shipyard with three drydocks.

949285—52——28

The project provides for a channel 34 feet deep over a width of 750 feet in East Waterway for 6,500 feet, thence of the same depth over a width of 400 feet to the West Spokane Street Bridge; a channel 34 feet deep over a width of 750 feet for 5,200 feet in West Waterway; a channel in the Duwamish River 30 feet deep over a width of 200 feet to First Avenue South, thence 20 feet deep over a width of 150 feet to Eighth Avenue South, thence 15 feet deep over a width of 150 feet to a point about 5.2 miles above Elliott Bay; and three turning basins in the Duwamish River as follows: 30 feet deep near the head of East Waterway, 20 feet deep and 600 feet long by 350 feet wide just above First Avenue South, and 15 feet deep and 500 feet long by 250 feet wide at the head of the project. Project depths are maintained.

Chart 6447.—Lake Washington Ship Canal extends from Puget Sound through Shilshole Bay, **Salmon Bay,** Lake Union, **Portage Bay,** and **Union Bay** to deep water in Lake Washington.

A double lock and fixed dam with movable crest and necessary accessory works are at the narrows at the entrance to Salmon Bay, approximately 1.2 miles from the deep water in Puget Sound. The large lock has a clear width of chamber of 80 feet, a maximum available length of 760 feet, a lift of 26 feet, and a depth on lower miter sill of 29 feet at mean lower low water. The small lock has a clear width of chamber of 30 feet, a maximum available length of 123 feet, a lift of 26 feet, and a depth on lower miter sill of 16 feet at mean lower low water. Ocean-going vessels make the passage through the large lock in less than 30 minutes, and small vessels pass through the small lock in 5 to 10 minutes.

The project provides for a channel 34 feet deep, 300 feet wide from Puget Sound to the Great Northern Railway bridge, about 5,500 feet, with a passing basin 34 feet deep and a log basin 8 feet deep at the turn below the railway bridge; thence 34 feet deep, 150 to 200 feet wide to the locks, about 900 feet, and for a guide pier 600 feet long; for the revetment of the canal banks between the locks and Lake Union and between Lake Union and Lake Washington; and for a channel 30 feet deep over a width of 100 feet from the locks to Lake Union, 200 feet thence to Portage Cut, thence 200 feet through Union Bay. The project is well maintained.

Navigation regulations for the Lake Washington Ship Canal are given in Chapter 2, § 207.750.

Lake Union is connected with both Puget Sound and Lake Washington by the Lake Washington Ship Canal and can accommodate deep-draft vessels. It is fringed by a number of piers and wharves used mainly for marine repairs, fitting out, and transshipment of lumber, fuel, and some industrial products. The buildings of the **University of Washington** are conspicuous just northward of the channel connecting Lake Union and Lake Washington.

Chart 6449.—Lake Washington is a large body of fresh water just eastward of Seattle. It has depths of up to more than 200 feet and can be navigated by deep-draft vessels for its entire length. Lake Washington has been examined by the wire drag and is clear of snags except as noted on the chart.

A measured course, one nautical mile long, for small boats is marked on the north side of the pontoon bridge crossing the lake to Mercer Island. The targets are one foot in diameter, the course is 091°–271°.

There are a number of piers and wharves on the shores of the lake, a majority of which are ferry and small-boat landings and moorings. At **Port Quelland** is a wharf on the eastern side of the lake, northeastward of the south end of **Mercer Island.** The wharf is 457 feet along its face and has a depth of 26 feet along this face. At **Houghton,** on the northeastern side of the lake, the Lake Washington Shipyards maintain three large piers for outfitting and other purposes in connection with its ship building and ship repair operations. In addition there are several large fuel and lumber piers.

The Naval Air Station at **Sand Point** is on the western shore of the lake just north of the Seattle city limit. A prohibited area, reserved for seaplane landings and marked by buoys, is northeast of the Naval Air Station. See Chapter 2, § 207.750. The eastern shore of the lake is built up with resort communities and suburban home developments.

Anchorage area is plentiful within defined limits. See Chapter 2, § 202.230 for description. In the Elliott Bay areas the water is deep, swinging room is limited, and vessels seldom anchor, usually going direct to the wharves. During heavy northerly weather, which is rare but occasionally occurs during the winter months, anchorage in the bay is uncomfortable. The city of Seattle maintains mooring buoys and floats.

Bridges span various waterways in the harbor area. The first one across the Lake Washington Ship Canal, approaching from seaward, is the Great Northern Railway bascule span with a horizontal clearance of 150 feet and a vertical clearance of 41 feet. The Ballard bridge, 0.65 mile east of the eastern end of the guide pier at the canal locks, also has a horizontal clearance of 150 feet and a vertical clearance through the center of the span of 43 feet. Southeastward 0.4 mile from the Ballard bridge is the Northern Pacific bascule span with a horizontal clearance of 150 feet and a vertical clearance of 15 feet. Farther southeastward 0.9 mile is the Fremont Avenue bascule bridge with a horizontal clearance of 150 feet, and a vertical clearance of 29 feet. Two hundred yards eastward of the latter is the George Washington Memorial fixed bridge with a width of opening of 525 feet and a vertical clearance of 135 feet.

Just east of the northeastern tip of Lake Union is the University Bridge with a bascule span affording a horizontal clearance of 175 feet and a vertical clearance of 43 feet through the center of the span. Midway of the passage between Portage Bay and Union Bay is the Montlake Boulevard bascule span with a horizontal clearance of 150 feet and a vertical clearance of 44 feet. Regulations governing the bridges over the Lake Washington Ship Canal are given in Chapter 2, § 203.795.

Lake Washington is crossed by a pontoon bridge extending from Seattle to the north end of Mercer Island. Fixed overhead spans bridge the channels along each shore while a draw span, 500 yards west of Mercer Island, admits passage of vessels. The west and east fixed spans have horizontal clearances of 190 feet, and vertical clearances of 29 and 30 feet, respectively. The floating draw span has a horizontal clearance of 200 feet. Mercer Island is con-

nected with the east shore of the lake by a fixed bridge with a horizontal clearance of 200 feet and a vertical clearance of 38 feet. Regulations governing these bridges are given in Chapter 2, § 203.800.

The double span, West Spokane Street highway bascule bridge crosses the Duwamish Waterway 500 yards southeast of its entrance into the West Waterway. These bridges have horizontal clearances of 150 feet and vertical clearances of 40 feet. The Northern Pacific Railway bascule bridge with a horizontal clearance of 150 feet and vertical clearance of 4.6 feet, crosses the waterway 200 yards southeast of the highway bridges. At First Avenue South, 1.7 miles south-southeast of the southern tip of Harbor Island, the waterway is spanned by a swing bridge having a horizontal clearance of 112 feet and a vertical clearance of 20 feet. Near the head of the waterway, 1.15 miles south of the swing bridge, the 14th Avenue South bascule bridge crosses with a horizontal clearance of 125 feet and a vertical clearance of 32 feet. For the regulations governing the Duwamish Waterway bridges see Chapter 2, § 203.790.

Tides at Seattle have a mean range of 7½ feet. The range between mean lower low water and mean higher high water is 11½ feet. A range of about 18 feet may occur at the time of maximum tides. Daily tide predictions for Seattle are given in the tide tables published annually in advance by the United States Coast and Geodetic Survey.

As a rule the **tidal currents** in the harbor have little velocity. At times, however, with a falling tide an appreciable current will be found setting northwestward along the water front.

Storm warnings are displayed day and night from the roof of the Exchange Building and at Lake Union. Daytime signals only are displayed from the Portage Bay Yacht Club.

Pilotage is compulsory. Licensed pilots can be obtained for the sound or for the inside water to Alaska. See discussion of Port Angeles.

Towboats, ranging in horsepower from 15 to 1,000, are available in Seattle.

Vessels subject to **quarantine** usually proceed to their docks where they are boarded by quarantine officers for inspection. Any vessel having on board suspected quarantinable or communicable diseases are required to make radio report to the quarantine office. The quarantine anchorage is just northward of Harbor Island. Fumigation with cyanide can be arranged for in Seattle. The quarantine office is in the Federal Office Building at First Avenue and Madison Street.

A **marine hospital** of the United States Public Health Service is at Fourteenth Avenue and Judkins Street, Seattle, on Beacon Hill which overlooks Elliott Bay.

Seattle is the headquarters of the Washington State **customs** collection district. The customhouse is in the Federal Office Building at First Avenue and Madison Street.

The **United States Immigration Service** maintains an office at 815 Airport Way.

A **Coast and Geodetic Survey District Office** is in the Federal Office Building, First Avenue and Madison Street. 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 supervisor in charge of the district office.

A **Branch Hydrographic Office** is maintained in the Federal Office Building, Seattle. Bulletins are posted here giving information of value to mariners, who are also enabled to avail themselves of publications pertaining to navigation and to correct their charts from standards. No charge is made for this service.

The **Coast Guard District Office** is in the New World Life Building. Other Federal activities are given in tables in the Appendix.

Harbor regulations are enforced by a port warden whose office is on Pier 66, Bell Street Terminal, Seattle. The port warden maintains a radio station for the purpose of furnishing information concerning the harbor regulations, securing wharfage for incoming vessels, etc. Masters are invited to take advantage of this service. The charges are five cents a word for ship's business and ten cents a word for private messages.

Terminal facilities consist of an extensive system of wharves, both municipal and private, some of which are equipped with the most modern facilities for handling cargo. The port of Seattle has constructed and operates a number of wharves especially equipped for handling various commodities such as lumber, grain, fish, fruit, dairy products, vegetable oil, etc., which are the principal items in the commerce of the port.

Dockage and **wharfage** charges are made. They vary with the size of vessel and the nature of the cargo.

Supplies of all kinds and in any quantity can be obtained. There are several sales agencies for Coast and Geodetic Survey Charts in the city.

Repairs of all kinds of hulls and machinery can be made. There are numerous shipbuilding and repair yards with drydocks or marine railways of various sizes. The largest drydock available, exclusive of those at the Bremerton Navy Yard which are available for private use when not required by the Government, is 518 feet long, 89 feet wide inside, and has a depth of 26 feet over the keel blocks. It is of the floating sectional type and has a lifting capacity of 15,000 tons.

Communication facilities are unlimited. Seattle is served by three transcontinental railway lines and is the terminus of a number of freight and passenger steamship lines. It is a port of call for many lines of intercoastal vessels and of vessels in coastwise shipping to California, Oregon, and Alaska. The city is served by nine commercial airlines. There are three airports at Seattle and two terminals on the water front for seaplane service. There are complete telephone, telegraph, and radio facilities, including two-way radiotelephone communications between ships in and near Seattle harbor and points on the interconnected Bell System land-line telephone network.

Yacht Clubs.—A list of the larger yacht clubs on the Pacific coast is given in the Appendix.

Chart 6450.—Possession Sound joins Puget Sound at the southern point of Whidbey Island and extends in a general northerly direction for about 10 miles to its junction with Saratoga Passage and Port Susan. From the entrance it extends for 3.5 miles with an average width of 2 miles, and then expands to an irregular basin about 6 miles in diameter. The eastern part of this basin is filled with extensive flats, a large portion of which are bare at low water, and rise abruptly from deep water. These flats are intersected by several shifting channels, forming the mouth of the Snohomish River. These channels are under improvement by the Government and are used by light-draft river steamers that navigate the deeper waters of the river. The waters of the sound are generally deep, and the only anchorage used by large vessels is off the town of Everett, close inshore, in about 10 to 15 fathoms.

A **measured nautical mile** has been established on the east shore of Possession Sound, south of Mukilteo. The course is 022°–202°. All range marks consist of 4-foot square diamond-shaped targets with a vertical red stripe painted in the center of each target. In 1950 the range marks were difficult to see because of a growth of trees.

Meadowdale is a village with a post office on the eastern side of the sound about 4 miles southward of Possession Point. Two piers are here about 0.5 mile apart. The northern pier is built out to 6 feet and has a face 160 feet wide by 200 feet long, with an approach 30 feet wide by 250 feet long. A large boat house and launching elevator are on the outer end of the pier which is a sport-fishing center.

Glendale is a village on the west side of the sound about 2.2 miles northward of Possession Point.

Chart 6448.—Elliot Point, on the eastern side of Possession Sound about 4 miles northeastward of Possession Point, is a low spit projecting over 200 yards from the high land. It is prominently marked by **Mukilteo Light,** shown from a white square tower. The light is 33 feet above water and visible 11 miles. A fog signal is sounded on a reed horn.

Mukilteo is a small town eastward of Elliot Point. An automobile ferry runs between Mukilteo and Columbia Beach, on Whidbey Island. A Government wharf for deep-draft vessels is 0.4 mile eastward of Mukilteo Light. A wharf for unloading tankers, owned by the Great Northern Railroad, is 2.2 miles eastward of Elliot Point. The tanks back of the wharf are prominent.

Everett is on **Port Gardner** at the eastern end of Possession Sound, 4 miles northeastward of Elliot Point. Lumber, pulp, and paper are its principal products. There are four deep-water wharves on Port Gardner with depths up to 38 feet. One of these is used for public transportation purposes, one is owned by fish-packing companies, and two to lumber mills. Oil is delivered by barge to wharves having about 12 feet of water at their ends.

Anchorage.—There are no designated anchorages in Everett Harbor, but vessels usually anchor about 0.5 mile southward of the jetty light in from 10 to 5 fathoms, sticky bottom.

Tides.—The mean range of the tide at Everett is about 7½ feet, while the

range between mean lower low water and mean higher high water is about 11 feet.

Storm warnings are displayed day and night by the Weather Bureau from a steel tower on the inshore end of pier 2.

Pilots.—Pilots are not stationed atEverett, but may be obtained from the Puget Sound Pilots' Association, Seattle, by telephone or radio.

Towboats.—Towboats, ranging in indicated horsepower from 40 to 400, are available.

Quarantine.—Vessels bound for Everett which are subject to quarantine inspection usually proceed to their docks where they are boarded by quarantine officers for inspection. Fumigation may be arranged for through the Seattle office. The Public Health Service maintains a medical relief station and a contract hospital at Everett. The marine hospital is at Seattle.

Customs.—Everett is a subport in the Washington customs district, the headquarters for which are in Seattle. The customhouse is in the Federal Building at the corner of Colby and Wall Streets.

Harbor regulations.—Dumping fuel oil, refuse, and ballast, and pumping bilges is prohibited. The handling of explosives is prohibited except by permit obtainable from the harbor department.

Supplies.—Water, provisions, and ship chandlery can be obtained. Gasoline and distillate are available and there are provisions for bunkering large vessels with fuel oil. There are no facilities for coal bunkering. A **chart agency** of the U. S. Coast and Geodetic Survey is in Everett.

Repairs.—There are good machine shops, but no drydocks except for vessels under 100-ton displacement.

Communication.—Everett is served by three lines of transcontinental railroads and is a port of call for coastwise freighters. Many foreign-bound vessels call to load lumber. There are radio, telegraph, and telephone facilities. It is on the Pacific Highway. Bus service is maintained to Vancouver, British Columbia, and to Seattle. A county airport is about 6 miles southward of the center of the city, west of the Pacific Highway.

Boat Harbor.—The Everett Port Commission maintains floats for berthing small boats up to a length of about 50 feet. A pile breakwater affords shelter. Dockage is charged.

Yacht Clubs.—A list of the larger yacht clubs on the Pacific coast is given in the Appendix.

Snohomish River.—The Snohomish River borders the city on the north and east and enters Port Gardner after flowing southward across the flats west of the city and inside of the controlling dike. The project provides for a channel 8 feet deep from the lower harbor to the gap in the dike opposite **Preston Point** with a settling basin 1,200 feet long, 700 feet wide, and 12 feet deep in the vicinity of the Fourteenth Street dock. In June 1942 the controlling depths were: From the lower harbor to the stilling basin 6.3 feet, in the stilling basin 3.2 feet, thence 0.6 feet to the gap. In November 1948 the controlling depths in the channel were: From the lower harbor to settling basin 6½ feet; in settling basin 12.6 feet; thence 7.6 feet to gap in the dike. The southern end of the dike is marked by a light shown from a black cylindrical house on white pile

dolphin. A fog signal is sounded on an air-diaphragm horn from Snohomish River Light. Many sawmills are on the river and a large amount of lumber is barged out.

The Snohomish River and connecting sloughs, navigated only by light-draft local craft, are crossed by several highway and railway drawbridges. These bridges require advance notice to be opened. The highway bridge at the foot of Hewitt Avenue requires 12 hours. The remainder require 24 hours.

Regulations governing the bridges across the Snohomish River are given in Chapter 2, § 203.805. Navigation regulations are given in Chapter 2, § 207.770.

Caution.—The flats of the river are reported as extending to the southward to a line joining pier 1 to the eastern end of Gedney Island. Vessels backing away from pier 1 are warned to use caution. The changeable and shoaling channel across the flats should not be attempted without local knowledge.

The flats at the mouths of **Ebey, Steamboat,** and **Union Sloughs** and eastward of **Priest Point** are log-booming grounds.

The bridges over Steamboat Slough require at least 4 hours' advance notice to be opened.

Gedney Island, known locally as **Hat Island,** is 3.5 miles northwestward of Elliot Point. It is about 1.5 miles long in an easterly direction and 0.5 mile wide. The island is high, wooded, and prominent. From its eastern point a shoal extends eastward, the 5-fathom curve being at a distance of 0.8 mile. Foul ground extends 0.2 mile from the south side of the eastern half of the island. About midway along the southern side a sand and gravel company maintains a wharf.

See Chapter 2, § 206.93 for regulations governing **restricted fishing areas** northeast, east, and southeast of Gedney Island.

Columbia Beach, 0.5 mile southward of **Randall Point,** has a float landing, a ferry slip, and an automobile tourist camp. An automobile ferry from Mukilteo lands here.

Sandy Point, the southern point at the entrance of Saratoga Passage, is a low spit, rising abruptly to an elevation of 100 feet, with bluffs on each side; the end of the point is marked by a light shown from a small white house. Sandy Point Light is 24 feet above water and visible 8 miles. A pier 200 feet long is a short distance east of the light. A group of houses and a pier built out to 7 feet are a short distance west of the light.

Camano Head is the southeastern point of Camano Island. A shoal, with a rock bare at low tide, extends nearly 0.2 mile southeastward from the point. A buoy marks the shoal.

Tulalip Bay is a small cove on the mainland at the junction of Possession Sound and Port Susan, on the northern side of which are the village of **Tulalip** and the agency buildings of the Tulalip Indian Reservation. The bay is shoal, with rocks extending more than 300 yards southward and westward from the point on the north side of the entrance. A buoy marks the edge of the shoal water westward of the point at the south side of the entrance. Several small wharves and landing floats, mostly dry at low water, are at Tulalip. A seaplane taxi service is maintained during the summer months. A shingle mill with large log booming grounds is near **Mission** in the southern part of the

bay. **Mission Beach,** immediately southward of the bay, has several boat houses and float landings.

Chart 6450.—Camano Island is between Port Susan and Saratoga Passage; it is irregular in shape and 14 miles in length, the southern portion consisting of a long, narrow tongue, terminating in Camano Head, 300 feet high. At its northern end it is separated from the mainland by Davis Slough and South and West Passes of Stillaguamish River, all dry at low water. A highway bridge crosses the slough and West Pass. There is a good system of highways on the island.

Port Susan, on the eastern side of Camano Island, has a total length of about 11 miles in a northwesterly direction, and a width of 2 miles at its entrance; it expands to a width of 5 miles at its head, terminating in flats, bare at low water, that extend over 3 miles. There are no important settlements. Deep water is throughout until nearing the head, where anchorage may be had off the extreme western edge of the flats in about 10 fathoms. Care should be used in approaching and anchoring, as the flats rise abruptly from deep water. A channel, dry at low tide, has been dredged over the flats to the **South Pass** of the **Stillaguamish River**; this is buoyed, privately maintained, and used by light-draft vessels at high water.

Stanwood is in a dairying and farming district on the north side of the Stillaguamish River at the junction of the South and West Passes.

Saratoga Passage, on the western side of Camano Island, is about 18 miles long in a northwesterly direction. At its entrance, between Sandy Point and Camano Head, it is 1.2 miles in width, widening to its upper end, where it expands into a basin 4.2 miles in diameter, connecting eastward with Skagit Bay. The depths decrease uniformly from 100 fathoms at the entrance to 17 to 18 fathoms at the head. There are few outlying dangers, and a mid-channel course is clear to the head.

There is considerable traffic in these waters, confined, as a rule, to small local steamers that take advantage of the shelter afforded in making their trips between ports on the waters of San Juan Archipelago and points on Puget Sound. There are several towns and settlements, but the majority are of little commercial importance. The principal products are lumber and fish.

Langley, on the eastern shore of Whidbey Island, about 1.2 miles westward of Sandy Point, is a banking town serving a farming community. There is a landing wharf built out to 11 feet with a float attached. Small oil barges call here. Gasoline is available by truck delivery to the wharf. Tugboats often anchor off the beach between Langley and Sandy Point.

Saratoga, about 3 miles northwestward from Langley, is a small village with a store and automobile tourist camp.

Mabana, a village with a post office on the western shore of Camano Island, 2 miles northwestward of Camano Head, has a store and a landing wharf built out to 6 feet. Gasoline is available at the wharf.

East Point, on the eastern shore of Whidbey Island, 6 miles northwestward of Sandy Point, is a low sandspit about 300 yards long. East Point Light, shown from a small white house, is 20 feet above water, visible 8 miles.

Elger Bay, a resort on the western shore of Camano Island across Saratoga Passage from East Point, is an open bight about 0.8 mile long and 1 mile wide. Tugboats anchor here in westerly and northwesterly winds. A number of houses are along the shore at the head of the bay. There is no wharf and supplies are not available.

Lowell Point, with a bare bluff at the southern end, is the point on the western side of Elger Bay.

Holmes Harbor, the entrance to which is about 8 miles above Sandy Point on Whidbey Island, extends in a southerly direction for 5 miles, with an average width of 1.2 miles. The depths range from 30 to 40 fathoms at the entrance, to 17 and 18 fathoms at the head, where anchorage may be had in muddy bottom. **Rocky Point,** the eastern point at the entrance, is low, but rises rapidly to a hill 500 feet high. **Hackney Island,** low and of small extent, with several houses on it, lies 0.2 mile northwestward of the point with which it is connected at low water. From the island a shoal, bare at extreme low water, extends 0.2 mile northwestward; a buoy marks the edge of the shoal.

In entering, round Rocky Point at a distance of 0.8 mile and follow a mid-channel course to the head. The harbor is but little used.

Greenbank, a small farming settlement, is on the western side of Holmes Harbor at the entrance. It has a post office and several tourist camps.

Freeland is at the head of Holmes Harbor. It has a post office, a store, and a landing wharf which is bare alongside at half tide. Mine timbers are shipped from here occasionally. There is a log booming area at the head of the bay. Several tourist camps are on the western shore of the harbor.

Camano is a small settlement on the eastern side of Saratoga Passage, about 3.5 miles northwestward of Lowell Point. It has a store, a highway service station, a hotel, and telephone facilities. Gasoline is available only to craft that can get in close to shore as there is no wharf. Onamac Point Light, 15 feet above water, is shown from a white battery house northward of Camano. **Madrona** is a small resort about 2 miles northward of Camano. There is a small pleasure pier built out to about 6 feet at **Madrona Beach.**

Penn Cove indents the western shore of the basin at the head of Saratoga Passage and extends west-southwestward for about 3.5 miles, with an average width of a mile. The head of the cove is about 1.5 miles eastward of Point Partridge, the western extremity of Whidbey Island.

Snatelum Point is the southern point at the entrance to Penn Cove; a narrow sunken spit extending northward 0.5 mile, with ¼ fathom near its end. The spit is marked by a lighted buoy at its northern extremity. **Long Point** is about 0.9 mile westward of Snatelum Point.

Blowers Bluff is the northern point at the entrance to Penn Cove; it is the southern point at the entrance of Oak Harbor. It is bare, light-colored, high, and rounding. Rocks lie offshore 200 yards at places along the bluff. The shoal extending off the southwestern end of the bluff reaches almost one-third the distance across Penn Cove. Vessels should favor the southern shore when passing this shoal; otherwise, a mid-channel course may be followed with safety. The cove affords good anchorage, muddy bottom, in 8 to 14 fathoms inside the entrance.

Coupeville, the county seat of Island County, is on the southern shore of Penn Cove about 2 miles from the head. It has two hotels, telephone service, stores, a garage, and a wharf built out to 12 feet. Gasoline and fresh water are piped to the wharf and Diesel oil, brought in by small barges, may be secured ashore. A sunken rock, with a reported depth of 9 feet at low tide, is about 200 yards northeastward of the wharf nearly in line with the tangent at the entrance to Penn Cove on the north side. Vessels generally approach the wharf from the northwestward. Shallow-draft vessels with local knowledge can pass inside the rock to approach from the eastward.

San de Fuca is a small town on the northern shore about 0.5 mile from the head. It has a store, a post office, and a wharf built out to 10 feet. Gasoline and Diesel oil can be had by truck delivery. **Coveland** is a small settlement at the head of the cove.

Chart 6404.—Oak Harbor indents the northern shore of Saratoga Passage westward of Crescent Harbor. It is a shallow semicircular cove about 1 mile in diameter with a winding narrow dredged channel, limiting depth 9 feet, leading to its head. **Maylor Point,** the eastern point of the entrance, is foul with several rocks, awash at low water, 0.5 mile southeastward from the point. These rocks are marked by a buoy 550 yards to the southwestward of the outermost rocks. The town of **Oak Harbor** located on the northern shore of the harbor serves a farming community. There is a long wharf extending from the town in a southerly direction with a least depth of 4 feet of water at its face. Oak Harbor is located within a restricted area and water borne commerce is no longer of importance. The chart is an adequate guide for entering.

Crescent Harbor, immediately west of Oak Harbor, is a semicircular bight 2 miles in diameter, lying between **Forbes Point** and **Point Polnell.** The latter is wooded and rather bold, and is connected to the main island by low ground, giving the point the appearance of an island when seen at a distance. There is a shoal extending westward 0.9 mile. Shoals, marked by a lighted buoy, extend 0.6 mile eastward from Forbes Point. With these exceptions the harbor is clear, affording anchorage in 10 to 11 fathoms, muddy bottom, but is exposed to the southward. A substantial pier extends from the west side of the harbor with an effective depth of 26 feet for the outer two thirds. The chart is an adequate guide for entering.

The entire Oak Harbor-Crescent Harbor area is restricted. No vessel may enter or navigate therein without permission from the Commandant, Thirteenth Naval District, or his authorized representative.

Chart 6450.—Skagit Bay, the southern entrance to which is between Point Polnell and Demock Point, is about 12 miles long in a west-northwesterly direction. The greater portion of it is filled with flats, bare at low water, and intersected by numerous channels through which the Skagit River discharges. Along the shore of Whidbey Island, between it and the edge of the flats, is a narrow channel varying in width from 0.2 to 0.6 mile; the shore of the island is also shoal for a distance of 100 to 300 yards offshore.

Demock Point, rounding, and rising rapidly to an elevation of several hundred feet back of the point, is at the southern entrance of Skagit Bay about 1.8 miles southeastward of Point Polnell. A fishing resort with a small wharf is near the point.

Utsaladdy is a small village on the northern shore of Camano Island about 1.2 miles northeastward of Demock Point. It has a store and highway service station. Vessels may anchor just eastward of Utsaladdy in a small inlet between the shoal water of the flats and the shore in 3 to 6 fathoms, muddy bottom, with shelter from southerly winds.

Strawberry Point, the eastern extremity of Whidbey Island, is marked by Strawberry Point Light, 15 feet above water, shown from a white platform on dolphin.

The **South Fork** channel leading into **Skagit River** winds through the flats northward of Camano Island where it is buoyed and lighted. This channel is used, to some extent, by log tows. Due to shoaling, however, it has largely been abandoned by boat traffic to **Mount Vernon** and the **North Fork** is used instead. A Federal project provides for obtaining a reliable channel of entrance through the delta by means of a dike at the mouth of South Fork; regulating dikes and a mattress sill near the head of North Fork; closing subsidiary channels in the delta; and for increasing the available depth at **Skagit City Bar** by combined dredging operations and training bars. Little work on either new construction or maintenance has been done recently.

The controlling elevation of the flats at the mouth of South Fork is about 2½ feet above mean lower low water and the controlling depth at low tide depends on river stage, probably not exceeding 1 foot during periods of minimum flow. The diurnal tidal range at the mouth of the river is 11½ feet. The extreme range at this point is estimated to be 20 feet. The bar at the mouth of South Fork bared 2½ feet in 1945 and the mouth of the North Fork bared 2½ feet in April 1944.

A highway bridge crosses the South Fork at **Conway (Fir Station)** 4.8 miles above the mouth. This is a swing span bridge with a horizontal clearance east and west of 115 feet and a vertical clearance of 10 feet. Another highway swing bridge crosses the river at Division Street, in Mount Vernon, 10.1 miles above the mouth. It has horizontal clearances of 112 feet east and 109 feet west and a vertical clearance of 10 feet. A swing span highway bridge 14.8 miles above the mouth, due north of Mount Vernon, has horizontal clearances of 108 feet east and west and a vertical clearance of 10 feet. The Great Northern Railway Bridge crosses the river 0.7 mile east of the latter bridge. It has a swing span with horizontal clearances of 80 feet east and west and a vertical clearance of 5 feet. Regulations governing these bridges are given in Chapter 2, § 203.810 and § 203.811.

There are six wharves at Mount Vernon. **A chart agency** of the U. S. Coast and Geodetic Survey is there.

From the northernmost point of Camano Island another channel, also buoyed, leads eastward across the flats and connects through **West Pass** and South Pass with the head of Port Susan. This channel is used only by small launches with local knowledge.

Skagit Bay, northern part, has been described previously.

Chart 6401.—The entrance to **Hood Canal** is at the lower end of Admiralty Inlet, between Foulweather Bluff and Tala Point, about 10 miles southward of Marrowstone Point. It extends in a general southerly direction for about 44 miles and then bends sharply northeastward for 11 miles, terminating in flats bare at low water. The head of Case Inlet, in the southern part of Puget Sound, is less than 2 miles from the head of Hood Canal. The shores are high, bold, and wooded, but logged off to a considerable extent, rising to a much greater height, particularly on the western shore, than in other parts of the sound. The water is deep as a rule, except at the heads of the bays and at the mouths of the streams. The chart is a sufficient guide for the purpose of navigation.

The Olympic Loop Highway follows the western shore of Hood Canal, and a connecting highway to Port Orchard follows the southern shore of the southern part of the canal around The Great Bend. There are road connections with Port Orchard and with the Puget Sound highway system from all the settlements on the eastern shore of the canal. Water traffic is in general confined to tugboats with log rafts, small boats, and pleasure craft. Along the shores are numerous small farming or lumber settlements, some with post offices and wharves or landing floats. Hood Canal is a favorite vacation resort, but most of the travel is by automobile. Numerous tourist camps are located along the shores, particularly along the western shore.

The **tidal currents** in Hood Canal at times attain velocities exceeding 1½ knots. At times there are heavy tide rips northward of and around Foulweather Bluff, sufficiently heavy to be dangerous to small boats and to break up log rafts. This is most pronounced when the ebb current from the main body of Puget Sound meets that from Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind. Off Point Hannon and Hazel Point, tide rips occur at times sufficiently strong to be troublesome to tugboats with log tows. Current observations taken at a station in mid-channel eastward of Hazel Point show that directions of both flood and ebb vary considerably at that location. At times, southwesterly winds from Hood Canal and northerly winds from Dabob Bay cause a chop dangerous for small boats. Under these conditions smoother water is found near either shore.

Sailing directions are not considered necessary. The dangers are few and generally close inshore. A number of low sandspits from 100 to 300 yards long are difficult to see at night, but many of them have been made into resorts and the buildings nearby show up well against the background of trees. Flats off the mouths of streams extend as much as 0.5 mile offshore and are extensive at the heads of some of the bays. When rounding Point Hannon, keep Snake Rock Light well open past Tala Point, or keep the power plant at Termination Point, which is lighted at night, open past the southern end of Hood Head. A mid-channel course is clear until reaching The Great Bend, where the canal turns eastward. Here the northern shore just eastward of Ayres Point should be favored to clear the flats extending from the eastern part of Annas Bay. The chart is the best guide.

Foulweather Bluff, the eastern point at the entrance to Hood Canal, has been described previously.

Chart 6421.—Twin Spits are two long, low, sand points, 0.5 mile and 1 mile southward of Foulweather Bluff. When waiting for smooth weather to round Foulweather Bluff, tugboats with log tows often anchor in 8 fathoms, 1 mile southeastward of the southern spit, in a bight known locally as **Races Cove,** with Colvos Rock Light slightly clear of the end of the southern point of Twin Spits.

Hood Head, on the western side of Hood Canal and 3 miles southward of the entrance, is practically an island, having only a long, narrow strip of low, sandy beach connecting it with the western shore. The head is 210 feet high, steep and wooded, and is a prominent feature when viewed from the entrance.

Point Hannon (Whiskey Spit) is a low, sandy spit more than 300 yards long, extending eastward from Hood Head. Shoal water extends about 150 yards from the spit. Point Hannon Light, 15 feet above the water, is shown from a small white house on the east end of the point.

A 6-foot shoal, marked by some kelp, extends more than 300 yards southward of Hood Head. **Bywater Bay** is a small cove between Hood Head and the western shore.

Shine is a village on **Termination Point,** 1.7 miles southwestward of Point Hannon. There is a transformer substation, lighted at night, on the point from which a submarine cable crosses the canal to Salsbury Point.

Sisters are two rocks a little over 200 yards apart, 0.5 mile southward of Termination Point. The rocks are awash at about half tide. Sisters Rock Light, 15 feet above water, is shown from a small white house on the southern rock. The light is 0.4 mile from the northern entrance point to **Squamish Harbor,** a small, open bight just southwestward of Termination Point. Towboats frequently anchor near the head of the harbor in about 6 fathoms, muddy bottom.

Case Shoal, partly bare at low water, is about 0.6 mile from and parallel with the western shore of Squamish Harbor. It is about 1 mile long and its northern end is 0.5 mile from the northern shore of the harbor.

Port Gamble is a small inlet on the eastern shore of the canal 5 miles from the entrance. It is 2 miles in length, with an average width of over 0.5 mile and a contracted entrance.

A channel with project dimensions of 200 feet wide and 30 feet deep has been dredged through the narrow entrance to Port Gamble. A lighted range, astern when entering, is about 1.0 mile north of the outer end of the channel. The azimuth of the range is 360°. The lights are visible only on the range. The channel is marked by two lights on pile dolphins on the eastern side. The southernmost of these lights is some distance away from the edge of the channel.

In July 1948 the controlling depth in the channel was 28 feet over a width of 120 feet. The channel depth is subject to change.

Port Gamble is on the western shore at the entrance. It is a mill port which ships considerable lumber. There are hotel, hospital, telephone, and telegraph facilities. The large mill wharf has ample depths for ocean vessels, and fresh

water is piped to the berthing face. A ballast pile, nearly bare at low tide, is southward from the mill. The town landing wharf, suitable for small vessels, is on the northern side of the town. An 8-foot shoal is about 83 yards northeastward from the north end of the town landing wharf. There are rocks baring at low tide on the southern side of the wharf. Diesel oil and gasoline are piped to the oil wharf, and provisions are obtainable. Supplies of all kinds may be obtained from Seattle on short notice.

Excellent **anchorage** may be had in the bay in 24 to 54 feet, muddy bottom.

Directions.—Vessels should hold a mid-channel course, 180°, on entering until 200 yards or more past the southern light, and then head for the wharf, keeping the long eastern face open to avoid shoal water on the western side of the channel. In entering the bay care should be taken not to work too far to the eastward when passing the mill wharf. A sandspit, partly bare at low water, extends from the point in front of **Indian Village** almost to the edge of the dredged channel, or about halfway to the mill wharf.

Caution.—Several vessels have grounded on the sandspit 1½ miles northward of the town. The entrance lights are easily confused with lights in the Indian Village.

A submerged cable crosses Hood Canal from **Salsbury Point,** 1 mile westward of Port Gamble, to Shine, on Termination Point.

Lofall, on the eastern shore about 8 miles southward of the entrance to Hood Canal, is a settlement with post office, store, and service station. A passenger and automobile ferry crosses the canal from Lofall to South Point. A good road connects the town with the Puget Sound highway system.

Chart 6422.—Thorndike Bay is a small bight on the west side of the canal about 4 miles southward of Squamish Harbor. An explosives anchorage has been established in the bay. The regulations defining this anchorage are given in Chapter 2, § 202.230.

Bangor Wharf, 12.7 miles southward of the canal entrance, is the property of the U. S. Navy and is restricted to use by vessels under Government jurisdiction. The regulations governing the restricted area surrounding it are given in Chapter 2, § 207.750. A Naval operating area, extending from 1.6 miles north of the wharf to a point 3.0 miles south, is shown on the chart, see Chapter 2, § 204.222.

Bangor is a village with a post office on the eastern side of Hood canal about 14.5 miles southward of the canal entrance. It has a wharf on the northern side of King Spit built out to 11 feet; a store, a service station, and a small clam cannery. A road leads to Poulsbo, on Liberty Bay, and connects with the highway system of Puget Sound. **King Spit,** a low, sandy point at the southern side of the town, affords some protection from southerly weather for boats at the wharf, and for small boats anchored just northward of the spit.

Chart 6450.—Seabeck, about 21 miles from Hood Canal entrance. is a settlement and summer resort at the head of **Seabeck Bay,** a small cove on the eastern shore. There are a landing wharf with a depth of 14 feet alongside, a store, and a post office. There is daily bus service to Bremerton.

A logging camp is on the western shore of Seabeck Bay, off which numerous piles are driven for a log dump. Shoal water extends 0.5 mile from the head of the bay. Good anchorage, well protected from southerly and southeasterly weather, is afforded in the bay in 5 to 10 fathoms. Shoal water extends more than 200 yards off **Misery Point,** at the western side of the entrance to the bay.

Oak Head, about 1.8 miles northward of Misery Point, is the southernmost point of **Toandos Peninsula. Hazel Point,** 1.8 miles northeastward of Oak Head, is the southeastern point of the peninsula, and the turning point where the canal bends sharply from southward to southwestward. **Tskutsko Point,** 1 mile westward of Oak Head, is the southwestern point of Toandos Peninsula, and is at the east side of the entrance to Dabob Bay.

Fisherman Harbor is a cove on the southern end of Toandos Peninsula, just eastward of Oak Head. It is about 200 yards wide, 0.8 mile long, and has a restricted entrance which is practically bare at low water. A sandspit extends partly across the entrance from the western shore. It affords sheltered anchorage for small boats. **Coyle,** a small settlement, is on the eastern shore of the cove.

Brinnon is a village on the southern side of **Dosewallips River,** about 3.5 miles westward of Oak Head, at the entrance of Dabob Bay. It has tourist camps, a post office, two hotels, a store, a service station, and a landing wharf built out to 7 feet. The wharf is at the southern end of Dosewallips River Flats, which extend 0.5 mile offshore and are bare at low water. Shoal water is found in line with the face of the wharf off both ends.

Dabob Bay, the largest inlet in the canal and separated from it by the Toandos Peninsula, extends 9 miles in a northerly direction. The entrance is between Tskutsko Point and **Sylopash Point** just northward of the mouth of the Dosewallips River. A small cove, **Jackson Cove,** between **Wawa** and **Pulali Points,** and a small inlet, **Quilcene Bay,** westward of **Bolton Peninsula,** indent the western shore. There is a Boy Scout camp, with a landing wharf, on the western shore of Jackson Cove. The western shore of Dabob Bay is particularly steep and bold, reaching an elevation of over 2,600 feet in less than 2 miles from the coast. The Naval operating area is described in Chapter 2, § 204.222.

Quilcene is a village with a post office at the mouth of **Big Quilcene River,** on the western side and near the head of Quilcene Bay. It is on the Olympic Loop Highway, and has stores, garages, a hotel, tourist camps, and service stations.

Pleasant Harbor is a small cove on the western shore of Hood Canal about 3 miles westward of Misery Point. It is about 300 yards wide, 0.5 mile long, and has a narrow, shallow entrance. Inside is sheltered anchorage for small boats with a maximum depth of 6 fathoms. A large log dump and log boom are in the harbor.

Duckabush, just westward from **Quatsap Point,** about 5 miles southwestward of Oak Head, is a settlement on the western shore, at the head of a shallow bay which is mostly dry at low water. There is a store, a service station, and two tourist camps, but no landing wharf. A large log dump and log boom are in the bight.

Triton Head, on the western shore, is about 8.2 miles southwestward of Oak Head. It is low, rocky, and timbered, with a reef, bare at low water, extending about 200 yards northward from the point. **Triton Cove** is a small cove formed by the head and the western shore, which affords anchorage for small vessels, with some protection from southerly winds. Oyster beds, marked by stakes and brush, are about 0.8 mile northward from Triton Head on the flat which extends off the mouth of **Fulton Creek.**

Chart 6460.—Holly, on the eastern shore of Hood Canal, is a settlement on the southern side of a small bight about 10 miles southwestward of Oak Head. It has a landing wharf built out to 10 feet, a store, a highway service station, a tourist camp, and road connections with the Puget Sound highway system. Shoal water extends about 300 yards from the shore northward and eastward of the wharf. It is reported that a boulder, baring at extremely low tides, projecting 3 to 4 feet above the surrounding shallow bottom, is about 0.2 mile northward of the wharf and 300 or 400 yards from the shore. Vessels should approach the wharf from the westward. Shoal water extends about 0.3 mile north-northwestward from the northerly point of the cove in which Holly is located. **Anderson Cove** is the shallow cove directly northward of Holly.

Eldon is a western shore settlement on the southern bank of the **Hamma Hamma River,** about 12.5 miles southwestward of Oak Head. It has a store and tourist camps. The flats from the Hamma Hamma River extend nearly 0.5 mile from the shore. An abandoned logging wharf, in ruins, is at the southern end of the flats.

Lilliwaup, a village with a post office, is on the southern shore of **Lilliwaup Bay,** a small shallow cove on the western shore of Hood Canal about 18 miles southwestward of Oak Head. It has a tourist camp. Small-scale logging operations are carried on nearby to the southward.

Dewatto is a small settlement on the southern side of **Dewatto Bay,** a small, shallow cove on the eastern shore opposite Lilliwaup. It is connected with the highway system of Puget Sound. There is a log boom in the bay.

Hoodsport is the largest town on Hood Canal. It is on the western shore about 21 miles southwestward of Oak Head. It has hotels, stores, schools, telephone connections, garages, and tourist camps. Diesel oil, gasoline, and water are piped to a small wharf which bares at low water. A log boom is on the extensive flats off the southern part of the town. The flats bare at low water for about 300 yards offshore. A road leads to Lake Cushman, a much frequented summer resort about 9 miles to the northwestward.

Potlatch is a logging town on the western side of the canal about 2 miles southward of Hoodsport and opposite **The Great Bend,** where Hood Canal turns northeastward. It has a post office and a substantial wharf with 15 feet at low water along the face of it. There are log booming grounds on both sides of the wharf and a log dump southward of the wharf. Bus lines connect it with Bremerton, Port Orchard, Brinnon, and Shelton. Telephone facilities are available. A large power plant with a standpipe can be seen on the western shore 0.5 mile southward of Potlatch.

Union is a town on the southern shore of The Great Bend. There is a float landing and a small wharf. Boats should approach the landing from the northeastward and beware of snags. Gasoline may be obtained at the landing. The water alongside the float is reported to be of sufficient depth for small boats at all stages of the tide. The town has a hotel, a post office, two stores, and a tourist camp.

Annas Bay is immediately westward of Union and is a broad, open bight, the eastern half being a flat, bare at low water. This flat extends about 0.2 mile into the canal immediately westward of Union and is formed by the **Skokomish River,** which empties at the head of the bay. There are no settlements of importance eastward of Union.

Hood Canal terminates in **Lynch Cove,** with flats, mostly bare at low tide, about 2.2 miles from the head. **Union River** empties into Lynch Cove. Gasoline may be obtained at **Happy Hollow** about 3 miles from the head. There are oyster beds on the flats.

Many resorts, auto camps, and summer cottages have been built along the shores of Hood Canal. Many of the resorts have small piers and boat landings.

Chart 6445.—Port Orchard is an extensive body of water westward of Bainbridge Island. Its general length is about 15 miles with an average width of over 0.8 mile. At its northern end it connects with Port Madison through Agate Passage. At its southern end Port Orchard connects with Puget Sound through Rich Passage. The depths in the main body of Port Orchard range from 36 to 150 feet with but few dangers, and these as a rule, close inshore. The shores are moderately low and wooded. Towns, villages, and numerous cottages line the shores of Port Orchard.

Vessels are requested to exercise caution when piloting in the vicinity of the rubber seaplane mooring buoys in Port Orchard. The buoys are unlighted and painted with black and orange vertical stripes.

Current observations taken in mid-channel about 1 mile southward of **Tolo** indicate that the tidal current in that locality is very weak.

Agate Passage is the northern entrance to Port Orchard and connects it with Port Madison. The channel extends about 1 mile in a northeasterly direction and averages about 380 yards in width. The controlling depth is about 20 feet. The passage is straight; the shores are wooded and fairly steep-to; the shoreline is for the most part rocky and fringed with kelp to Point Bolin. the ebb northeastward.

The currents have velocities up to 6 knots; the flood sets southwestward and

The passage is obstructed by a shoal near the middle of the northern end with depths of 9 to 10 feet, and there are other depths of 14 to 18 feet almost in mid-channel. It has been examined by wire drag and the dangers are shown on the chart.

The northern entrance is marked by Agate Passage Light, shown from a white house on piles on the western side of the channel opposite **Agate Point;** also, by a buoy on the western side of the channel. The southern entrance is marked by a buoy on the western side of the channel.

Agate Passage Bridge spans the passage just southwestward of Agate Point. For a width of 300 feet over the channel the vertical clearance is 75 feet at mean high water.

Seabold, a village with a post office on Bainbridge Island, is about 0.5 mile southward of the southern entrance to Agate Passage. There is no wharf at this village. **Seabold Wharf** is about 0.7 mile south of the village.

Sandy Hook is a residential development about 0.8 mile northward of **Point Bolin,** the southern point of Agate Passage; a wharf is here.

Liberty Bay, also known as **Dogfish Bay,** is a narrow inlet extending about 4 miles in a northerly direction from the northwestern part of Port Orchard. The bay averages 0.5 mile in width, the southeastern half being narrow and tortuous. The shores are low and wooded; the shoreline is mostly sand and gravel. There are mud flats at the head of the bay and in the small bights on the southern side of the bay. Mud is the predominating bottom characteristic. The current north of Keyport, in the narrow entrance to the bay, has an average velocity at strength of about ¾ knot. Velocities exceeding 1 knot occur at times. A 16-foot shoal is about 350 yards northwestward of the northern tower of the overhead cable crossing at Keyport.

The **Keyport Torpedo Station** with two wharves is on the western side of the entrance to Liberty Bay. Wharf No. 1 is built out to 19 feet, and No. 2 is built out to 26 feet. There are several prominent buildings on the reservation.

Torpedo warning.—A red flag is hoisted on the south wharf at the torpedo station and one displayed on the southern lighter indicate that torpedo firing is in progress and vessels are to keep well to the east of the channel clear of the range, marked by white buoys, keeping a sharp lookout for torpedoes. See Chapter 2, § 207.750.

Keyport is on the southern side of the passage leading to Liberty Bay. An electric transmission line with a vertical clearance of 90 feet crosses the passage at Keyport.

Lemolo is a village with a post office on the eastern side of Liberty Bay.

A rock with a little water over it at low tide is 150° from the southwestern corner of the dock which is about midway between Lemolo and Poulsbo, on the eastern side of Liberty Bay.

Pearson, a village with a post office on the southern shore of Liberty Bay, has a landing wharf with 8 feet alongside, built out from the end of a low point.

Scandia, about 0.3 mile northwestward of Pearson, has a wharf built out to 7 feet.

Poulsbo, a town on the east shore at the head of Liberty Bay, has several wharves with from 8 to 12 feet at low water, and is the center of an extensive fishing industry. A saltery, a sawmill, and a boatyard are here. Provisions may be had and fuel oils are obtainable at a small oil dock. A road connects Poulsbo with Bangor and other settlements on Hood Canal. There is a large area of farming country around Poulsbo and extending toward Hood Canal, and a considerable amount of produce and lumber is shipped. Oysters are cultivated on the flats at the head of the bay.

Manzanita is a settlement on the western side of Bainbridge Island in a small cove about 1.5 miles southward from Seabold. **Manzanita Bay,** south-

949285—52——29

ward of the town, affords an excellent anchorage for small craft in 27 feet, mud bottom.

Battle Point, a sandy spit, is on the eastern side of Port Orchard about 1.7 miles southward of Point Bolin; it marks the turn in the direction of the channel from southwest to southward. Battle Point Light is shown from a white house on piles off the end of the spit. The light is 25 feet above water and visible 9 miles. There is a small lagoon southeastward of the point.

Brownsville, on the western shore of Port Orchard, is on the northern shore of Burke Bay, about 1.2 miles southwestward of Battle Point. The town has a landing wharf built out to 10 feet. All of **Burke Bay** bares at low water, but it may be entered by small boats at about half tide.

The southern part of Port Orchard is described in the next chapter.

CHAPTER 18

Puget Sound, Seattle to Olympia

Chart 6460

THIS chapter describes the southern part of Puget Sound and the various inlets leading from it. The southern part of Hood Canal, the northern part of Port Orchard, and Restoration Point have been described in Chapter 17.

Chart 6446.—From Restoration Point the shore of Bainbridge Island trends southwestward for about 2 miles to **Beans Point,** the north point at the entrance to Rich Passage. Between the points the shores are thickly settled with summer cottages. **South Beach** is 1.2 miles southwestward of Restoration Point.

Bainbridge Reef, with depths of 36 feet at the outer end and deeper water inside, extends 0.4 mile southward from the shore between South Beach and Beans Point, and constitutes the principal danger in the approach to Rich Passage for deep-draft vessels. Its outer end is marked by a lighted bell buoy.

Orchard Point, the southern point at the entrance to Rich Passage, is marked by a light shown from a white pyramidal tower. Orchard Point Light is 34 feet above water and visible 11 miles. The fog signal is sounded on a reed horn.

General anchorage.—A general anchorage area is established in the vicinity of Orchard Point. For regulations regarding this area see Chapter 2, § 202.230.

Blake Island, about 2.5 miles southwestward of Restoration Point, is described later.

Port Orchard is connected with Puget Sound by **Rich Passage,** at the southern end of Bainbridge Island, which is the principal entrance to Port Orchard, and the one in general use. The approach to the passage is between Restoration Point and Blake Island and is deep and free from dangers except for Bainbridge Reef.

Rich Passage is about 3 miles long, with a rather sharp bend near its western end, and varies in width from 0.8 mile at its eastern end to a little more than 0.2 mile at the western end. It has been examined by means of the wire drag and the dangers are shown on the chart. **Orchard Rocks,** 500 by 350 yards in extent, are on the northern side of the channel just inside the eastern entrance. A small area near the center of the reef is bare at low tide; the highest point covers at about half tide and is marked by a white echo board facing northeast and southwest. The rocks are marked by a lighted buoy 400 yards southward from the echo board. The reef off **Point Glover** is marked by a

light shown from a small white house on pile structure, a fog signal is sounded on an air-diaphragm horn. **Waterman Point,** at the western entrance, is marked by a light shown from a white square house on black cylindrical base; a fog signal is sounded on an air-diaphragm horn. A day range, bearing 319½°, leads over the best water off Point Glover; the front mark is a white square and the rear mark is a white diamond; each has a red vertical stripe.

A lighted buoy marks the southern edge of the shoal extending from **Point White,** the north point at the western entrance to Rich Passage.

Currents.—Continuous hourly observations for about one month at a station in mid-channel about midway between Point Glover and Point White, and similar observations for shorter periods at various other points in the passage indicate the following:

At this station the strongest currents which have been observed are about 4 knots on the flood and 5 knots on the ebb. The average maximum velocity of the flood current is about 2½ knots and of the ebb 3 knots.

Near the time of slack water, the average period when the current velocity does not exceed ¼ knot is about 20 minutes. For strong currents these periods will be decreased and for weak currents they will be increased.

In the channel between Pleasant Beach and Point Glover the average velocity of the flood at strength is about 1¼ knots and of the ebb about 2¼ knots.

North-northwestward of Orchard Rocks the average velocity of the flood stream is about ½ knot, and the velocity of the ebb about 2 knots.

The flood stream through the passage is of simple and regular character. The stream lines are nearly uniform in trend from shore to shore, except off the bight just northwestward of Middle Point and in the large cove on the northern shore opposite Point Glover, where eddies occur. These eddies, however, are both of limited extent, neither extending outward to the usual steamer track. This regularity tends to increase the actual or available cross section of the flood stream and consequently to diminish its strength.

The funnel-shaped configuration of the passage is not favorable to the production of regular stream-line motion on the ebb current and extensive eddies and countercurrents occur.

Between Middle Point and Point Glover, an extensive eddy extends from shore almost to mid-channel, and will frequently be encountered by vessels on the track between Orchard Rocks and Point Glover buoys.

An eddy fills the cove on the northern shore opposite Point Glover, but does not extend outward to the steamer track.

An eddy occurs about 0.2 mile south-southwestward of Point White and a little northward of mid-channel at the western entrance to the passage.

A weak countercurrent occurs inshore along the southeastern side of Point White.

These eddies and countercurrents on the ebb greatly diminish the effective cross section of the passage, and so increase the ebb velocities in the channel.

Directions, Port Orchard.—Strangers should not attempt to navigate Port Orchard, and particularly Rich Passage, in thick weather on account of the strong tidal currents. In clear weather, however, the navigation of these waters presents no difficulty. Enter between Restoration Point and Blake Is-

land, giving either shore a berth of not less than 0.5 mile, and steer so as to pass 300 yards southward of Bainbridge Reef lighted bell buoy. From a mid-channel position between that buoy and Orchard Point Light, steer 310° heading for Middle Point, to pass 200 yards southward of Orchard Rocks lighted buoy. When the buoy is abeam, steer 000° for 0.75 mile until nearly up to buoy, then haul on to the range, bearing 319½° holding a little southward of it. When abeam of Point Glover Light follow mid-channel courses to Waterman Point Light. From this point a 225° course for 2.3 miles leads to a position with Point Herron Light abeam, distance 0.3 mile.

Caution.—Rich Passage, because of activities of the Puget Sound Navy Yard, has a very large volume of traffic. Many ferries a day each way, numerous tugs with hawser tows, and various types of Naval craft, all contribute to create a considerable collision hazard in the passage, particularly at the sharp bend off Point Glover. Strong tidal conditions prevail in this vicinity, and Naval authorities call attention to the fact that deep-draft outbound Government vessels making the sharp turn are usually unavoidably set well over toward Buoy No. 8, necessitating a two-blast, starboard-to-starboard meeting with inbound vessels. There is, accordingly, a well-established local custom to regard navigation at this bend as a special circumstance situation subject to the provisions of *Articles 27 and 29, Inland Rules.* Outbound vessels should give notice of their approach by sounding one long blast of the whistle when within half a mile of Point Glover, or approximately at Point White Buoy No. 10, as provided in *Article 18, Rule V, Inland Rules,* to be answered with a similar long blast by any inbound vessel nearing the bend. To avoid accident, inbound vessels should approach the bend with great caution, preparing to pass an outbound vessel in accordance with the latter's proposed signals, two short blasts signifying intention of the outbound vessel to pass starboard to starboard and one short blast signifying her intention to pass port to port. The appropriate passing signal should be given by the outbound vessel and answered by the inbound vessel as soon as practicable after sighting each other.

There are many towns and villages along the shores of Port Orchard, many of the former landing wharves have fallen into ruins.

Fort Ward is a Naval post on Bainbridge Island near the eastern entrance to Rich Passage, just inside Beans Point. There is a wharf built out to 18 feet. A rocky patch with 13 feet over it, dangerous to vessels approaching the wharf from southward, is 150 yards 170° from the southeastern end of the wharf.

Pleasant Beach is a summer resort on the northern shore of Rich Passage about a mile northwestward of Fort Ward.

Waterman, a village with a post office on the southeastern shore of Port Orchard about a mile southwestward from Rich Passage, has a landing wharf built out to 13 feet. **Enetai,** with a landing wharf built out to 13 feet, is a community of summer cottages on the western shore opposite Waterman.

Gibson, a small settlement on the eastern shore of Port Orchard about 0.8 mile northwestward of Point White, has a private wharf built out to 6 feet. **Crystal Springs** and **Westwood** are small settlements on the eastern shore, 0.5 mile and 1.1 miles, respectively, northward of Gibson. They have no landing wharves.

Illahee and **Gilbertson** are small settlements on the western shore opposite Crystal Springs and Fletcher Bay, respectively.

Fletcher Bay is a village on the eastern shore of Port Orchard about 1.2 miles southeastward of Battle Point. The wharf is in ruins. Small boats can enter Fletcher Bay at ¾ tide and find anchorage in 12 feet, mud bottom; the swinging room is limited. The bar across the entrance to the bay bares at half tide.

Chart 6440.—Sinclair Inlet, about 3.5 miles long and averaging a mile in width, makes in southwestward beyond Port Washington Narrows, and is the principal inlet in Port Washington.

Restricted area.—A Naval restricted area is established in Sinclair Inlet. For regulations regarding this area see Chapter 2, § 207.750.

Port Herron, at this junction of Port Orchard, Sinclair Inlet, and Port Washington Narrows, is marked by Point Herron Light, 24 feet above water and shown from a platform on pile dolphin in 18 feet, southward of the point. A fog signal is sounded on an air horn.

East Bremerton (Manette P. O.) is on the eastern side of the entrance to Port Washington Narrows. A fixed bridge with a clear span of 231 feet and a vertical clearance of 80 feet crosses Port Washington Narrows to Bremerton, about 0.3 mile northward of **Point Turner.** There are several wharves and a ferry slip at East Bremerton. There is bus service to Tacoma and neighboring towns.

A soldiers' home for Washington veterans, with a landing wharf built out to 24 feet, is on the southern shore of Sinclair Inlet, about 1.2 miles southward of Point Herron. **Retsil** is the post office. **Annapolis,** a small settlement, is on the shore just westward of the wharf at the **Veterans Home.**

Port Orchard is on the southern shore of Sinclair Inlet opposite the Navy Yard. It has a ferry wharf and float landing with a depth of 11 feet, an oil wharf with 10 feet alongside at which small boats can obtain gasoline, and several small private landings. Ferry and freight service is maintained with Bremerton. A marine railway and machine shop are available for repairs; boats up to 55 feet long can be hauled out.

A flat, largely bare at low tide, extends 0.4 mile from the shore of the bight eastward of Port Orchard. A buoy marks the edge of the shoal. Shoal water extends about 100 yards outside the line between the ends of the city wharf ruins and the long wharf eastward of it.

Restricted area.—A Naval restricted area is established in Port Orchard. For regulations regarding this area see Chapter 2, § 207.750.

Puget Sound Navy Yard is on the northern shore of Sinclair Inlet on the western side of the entrance to Port Washington Narrows.

Warning signal.—A triple combination air horn has been installed on the 250-ton erecting crane at the outer end of Pier 6. Vessels are warned to run at slow speed when within 0.8 mile of the pier if signal is blown.

Bremerton, the principal city on Port Orchard, is on the northern shore of Sinclair Inlet, adjoining the Navy Yard; East Bremerton is included in the city

limits. Communication with Seattle is maintained by frequent ferry service and by highway with Tacoma.

Chart 6446.—Port Washington Narrows, a passage about 3 miles long with an average width of 0.2 mile, connects Sinclair and Dyes Inlets. Tidal currents in the narrows attain velocities up to 4 knots at times. See current tables and tidal current charts for details. There are four day ranges for navigating Port Washington Narrows northward of the bridge. On the ranges, 14 feet can be taken through the narrows; with local knowledge a slightly greater depth can be carried by deviating slightly from the ranges.

An oil wharf, built out to 15 feet, is on the western shore of Port Washington Narrows about 0.2 mile above the bridge. Gasoline and Diesel oil can be obtained. **Anderson Cove** is a small bight on the south shore about 1.5 miles above the bridge. As there is little or no water, small boats anchor off the cove. There is a small-boat mooring and service station here. **Sheridan,** on the eastern shore of the narrows about 2 miles above the entrance, has a landing wharf. **Phinney Bay,** about 0.4 mile wide and 0.8 mile long, makes into the western shore opposite Sheridan.

Rocky Point is on the western side of the northern entrance of Washington Narrows. There are tide rips off this point.

Dyes Inlet is about 3 miles long and averages a mile in width. A number of towns are on the shores of the inlet.

Tracyton, a village with a post office, is on the eastern shore of Dyes Inlet near the northern end of the narrows. On the south side of the village is a boat yard where small yachts are built. There are several stores and a hotel in the town.

Fairview, on **Windy Point** about 1.2 miles northwestward of Tracyton, is a settlement of beach cottages.

Silverdale, a town on the western side of the head of Dyes Inlet, has a wharf built out to 10 feet. There is some water-borne traffic in general merchandise and poultry supplies. Gasoline, water, and supplies may be obtained here. The town has several stores and a hotel.

Chico is a town on the western side of Dyes Inlet. It has a wharf used only as a log dump. Considerable logging operations are carried on here.

Ostrich Bay is an inlet in the southwestern part of Dyes Inlet. **Erland** is a small settlement on the western shore at the entrance. A sunken rock is reported in Ostrich Bay 250 yards, 010° from the end of the dock on the western shore.

A depth of 6 feet can be carried from Ostrich Bay into **Oyster Bay** on mid-channel courses. There is 6 feet or more in Oyster Bay. **Mud Bay,** a narrow slough eastward of Ostrich Bay, bares at low water.

Chart 6460.—East Passage, on the eastern side of Vashon and Maury Islands, extends from Alki Point southeastward for 12.5 miles to Point Robinson, thence southwestward a distance of 6 miles to Point Brown. The waters throughout are deep and free of dangers, which in no case extend as much as 0.5 mile from shore.

From Alki Point to **Point Williams,** 3 miles, the shores are thickly settled. **Fauntleroy Cove** is between Point Williams and **Brace Point,** 1 mile southward, and is included in the city limits of Seattle. There is an automobile ferry from **Fauntleroy** to Vashon Heights and Harper.

From Orchard Point the shores trend southward and then eastward, forming, with the south shore of Bainbridge Island, a bay semicircular in form and about 3.5 miles in diameter.

Manchester, Colby, South Colby, Harper, and **Southworth** are small towns on the shores of this bay, between Orchard Point and Point Southworth at the entrance to Colvos Passage. Manchester has a combination ferry slip and landing wharf built out to 14 feet, with fresh water piped to the end. A row of lights on the wharf is prominent at night. Manchester Ferry Terminal fog signal is sounded on a horn from 6:45 a. m. to 11 p. m. during fog. There is a small launch-building plant at Colby. Harper has a combination ferry slip and landing wharf built out to 12 feet. A row of lights on the wharf is prominent at night. Passenger and automobile ferry service is maintained with Fauntleroy.

Blake Island, about 1 mile in extent, 160 feet high, and covered with trees, is in the southeastern part of this bay, off the northern entrance to Colvos Passage. Heavy tide rips, strongest with a flood current, and strong southerly winds are encountered at the northern entrance to Colvos Passage southward of Blake Island. Shallow, irregular bottom extends about 0.5 mile off the northern shore of the island. Just southward of the northeastern point of the island are the ruins of a wharf.

Explosives anchorage.—An explosives anchorage area is established in the vicinity of Blake Island. For regulations regarding this area, see Chapter 2, § 202.230.

East Blake Island Light, 15 feet above water, is shown from a white triangular structure on the northeastern point of Blake Island.

Blake Island Southwest Light, 15 feet above water, is shown from a white triangular structure on the southwestern point of Blake Island.

Yukon Harbor, about 2 miles southwestward of Blake Island, affords anchorage in 6 to 10 fathoms, with protection from southerly winds.

Vashon Island is 11 miles long in a northerly direction and has an average width of about 3 miles.

Vashon Head Light, 15 feet above water, is shown from a white triangular structure on the northwestern point of Vashon Island.

Maury Island, a part of Vashon Island, the two being connected by a narrow neck of land which bares at high water, is off the eastern side of Vashon Island, and is 5 miles long, with an average width of 1 mile.

On these islands the land is of moderate elevation, rolling, and in places rugged, and the country throughout is heavily wooded except for the numerous clearings where farming is in progress. The transmitting towers of Seattle broadcasting stations are on the islands; two groups of towers are on Vashon Island and two on Maury Island. The shores on all sides have numerous settlements. The county wharves, formerly used to ship farm produce, are no longer kept in repair, and shipments are now by truck.

Point Vashon, the northwestern extremity of Vashon Island, is 280 feet high, steep, and wooded. Shoal water extends 0.2 mile northward from Point Vashon and nearly as far along the northern shore to **Dolphin Point,** 1 mile eastward.

Vashon Heights Landing, 0.5 mile eastward of Point Vashon, has a combination ferry slip and landing wharf built out to 14 feet. An automobile ferry runs to Fauntleroy.

Glen Acres and **Dilworth,** on the northern and southern shores of **Point Beals** 2.5 miles southeastward of Dolphin Point, are small settlements. The tall radio towers of station KOMO are on Point Beals.

The town and post office of **Vashon** are on high land 1.5 miles southwestward of Point Beals.

Measured course.—There are ranges for a measured nautical mile trial course on either side of Point Beals. The range marks are steel towers with round red and white targets, course 159°58′.

Point Pully, about 7.8 miles southward of Alki Point, is a sharp low spit, projecting 300 yards from the high land which in 1 mile rises to 430 feet elevation. On the low part of the point is **Three-tree Point,** a grassy knoll 30 feet high, with several trees on it. Point Pully is marked by a light shown from a white skeleton structure, 20 feet above water. Pully Point Light has a fixed fog light of very high power, 25 feet above water, which is shown from sunset to sunrise and at other times of low visibility. The fog signal is sounded on an electric-diaphragm horn.

Point Heyer, a sandspit behind which the ground rises rapidly, is about 2.5 miles southward of Point Beals. A shoal extends 0.2 mile southeastward from the point. A radio tower on this point is about 450 feet high.

Ellisport is a village with a post office just southward of Point Heyer.

Portage is a village with a post office and a hotel on the northern side of the low isthmus that connects Vashon and Maury Islands. Just northward of the isthmus is an oil wharf where oil and other fuels are delivered by barge at high tide. Several tanks are here. Boats may obtain gasoline, but there are no service pipe lines to the end of the wharf. Two radio towers, about 526 feet high, are about 0.6 mile southward of the isthmus.

Point Robinson, the easternmost extremity of Maury Island, is a low spit projecting 140 yards from the wooded high land. It is the turning point in the East Passage and is marked by a white octagonal tower attached to fog-signal building. Point Robinson Light is 40 feet above water and visible 12 miles. The fog signal is sounded on an air-diaphragm horn.

There are no landings on the southeastern shore of Maury Island. Two abandoned sand and gravel bunkers, now in ruins, are about 1.5 and 2.5 miles, respectively, southwestward of Point Robinson.

Des Moines is a town about 4 miles southeastward of Point Pully. It has bus connections with Seattle and Tacoma. There is a submarine cable crossing to Robinson Point. The town of **Zenith** adjoins Des Moines on the south. The Masonic Home and water tank in Zenith are prominent landmarks.

Redondo, on **Poverty Bay,** about 6.8 miles southeastward of Pully Point, is a village with a post office. There is no landing wharf, communication being

by highway. Only a few pilings remain of the former wharf at **Lakota,** 15 miles southward of Redondo. **Dumas Bay,** a cove just to the westward of Lakota, has several small wharves, which bare at low water.

Quartermaster Harbor is between Maury and Vashon Islands, opposite Commencement Bay. The shores are low and wooded, with numerous clearings, and at the head of the harbor a narrow isthmus connects Vashon and Maury Islands. It almost covers at extreme high tide. The harbor is irregular in shape, with a total length of about 5 miles and an average width of 0.5 mile. It affords excellent anchorage about 2 miles inside the entrance in 5 to 10 fathoms, muddy bottom. The harbor is easy of access, and a mid-channel course may be followed with safety.

A shoal just inside the entrance, between **Neill Point** and **Point Piner,** extends 300 yards from the eastern shore and is marked at its outer end by a buoy. Just northward of Neill Point and also for 1 mile along the western shore opposite **Manzanita,** shoal spots extend 400 yards offshore, with depths of 2¼ to 2¾ fathoms. Depths of 4¼ fathoms are near mid-channel westward of Manzanita, and also near mid-channel westward of Dockton.

Many settlements are along the shores of the harbor, but the landing wharves, for the most part, are in disrepair. Under the high bluffs on the western side from Neill Point northward are the following summer resorts: **Harbor Heights, Indian Point, Magnolia Beach,** and **Shawnee,** and on the eastern side are **Rosehilla** and **Manzanita.** The harbor is visited by many pleasure craft.

Burton is a town on **Burton Peninsula** which projects eastward from the western side about 3 miles from the entrance. A landing wharf, 760 feet long, is built out southward from the narrow part of the peninsula to a depth of 12 feet. There is a hotel at Burton.

Dockton, in the bight on the eastern side about 2.5 miles from the entrance, is a village with dock and float landing for small craft.

Newport is on the western shore just northward of the Burton Peninsula and **Quartermaster** is on the northern shore at the head of the harbor. These places have only a few houses.

In the upper part of the harbor, northward of the Burton Peninsula, are several private wharves and floats.

Colvos Passage, on the western side of Vashon Island, is about 11 miles in length in a general southerly direction, with an average width of 1 mile. The passage is nearly straight and free of dangers. The northern entrance is about 4.5 miles southward of Alki Point, and the southern entrance is about 4 miles westward of Point Brown and abreast Point Defiance. The passage is used principally by local passenger steamers, and by tugs from upsound points with logs for the sawmills. A mid-channel course can be followed with safety.

Colvos Passage is marked by four lights between Point Southworth at the northern entrance and Point Dalco at the southern entrance.

The current in Colvos Passage nearly always sets northward, and at times advantage is taken of this fact by vessels bound from Tacoma to Seattle. The current in the middle of Dalco Passage and along the southwest shore of Commencement Bay sets westward or northwestward almost continuously.

To obtain full advantage of the peculiar currents in Colvos Passage and connecting waterways, use should be made of the *Tidal Current Charts, Puget Sound, Southern Part.*

Point Southworth, on the western side of the northern entrance, is high and wooded.

Fragaria and **Olalla,** on the western shore of Colvos Passage, have fish wharves. There are logging operations at Olalla. A rock baring at half tide is reported 400 yards northward of the wharf at Olalla. The wharf at **Maplewood** is in ruins.

The old steamer wharves at **Cove** and **Lisabeula,** on the eastern shore, were used occasionally in 1950, but are not in good repair. Cove has a post office, a store, and a boatyard where pleasure craft up to 30 feet long are built. Other resort settlements on the eastern shore include **Biloxi, Sylvan, Colvos, Camp Sealth,** and **Spring Beach.**

Tahlequah is a resort on the southern shore of Vashon Island between Neill Point and **Point Dalco.** An automobile ferry operates between Tahlequah and Tacoma.

Gig Harbor is an inlet about 1 mile long and 0.2 mile wide, on the west side of the southern entrance to Colvos Passage abreast Port Defiance. Gig Harbor Light, 12 feet above water, is shown from a white wooden house on the southern end of the sandspit at the eastern side of the entrance. A low sandspit, 220 yards long, projects southwestward from the eastern point, constricting the entrance to less than 100 yards in width; a narrow 10-foot channel in the middle has currents of considerable velocity. Inside the entrance the basin has from 4 to 6 fathoms in it. The surrounding land, partially cleared of timber, slopes gently toward the shores, and is thickly settled.

The town of **Gig Harbor** extends along the western shore and the head of the harbor. It serves an extensive agricultural district and is the home port of many fishing boats. Log rafts are made up in the harbor. The town has two boat yards, one of which has a small concrete graving dock 171 feet long which will accommodate vessels of 9-foot draft. There are several landing wharves in the harbor, including two at which fuel, oils, and fresh water may be obtained.

Communication with Tacoma is by telephone and by highway over the Narrows bridge. Bus connections are made with Port Orchard and Bremerton.

Directions.—On entering, hold midway between the spit on the eastern side and the western shore until just inside the entrance. Then swing right toward the eastern shore until past the short spit extending from the western shore, and steer a mid-channel course into the harbor.

Chart 6407.—Commencement Bay (Tacoma Harbor) has its entrance about 18 miles southward of Alki Point and 56 miles from Point Wilson. The bay is about 2.5 miles in length and has an average width of nearly 2 miles. The waters are deep throughout, ranging in depth from 570 feet at the entrance to 100 feet at the head where they shoal abruptly to mud flats, bare at low water. The bay is easy of access and free of dangers.

Tacoma, the second city in size and importance on the sound, is on the southern and southwestern shores of Commencement Bay. It has an extensive

commerce, both foreign and domestic, exporting large amounts of non-ferrous metals, wheat, flour, machinery, lumber, and general merchandise; it also has part of the Alaska trade.

Point Brown, the northern point at the entrance to Commencement Bay, is marked by a light, 38 feet above water and visible 11 miles, and shown from a white tower. The fog signal is sounded on an air horn. In the bight just northward of the point is **Caledonia,** a small settlement.

Dash Point is about 1 mile northward of Point Brown. The town of Dash Point is on the point, and on its north side is a wharf built out to 20 feet.

Point Defiance, the western entrance of Commencement Bay, terminates in a very prominent abrupt dirt bluff, 160 feet high. Point Defiance Light, 21 feet above water, is shown from a white house on platform on piles, westward of the point. A fog signal is sounded on an air-diaphragm horn. **Point Defiance Park,** covering the area around Point Defiance, is wooded for a mile from the end of the point.

From the flats at the head of Commencement Bay, the city water front extends northwestward to within 1.5 miles of Point Defiance. Here are numerous industrial plants with wharves to accommodate deep-draft vessels.

The most prominent of these is a large ore smelter 2 miles southeastward of Point Defiance. The remarkably high chimney is the predominating landmark of the vicinity.

The flats at the head of the bay have been improved by dredging several basins and channels and by the construction of wharves, warehouses, railway terminals, and various industrial plants.

The **City Waterway,** the southernmost of these basins, has project dimensions as follows: 500 feet wide and 29 feet deep from deep water to the South Eleventh Street Bridge; 500 feet wide and 22 feet deep to the South Fourteenth Street Bridge. thence varying from 500 feet to 250 feet wide and 19 feet deep to the head of the waterway, a total length of 8,500 feet.

The controlling depths were 29 feet from Commencement Bay to South Eleventh Street, May 1949; 22 feet from South Eleventh Street to South Fourteenth Street, June 1949; and 16½ feet from South Fourteenth Street to the head of the waterway, February 1949. At the eastern side of the entrance is the **Tacoma Waterway Light** and fog signal. The light is shown from a white post, at a height of 23 feet above water, and the fog signal (bell) is sounded from a white house on black pile structure.

Across City Waterway are three bridges. A vertical lift highway and railway bridge, 0.5 mile above the mouth, has a horizontal clearance of 200 feet and a vertical clearance of 135 feet raised and 60 feet closed. A railroad swing bridge, 0.7 mile above the mouth, has a horizontal clearance of 100 feet and a vertical clearance of 12 feet. A railroad swing bridge, 0.8 mile above the mouth, has a horizontal clearance of 100 feet and a vertical clearance of 3 feet. The regulations regarding these bridges are given in Chapter 2, § 203.785.

The **Middle Waterway** is the next waterway northeastward of the City Waterway. The outer wharf has been dredged to 32 feet on the east, north, and west sides. The upper part of the Middle Waterway has shoaled and was not navigable in 1950.

St. Paul Waterway, northeastward of Middle Waterway, is used for log storage.

Puyallup Waterway, through which the **Puyallup River** discharges, has shoaled to such an extent that it cannot be used commercially.

A city highway vertical lift bridge crosses the Puyallup Waterway at South Eleventh Street. It has a horizontal clearance of 150 feet and a vertical clearance of 22 feet closed and 133 feet raised. The signal for opening is three long and one short blasts of the whistle.

Just southward of the South Eleventh Street Bridge, the Chicago, Milwaukee, St. Paul and Pacific Railroad crosses the Puyallup Waterway on a swing bridge with two openings each of 120 feet horizontal clearance, and vertical clearance of 4½ feet. The opening signal is three long and two short blasts. The regulations regarding these bridges are given in Chapter 2, § 203.810.

Several bridges span the Puyallup River farther up, but this section of the river is used only by small boats with local knowledge.

Milwaukee Waterway has been dredged to 35 feet. Various commercial interests have leased the wharves in this waterway. Milwaukee Shoal Light, 23 feet above water, is shown from a white square house on piles at the southwestern side of the entrance. A fog signal is sounded on an air horn.

Sitcum Waterway, northeastward of Milwaukee Waterway, is shoal and used for log storage.

In June 1950 the controlling depths in the **Port-Industrial (Wapato) Waterway** were 30 feet over a width of 500 feet in the lower 1,600 feet of the waterway, thence a channel 80 feet wide with a minimum depth of 14½ feet extended southerly along the west margin for about 1,800 feet; and a channel 200 feet wide and 20½ feet deep extending southerly along the east margin. A narrow channel with 15 feet depth is dredged to the upper end of the waterway to serve a large float for small boats, a sawmill, and a boat-building plant. The channel is marked by buoys.

Port-Industrial Waterway Light, 12 feet above water, is shown from the northwest corner of Pier 1. Port-Industrial Waterway fog signal, an air horn, is on Pier 4, opposite the light.

Hylebos Waterway, through which the **Hylebos Creek** discharges, is the northernmost of the waterways. The Federal project dimensions of this waterway are as follows: 200 feet wide and 30 feet deep from deep water to the bend below Lincoln Avenue; thence, 150 feet wide and 30 feet deep to a turning basin of the same depth at the inner end, 410 feet wide, and 900 feet average length. The controlling depths in Hylebos Waterway were 28½ feet over a width of 200 feet from deep water in Commencement Bay to East Eleventh Street, July 1948; 27 feet over a mid-channel width of 100 feet from East Eleventh Street to bend below Lincoln Avenue, and 28 feet deep and 100 feet wide above Lincoln Avenue, with a least depth in the turning basin of 27 feet, June 1950.

Hylebos Waterway is crossed by the East Eleventh Street Bridge, a double-leaf bascule span with a horizontal clearance of 150 feet and a vertical clearance of 17 feet. The signal for opening is four long blasts of the whistle.

Hylebos Waterway Light, 15 feet above water, is shown from a white cross-arm on a black pile structure off the edge of the shoal on the north side of the entrance to Hylebos Waterway. An air horn fog signal is on the outer end of Pier 1, U. S. Naval Station.

Anchorage.—The depths as a rule are too great for convenient anchorage, but vessels occasionally anchor under the northern shore about 1 mile eastward of Point Brown. Vessels may anchor in about 60 feet 450 yards north-northwestward of the outer end of Puyallup Waterway west jetty. The city maintains one mooring buoy just eastward of the entrance to the city waterway. It is in charge of the harbor master.

Restricted area.—A Naval restricted area is established in the waters surrounding the Naval Station at Tacoma. For regulations regarding this area see Chapter 2, § 207.750.

Tides.—The mean range of tide at Tacoma is 8 feet. The range between mean lower low water and mean higher high water is 12 feet. A range of about 19 feet may occur at the time of maximum tides. The **tidal currents** in the harbor have little velocity.

Storm warnings are displayed day and night in Tacoma from the roof of the Winthrop Hotel Building, and day signals at the Tacoma Yacht Club.

Pilots.—Pilotage is compulsory for all vessels except under coasting trade on the west coast of the United States, including Alaska and British Columbia. Pilots may be obtained from Puget Sound Pilots, Seattle, on short notice.

Towboats.—Towboats are available at Tacoma.

Quarantine.—Vessels subject to quarantine inspection usually proceed to their docks, where they are boarded by the quarantine officer. If vessels require fumigation after discharging cargo at Tacoma, this service is performed at the port. Advance notice of 24 hours should be given to the quarantine officer at Tacoma or the senior surgeon of the Public Health Service at Seattle.

Marine hospital.—The Public Health Service maintains a relief station and a contract hospital at Tacoma.

Customs.—Tacoma is a port of entry in charge of a deputy collector. The customhouse is in the Federal Building at South Eleventh and A Streets.

Immigration.—The Bureau of Immigration maintains an office in the Federal Building, Tacoma.

The **United States Coast Guard** office and the **harbor master's** office are on the municipal dock which is on the western side of the city waterway near Eleventh Street.

The Coast and Geodetic Survey has a **chart sales agency** in Tacoma.

Harbor regulations are enforced by the harbor master. The following are extracts from the regulations.

In aid of commerce and navigation, anchorage for vessels is authorized in the following-described water: Any part of Commencement Bay, outside the outer harbor line, which is not used by vessels arriving at or departing from any dock.

Anchorage at city buoys: No charge is made for use of the city mooring buoy near the entrance to city waterway.

It shall be unlawful for any vessel in fog mist, falling snow, or heavy rainstorm, whether by day or night, to travel in excess of 6 nautical miles per hour on any of the waters of

Tacoma Harbor. It shall be unlawful for any vessel in clear weather to travel in excess of 8 nautical miles per hour within 500 feet of the outer harbor-line on any of such waters.

No master or other person in charge of any vessel or obstruction shall attach the same to any city buoy until he shall have obtained permission so to do from the harbor master: *Provided,* That during the night or in bad weather such vessel or obstruction may be attached to any vacant city buoy, but the master, owner, or person in charge thereof shall notify the harbor master not later than 9 a. m. of the next legal day of such act, stating the name and character of such vessel or obstruction and the probable length of time it is desired to remain at said buoy.

No ballast, iron, rock, sand, gravel, or earth shall be deposited in Tacoma Harbor except at such places and under such conditions as may be prescribed by the harbor master and after written permit granted by him, or at such places as may be designated by ordinance. The fire signal is five long blasts of the whistle. The city maintains a fire boat.

Wharfage and **dockage** are charged. Wharves sufficient to accommodate the largest vessels are available. Storage is available for all types of cargo. There is no free lighterage, but scows and tugs are available. **Wrecking** and **salvage** facilities are available.

Supplies.—Coal, fuel oils, provisions, and ship chandler's stores can be had in any quantity.

Repairs.—Only minor repairs can be made. The nearest large dry dock is at Seattle. There are marine ways for hauling out vessels up to 125 feet in length; also extensive ship-building plants.

Communication.—Tacoma is served by four important railroads, by three commercial air lines, and by bus lines to all parts of the country. Many foreign and coastwise vessels call. Small freight and passenger vessels serve Puget Sound towns. There are complete telegraph and telephone facilities.

The Tacoma Yacht Club Basin is about 1.8 miles southeastward of Point Defiance, inside a slag breakwater.

Chart 6460.—Southward of Point Defiance the sound has numerous inlets, passages, and islands. At many of the villages the landing wharves have fallen into ruins, all transportation following the highways. These waters are navigated by log tows and by pleasure craft. Deep-draft vessels call at Olympia for lumber and other forest products. The depths are generally great and there are but few dangers. The shores are well wooded and moderately low. The beaches are sand and gravel, with boulders in places, and are often backed by steep, bare sand and gravel bluffs. Olympia, the State capital at the head of Budd Inlet, is the only city, but there are a number of smaller settlements. The chart is a sufficient guide for safe navigation in daytime. Strangers, bound through these waters at night, are advised to take a pilot.

From Point Defiance, the sound extends in a general southerly direction for about 15 miles to the flats at the mouth of the Nisqually River. **The Narrows** is the narrow passage southward of Point Defiance; it is about 5 miles long and 0.8 mile wide and clear of dangers.

Currents.—In The Narrows current velocities exceed 5 knots at times. At the north end of The Narrows the current sets northward most of the time on the east side of the passage and southward most of the time on the west side.

Daily current predictions for a mid-stream position near the north end of

The Narrows and details of the current movement at other locations are contained in the *Current Tables, Pacific Coast.* These tables and the *Tidal Current Charts, Puget Sound, Southern Part,* should both be consulted for full details of the complicated currents of this area.

From Point Defiance the eastern shore of The Narrows consists of high bold bluffs, until near Days Island Anchorage. A railway, emerging from a tunnel about 1.8 miles southeastward of Point Defiance, follows the beach to the Nisqually River.

From Point Defiance to the head of the sound the western shore is broken by a number of inlets and passages which afford communication to small settlements devoted to lumbering or agriculture.

Point Evans, 2 miles southward of Point Defiance, is marked by a light on a white skeleton tower, Point Evans Light, 39 feet above the water.

The Narrows are crossed by a power line, with an overhead clearance of about 200 feet, at a point about 200 yards southwestward of Point Evans. Three miles southward of Point Defiance a highway suspension bridge spans The Narrows. The horizontal distance between the pier fenders is 2,706 feet. The vertical clearance at the middle 500 feet is 179 feet and at the piers, 158 feet.

Days Island Anchorage is about 4.5 miles southward of Point Defiance. **Sixth Avenue Ferry Landing,** locally called **Titlows Wharf,** is a small town along the railroad just eastward of Days Island. There are two ferry slips and a wharf built out to 10 feet. A lumber mill is between the ferry docks and the bridge to **Days Island.** The high mill stack is a prominent landmark. There is a 2¾-fathom shoal 230 yards westward of the ferry docks.

A small boat channel, 1 foot deep, leads in to **Days Island Lagoon.** The channel favors the Days Island side and under the bridge it is 30 yards from the island shore. It is of little value to strangers, being used only by local boats. Local boats anchor in 3 feet in the lagoon. There is a small boat mooring and service station adjacent to the ferry docks. Anchorage for small boats may be obtained eastward of the northern end of Days Island and southward of the ferry lane.

Automobile ferry service is maintained from Days Island to **Point Fosdick.** The ferry service to Point Fosdick was scheduled to be discontinued in the fall of 1950, upon the opening of the new highway bridge across The Narrows a mile northward of the ferry landing. A small passenger and freight vessel plies between Tacoma, Days Island, Carr Inlet, and Hale Passage.

Hale Passage, entering on the western shore opposite Days Island, is described later.

Gibson Point, the southern extremity of Fox Island and the northern entrance point to the Carr Inlet, is marked by a light. Gibson Point Light is shown from a white house. The light is 22 feet above water and visible from 222° to 055°.

Toliva Shoal is nearly in mid-channel, about 8 miles southward from Point Defiance. It consists of two rocks with 1¾ fathoms over them, and is marked by a lighted bell buoy. The shoal may be passed on either side, giving the buoy a berth of 300 yards.

Three miles southward of Days Island anchorage, the shores consist of bright bare bluffs, which are prominent from southward. A bunker for loading sand and gravel is here just southward of some old pilings which mark the sites of former sand and gravel bunkers.

Balch Passage, between **McNeil** and **Anderson Islands,** is the channel most generally used by vessels bound to Olympia. It is 2 miles long, with an average width of 0.6 mile, and connects at its western end with Drayton Passage.

The Federal penitentiary, on the southeastern side of McNeil Island about 0.8 mile southwestward of **Hyde Point,** is prominent when approaching. It has a wharf, built out to 16 feet at mean lower low water, which is lighted by a row of lights. Fresh water is piped to the end of the wharf. **Bee** is an automobile ferry landing on the south side of McNeil Island, 1 mile westward of the penitentiary. The ferry connects with Steilacoom and Anderson Island landing.

Eagle Island, small, low and wooded, is near the middle of Balch Passage, 0.2 mile from Anderson Island, and is marked on its northern end by a light. Eagle Island Light is shown from a white house; the light is 18 feet above water and visible 6 miles. On the shore of Anderson Island southward of Eagle Island is a small private landing. Just westward of this wharf is **Yoman** post office with a float landing.

Eagle Island Reef, 300 yards westward of Eagle Island, bares 1 foot at its southern part and has a depth of ½ fathom at its northern part. A buoy is moored off the northern extremity of the reef.

Drayton Passage, westward of Anderson Island, is about 3 miles long in a northerly direction and about 1 mile wide; it connects with Pitt Passage and Balch Passage, at its northern end, and at its southern end it connects with the western part of Nisqually Reach. With the exception of a spit extending 0.2 mile from the western shore about 1 mile northward of the southern entrance and marked by a light, the waters are deep and free of dangers. Drayton Passage Light is shown from a platform on a black pile dolphin. The light is 20 feet above water and visible 5 miles. Estimated current velocities of 1 to 2 knots occur at the southwestern end of the passage.

Filucy Bay, on the western shore opposite Balch Passage, is about 1.5 miles long and irregular in shape; its widest part, 0.4 mile, is at the entrance. **McDermott Point,** the spit at the southern side of the entrance. is marked by a conspicuous tower. Good anchorage in 7 to 8 fathoms, muddy bottom, is afforded 0.2 mile inside the entrance. There are numerous houses around the shores of this bay, and **Longbranch,** with a wharf built out to 9 feet, is in the small cove 0.6 mile from and opposite the entrance.

Amsterdam Bay, on the eastern shore of Drayton Passage, about 0.8 mile northward of **Treble Point,** the southwestern extremity of Anderson Island, is a small and shallow cove. There is 1 foot in the entrance and about 2 to 3 feet inside the bay. The channel into the bay is close to the northern shore.

Steilacoom is on the mainland about 9 miles southward of Point Defiance. The town is of little commercial importance; a limited amount of provisions can be obtained. It has rail and telegraph facilities and a wharf from which a ferry service is maintained to Anderson and McNeil Islands. The State asylum for the insane is near here. Indifferent anchorage may be had along the water

front close inshore, but is is not recommended, as the holding ground is poor and the currents have considerable velocity. Off Steilacoom there are tide rips which, with a wind opposing the current, are dangerous to small boats. **Chambers Creek,** 1 mile northward of Steilacoom, has small lumber mills and a sand and gravel works. Except for the towing of log rafts, shipments are made by rail and truck.

Ketron Island, about 1 mile long, narrow, and about 200 feet high, is in the southern part of the channel, 10 miles southward of Point Defiance and eastward of Anderson Island. The island is wooded, and the shores are bluff except at the northern end. **Cormorant Passage,** 0.5 mile wide, separates the island from the mainland southward. The passage is clear but is little used.

Nisqually Reach trends southward and westward around Anderson Island. The southern shore is formed by the **Nisqually River** flats which at low water are bare for nearly a mile offshore. The edge of the flats is bold with deep water close-to. The reach may be considered to extend about 6 miles from Ketron Island to the southern end of Drayton Passage, the narrowest part, 0.8 mile wide, being off the southern extremity of Anderson Island. The edge of the flats is marked by a buoy southward of the end of Anderson Island.

Oro Bay, in the southeastern part of Anderson Island, is an irregular bight between **Cole** and **Lyle Points,** the greater part of which is shallow; it affords an indifferent anchorage in about 10 fathoms, but is affected by the currents and affords no protection in northeasterly weather. A small shallow arm extends about 1 mile northwestward on the western side of the bay. A wharf built out to 7 feet on the western side of this arm serves **Vega,** a small village with a post office. An anchorage for small vessels is available about 200 yards eastward of the wharf at Vega. A long submerged spit extends from the southern entrance point of the arm almost to the small bight on the opposite shore. Care should be taken to clear this shoal in entering.

A wharf of the Dupont powder works, built out from the mouth of **Sequalitchew Creek,** 13 miles southward of Point Defiance, has 23 feet of water. The plant of the powder works is a short distance inland and cannot be seen from passing vessels.

Nisqually Flats, bare at low tide, begin just westward of the powder wharf and extend west-southwestward for about 3 miles, the western edge being about 0.4 mile westward of **Nisqually Head.** The edge of the flats is steep-to. The wharf of the Giant Powder Works, about 1.5 miles northwestward of Nisqually Head, has a depth alongside of 24 feet. There is a depth of 20 feet on the shoreward side of the slough channel about 70 yards 000° from the wharf.

From Nisqually Reach the sound extends northwestward for about 3 miles, where it branches into a number of inlets, which are described under separate headings following.

Devils Head, the western point at the southern entrance to Drayton Passage, is 280 feet high and heavily wooded. From this point, the shore, broken by two small shallow bights of no importance, extends northwestward for about 5 miles and then trends northward, forming the eastern shore of Case Inlet.

Johnson Point, 90 feet high, marks the western end of the main body of

Puget Sound. A light, 22 feet above water and visible 10 miles, is shown from a small white structure on the sandspit at the extremity of the point.

Henderson Inlet, known locally as **South Bay,** immediately westward of Johnson Point, extends about 4.5 miles in a southerly direction; the southern part is an extensive flat. The average width of the inlet is about 0.5 mile. Good anchorage is afforded inside the entrance in 5 to 6 fathoms, muddy bottom. A spit makes out about 0.2 mile northward from the western point at the entrance; on the western shore, 0.8 mile southward of the entrance point, a long sandspit projects. The low shores are timbered but there are some clearings. On the western shore about 2 miles southward of the entrance is a railroad log dump with booming grounds. There are oyster beds in the southern part of the bay.

Itsami Ledge, 1 fathom deep, is 1 mile 250° from Johnson Point Light, and 0.5 mile northward of the western point at the entrance to Henderson Inlet. It is surrounded by kelp and marked by a light, 20 feet above water, shown from a small white house on black pile structure. This is a danger in entering Henderson Inlet or Dana Passage, and vessels should pass northward of the light.

Directions, Point Defiance to Budd Inlet.—From Tacoma to Point Defiance, vessels usually give the shore a berth of 0.2 to 0.5 mile, and if meeting the ebb current from The Narrows, round Point Defiance close aboard; or, if going with the flood, stand out and take a mid-channel course. From Point Robinson vessels steer about 232°, giving **Point Piner** and Neill Point a berth of about 0.3 mile, and then head for Point Defiance. Vessels from northward, through Colvos Passage, can hold a mid-channel course.

From Point Defiance, vessels can hold a mid-channel course for 7.8 miles until up with Toliva Shoal, which may be passed on either side, giving the buoy a berth of over 300 yards. Then steer about 249° from Toliva Shoal buoy and follow the southern shore of McNeil Island at a distance of 0.25 mile; Eagle Island may be passed on either side. The passage northward of Eagle Island is the wider, and a mid-channel course through it should be held until well past Eagle Island Reef buoy and until Drayton Passage is well open. A mid-channel course through Drayton Passage clears all dangers. Round Devils Head at a distance of 0.3 mile and steer 305° to pass 0.3 mile northward of Johnson Point Light.

Or, if bound through Nisqually Reach, a general mid-channel course should be steered from Toliva Shoal buoy, rounding Lyle Point, the southern end of Anderson Island, at a distance of 0.4 mile, passing halfway between the point and Nisqually Flats buoy, and then steering a general mid-channel course until up with Johnson Point.

Round Johnson Point at a distance of 0.3 mile and pass northward and westward of Itsami Ledge Light; keep in mid-channel through Dana Passage, giving the southern shore a berth of not less than 0.2 mile until up with the Dofflemyer Point, then follow the directions for Budd Inlet.

Budd Inlet (Olympia Harbor), 26 miles from Tacoma, is about 6 miles in length, and an average width of 1 mile, extending southward from Dana Passage and terminating in flats bare at low water. The entrance is 4.5 miles southwestward from Johnson Point Light, between Cooper Point and **Doffle-**

myer Point, the latter being marked by a light, 30 feet above the water, shown from a white pyramidal tower. A fog signal is sounded on an air horn. The depths in the entrance to Budd Inlet range from 27 to 36 feet. Good anchorage may be had anywhere inside the entrance in muddy bottom. The shores are comparatively low and wooded, and the depths shoal less abruptly on the eastern than on the western side of the inlet. The southern half of the bay is obstructed by flats and shoals that bare at low water for 0.8 mile, through which channels have been dredged to the Olympia water front. A shoal, with 5 to 15 feet over it, extends 700 yards from the eastern shore between Olympia Shoal and the entrance to the dredged channel.

Chart 6462.—Dana Passage, between **Brisco Point,** the southern extremity of Hartstene Island and the mainland, is about 2 miles long and nearly 0.5 mile wide at its narrowest part. Brisco Point Light, 40 feet above the water and visible 5 miles, is shown from a white house. Dana Passage connects at its western end with Budd and Eld Inlets, and northward with Peale and Squaxin Passages leading to Totten and Hammersley Inlets and Pickering Passage. With the exception of Itsami Ledge near its eastern end, the passage is clear and a mid-channel course may be safely followed. The currents in Dana Passage frequently attain velocities of 3 knots or more.

Olympia, the capital of the State of Washington, is at the head of Budd Inlet. It is rapidly growing in importance as an overseas port. Lumber and logs comprise over 90 percent of the water-borne traffic of the port. The eastern side and end of the main dredged channel is the only part of Olympia Harbor with wharves open to public use. The port terminal is the principal wharf; it is 2,000 feet long, with berthing space for its full length and a depth of 35 feet alongside. The industrial plants, chiefly lumber mills, are in the shallower portions of the harbor along the western and southeastern shores and these move their products either by lighters to vessels, or by trucks or cars to the port terminal. The oil wharf northward of the port terminal has a depth of 32 feet at its face. Landing floats for yachts are maintained just westward of the end of the main channel.

Olympia Harbor has been improved by dredging. A Federal project provides for a channel 500 feet wide and 30 feet deep, from deep water in Budd Inlet to the port terminal, with suitable widening at the bend, and a turning basin adjacent to the port terminal, 3,350 feet long, 500 to 960 feet wide, and 30 feet deep. In July 1949 the controlling depths were 29 feet in the outer channel, 29½ feet in the inner channel, and 28 feet in the turning basin. A second (west) channel 12 feet deep and 200 feet wide has been dredged along the western shore, but it has not been maintained since the eastern channel has been deepened. The eastern or main channel is marked by lights, buoys, and ranges.

Landmarks.—The capitol dome is the most prominent object in this vicinity. It is conspicuous from the entrance of Budd Inlet.

Olympia Shoal is about 0.4 mile off the western shore and 0.8 mile northward of **Butler Cove,** which is a small bight on the western shore about 4 miles southward of Cooper Point. It bares and is marked on its eastern side by a

light. The light, 25 feet above water, and visible 10 miles, is shown from a white house on a pile dolphin. A fog signal is sounded on an air-diaphragm horn. The channel to the westward of Olympia Shoal is marked by a light on either side. The lights are shown from pile dolphins.

Restricted area.—An area restricted for berthing of maritime commission vessels is on the easterly side of Budd Inlet. For regulations regarding this area, see Chapter 2, § 207.900.

Directions.—No detailed directions are necessary. A mid-channel course through Budd Inlet clears all dangers until approaching Olympia Shoals. Then change course so as to pass between the lights marking the channel to the westward of Olympia Shoal. When off Butler Cove, pick up the range ahead 144° and follow it through the dredged channel. At the turn in the channel pick up the range astern, 354°, and follow it to the wharves.

Tides.—The mean range of the tide at Olympia is 10½ feet while the range between mean lower low water and mean higher high water is 14½ feet. **Storm warnings** are displayed day and night on the main dock of Port of Olympia.

Pilots and quarantine.—The same procedure applies as at Tacoma.

Marine hospital.—The Public Health Service maintains a medical relief station and a contract hospital at Olympia. The out-patient office is in 407 Security Building.

Towboats.—Several towing companies maintain headquarters at Olympia. The largest tug has 250 horsepower.

Customs.—A deputy collector of customs maintains an office at the port terminal. There are neither customs nor bonded warehouses in Olympia.

A chart agency of the Coast and Geodetic Survey is here.

Supplies.—Water, provisions, and a moderate amount of ship chandler's stores can be obtained. Diesel oil and gasoline are available at two oil wharves.

Repairs.—There is a marine way and a gridiron large enough to take care of small local boats. Emergency repairs can be handled by local machine shops, a welding works, and a boiler works.

Communication.—Olympia is served by two transcontinental railways and several foreign and domestic steamship lines operate on regular schedules. There are complete telephone and telegraph facilities. The municipal airport is 4.5 miles southward of the city.

Deschutes Basin, at the head of Budd Inlet, is a fresh water lake 1.5 miles long. It is closed to navigation by a dam and spillway at Fifth Avenue. **Deschutes River** empties into the southern end of the basin at the town of **Tumwater.**

Eld Inlet, known locally as **Mud Bay,** immediately westward of Budd Inlet, is of little commercial importance. Somewhat narrower than Budd Inlet, it extends about 6 miles in a general southwesterly direction with two slight bends. It affords good anchorage anywhere inside the entrance in 24 to 42 feet, soft bottom. A mid-channel course is clear to the flats at its head. In entering, **Cooper Point,** the eastern point at the entrance, should be given a berth of not less than 0.2 mile. Logs are towed from here to Olympia, Tacoma, or Seattle. Extensive oyster beds are cultivated near the head of the bay.

Chart 6460.—Hale Passage, between **Fox Island** and the mainland, enters on the western shore about 5 miles southward of Point Defiance. It is about 4 miles in length and varies in width from 1 mile at its eastern end to less than 0.4 mile at its western end, where it connects with Carr Inlet. A shoal is about 0.8 mile eastward of the northern end of Fox Island and near the middle of the passage; it is boulder-strewn and bares at low water. A 1-fathom kelp-marked shoal is 200 yards eastward of Grave Island. A good small boat anchorage is available on either side of Grave Island. The tidal currents attain velocities of from 2 to 3 knots at times. The eastward (ebb) current is stronger than the westward. Current predictions may be obtained from the *Current Tables, Pacific Coast.*

Sylvan, a village with a post office, is on the south side of Hale Passage, on the eastern side of the bight in Fox Island southward of **Grave Island;** it has a landing wharf in 9 feet of water. A church, schoolhouse, and store are here, and the village has telephone connection with Tacoma.

There are fruit farms along the north shore of Hale Passage, also on Fox Island. **Warren** is a small village on the northern shore of Hale Passage abreast the northwestern end of Fox Island; it has a landing wharf. **Arletta,** also on the northern shore in the bight abreast the western end of Hale Passage, has a wharf built out to 8 feet. There are other villages and landings of lesser importance on this shore, including **Sunny Bay, Cromwell** and **East Cromwell.**

Wollochet Bay is a small inlet about 2 miles long and 0.2 mile wide, extending northward from Hale Passage about 1 mile inside the eastern entrance. The upper part of the bay is narrow and shoal. It affords an anchorage about 0.3 mile inside the entrance, in mid-channel, in 11 to 12 fathoms, sticky bottom. A small private pier is about 0.5 mile from the head of the bay. **Wollochet,** with 12 feet at the wharf, is on the eastern point at the entrance, and there are farmhouses on both sides of the bay. A small sawmill is at Wollochet. An area at the head of the bay is planted with oysters.

Carr Inlet enters the western shore of the sound about 8 miles southward of Point Defiance. From the entrance, between Fox and McNeil Islands, it extends about 6 miles west-northwestward and then trends northward for 8 miles, terminating in flats at the head. Good anchorage is afforded at and near the head in 6 to 15 fathoms, soft bottom, and in several small coves on its southern and eastern shores. From the entrance, a mid-channel course may be followed with safety.

Gertrude, a village with a post office, is on the southern side of Carr Inlet, on the shore of **Still Harbor,** which is a bight on the northern side of McNeil Island, southward of **Gertrude Island.** It has a landing in 10 feet of water. The bottom in the middle of Still Harbor is uniform, with depths of 8 to 9 fathoms, sand and mud bottom. The bottom slopes gradually to a flat of sand and gravel at the head of the bay, eastward of the wharf at Gertrude.

Wyckoff Shoal, partly bare at low tide, extends 0.8 mile westward from the northwestern part of McNeil Island. A winding channel of 2 fathoms, between Wyckoff Shoal and McNeil Island, is used with local knowledge.

Pitt Passage, westward of McNeil Island, connects Drayton Passage and Carr Inlet. It is obstructed about midway of its length by **Pitt Island** and its

surrounding rocks and shoals, and is used only by small craft with local knowledge, which use the passage east of Pitt Island. In this passage the ebb (northward current) is stronger than the flood and attains a velocity of 2½ knots or more at times. **Meridian,** a small village with a post office and a wharf built out to 4 feet, is on the eastern shore of Pitt Passage, about 0.4 mile inside the southern entrance.

Delano Beach is a summer resort on the southern shore of Carr Inlet in the bight westward of **South Head.** It has a landing wharf which has 4 feet of water. The bight is shallow, a large part of it baring at low tide.

Lakebay in **Mayo Cove** on the southwestern shore of Carr Inlet, is a village with a post office and a landing wharf for small boats. The cove is shoal except in the middle near the entrance. The channel to the wharf is difficult to navigate, and strangers are advised to proceed cautiously or to obtain local advice.

Home, a farming village on the western side of **Von Geldern Cove,** is known locally as **Joes Bay.** There are extensive log dumps and booming areas in Von Geldern Cove. The wharf is reported to have 6 feet of water alongside. The outer edge of the sandspit extending out from the eastern shore of the cove is only about 75 yards distant from the wharf. A farming colony occupies the shores of the cove.

Glencove is a small settlement in Glen Cove on the western side of Carr Inlet, about 5 miles north-northwestward of South Head. There are extensive log dumps and booming areas in Glen Cove. A road leads across to Vaughn Bay on Case Inlet.

Elgin is a village with a post office on **Huge Creek** on the western side of Carr Inlet. The entrance to the creek is bare at low water. A number of old wooden ships have been beached and partly burned on the western shore of Carr Inlet near Huge Creek. Considerable quantities of logs are towed from the creek.

Wauna, a village with a post office, is at the head of Carr Inlet, where the spit enclosing **Burley Lagoon** joins the mainland. A county road extends along the spit and across the entrance to the lagoon over a fixed highway bridge to Rosedale and Gig Harbor. The bridge has a horizontal clearance of 140 feet and a vertical clearance of 18 feet. The landing wharf dries at low water. **Burley** is a village at the head of Burley Lagoon. **Purdy** is on the eastern shore at the head of Carr Inlet.

Rosedale is a farming village on the cove on the eastern side of Carr Inlet, eastward of **Raft Island,** which is 180 feet high. There is an extensive shoal area around and between Raft and **Cutts Island.** The shores of these islands are strewn with boulders.

Horsehead Bay, about 1 mile in length and 0.1 mile in width, in a southerly direction, is directly northward of **Green Point,** at the western extremity of Hale Passage. A small wharf, near the eastern entrance of the bay, can accommodate fair-sized craft, and on the northern side is a float for small boats.

Case Inlet (North Bay) extends northwestward for about 4 miles and then trends northward for 10 miles more, terminating in flats at the head, which is but 2 miles from the head of Hood Canal. Its average width is 1.5 miles, nar-

rowing at the head. The depths are irregular, varying from 10 to 30 fathoms, but there are no outlying dangers. The western shore southward of Pickering Passage is formed by **Hartstene Island. Herron Island,** steep and bluff on its western face, is near the eastern shore about 4 miles from the entrance. A bar extends across the northern end of the passage between Herron Island and the eastern shore of the inlet. A depth of 21 feet can be carried over the bay by rounding the northeastern tip of Herron Island at a distance of 300 to 500 yards. A low-water spit extends 200 yards off the northeastern tip of the island. At the northern end of Hartstene Island is the entrance to Pickering Passage. Good anchorage may be had anywhere northward of Hartstene Island, in 6 to 15 fathoms, muddy bottom, and a mid-channel course through the inlet is clear of all dangers.

There are numerous farms and several small settlements whose chief industries are oyster culture, farming, and some logging. The flats near the head of the inlet are largely covered with oyster beds. Communication is had by highway and small freight vessels.

Ballow is a small village with float landing on the western shore of the inlet, about 2.2 miles northwestward of **Wilson Point,** which is on the western side at the southern entrance to the inlet. **McMicken Island** is 0.5 mile northward of the village and is connected with the shore by a flat, bare at low tide.

Herron, with wharf built out to 2 feet, is a small village on the eastern shore, about 0.5 mile northward of Herron Island.

Pickering Passage indents the western shore of Case Inlet, about 2 miles northwestward of Herron Island. The passage extends in a general southerly direction for 8 miles, connecting at its southern end with Peale Passage and Totten Inlet. The width varies from 9.2 to 0.5 mile, the shores generally low and wooded, and the depths vary from about 6 to 15 fathoms. Except for the shoals extending eastward from the mouth of Hammersley Inlet, the passage is free from outlying dangers, and a mid-channel course can be followed with safety. In Pickering Passage the flood current sets from Case Inlet toward Hammersley Inlet and the ebb in the opposite direction. The strongest currents are near the southern end where velocities reach 2½ knots at times. Numerous small farming settlements, generally consisting of 2 or 3 houses and a float landing or small wharf, are along the shores of the passage. The settlements are served by small local vessels. A small automobile ferry crosses the inlet about 3.5 miles northward of Hammersley Inlet.

Dutchers Cove is a small bay on the eastern side of Case Inlet about 2.5 miles northward of Herron Island.

Stretch Island is near the western shore of Case Inlet, just northward of the entrance to Pickering Passage. There is no through channel westward of this island. The northern part of this island is partly cleared of trees and laid out in orchards. Two small grape-juice factories are on the island. There is a private landing wharf built out to 12 feet on the northern end of the island. A highway bridge connects with the mainland.

Grapeview is a village with a post office on the northern shore of Stretch Island. It has a wharf obstructed by rocks which have been dumped along its face; the wharf bares at low water.

Detroit is a village on the mainland opposite Grapeview. It has a wharf with a depth of 6 feet.

Reach Island, known locally as **Oak Island,** 0.2 mile northward of Stretch Island, is separated from the western shore by a shallow channel, known locally as **Fair Harbor.** A rock baring 5 feet is near the middle of the passage back of Reach Island. The through channel is westward of the rock and has a controlling depth of 1 foot. To avoid the rock when it is covered, favor the western shore.

Vaughn, a village with a post office and a county wharf with 2 feet of water, is on the northern shore of **Vaughn Bay,** which lies on the eastern shore of the inlet, about 4 miles from the head. A channel 2 feet deep leads to the deeper water in the bay. Follow the northern shore for 200 yards after entering in mid-channel off the end of the spit; then cross the bay parallel with the spit at a distance of 200 yards, heading toward the southern shore, and then follow the southern shore at a distance of 200 yards, steering toward the head of the bay. Around the shores are numerous farmhouses and orchards. A county road leads hence to Glencove on Carr Inlet and connects with points to the northward and southward. A small sawmill is at the head of the bay. There are extensive log booming areas at Vaughn.

Rocky Bay is the shallow bay northward of Vaughn Bay. A float landing, in 10 feet of water northward of the point dividing the two bays, is used at low tide when Vaughn Bay cannot be entered. A channel 3 feet deep leads to the lagoon back of the sandspit near **Windy Bluff,** the point between Vaughn and Rocky Bays. It is necessary to come around the small sand island northward of the spit. Oyster beds are planted on the eastern side of the bay northward of the spit.

Eberhardt Cove is the local name of the small cove on the western side of Case Inlet about 0.7 mile northward of Reach Island.

Allyn is a village with a post office on the western side of Case Inlet, near the head, about 0.5 mile northward of **Sherwood Creek.** A draft of 7 feet can be carried to the oyster wharf at Allyn by following the eastern shore at a distance of 125 to 150 yards when past the oyster beds on the eastern side of the inlet; when abreast the wharf, cross over to it. Oyster culture and fruit raising are the principal industries.

Victor is a small village near the head of Case Inlet, on the eastern shore. Logging is carried on in the vicinity.

Peale Passage, about 4 miles long, between Hartstene and Squaxin Islands, extends in a general northwesterly direction from Dana Passage, connecting at its northern end with Pickering Passage. It has a controlling depth of about 13 feet in mid-channel. Strangers should not attempt the passage. The current at times attains a velocity of 1½ knots in the narrow part of the passage. It sets northward on the flood.

Squaxin Passage, southward of **Squaxin** and **Hope Islands,** is about 1 mile in length and extends in a general westerly direction. It leads to the entrance of Totten and Hammersley Inlets. Hunter Point Light marks the southwestern entrance point of the passage. The northern shore is foul; a shoal with 19 feet over it is 150 yards off the western shore of Hope Island abreast Steamboat Is-

land. The passage is narrow, and although the chart is a good guide, strangers should proceed with caution. The southern shore should be favored, and at the western end, the northern point of Steamboat Island should be favored to avoid the shoal mentioned above. Tide rips are said to occur in the passage. The usual velocity of the current at strength is about 1½ knots. The passage between Hope and Squaxin Islands has a least depth of 9 feet in the middle. A reef, bare at extreme low water, southeastward of Hope Island, is easily avoided in Squaxin Passage by keeping the northern point of Steamboat Island well open of the southern point of Hope Island.

Steamboat Island is connected with **Carlyon Beach** on the mainland by a roadway on piling. In 1950 the roadway was in poor condition and used as a foot-walk only. The island is practically a part of the mainland. The northwestern end of the island terminates in a long sandspit. On the eastern side of Carlyon Beach is a large building with a float landing.

Totten Inlet extends southwestward from the western end of Squaxin Passage. It is about 8 miles long and varies in width from 0.2 to over 1.8 miles. A depth of 30 feet can be carried to a point off the entrance to Skookum Inlet. A 3½-fathom shoal is about in mid-channel at the entrance, 620 yards 240° from the southern end of Steamboat Island. A spit extends westward for about 100 yards from Steamboat Island. In entering, favor the western shore to avoid the spit and shoal. The inlet shoals gradually to about the longitude of **Burns Point**, 100 feet high, on the southern shore, where it bares at low tide. **Oyster Bay**, southward of Burns Point, is an extensive mud flat; oysters are grown in this area, and there are log booms. Southward of the entrance to Skookum Inlet, along the shores of Totten Inlet, are rock or concrete walls enclosing the oyster beds. The walls are a danger to navigation, and the oyster industry discourages boatmen entering these waters. Local knowledge is required in piloting boats beyond the rounding point on the western shore which is about 3 miles from the head. Good anchorage may be had anywhere inside the entrance to the mouth of Skookum Inlet.

Skookum Inlet is a small shoal inlet with a narrow entrance which indents the western shore of Totten Inlet about 3.5 miles from the entrance. There is a small boat landing with 4 to 6 feet of water in the easterly part of **Wildcat Harbor**, on the south side of Skookum Inlet, just inside the entrance. **Deer Harbor**, on the northern side of the inlet opposite Wildcat Harbor, is used for log dumps and booming grounds; there are also extensive booming grounds at the head of the inlet.

Hammersley Inlet indents the western shore of the sound about a mile northward of the western end of Squaxin Passage. It is about 6 miles in length, expanding at its head into **Oakland Bay**, which is 3.5 miles long in a northeasterly direction, and from 0.2 to 0.5 mile wide. The inlet averages 0.2 mile in width and is obstructed by shoals, particularly at its mouth, where there is an extensive bar. The shoals have been partly removed. A Federal project provides for a channel 13 feet deep and 150 feet wide from the entrance of the inlet to Shelton. In January 1950 the controlling depth in the project channel was 6½ feet, but a channel 10½ feet deep and 100 feet wide was available by deviating from the established channel. It is navigated only by light-draft ves-

sels, and by tugboats with log rafts; local knowledge is required. Tidal current velocities may reach 5 knots at times in the constricted parts of the inlet. Current predictions may be obtained from the *Current Tables, Pacific Coast.* Vessels enter on the flood, usually after half tide, and leave on the ebb, usually before maximum strength. Hammersley Inlet is considered dangerous for strangers. Vessels with sharp rise of bilge should avoid the inlet as there is danger of turning over in the strong current in case of grounding.

Arcadia is a small settlement on the southern point of the entrance of Hammersley Inlet, which is marked by a light. Arcadia Light, shown from a white arm on a post is 18 feet above water and visible 8 miles.

Libby Point, on the northern side, 2 miles from the entrance, is marked by a light shown from a white arm on a post. Libby Point Light is opposite the entrance of **Gosnell Creek.**

Church Point, on the northern side of the inlet, about 3.5 miles from the entrance, is marked by a light. Church Point Light, 20 feet above water and visible 8 miles, is shown from a square white house.

Shelton, at the head of the inlet, is a town of some commercial importance. Extensive logging and lumber interests are centered here. It is on a branch of the Northern Pacific Railway; lumber is shipped by rail only. Railway trestles used as log dumps extend across the flats. An oil wharf on the northern shore extends out to a depth of 12 feet. Several floats, just southward of the wharf, accommodate small craft. Communication with Olympia is by rail and bus; there is complete telephone and telegraph service. Launch fuels and some supplies can be obtained. Oysters are cultivated in the shoal portions of Oakland Bay.

Blank page retained for pagination

Appendix

COAST and GEODETIC SURVEY.—COAST PILOTS.—Atlantic Coast, Section A, St. Croix River to Cape Cod, 1950.
Atlantic Coast, Section B, Cape Cod to Sandy Hook, 1950.
Atlantic Coast, Section C, Sandy Hook to Cape Henry, 1947.
Atlantic Coast, Section D, Cape Henry to Key West, 1948.
Gulf Coast, Key West to Rio Grande, 1949.
West Indies, Puerto Rico and Virgin Islands, 1949.
Pacific Coast, California, Oregon, and Washington, 1951.
Alaska, Part I, Dixon Entrance to Yakutat Bay, 1943.
Alaska, Part II, Yakutat Bay to Arctic Ocean, 1947.
Hawaiian Islands, 1950.
Distances between United States Ports, 1938.

DISTRICT OFFICES.—Northeastern District: Tenth Floor, Customhouse, Boston 9, Mass.
Eastern District: 602 Federal Office Bldg., 90 Church St., New York 7, N. Y.
Southeastern District: 418 U. S. Post Office Bldg., Norfolk 10, Va.
Southern District: 314 Customhouse, 423 Canal St., New Orleans 16, La.
Caribbean District: Post Office Box 3067, Santurce, San Juan, Puerto Rico.
Southwestern District: 1434 U. S. Post Office and Courthouse, Los Angeles 12, Calif.
Western District: 114 Customhouse, San Francisco 26, Calif.
Midwestern District: 502 Panama Bldg., 534 Southwest Third Ave., Portland 4, Oreg.
Northwestern District: 705 Federal Office Bldg., Seattle 4, Wash.
Pacific District: 244 Federal Office Bldg., Honolulu, T. H.

CHART AGENCIES.—Agents marked with an (*) asterisk also handle certain United States Hydographic Office publications.

Agents marked with a (†) dagger also handle United States Coast Guard publications.

CALIFORNIA:

Berkeley: *Hinds Boat Supply, 801 University Avenue.
Crescent City: Nielson Hardware & Electric Co.

Eureka: †C. O. Lincoln & Co., 615 Fifth St.
Long Beach: *Globe Nautical Instruments Co., 217 E. First St.
Los Angeles: Coast and Geodetic Survey District Office, 1434 U. S. Post Office and Courthouse.
Monterey: †Cincotta Brothers, 203 Alvarado St.
Morro Bay: Morro Bay Marine Supply.
Moss Landing: Moss Landing Maritime Associates, P. O. Box 45.
Newport Beach: †South Coast Co., 2212 Central St.
Balboa Marine Hardware Co., 911 Coast Highway.
North Hollywood: †Pan-American Navigation Service, 12021 Ventura Blvd.
Oakland: Harbor Marine Supply, 370 11th St.
Pittsburg: Pittsburg Yacht Harbor, 5 Cutter St.
San Diego: *†Arey-Jones Co., 933 Fourth St.
†Nuttall-Styris Co., 825 Columbia St.
San Francisco: U. S. Coast and Geodetic Survey District Office, 114 Customhouse.
*†Geo. E. Butler Co., Alaska Commercial Bldg., 356 California St.
*†A. Lietz Co., 520 Montgomery St.
†C. J. Hendry Co., 27 Main St.
†San Francisco Instrument Co., 510 Battery St.
San Pedro: *† Marine Hardware Co., 509 Beacon St.
†C. J. Hendry Co., 111-121 So. Front St.
*†Southwest Instrument Co., 246 W. Seventh St.
San Rafael: Marin Yacht Sales, 101 Third St.
Santa Barbara: *†Ott's, 727 State St.
Sausalito: Bauman Bros. Yacht Service, Sausalito Yacht Harbor
Stockton: Morris Brothers, 15 N. Hunter St.
Vallejo: Clifford M. Hewitt, Vallejo Boat Center, 823 Wilson Ave.

OREGON:

Astoria: *The Beebe Co., 587 Bond St.
Coos Bay: Independent Stevedore Co., Inc.
Newport: Englund Marine Supply.
North Bend: Oregon Pacific Co., Inc.
Portland: U. S. Coast and Geodetic Survey District Office, Room 502, Panama Bldg., 534 S. W. Third Ave.
*†The Beebe Co., 504-510 S. W. First Ave.
*†Frank H. Parks, 213 S. W. Washington St.
†Portland Instrument Co., 334 S. W. 5th Ave.

WASHINGTON:

Anacortes: †Marine Supply and Hardware
Transmission Supply, 420 Commercial St.
Bellingham: †Griggs, Stationers and Printers, 120 E. Holly St.
Bellingham Marine Supply Co., 14 Squalicum Fill.
Everett: Black and King, 2930 Colby Ave.
Friday Harbor: †Friday Harbor Drug Co.
Hoquiam: Harbor Marine Supply, Inc., 912 J St.
Neah Bay: Washburns General Merchandise.

Olympia: The Marina, Columbia and B St.
Port Angeles: †Wilson Hardware Co., 111 W. First St.
Seattle: U. S. Coast and Geodetic Survey District Office, 705 Federal Office Bldg.
†Marina Mart, Inc., 1500 Westlake Ave., North.
†Northwest Instrument Co., Inc., 2313 Third Ave.
*†Pacific Marine Supply Co., 1223 Western Ave.
†Shrock, the Compass Adjuster, Fisherman's Dock.
Schrock, the Compass Adjuster, 1117 E. North Lake Ave.
Charles F. Metsker, 1020 Third Ave.
Tacoma: *†The Stationers, Inc., 926 Pacific Ave.
*Steven Marine Supply, 734 Broadway.

Distance Table

DISTANCES GIVEN IN NAUTICAL MILES

From: / To:	San Diego 32° 43.0′ N., 117° 10.5′ W.	Newport Beach 33° 37.1′ N., 117° 55.0′ W.	Long Beach 33° 46.2′ N., 118° 13.3′ W.	Los Angeles 33° 45.7′ N., 118° 15.5′ W.	Port Hueneme 34° 09.0′ N., 119° 12.4′ W.	Santa Barbara 34° 24.5′ N., 119° 41.1′ W.	San Luis Obispo Bay 35° 10.4′ N., 120° 44.8′ W.	Monterey 36° 36.3′ N., 121° 53.5′ W.	San Francisco Lightship 37° 44.4′ N., 122° 42.5′ W.	San Francisco wharves 37° 47.2′ N., 122° 23.0′ W.	Oakland 37° 48.2′ N., 122° 19.5′ W.	Stockton 37° 57.2′ N., 121° 18.8′ W.	Sacramento 38° 35.2′ N., 121° 30.3′ W.	Eureka 40° 47.8′ N., 124° 11.2′ W.	Crescent City 41° 44.5′ N., 124° 11.4′ W.	Coos Bay 43° 22.4′ N., 124° 12.5′ W.	Gardiner 43° 43.9′ N., 124° 06.7′ W.	Florence 43° 58.0′ N., 124° 06.3′ W.	Newport 44° 37.8′ N., 124° 03.1′ W.	Depoe Bay 44° 48.4′ N., 124° 04.0′ W.	Tillamook 45° 27.6′ N., 123° 50.5′ W.	Columbia River Lightship 46° 11.1′ N., 124° 11.7′ W.	Astoria 46° 11.7′ N., 123° 50.8′ W.	Portland 45° 32.0′ N., 122° 41.3′ W.	Longview 46° 06.3′ N., 122° 57.7′ W.	Vancouver 45° 37.6′ N., 122° 41.1′ W.	South Bend 46° 40.1′ N., 123° 47.5′ W.	Aberdeen 46° 58.4′ N., 123° 48.5′ W.	Cape Flattery 48° 25.7′ N., 124° 46.5′ W.	Seattle 47° 36.2′ N., 122° 20.3′ W.	Tacoma 47° 16.9′ N., 122° 25.9′ W.	Olympia 47° 03.1′ N., 122° 54.3′ W.
California:																																
San Diego		78	94	96	147	176	259	371	438	456	458	525	543	654	705	817	832	848	881	890	947	970	988	1,073	1,032	1,068	1,019	1,029	1,104	1,226	1,246	1,278
Newport Beach	78		25	28	81	110	193	305	372	390	392	459	477	588	639	751	766	782	815	824	881	904	922	1,007	966	1,002	953	964	1,038	1,161	1,180	1,212
Long Beach	94	25		2	66	95	178	290	357	375	377	444	462	573	624	736	751	767	800	809	866	889	907	992	951	987	938	949	1,023	1,146	1,165	1,197
Los Angeles	96	28	2		63	92	175	288	354	372	374	442	459	570	621	733	748	764	798	806	863	886	904	989	948	984	936	946	1,020	1,143	1,162	1,194
Port Hueneme	147	81	66	63		31	116	229	295	313	315	383	400	511	562	674	689	706	739	748	804	828	845	930	889	925	877	887	961	1,084	1,103	1,135
Santa Barbara	176	110	95	92	31		91	203	270	288	290	357	375	486	537	649	664	680	713	722	779	802	820	905	864	900	851	862	936	1,059	1,078	1,110
San Luis Obispo Bay	259	193	178	175	116	91		122	189	207	209	276	294	405	456	568	583	599	632	641	698	721	739	824	783	819	770	781	855	978	997	1,029
Monterey	371	305	290	288	229	203	122		80	98	100	167	185	296	347	459	474	490	523	532	589	612	630	715	674	710	661	672	746	869	888	920
San Francisco Lt. Ship	438	372	357	354	295	270	189	80		18	20	88	105	216	267	379	394	410	443	452	509	532	550	635	594	630	581	592	666	789	808	840
San Francisco wharves	456	390	375	372	313	288	207	98	18		3	77	95	234	285	397	412	428	461	470	527	550	568	653	612	648	599	610	684	807	826	858
Oakland	458	392	377	374	315	290	209	100	20	3		79	96	236	287	399	414	430	463	472	529	552	570	655	614	650	601	612	686	808	828	860
Stockton	525	459	444	442	383	357	276	167	88	77	79		86	303	354	467	482	498	531	540	596	620	637	722	681	717	669	679	754	876	895	928
Sacramento	543	477	462	459	400	375	294	185	105	95	96	86		321	372	484	499	515	548	557	614	637	655	739	699	735	686	697	771	894	913	945
Eureka	654	588	573	570	511	486	405	296	216	234	236	303	321		64	180	195	212	245	253	310	334	351	436	395	431	383	393	467	590	609	641
Crescent City	705	639	624	621	562	537	456	347	267	285	287	354	372	64		127	142	159	192	200	257	281	298	383	342	378	330	340	419	541	560	593
Oregon:																																
Coos Bay	817	751	736	733	674	649	568	459	379	397	399	467	484	180	127		42	59	92	101	159	184	201	286	245	281	233	243	322	444	463	496
Gardiner	832	766	751	748	689	664	583	474	394	412	414	482	499	195	142	42		36	70	78	136	160	178	263	222	258	210	220	298	421	440	472
Florence	848	782	767	764	706	680	599	490	410	428	430	498	515	212	159	59	36		44	53	110	135	153	238	197	233	184	194	273	396	415	447
Newport	881	815	800	798	739	713	632	523	443	461	463	531	548	245	192	92	70	44		15	72	97	115	200	159	195	146	156	235	358	377	409
Depoe Bay	890	824	809	806	748	722	641	532	452	470	472	540	557	253	200	101	78	53	15		59	84	101	186	145	181	133	143	222	344	364	396
Tillamook	947	881	866	863	804	779	698	589	509	527	529	596	614	310	257	159	136	110	72	59		50	67	152	111	147	99	109	188	310	329	362
Columbia River Lt. Ship	970	904	889	886	828	802	721	612	532	550	552	620	637	334	281	184	160	135	97	84	50		18	103	62	98	49	60	138	261	280	312
Astoria	988	922	907	904	845	820	739	630	550	568	570	637	655	351	298	201	178	153	115	101	67	18		85	44	80	67	77	156	278	298	330
Portland	1,073	1,007	992	989	930	905	824	715	635	653	655	722	739	436	383	286	263	238	200	186	152	103	85		41	13	152	162	241	364	383	415
Washington:																																
Longview	1,032	966	951	948	889	864	783	674	594	612	614	681	699	395	342	245	222	197	159	145	111	62	44	41		36	111	121	200	322	342	374
Vancouver	1,068	1,002	987	984	925	900	819	710	630	648	650	717	735	431	378	281	258	233	195	181	147	98	80	13	36		147	157	236	358	378	410
South Bend	1,019	953	938	936	877	851	770	661	581	599	601	669	686	383	330	233	210	184	146	133	99	49	67	152	111	147		46	126	249	268	300
Aberdeen	1,029	964	949	946	887	862	781	672	592	610	612	679	697	393	340	243	220	194	156	143	109	60	77	162	121	157	46		118	241	260	292
Cape Flattery	1,104	1,038	1,023	1,020	961	936	855	746	665	684	686	754	771	467	419	322	298	273	235	222	188	138	156	241	200	236	126	118		123	142	174
Seattle	1,226	1,161	1,146	1,143	1,084	1,059	978	869	789	807	808	876	894	590	541	444	421	396	358	344	310	261	278	364	322	358	249	241	123		25	57
Tacoma	1,246	1,180	1,165	1,162	1,103	1,078	997	888	808	826	828	895	913	609	560	463	440	415	377	364	329	280	298	383	342	378	268	260	142	25		37
Olympia	1,278	1,212	1,197	1,194	1,135	1,110	1,029	920	840	858	860	928	945	641	593	496	472	447	409	396	362	312	330	415	374	410	300	292	174	57	37	

Distance Table

DISTANCES GIVEN IN NAUTICAL MILES

From: \ To:	Cape Flattery 48° 25.7 N., 124° 46.5 W.	Swiftsure Bank Lightship 48° 31.4 N., 125° 00.6 W.	Anacortes 48° 31.4 N., 122° 36.7 W.	Bellingham 48° 45.1 N., 122° 29.0 W.	Blaine 48° 59.5 N., 122° 45.9 W.	Bremerton 47° 34.2 N., 122° 37.2 W.	Dupont 47° 07.1 N., 122° 40.0 W.	Eagle Harbor 47° 37.2 N., 122° 30.7 W.	Everett 47° 59.3 N., 122° 13.2 W.	Friday Harbor 48° 32.2 N., 123° 00.9 W.	Nanaimo 49° 10.1 N., 123° 56.0 W.	Neah Bay 48° 22.7 N., 124° 35.2 W.	New Westminster 49° 12.5 N., 122° 53.6 W.	Olympia 47° 03.1 N., 122° 54.3 W.	Port Angeles 48° 07.5 N., 123° 26.4 W.	Port Gamble 47° 51.3 N., 122° 34.7 W.	Port Ludlow 47° 55.3 N., 122° 41.0 W.	Port Townsend 48° 06.3 N., 122° 45.2 W.	Point Wells 47° 47.1 N., 122° 23.7 W.	Roche Harbor 48° 36.6 N., 123° 09.1 W.	Seattle 47° 36.2 N., 122° 20.3 W.	Tacoma 47° 16.9 N., 122° 25.9 W.	Vancouver 49° 17.4 N., 123° 06.6 W.	Victoria 48° 25.0 N., 123° 23.5 W.
Cape Flattery		11	93	107	111	130	158	122	117	87	146	9	142	174	61	104	100	86	110	82	123	142	142	62
Swiftsure Bank Lightship	11		104	118	122	140	168	132	127	98	156	20	153	184	72	114	110	97	120	92	133	152	152	72
Anacortes	93	104		20	39	74	102	66	61	28	76	86	73	118	43	47	44	28	54	39	67	86	73	37
Bellingham	107	118	20		40	88	116	80	75	42	77	100	74	132	57	62	58	43	68	53	81	100	73	51
Blaine	111	122	39	40		107	135	99	94	61	58	105	53	151	65	81	77	62	87	35	100	119	53	55
Bremerton	130	140	74	88	107		45	12	37	75	142	123	138	60	76	41	40	47	22	84	14	28	138	79
Dupont	158	168	102	116	135	45		41	65	104	170	151	166	18	105	70	68	76	50	112	41	21	166	107
Eagle Harbor	122	132	66	80	99	12	41		29	67	134	115	130	57	68	34	32	40	14	76	8	24	130	71
Everett	117	127	61	75	94	37	65	29		62	128	110	125	81	63	28	26	34	16	71	30	49	124	66
Friday Harbor	87	98	28	42	61	75	104	67	62		69	80	66	119	37	47	43	28	53	12	66	85	66	30
Nanaimo	146	156	76	77	58	142	170	134	128	69		139	48	186	100	115	112	98	121	68	134	154	36	89
Neah Bay	9	20	86	100	105	123	151	115	110	80	139		136	167	54	97	93	78	103	75	116	135	135	55
New Westminster	142	153	73	74	53	138	166	130	125	66	48	136		182	96	112	108	93	118	64	131	150	43	86
Olympia	174	184	118	132	151	60	18	57	81	119	186	167	182		120	86	84	92	66	128	57	37	182	123
Port Angeles	61	72	43	57	65	76	105	68	63	37	100	54	96	120		50	46	31	56	36	69	88	96	19
Port Gamble	104	114	47	62	81	41	70	34	28	47	115	97	112	86	50		10	21	21	58	34	53	111	53
Port Ludlow	100	110	44	58	77	40	68	32	26	43	112	93	108	84	46	10		18	19	54	32	52	108	49
Port Townsend	86	97	28	43	62	47	76	40	34	28	98	78	93	92	31	21	18		27	41	40	59	94	34
Point Wells	110	120	54	68	87	22	50	14	16	53	121	103	118	66	56	21	19	27		64	14	34	117	59
Roche Harbor	82	92	39	53	35	84	112	76	71	12	68	75	64	128	36	58	54	41	64		77	96	64	25
Seattle	123	133	67	81	100	14	41	8	30	66	134	116	131	57	69	34	32	40	14	77		25	130	72
Tacoma	142	152	86	100	119	28	21	24	49	85	154	135	150	37	88	53	52	59	34	96	25		150	91
Vancouver	142	152	73	73	53	138	166	130	124	66	36	135	43	182	96	111	108	94	117	64	130	150		85
Victoria	62	72	37	51	55	79	107	71	66	30	89	55	86	123	19	53	49	34	59	25	72	91	85	

Monthly Mean Surface Water Temperatures

Place	Years of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
		°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
San Diego, Calif.	4	56.2	56.7	58.2	59.3	62.5	64.0	67.2	67.3	65.1	63.0	59.7	58.1	61.4
La Jolla, Calif.	25	57.3	57.1	58.3	59.9	63.2	65.6	67.8	69.3	66.8	64.4	61.4	59.1	62.5
Los Angeles (Outer Harbor), Calif.	26	56.3	56.8	57.8	58.8	61.2	63.6	65.6	66.9	65.4	63.8	60.7	58.1	61.2
Santa Monica, Calif.	4	55.2	55.7	57.2	59.8	62.1	65.6	67.2	68.0	66.0	62.7	59.4	56.9	61.3
Avila, Calif.	4	52.9	52.8	52.6	53.6	54.4	56.9	58.4	59.2	59.0	57.2	55.3	54.0	55.5
San Francisco (Fort Point), Calif.	28	51.0	51.8	53.6	54.6	55.9	57.6	59.0	59.9	60.3	59.2	55.8	52.6	55.9
Alameda (Naval Air Station), Calif.	10	50.3	52.8	56.9	60.6	63.9	66.8	68.8	68.3	67.8	63.6	57.1	52.2	60.8
Crescent City, Calif.	14	49.6	49.6	50.2	51.1	52.7	54.1	56.2	57.0	55.4	53.2	51.7	50.5	52.6
Astoria (Tongue Point), Oreg.	25	40.0	41.3	45.9	51.5	56.5	60.7	66.1	67.2	63.9	57.1	48.5	43.0	53.5
Tokeland, Willapa Bay, Wash.	5	44.6	44.0	47.9	51.4	55.8	60.5	63.3	63.6	60.3	55.9	49.9	46.8	53.7
Raymond, Willapa Bay, Wash.	7	44.2	45.0	48.2	53.5	59.8	64.2	68.5	68.4	64.7	58.3	48.9	46.0	55.8
Neah Bay, Wash.	14	45.6	45.3	46.6	48.7	51.4	53.1	53.4	52.5	51.9	50.9	49.1	47.2	49.6
Seattle (Elliott Bay), Wash.	28	47.6	46.8	47.0	48.3	51.0	53.9	55.7	56.2	55.5	54.0	51.5	49.3	51.4
Friday Harbor, San Juan I., Wash.	14	45.7	45.1	45.5	46.9	48.8	50.5	51.8	52.0	51.0	49.7	48.1	46.9	48.5

The monthly means of surface water temperature may vary somewhat from year to year and therefore means from different series are not strictly comparable. For temperature data in greater detail, write to the Director, U. S. Coast and Geodetic Survey, Washington 25, D. C., for publication TW-2, *Surface Water Temperatures, Pacific Ocean.*

Monthly Mean Sea Water Densities

Reduced to 15° C. (59° F.)

Place	Years of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
San Diego, Calif.	4	1.0246	1.0246	1.0247	1.0248	1.0250	1.0251	1.0253	1.0252	1.0251	1.0248	1.0249	1.0247	1.0249
La Jolla, Calif.	25	1.0249	1.0248	1.0248	1.0248	1.0249	1.0250	1.0250	1.0250	1.0249	1.0249	1.0249	1.0249	1.0249
Los Angeles (Outer Harbor), Calif.	26	1.0247	1.0246	1.0247	1.0249	1.0250	1.0250	1.0250	1.0250	1.0250	1.0249	1.0249	1.0248	1.0249
Santa Monica, Calif.	4	1.0248	1.0248	1.0249	1.0250	1.0251	1.0251	1.0252	1.0250	1.0250	1.0249	1.0249	1.0248	1.0250
Avila, Calif.	4	1.0250	1.0250	1.0251	1.0252	1.0253	1.0253	1.0253	1.0253	1.0252	1.0251	1.0250	1.0250	1.0252
San Francisco (Fort Point), Calif.	28	1.0214	1.0200	1.0193	1.0193	1.0201	1.0210	1.0228	1.0237	1.0241	1.0240	1.0234	1.0227	1.0218
Alameda (Naval Air Station), Calif.	10	1.0177	1.0155	1.0150	1.0153	1.0163	1.0180	1.0199	1.0215	1.0224	1.0223	1.0215	1.0204	1.0188
Crescent City, Calif.	14	1.0210	1.0208	1.0211	1.0218	1.0225	1.0231	1.0237	1.0239	1.0241	1.0240	1.0225	1.0218	1.0225
Astoria (Tongue Point), Oreg.	25	1.0007	1.0002	0.9997	0.9995	0.9994	0.9995	0.9996	0.9999	1.0006	1.0014	1.0013	1.0010	1.0002
Tokeland, Willapa Bay, Wah.	5	1.0146	1.0158	1.0154	1.0157	1.0173	1.0174	1.0193	1.0213	1.0214	1.0212	1.0191	1.0173	1.0180
Raymond, Willapa Bay, Wash.	7	1.0041	1.0044	1.0037	1.0049	1.0059	1.0080	1.0113	1.0151	1.0141	1.0129	1.0079	1.0053	1.0081
Neah Bay, Wash.	14	1.0229	1.0229	1.0229	1.0230	1.0232	1.0232	1.0239	1.0242	1.0242	1.0238	1.0233	1.0228	1.0234
Seattle (Elliott Bay), Wash.	28	1.0205	1.0203	1.0198	1.0193	1.0193	1.0197	1.0208	1.0214	1.0218	1.0219	1.0215	1.0210	1.0206
Friday Harbor, San Juan I., Wash.	14	1.0223	1.0224	1.0225	1.0225	1.0224	1.0222	1.0220	1.0223	1.0225	1.0227	1.0227	1.0225	1.0224

The monthly means of sea water density may vary somewhat from year to year and therefore means from different series are not strictly comparable. For density data in greater detail, write to the Director, U. S. Coast and Geodetic Survey, Washington 25, D. C., for publication DW-2, *Density of Sea Water, Pacific Ocean.* A table for converting density to salinity is included in that publication.

CORPS OF ENGINEERS DISTRICTS.—Los Angeles, Calif., District: Office—751 South Figueroa Street.

The Los Angeles District includes that part of California which lies south of Cape San Martin embraced in the drainage basins tributary to the Pacific Ocean north of the United States-Mexico international boundary.

San Francisco, Calif., District: Office—180 New Montgomery Street.

The San Francisco District includes parts of southern Oregon and northern and western California embraced in the drainage basins tributary to the Pacific Ocean from the Oregon-California State line on the north to Cape San Martin on the south, except the waters of Suisun Bay and the Sacramento and San Joaquin Rivers and their tributaries.

Sacramento, Calif., District: Office—1209 Eighth Street.

The Sacramento District includes the basins of Suisun Bay and the San Joaquin and Sacramento Rivers, in California.

Portland, Oreg., District: Office—628 Pittock Block, S. W. 10th Avenue and Washington Street.

The Portland District includes all of Oregon which lies within the watershed of Columbia River and tributaries below Irrigon, also the coastal drainage area, together with south-central Oregon but not including that part which drains into Klamath Lake and River. It also includes that part of southern Washington within said watershed and downstream from a point opposite Irrigon, Oregon.

Walla Walla, Wash., District: Office—19 East Poplar Street.

The Walla Walla District includes southeastern Washington, exclusive of the watershed of the Columbia River and tributaries above and including the Yakima River, Wash.

Seattle, Wash., District: Office—4735 East Marginal Way.

The Seattle District includes all of Washington except the southern and southeastern portions, northern Idaho, and northwestern Montana embraced in the drainage basins tributary to the Pacific Ocean south of the United States-Canada international boundary to Cape Disappointment, and to the Columbia River above the Yakima River, inclusive.

BRANCH HYDROGRAPHIC OFFICES.—San Francisco, Calif.—Room 219A, U. S. Customhouse.
Portland, Oreg.—Room 211, U. S. Courthouse Bldg.
Seattle, Wash.—Room 453, Federal Office Bldg.

COAST GUARD.—Commander, 11th Coast Guard District, 706 Times Building, Long Beach 2, California. District includes Arizona; Clark County in Nevada; and the southern part of California comprising the counties of Santa Barbara, Kern, and San Bernardino, and all counties south thereof.

Examiner office, Long Beach, California.
Marine Inspection Office, Long Beach, California.
Marine Inspection Office, San Pedro, California.

Commander, 12th Coast Guard District, 907 Appraisers Building, 630 Sansome Street, San Francisco 26, Calfornia. District includes Utah; Nevada, except Clark County, and the northern part of California comprising the counties of San Luis Obispo, Kings, Tulane, and Inyo and all counties north thereof.
Examiner Office, San Francisco, California.
Marine Inspection Office, San Francisco, California.

Commander, 13th Coast Guard District, New World Life Building, 618 Second Avenue, Seattle 4, Washington. District includes Washington, Oregon, Idaho, and Montana.
Examiner Office, Seattle, Washington.
Examiner Office, Portland, Oregon.
Marine Inspection Office, Seattle, Washington.
Marine Inspection Office, Portland, Oregon.

Lifeboat Stations, Pacific Coast

Number	Station	State	Location
		Eleventh Coast Guard District	
307	Point Arguello	California	34°33′15″ N., 120°36′30″ W. 2.2 miles southeast of Point Arguello Light.
		Twelfth Coast Guard District	
308	Monterey	California	36°36′30″ N., 121°53′42″ W. At foot of Monterey Breakwater.
309	Golden Gate	do	37°46′15″ N., 122°30′36″ W. 0.8 mile south of Point Lobos.
310	Fort Point	do	37°48′20″ N., 122°27′57″ W. On Presidio, 0.8 mile east of Fort Point Light.
313	Point Reyes	do	37°59′44″ N., 122°58′16″ W. Drakes Bay, 2.6 miles east of Point Reyes Light.
314	Arena Cove	do	38°54′50″ N., 123°42′30″ W. 3 miles southeast of Point Arena Light.
316	Humboldt Bay	do	40°46′00″ N., 124°13′00″ W. East side of North Spit at entrance to Humboldt Bay.
		Thirteenth Coast Guard District	
318	Port Orford	Oregon	42°44′16″ N., 124°30′26″ W. Nelly Cove.
319	Coquille River	do	43°07′15″ N., 124°25′00″ W. East end of south jetty at Bandon, Oregon.
320	Coos Bay	do	43°20′58″ N., 124°19′50″ W. South side of entrance to Coos Bay, about 0.4 mile east of Coos Head.
321	Umpqua River	do	43°39′50″ N., 124°11′50″ W. Southeast side of river entrance near light.
322	Siuslaw River	do	44°00′10″ N., 124°07′18″ W. East side of river near mouth, south of Cannery Hill.
323	Yaquina Bay	do	44°37′37″ N., 124°03′18″ W. Newport water front, north side of bay, east of bridge.
325	Tillamook Bay	do	45°33′30″ N., 123°55′12″ W. North side of entrance at Garibaldi, Oregon, opposite west end of Sow and Pigs.
326	Point Adams	do	46°12′00″ N., 123°56′45″ W. At Hammond, 0.8 mile southeast of Fort Stevens.
327	Cape Disappointment	Washington	46°16′45″ N., 124°02′52″ W. Southwest side of Baker Bay, in cove west of Main Channel Range Rear Light.
329	Willapa Bay	do	46°43′05″ N., 124°02′40″ W. 1.2 miles east of Willapa Bay Light on inlet at southeast end of Cape.
330	Grays Harbor	do	46°54′29″ N., 124°06′38″ W. 200 yards southwest of Point Chehalis Range Rear Light.
331	Quillayute River	do	47°54′30″ N., 124°38′15″ W. 0.2 mile northeast of James Island Light south side of river mouth.
332	Neah Bay	do	48°22′16″ N., 124°35′46″ W. 5.8 miles 103° from Cape Flattery Light. South of southwest tip of Waada Island.

949285—52——31

Customs Districts and Ports of Entry

[The first port named in the following list is the headquarters port]
*Indicates customs ports authorized to issue marine documents

Name of District	Limits of district	Ports of entry
San Diego	The counties of San Diego and Imperial in the State of California.	*San Diego
Los Angeles	That part of the State of California lying south of the northern boundaries of the counties of San Luis Obispo, Kern, and San Bernardino, except the counties of San Diego and Imperial.	*Los Angeles (including San Pedro, Wilmington, and Long Beach). *Port San Luis
San Francisco	That part of the State of California lying north of the northern boundaries of the counties of San Luis Obispo, Kern, and San Bernardino. NOTE: Collector of Customs is located at San Francisco.	*San Francisco-Oakland (including all points on San Francisco Bay) *Eureka
Oregon	The State of Oregon and that part of the State of Washington which embraces the waters of Columbia River and the north bank of said river west of Long. 119° W.	*Portland *Astoria Longview *Coos Bay Newport
Washington	The State of Washington except that part which embraces the waters of the Columbia River and the north bank of the said river west of Long. 119° W.	*Seattle *Aberdeen Anacortes *Bellingham Blaine Everett Friday Harbor Neah Bay Northport Olympia *Port Angeles *Port Townsend South Bend *Tacoma

PUBLIC HEALTH SERVICE

Quarantine Stations:

San Diego, 208 New Post Office Bldg., San Diego 1, Calif.
Los Angeles, P. O. Box 97, Terminal Island, Calif.
San Francisco, Foot of Hyde St., San Francisco, Calif.
Portland, 215 U. S. Courthouse, Portland 5, Oreg.
Seattle, 45 Federal Office Bldg., Seattle 4, Wash.

Additional ports of entry at which quarantine inspection and/or medical examination of aliens is performed, are as follows:

Hueneme, Calif.
Eureka, Calif.
Astoria, Ore.
Anacortes, Wash.
Everett, Wash.
Olympia, Wash.
Tacoma, Wash.
Winslow, Wash.
Bellingham, Wash.
San Luis Obispo, Calif.
Fort Bragg, Calif.
Coos, Bay, Oreg.
Bremerton, Wash.
Kirkland, Wash.
Port Angeles, Wash.
Port Townsend, Wash.
Aberdeen, Wash.
Raymond, Wash.

Marine Hospitals:
San Francisco, 14th Avenue and Park Blvd.
Seattle, P. O. Box 3145.

Medical Relief Stations:
CALIFORNIA:
San Diego, 208 New Post Office Bldg., San Diego 1.
Los Angeles, 408 Federal Bldg., Los Angeles 12.
San Pedro, 308 Federal Bldg., San Pedro.
Eureka, Med. Dent. Bldg., 730 7th St., Eureka.
OREGON:
Astoria, 211 Post Office Bldg., Astoria.
Coos Bay, 510 Hall Bldg., Coos Bay.
Newport, 625 Hurlburt St., Newport.
Portland, 220 U. S. Courthouse Bldg.
WASHINGTON:
Aberdeen, 700 Becker Bldg., Aberdeen.
Anacortes, Med. Dent. Bldg., Anacortes.
Bellingham, 512 Herald Bldg., Bellingham.
Everett, 416 Med. Dent. Bldg., Everett.
Olympia, 407 Security Bldg., Olympia.
Port Angeles.
Port Townsend, Medical Bldg., Port Townsend.
Raymond, Raymond Bank Bldg., Raymond.
Tacoma, 435 Medical Arts Bldg., Tacoma 2.

IMMIGRATION AND NATURALIZATION OFFICES:
CALIFORNIA:
San Diego, U. S. Customhouse and Courthouse Bldg., San Diego, Calif.
Los Angeles, 458 So. Spring St., Los Angeles 13, Calif.
San Pedro, Terminal Island, Los Angeles Harbor.
Ventura, 121 North Fir St., Ventura, Calif.
San Luis Obispo, 775 Higuerra St., San Luis Obispo, Calif.
San Francisco, Appraisers Bldg., 630 Sansome St., San Francisco 11, Calif.
Salinas, 1610 E. Alisal St., Salinas, Calif.
Oakland, 313 New Post Office Bldg., Oakland 7, Calif.
Sacramento, 432 Federal Bldg., Sacramento 9, Calif.
Stockton, 235 City Hall, Stockton 3, Calif.
OREGON:
Astoria, Post Office Bldg., 326 Commercial St., Astoria, Ore.
Portland, 333 U. S. Courthouse, Broadway and Main Sts., Portland 5, Oreg.
WASHINGTON:
Aberdeen, Post Office Bldg., 2nd and G Sts., Aberdeen, Wash.
Anacortes, Post Office Bldg., 6th and Commercial Sts., Anacortes, Wash.
Bellingham, Post Office Bldg., Magnolia and Cornwall Sts., Bellingham, Wash.
Port Angeles, Post Office Bldg., 1st and Oak Sts., Port Angeles, Wash.

Seattle, 815 Airport Way, Seattle 4, Wash.
Tacoma, Post Office Bldg., 11th and A Sts., Tacoma 1, Wash.

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE.—List of ports at which inspectors are located:

CALIFORNIA: San Diego, 308 Broadway Pier Bldg.
Los Angeles, 204 State Bldg., 217 W. First St.
San Pedro, 104 Ferry Bldg.
San Francisco, 2 Agriculture Bldg., Embarcadero at Mission St.
OREGON: Portland, 439 U. S. Courthouse, 620 Southwest Main St.
WASHINGTON: Seattle, 904 Federal Office Bldg.

Foreign Consuls

Argentina.—Los Angeles, San Francisco, Seattle.
Australia.—San Francisco.
Austria.—Los Angeles, San Francisco.
Belgium.—Los Angeles, San Francisco, Portland, Seattle.
Bolivia.—Los Angeles, San Francisco.
Brazil.—Los Angeles, San Francisco, Seattle.
Canada.—San Francisco.
Chile.—San Diego, Los Angeles, San Francisco.
China.—Los Angeles, San Francisco, Portland, Seattle.
Colombia.—Los Angeles, San Francisco.
Costa Rica.—Los Angeles, San Francisco, Oakland, Seattle.
Cuba.—Los Angeles, San Francisco, Portland, Seattle.
Denmark.—Los Angeles, San Francisco, Portland, Seattle.
Dominican Republic.—Los Angeles, San Francisco, Seattle.
Ecuador.—San Diego, Los Angeles, San Francisco, Seattle.
Egypt.—San Francisco.
El Salvador.—Los Angeles, Santa Monica, San Francisco, Berkeley.
Estonia.—Los Angeles.
Finland.—Los Angeles, San Francisco.
France.—Los Angeles, San Francisco, Portland, Seattle.
Great Britain.—Los Angeles, San Francisco, Portland, Seattle.
Greece.—San Francisco.
Guatemala.—Los Angeles, San Francisco, Berkeley, Oakland, Portland.
Haiti.—San Francisco.
Honduras.—Los Angeles, San Francisco.
Iceland.—Los Angeles, San Francisco, Portland, Seattle.
India.—San Francisco.
Ireland.—San Francisco.
Israel.—Los Angeles.
Italy.—Los Angeles, San Francisco, Portland, Seattle.
Korea.—Los Angeles, San Francisco.

Latvia.—Los Angeles.
Lithuania.—Los Angeles.
Luxembourg.—Los Angeles.
Mexico.—San Diego, Los Angeles, Santa Barbara, San Francisco, Sacramento, Portland.
Monaco.—San Francisco.
Netherlands.—San Diego, Los Angeles, San Francisco, Portland, Seattle.
New Zealand.—San Francisco.
Nicaragua.—San Diego, Long Beach, Los Angeles, San Francisco, Sacramento.
Norway.—San Diego, Los Angeles, San Francisco, Portland, Seattle.
Panama.—San Diego, Long Beach, Los Angeles, Santa Monica, San Francisco, Berkeley, Oakland, Stockton, Portland, Seattle.
Paraguay.—San Diego, Los Angeles, San Francisco, Sacramento, Portland, Seattle.
Peru.—Los Angeles, San Francisco, Portland, Seattle.
Philippines.—Los Angeles, San Francisco, Seattle.
Portugal.—San Francisco.
Thailand.—San Francisco.
Spain.—Los Angeles, San Francisco, Seattle.
Sweden.—San Diego, Los Angeles, San Francisco, Portland, Seattle.
Switzerland.—Los Angeles, San Francisco, Seattle.
Uruguay.—Los Angeles, San Francisco, Portland, Seattle.
Venezuela.—Los Angeles, San Francisco, Portland, Seattle.

FEDERAL COMMUNICATIONS COMMISSION.—Regional offices: San Francisco, 323A U. S. Customhouse, San Francisco 26, Calif.
Seattle, 801 Federal Office Bldg., Seattle 4, Wash.

Engineers in Charge: Los Angeles Field Office, 539 U. S. Post Office and Courthouse, Los Angeles 12, Calif.
San Francisco, 323A U. S. Customhouse, San Francisco 26, Calif.
Portland, 307 Fitzpatrick Bldg., 917 Southwest Oak St., Portland 5, Oreg.
Seattle, 801 Federal Office Bldg., Seattle 4, Wash.

Commercial Broadcasting Stations Along the Coast

Frequency	Call	Power	City	Position of Antenna	Week-day Hours of operation
			California		
550	KFMB	1 kw	San Diego	32° 47′.7 N. 117° 04′.8 W.	0600–2400
600	KFSD	5 kw	do	32° 43′.0 N. 117° 04′.2 W.	24 hours
1130	KSDO	1 kw	do	32° 47′.0 N. 117° 06′.7 W.	0600–2400
1170	KCBQ	1 kw	do	32° 45′.6 N. 117° 03′.7 W.	0600–0100
1240	KSON	250 w	do	32° 41′.5 N. 117° 07′.1 W.	24 hours
1360	KGB	1 kw	do	32° 43′.0 N. 117° 09′.8 W.	0600–2400
1520	KTED	250 w	Laguna Beach	33° 33′.1 N. 117° 45′.4 W.	0700–2400
1280	KFOX	1 kw	Long Beach	33° 47′.0 N. 118° 11′.4 W.	17½ hours
1390	KGER	5 kw	do	33° 53′.4 N. 118° 11′.1 W.	0500–2400
570	KLAC	1 kw	Los Angeles	34° 04′.2 N. 118° 11′.6 W.	0600–0100
640	KFI	50 kw	do	33° 52′.8 N. 118° 00′.8 W.	24 hours
710	KMPC	10 kw	do	34° 10′.5 N. 118° 24′.6 W.	24 hours
790	KECA	5 kw	do	34° 01′.7 N. 118° 22′.3 W.	0530–2400
930	KHJ	5 kw	do	34° 02′.3 N. 118° 22′.4 W.	0600–0100
980	KFWB	5 kw	do	34° 01′.4 N. 118° 22′.4 W.	0545–0100
1020	KFVD	5 kw	do	33° 54′.9 N. 118° 10′.8 W.	0600–sunset
1070	KNX	50 kw	do	33° 51′.6 N. 118° 21′.0 W.	0525–0105
1150	KRKD	1 kw	do	34° 05′.1 N. 118° 12′.2 W.	shares time
do	KFSG	do	do	34° 04′.6 N. 118° 15′.6 W.	with KFSG
1230	KGFJ	250 w	do	34° 02′.2 N. 118° 16′.6 W.	24 hours
1330	KFAC	5 kw	do	34° 01′.2 N. 118° 20′.8 W.	24 hours
1580	KOWL	5 kw	Santa Monica	34° 01′.0 N. 118° 25′.7 W.	sunrise-set
870	KIEV	250 w	Glendale	34° 08′.9 N. 118° 14′.7 W.	0600–sunset
1450	KVEN	do	Ventura	34° 16′.2 N. 119° 14′.8 W.	0530–2400
1590	KVVC	1 kw	Ventura-Oxnard	34° 16′.1 N. 119° 16′.3 W.	0600–2400
1250	KTMS	do	Santa Barbara	34° 25′.1 N. 119° 49′.1 W.	0630–2400
1340	KIST	250 w	do	34° 25′.2 N. 119° 42′.0 W.	0600–2400
1490	KDB	do	do	34° 25′.9 N. 119° 42′.3 W.	0630–2400
1240	KSMA	do	Santa Maria	34° 56′.6 N. 120° 26′.5 W.	0700–2330
1400	KCOY	do	do	34° 59′.0 N. 120° 27′.2 W.	0630–2300
920	KVEC	500 w	San Luis Obispo	35° 18′.1 N. 120° 40′.3 W.	0600–2400
1340	KMNS	250 w	do	35° 16′.0 N. 120° 39′.8 W.	0730–2330
1240	KMBY	do	Monterey	36° 36′.4 N. 121° 53′.8 W.	0600–0005
1380	KSBW	1 kw	Salinas	36° 42′.0 N. 121° 39′.8 W.	----------
1340	KHUB	250 w	Watsonville	36° 55′.8 N. 121° 46′.0 W.	24 hours
1080	KSCO	500 w	Santa Cruz	36° 57′.7 N. 121° 58′.8 W.	0600–2305
1460	KDON	5 kw	do	36° 52′.2 N. 121° 49′.1 W.	0700–2400
1220	KIBE	250 w	Palo Alto	37° 28′.6 N. 122° 08′.4 W.	sunrise-set
560	KSFO	1 kw	San Francisco	37° 44′.7 N. 122° 22′.7 W.	0600–0015
610	KFRC	5 kw	do	37° 47′.1 N. 122° 25′.2 W.	0600–2400
680	KNBC	50 kw	do	37° 32′.8 N. 122° 14′.0 W.	0600–0100
740	KCBS	5 kw	do	38° 08′.3 N. 122° 31′.6 W.	0550–2400
810	KGO	50 kw	do	37° 31′.7 N. 122° 06′.1 W.	0600–2400
1100	KJBS	1 kw	do	37° 47′.4 N. 122° 25′.1 W.	2201–sunset
1260	KYA	do	do	37° 43′.0 N. 122° 23′.7 W.	0530–2400
1450	KSAN	250 w	do	37° 46′.6 N. 122° 24′.9 W.	18 hours
1050	KVSM	do	San Mateo	37° 34′.2 N. 122° 17′.7 W.	sunrise-set
1550	KSMO	1 kw	do	37° 32′.0 N. 122° 16′.5 W.	0630–2400
910	KLX	1 kw	Oakland	37° 48′.2 N. 122° 16′.2 W.	0600–2400
960	KROW	1 kw	Oakland	37° 47′.7 N. 122° 14′.9 W.	0530–2400
1310	KWBR	do	do	37° 48′.6 N. 122° 15′.8 W.	24 hours
1400	KRE	250 w	Berkeley	37° 51′.0 N. 122° 17′.7 W.	do
1510	KTIM	1 kw	San Rafael	37° 57′.1 N. 122° 32′.8 W.	0700–1900
1190	KGYW	250 w	Vallejo	38° 07′.0 N. 122° 15′.3 W.	0645–1730
1490	KAFP	do	Petaluma	38° 13′.6 N. 122° 37′.3 W.	0600–2400
1350	KSRO	1 kw	Santa Rosa	38° 25′.2 N. 122° 45′.5 W.	0630–2300
1240	KHUM	250 w	Eureka	40° 47′.4 N. 124° 10′.9 W.	0600–2400
1480	KIEM	5 kw	do	40° 48′.1 N. 124° 08′.3 W.	0555–2330
1400	KCRE	250 w	Crescent City	41° 45′.7 N. 124° 11′.2 W.	----------

NOTE: It should be kept in mind that many coastal stations broadcast on directional antennas which may blank out the signal on the seaward side.

Frequency	Call	Power	City	Position of Antenna	Week-day Hours of operation
			Oregon		
1450	KWRO	250 w	Coquille	43° 10′.9 N. 124° 11′.9 W.	0600–2200
1230	KOOS	do	Coos Bay	43° 23′.0 N. 124° 12′.9 W.	0500–0100
1230	KNPT	do	Newport	44° 39′.1 N. 124° 03′.0 W.	0600–2200
1590	KTIL	do	Tillamook	45° 27′.4 N. 123° 52′.6 W.	0600–2200
1050	KVAS	do	Astoria	46° 10′.9 N. 123° 49′.1 W.	----------
1370	KAST	1 kw	do	46° 10′.5 N. 123° 50′.8 W.	0600–2400
			Washington		
1320	KXRO	1 kw	Aberdeen	46° 57′.5 N. 123° 48′.6 W.	0700–2300
1450	KBKW	250 w	do	46° 58′.6 N. 123° 48′.6 W.	0630–2300
790	KVOS	1 kw	Bellingham	48° 43′.3 N. 122° 26′.8 W.	0600–2400
1170	KPUG	do	do	48° 46′.6 N. 122° 26′.4 W.	0600–2400
1380	KRKO	do	Everett	48° 00′.5 N. 122° 12′.0 W.	0600–2400
1450	KONP	250 w	Port Angeles	48° 07′.3 N. 123° 26′.3 W.	0645–2230
570	KVI	5 kw	Seattle	47° 25′.3 N. 122° 25′.7 W.	0530–2400
710	KIRO	50 kw	do	47° 23′.9 N. 122° 26′.0 W.	0600–2400
770	KXA	1 kw	do	47° 36′.8 N. 122° 20′.8 W.	----------
950	KJR	5 kw	do	47° 35′.0 N. 122° 21′.7 W.	0600–2400
1000	KOMO	50 kw	do	47° 27′.8 N. 122° 26′.4 W.	0600–2400
1090	KING	do	do	47° 23′.6 N. 122° 25′.4 W.	0600–0200
1150	KRSC	1 kw	do	47° 34′.6 N. 122° 19′.7 W.	24 hours
1250	KTW	do	do	47° 36′.5 N. 122° 19′.8 W.	shares time with KWSC
1300	KOL	5 kw	do	47° 35′.1 N. 122° 20′.9 W.	24 hours
810	KTBI	1 kw	Tacoma	47° 14′.0 N. 122° 28′.2 W.	----------
1360	KMO	5 kw	do	47° 14′.6 N. 122° 22′.0 W.	24 hours
1240	KGY	250 w	Olympia	47° 02′.8 N. 122° 54′.0 W.	0600–2300
			British Columbia		
600	CJOR	5 kw	Vancouver	49° 10′.1 N. 123° 00′.8 W.	----------
980	CKWX	5 kw	do	49° 10′.7 N. 123° 04′.6 W.	----------
1130	CBR	5 kw	do	49° 08′.6 N. 123° 06′.6 W.	----------
1410	CKMO	1 kw	do	49° 11′.8 N. 123° 05′.1 W.	----------
900	CJVI	250 w	Victoria	48° 27′.6 N. 123° 25′.7 W.	----------

NOTE: It should be kept in mind that many coastal stations broadcast on directional antennas which may blank out the signal on the seaward side.

Radio Ranges

[*Asterisk indicates privately maintained facilities operated only when airline craft are due, or by prior arrangement]

Location	Ident.	Freq.	Position of range transmitter	Power
San Diego, Calif.	SAN	224	32° 46′.0 N. 117° 12′.4 W.	Over 150 w
El Toro, Calif.	NZJ	440	33° 42′.4 N. 117° 48′.7 W.	50–150 w
Long Beach, Calif.	LGB	233	33° 46′.4 N. 118° 05′.5 W.	do.
Los Angeles, Calif.	LAX	332	33° 56′.9 N. 118° 18′.7 W.	Over 150 w
Camarillo, Calif.	CAV	359	34° 12′.4 N. 119° 04′.9 W.	do.
Santa Barbara, Calif.	SBA	350	34° 25′.7 N. 119° 53′.0 W.	50–150 w
Salinas, Calif.	SNS	260	36° 37′.7 N. 121° 34′.7 W.	do.
Moffett, Calif.	NUQ	323	37° 23′.0 N. 122° 02′.0 W.	do.
San Francisco, Calif.	SFO	227	37° 35′.2 N. 122° 19′.5 W.	do.
Oakland, Calif.	OAK	362	37° 44′.5 N. 122° 13′.5 W.	do.
Arcata, Calif.	ACV	209	40° 56′.0 N. 124° 07′.6 W.	do.
North Bend, Ore.*	OTH	206	43° 29′.3 N. 124° 13′.7 W.	do.
Astoria, Ore.*	AST	323	46° 12′.9 N. 124° 00′.0 W.	do.
Portland, Ore.	PDX	332	45° 38′.5 N. 122° 35′.9 W.	Over 150 w
Hoquiam, Wash.*	HQM	254	46° 58′.2 N. 123° 50′.5 W.	50–150 w
Neah Bay, Wash.	EBY	379	48° 21′.5 N. 124° 33′.3 W.	Over 150 w
Whidbey Id., Wash.	NUW	353	48° 18′.0 N. 122° 37′.1 W.	50–150 w
Port Angeles, Wash.*	CLM	329	48° 06′.5 N. 123° 23′.8 W.	do.
Bellingham, Wash.	BLI	391	48° 49′.9 N. 122° 35′.2 W.	Over 150 w

Aircraft Homing Beacons

[*Asterisk indicates privately maintained facilities operated only when airline craft are due, or by prior arrangement]

Location	Ident.	Freq.	Position of transmitter	Power
Oceanside, Calif.	OCN	323	33° 13′.8 N. 117° 24′.0 W.	50–2000 w
San Francisco, Calif.	SFG	332	37° 40′.7 N. 122° 28′.2 W.	50 w
Farallon, Calif.	FLI	379	37° 42′.0 N. 123° 00′.0 W.	50–2000 w
North Bend, Ore.*	OBN	236	43° 25′.7 N. 124° 14′.8 W.	50 w
Port Angeles, Wash.*	NOW	544	48° 08′.0 N. 123° 27′.0 W.	50–2000 w
Whidbey Id., Wash.	K	522	48° 21′.3 N. 122° 40′.3 W.	50 w

FISH AND WILDLIFE SERVICE.—Enforcement agents:

Los Angeles, Calif., 1503 Federal Bldg.
Berkeley, Calif., 1261 University Ave.
Sacramento, Calif., P. O. Box 1317.
Portland, Oreg., 110 Pioneer P. O. Bldg.
Seattle, Wash., 1823 Smith Tower.

National Wildlife Refuges:

CALIFORNIA:
- Farallon
- Sacramento

OREGON:
- Goat Island
- Three Arch Rocks
- Cape Meares
- Cold Springs

WASHINGTON:
- Willapa
- Columbia River
- Copalis
- Quillayute Needles
- Flattery Rocks
- Jones Island
- Matia Island
- Smith Island
- Dungeness

Yacht Clubs

CALIFORNIA:

Coronado Yacht Club, Glorietta Bay, Coronado.
Southwestern Yacht Club, Harbor Drive at Jarvis St., San Diego.
San Diego Yacht Club, Foot Talbot St., Pt. Loma, San Diego.
San Diego Powerboat Club, San Diego.
Mission Bay Yacht Club, Mission Beach, San Diego.
La Jolla Corinthian Yacht Club, southwest shore Mission Bay, San Diego.
Balboa Yacht Club, Bayside Dr., Newport Beach.
Lido Isle Yacht Club, 701 Via Lido Soud, Newport Beach.

Newport Harbor Yacht Club, 720 W. Bay Ave., Balboa, Newport Beach.
Voyagers Yacht Club, P. O. Box 104, Newport Beach.
Catalina Island Yacht Club, Avalon, Santa Catalina Island.
Long Beach Yacht Club, Pacific Coast Club, Long Beach.
Corsair Yacht Club, P. O. Box 789, Long Beach.
Cabrillo Beach Yacht Club, San Pedro, Los Angeles Harbor.
Santa Monica Yacht Club, Watchhorn Basin, San Pedro.
Alamitos Bay Yacht Club, 5437 E. Ocean Blvd., Long Beach.
California Yacht Club, 431 W. 7th St., Los Angeles.
Los Angeles Yacht Club, Terminal Island, Los Angeles Harbor.
Blue Water Cruising Club, San Pedro.
Hollywood Yacht Club, Los Angeles.
Transpacific Yacht Club, Los Angeles.
Emerald Bay Yacht Club, 9862 Olympic Blvd., Beverly Hills.
South Coast Corinthian Yacht Club, Santa Monica.
Ventura County Boat Club, 692½ Front St., Ventura.
Santa Barbara Yacht Club, Yacht Basin, Santa Barbara.
San Luis Yacht Club, Avila, San Luis Obispo Bay.
Elkhorn Yacht Club, Moss Landing.
Santa Cruz Yacht Club, Municipal Pier, Santa Cruz.
Golden Gate Yacht Club, San Francisco.
St. Francis Yacht Club, Marina Blvd., San Francisco.
Coyote Point Yacht Club, San Mateo.
Aeolian Yacht Club, Alameda.
Encinal Yacht Club, Alameda.
Berkeley Yacht Club, Yacht Harbor, Berkeley.
Corinthian Yacht Club of San Francisco, Corinthian Island, Belvedere.
Oakland Yacht Club, 1045 19th Ave., Oakland 6.
Richmond Yacht Club, 535 Canal St., Richmond.
Palo Alto Yacht Club, Palo Alto.
Sequoia Yacht Club, Redwood City.
Point San Pablo Yacht Club, Pt. Richmond.
San Rafael Yacht Club, San Rafael.
Windjammers, 2517 Blanding Ave., Alameda.
South Bay Yacht Club, Alviso.
Vallejo Yacht Club, Mare Id. Blvd. and Trinity St., Vallejo.
Delta Yacht Club, Tule Isle, Stockton.
Stockton Yacht Club, Atherton Cove, Stockton.
Ionic Sailing Club, P. O. Box 288, Stockton.
Sacramento Yacht Club, Miller Park, Sacramento.
Humboldt Yacht Club, Foot of A St., Eureka.

OREGON:

Coos Bay Yacht Club, between North Bend and Coos Bay.
Yaquina Bay Yacht Club, Newport.
Astoria Yacht Club, Astoria.
Bonneville Yacht Club, Bonneville.
Oregon Yacht Club, The Oaks, Portland.
Columbia River Yacht Club, 1919 N. E. Marine Dr., Portland.
Portland Yacht Club, 1241 N. E. Marine Dr., Portland.
Riverside Yacht Club, Canby.
Eugene Yacht Club, Eugene.
Southern Oregon Boat Club, Ashland.

WASHINGTON:

Longview Yacht Club. Longview.
Swinonish Yacht Club, La Conner.
Port Angeles Yacht Club, Port Angeles.
Bellingham Yacht Club, Foot Cornwell Ave., Bellingham.
Archipelago Yacht Club, Shoal Bay, Lopez Island.
Bremerton Yacht Club, Rocky Point Road, Phinney Bay, Bremerton.
Anacortes Yacht Club, Anacortes.
Port Townsend Yacht Club, Port Townsend.
Everett Yacht Club, Foot Bond St., Everett.
Corinthian Yacht Club, 102 Lakeside Ave. So., Seattle.
Queen City Yacht Club, 2608 Boyer Ave., Seattle.
Seattle Yacht Club, 1807 Hamlin St., Seattle.
Rainier Yacht Club, 9094 Seward Park Ave., Seattle.
Tyee Yacht Club, 1500 Westlake N., Seattle.
Tacoma Yacht Club, Point Defiance Park, Tacoma.

Day Island Yacht Club, east side of Day Island, Tacoma.
Olympia Yacht Club, Foot of Simmons St., Olympia.

BRITISH COLUMBIA:

Royal Victoria Yacht Club, 3475 Ripon Road, Victoria.
Capital City Yacht Club, 1210 Wharf St., Victoria.
Burrard Yacht Club, Stanley Park, Vancouver.
Kitsilano Yacht Club, Foot of Balsam St., Vancouver.
Royal Vancouver Yacht Club, 3811 Point Grey Road, Vancouver.
West Vancouver Yacht Club, Pilot Cove, West Vancouver.
Kelowna Yacht Club, Kelowna.
Nanaimo Yacht Club, Nanaimo.
April Point Yacht Club, Quadra Island, Quathiaski Cove.
Prince Rupert Rowing and Yachting Club, Prince Rupert.

WEATHER BUREAU.—Offices.—Barometers may be compared with standards at the following offices:

San Diego, Administration Building, Lindbergh Municipal Airport, 2930 Pacific Boulevard.
San Pedro, Customhouse and Post Office Building, 8th and Beacon Streets.
San Francisco, 219-A Customhouse.
Sacramento, 480 Federal Bldg.
Portland, 320 Customhouse.
Seattle, 709 Federal Building, 1st Avenue and Marion Street,

STORM WARNING DISPLAY STATIONS.—Stations marked with an asterisk (*) display signals both day and night.

CALIFORNIA:

Point Loma; Navy Electronics Laboratory
San Diego; *Yacht Club; Naval Air Station, North Island
Coronado; Yacht Club
Mission Beach; Lifeguard Station
*Newport Beach
San Pedro; *Marine Exchange Bldg.
Terminal Island; Los Angeles Yacht Club
Wilmington
Long Beach; *Harbor Pilot Station
Redondo Beach; Breakwater
*Santa Monica
*Avalon, Santa Catalina Island
Port Hueneme; *Port Hueneme Naval Station
*Santa Barbara
Port San Luis
*Monterey Coast Guard Station
San Francisco Lightship
San Francisco; Marine Exchange Lookout; *Telephone Bldg.
Palo Alto; Yacht Harbor
Berkeley; *Berkeley Yacht Harbor
Antioch; *Bridge Marina Yacht Harbor
Blunts Reef Lightship
*Humboldt Bay Coast Guard Station
Eureka; Signal Oil Dock

OREGON:

*Cape Blanco Light
Coquille River Coast Guard Station
*Cape Arago Light
Coos Bay Coast Guard Station
North Bend
*Coos Bay
*Umpqua River Coast Guard Station
*Yaquina Head Light
*Yaquina Bay Coast Guard Station
Tillamook Bay Coast Guard Station
*Point Adams Coast Guard Station
Columbia River Lightship
*Astoria

WASHINGTON:

*Willapa Bay Coast Guard Station
*South Bend
*Grays Harbor Light
Aberdeen; *Port of Grays Harbor Dock
North Head; *Weather Bureau Bldg.
Ilwaco; Port of Ilwaco
*Destruction Island Light
Quillayute River Coast Guard Station
Umatilla Reef Lightship
Tatoosh Island; *Weather Bureau Bldg.
Swiftsure Bank Lightship
*Neah Bay Coast Guard Station
*Port Angeles

*New Dungeness Light
*Bellingham
*Blaine
*Port Townsend
Seattle; *Exchange Bldg.; Yacht Club, Portage Bay
*Everett
Tacoma; *Fidelity Bldg.

Weather broadcasts by commercial radio stations.—The following table lists commercial radio stations that have installed microphones in nearby Weather Bureau offices. From these offices forecasts and weather summaries are broadcast on regular schedule by Weather Bureau personnel, as follows:

City	Station	Freq.	Power	Time of broadcast		
				Week-days	Saturdays	Sundays
San Diego, Calif.	KFSD	600 kc.	5 kw.	0823	0900	0845
do	KCBQ	1170 kc.	1 kw.	0845 1215	----------	0845
Eureka, Calif.	KIEM	1480 kc.	5 kw.	0650 1215 2200	0650 1215 2200	0650 1225 1710 2230
Portland, Oreg.	KOIN	970 kc.	5 kw.	1225	----------	----------
Seattle, Wash.	KOMO	1000 kc.	50 kw.	0605 0805 2220	0605 2220	----------
do	KIRO	710 kc.	50 kw.	0655	0655	0655
Olympia, Wash.	KGY	1240 kc.	250 w.	1230	1230	1230

Radiotelephone broadcasts by United States Coast Guard.—Regular broadcasts including weather forecasts, small craft and storm warnings, Local Notices to Mariners, and hydrographic information are transmitted by United States Coast Guard and commercial coastal harbor radiotelephone stations in plain language on the schedules following. The Coast Guard stations (those whose call letters begin with N) all broadcast on 2698 kc., preceded by a preliminary announcement on 2670 kc.

Station		*Frequency (kc.)*	*Time (PST)*	
NMW*	Seattle, Wash.	2698	0930	2130
KOW	Seattle, Wash.	2522	0900	2100
KFX	Astoria, Oreg.	2598	0915	2115
KQX	Portland, Oreg.	2598	0930	2130
KOE	Eureka, Calif.	2506	0900	2100
NMC	San Francisco, Calif.	2698	0830	2030
KLH	San Francisco, Calif.	2506	0830	2030
NMQ*	Long Beach, Calif.	2698	0900	2100
KOU	San Pedro, Calif.	2566	0800	2000

Emergency broadcasts including storm warnings, advisories, and urgent information are transmitted immediately on receipt and at 2-hour intervals thereafter on each odd hour (* even hour) for a period of 6 hours unless the information is canceled or superseded.

All radiotelephone broadcasts will be made once through at good writing speed.

Hours of Operation of Fog Signals

Station	January	February	March	April	May	June	July	August	September	October	November	December	Total
Ballast Point, San Diego Bay	27	11	8	3	9	10	8	5	7	19	22	8	137
Point Loma	12	54	34	21	5	10	4	23	18	35	27	18	261
Los Angeles Harbor	16	49	35	37	16	13	9	47	45	63	56	38	424
Point Hueneme	10	38	22	28	19	42	35	89	60	45	31	9	428
Point Arguello	36	34	35	54	47	104	151	145	116	67	53	26	868
San Luis Obispo	33	22	33	55	48	94	162	159	146	87	50	17	906
Piedras Blancas	40	41	53	55	40	96	188	160	151	93	73	30	1,020
Point Sur	26	25	49	52	30	86	164	145	130	95	41	16	859
Ano Nuevo Island	30	39	50	33	23	52	105	92	122	116	68	37	767
Farallon	28	48	55	30	27	61	104	116	126	110	68	28	801
Point Bonita	51	51	46	29	24	59	112	108	121	118	90	49	858
Alcatraz fog signal	31	37	37	18	12	37	67	58	68	66	55	27	516
Mare Island	38	23	10	4	3	----	12	6	2	10	28	38	171
Point Reyes	68	74	65	54	63	108	189	191	175	168	97	64	1,316
Point Arena	30	49	55	30	41	82	159	168	146	125	71	30	986
Point Cabrillo	33	49	98	30	43	92	150	188	171	136	68	26	1,074
Punta Gorda	36	41	43	17	35	74	118	112	97	90	28	16	707
Blunts Reef Light Vessel	77	95	84	48	56	104	146	175	160	140	72	45	1,202
Table Bluff	26	77	72	24	32	81	158	156	161	137	60	30	1,014
Humboldt Bay	42	61	81	28	44	81	148	160	209	190	92	35	1,171
Trinidad Head	16	84	50	33	41	67	177	158	182	128	67	21	1,024
St. George Reef	26	59	64	26	47	92	178	200	160	118	53	14	1,037
Coquille River	21	50	23	26	38	59	90	122	128	103	46	17	723
Tillamook Rock	30	54	42	24	22	40	83	89	66	54	28	30	562
Columbia River Light Vessel	58	68	55	36	25	26	53	70	66	63	60	54	634
Desdemona Sands	18	17	17	9	10	7	18	17	23	23	17	10	186
Willamette River	60	32	12	1	1	----	----	----	14	40	71	61	292
Grays Harbor	69	52	57	25	25	40	83	138	92	81	82	56	800
Destruction Island	28	27	37	19	25	43	85	105	68	56	25	22	540
Umatilla Reef Light Vessel	51	47	50	36	40	35	76	148	89	73	60	41	746
Cape Flattery	52	34	34	22	40	67	105	168	100	52	27	21	722
Point Wilson	40	40	16	11	17	29	30	88	62	46	25	7	411
West Point	31	45	20	4	4	6	8	31	39	49	56	51	344
Point Browns	98	96	48	24	8	9	11	80	129	130	99	105	837

NOTE.—It should be borne in mind that the amount of fog encountered in any month may vary widely from the mean values given above. For example, in February 1925 there were 158 hours of fog in Los Angeles Harbor. At Farallon Island there were 153 hours of fog in January 1925 while the average shown in the table is 28 hours. The winter of 1925 was an exceptionally foggy one for the coasts of southern California.

Table 1.—Average Occurrence of Low Visibilities

[IN PERCENT OF HOURS]

Stations	Elevation, Feet	Years of Record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Bellingham, Wash.	103	2													
0-¼ mi.			0.9	0.2	0.8	0.0	0.0	0.0	0.3	0.2	1.8	3.1	1.9	0.6	0.9
0-½ mi.			1.7	0.5	1.4	0.0	0.0	0.0	0.4	0.5	2.4	4.7	2.5	1.0	1.3
0-2 mi.			3.4	3.5	3.1	0.7	*	*	0.5	3.1	8.2	10.7	6.1	3.0	3.5
Brookings, Oreg.	151	5													
0-¼ mi.			4.8	5.3	6.1	4.2	4.3	3.0	17.4	17.5	13.0	8.4	9.1	10.7	9.0
0-½ mi.			6.8	7.2	7.5	5.7	5.7	9.3	19.3	20.3	14.9	9.8	11.1	13.6	10.9
0-2 mi.			14.6	16.4	15.2	11.6	10.6	14.1	26.4	26.6	21.2	16.5	17.2	22.3	17.7
Buffalo Springs, Calif.	1653	2													
0-¼ mi.			18.2	17.2	19.5	12.8	10.1	36.5	14.7	17.7	14.2	6.5	6.7	11.6	15.4
0-½ mi.			18.2	17.4	19.5	12.8	10.1	36.5	14.8	17.8	14.2	6.6	6.8	11.6	15.5
0-2 mi.			20.0	19.8	24.9	16.1	11.7	41.0	17.7	22.0	17.6	8.1	9.2	12.2	18.4
Estero, Calif.	6	5													
0-¼ mi.			2.0	3.2	5.3	6.3	8.4	9.6	18.1	17.5	15.7	12.7	5.7	2.8	9.0
0-½ mi.			2.3	3.9	5.8	7.6	9.2	11.1	19.9	18.7	16.9	13.6	5.9	2.9	9.9
0-2 mi.			3.4	5.2	6.9	10.1	12.2	15.3	24.4	23.4	22.6	17.0	6.4	4.6	12.7
Eureka, Calif.	60	2													
0-¼ mi.			1.9	0.4	0.9	0.6	0.1	2.0	3.1	4.8	6.2	11.8	6.8	6.0	3.8
0-½ mi.			2.2	0.4	1.2	0.6	0.1	2.3	3.8	6.1	7.3	13.1	7.1	7.2	4.4
0-2 mi.			3.1	1.4	3.2	1.4	3.0	4.6	10.0	15.1	12.3	21.7	12.7	12.2	8.5
Everett, Wash.	127	2													
0-¼ mi.			1.0	1.1	2.2	0.1	0.2	0.1	1.1	2.0	3.3	4.5	4.1	1.8	1.8
0-½ mi.			2.1	1.3	2.5	0.2	0.2	0.3	1.3	2.3	4.2	5.4	4.9	2.3	2.3
0-2 mi.			6.1	3.6	4.5	1.7	0.7	2.2	2.7	6.2	13.5	12.6	10.6	5.7	6.0
Fort Bragg, Calif.	74	5													
0-¼ mi.			0.5	0.0	0.2	0.9	1.7	2.0	5.0	5.0	7.9	2.8	2.2	3.1	2.7
0-½ mi.			0.5	0.4	0.7	1.1	1.7	4.0	5.5	5.8	8.5	3.4	2.7	3.3	3.2
0-2 mi.			2.7	0.4	1.6	2.0	4.5	5.7	10.0	8.6	17.1	9.0	5.6	6.2	6.2
Goleta, Calif.	20	2													
0-¼ mi.			0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	2.7	1.2	0.0	0.5
0-½ mi.			0.0	4.5	0.9	0.9	0.0	0.0	0.8	0.8	0.0	3.8	4.0	1.1	1.4
0-2 mi.			1.1	12.6	5.6	0.9	10.7	6.7	12.1	13.0	7.0	14.0	6.3	3.8	7.8
Laguna Beach, Calif.	205	6													
0-¼ mi.			2.2	2.1	3.6	2.5	0.9	0.7	0.8	2.0	2.8	4.5	2.2	1.1	2.1
0-½ mi.			2.7	2.8	4.5	3.2	1.2	1.2	1.4	2.8	3.7	6.0	2.8	1.4	2.8
0-2 mi.			5.0	7.7	9.4	7.0	4.4	5.7	5.1	7.1	8.4	12.9	7.2	3.0	6.9
Moclips, Wash.	63	4													
0-¼ mi.			0.5	0.3	0.4	0.0	1.4	1.2	7.6	8.7	7.2	3.5	0.5	1.7	2.8
0-½ mi.			1.7	1.5	1.3	0.5	2.2	2.1	10.2	14.7	10.0	5.4	0.7	2.7	4.5
0-2 mi.			5.9	6.2	4.6	2.4	4.8	3.8	13.6	21.8	17.8	11.3	5.4	9.3	9.0
Monterey, Calif.	152	2													
0-¼ mi.			0.4	0.0	0.0	0.9	0.0	2.1	4.4	2.0	1.2	2.1	0.9	1.8	1.4
0-½ mi.			0.4	0.0	0.0	0.9	0.0	2.1	5.6	3.6	1.2	2.1	1.8	2.2	1.7
0-2 mi.			0.8	1.8	0.0	0.9	1.7	3.4	11.6	4.8	1.2	2.5	2.3	2.6	2.9
Newport, Oreg.	159	7													
0-¼ mi.			0.9	0.5	1.9	1.2	1.2	1.4	5.2	9.5	10.0	7.5	2.8	1.9	3.7
0-½ mi.			1.2	0.9	2.1	1.7	1.5	2.2	6.2	11.9	11.3	8.5	3.8	2.9	4.6
0-2 mi.			3.7	5.4	5.8	4.4	4.6	5.4	12.6	20.2	19.5	19.7	11.0	9.0	10.2

*Indicates less than .05%

Stations	Elevation, Feet	Years of Record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
North Bend, Oreg.	207	7													
0-¼ mi.	------	------	1.6	1.0	1.9	1.8	2.4	2.0	2.9	6.1	6.3	7.8	5.3	2.9	3.5
0-½ mi.	------	------	1.9	2.2	2.6	2.6	2.7	2.0	4.2	6.8	9.1	9.9	6.5	4.2	4.6
0-2 mi.	------	------	3.0	4.7	5.7	4.8	4.6	6.1	8.4	12.8	16.7	15.4	8.9	8.5	8.4
North Head, Wash.	211	12													
0-¼ mi.	------	------	1.7	1.3	2.2	0.4	0.5	1.7	3.4	8.8	8.4	7.7	2.8	1.3	3.4
0-½ mi.	------	------	2.6	1.7	2.9	0.6	0.7	2.2	4.4	10.3	10.0	8.8	3.9	2.1	4.3
0-2 mi.	------	------	8.7	6.2	8.5	3.4	3.7	6.0	8.7	16.3	18.2	17.1	9.4	8.8	9.7
Point Arena, Calif.	238	7													
0-¼ mi.	------	------	4.0	0.9	3.3	3.1	8.3	9.1	17.0	25.2	17.0	11.7	4.2	5.4	9.2
0-½ mi.	------	------	5.5	2.1	3.7	3.7	9.9	10.2	20.7	27.0	17.6	12.6	5.0	5.7	10.4
0-2 mi.	------	------	10.2	4.8	7.5	6.7	15.8	14.5	31.2	36.4	24.6	18.1	8.3	9.2	15.7
Point Arguello, Calif.	112	9													
0-¼ mi.	------	------	3.3	1.8	2.9	4.2	6.7	10.0	19.8	14.5	11.1	6.6	1.8	0.9	7.0
0-½ mi.	------	------	4.5	2.3	4.4	6.3	7.8	12.7	23.0	17.1	13.5	7.8	3.2	1.3	8.7
0-2 mi.	------	------	8.7	5.9	7.6	9.7	10.5	17.9	30.4	21.9	18.6	11.3	5.3	3.9	12.7
Point Hueneme, Calif.	16	4													
0-¼ mi.	------	------	1.6	0.2	2.4	2.5	2.7	2.0	6.1	1.9	2.9	2.7	1.3	1.0	2.3
0-½ mi.	------	------	1.8	0.8	2.9	4.7	4.0	4.6	9.9	2.9	3.7	3.1	1.4	1.5	3.5
0-2 mi.	------	------	3.5	3.4	4.9	8.0	8.8	14.8	21.7	14.0	6.1	6.5	5.8	4.3	8.6
Point Fermin, Calif.	10	5													
0-¼ mi.	------	------	2.6	0.7	2.0	2.3	2.6	1.9	3.1	1.9	3.2	3.3	4.7	4.8	2.7
0-½ mi.	------	------	4.2	1.9	2.3	2.7	3.0	3.4	3.8	2.9	3.9	4.4	5.8	6.1	3.7
0-2 mi.	------	------	12.4	6.8	5.4	5.7	6.0	9.3	11.4	10.5	10.9	10.6	14.0	16.0	10.0
Point Montara, Calif.	64	4													
0-¼ mi.	------	------	1.0	0.7	0.3	1.2	4.0	2.2	6.9	5.0	7.0	6.3	4.3	4.7	3.7
0-½ mi.	------	------	1.3	1.3	0.7	2.1	5.8	3.9	12.5	8.3	10.2	7.6	6.6	6.2	5.6
0-2 mi.	------	------	7.2	7.6	4.1	5.5	9.1	8.6	25.0	16.9	15.4	11.3	10.3	14.8	11.4
Point Piedras Blancas, Calif.	69	5													
0-¼ mi.	------	------	3.2	0.9	2.2	2.7	7.5	11.9	27.7	18.3	17.8	7.5	4.5	1.4	8.9
0-½ mi.	------	------	3.4	0.9	2.6	2.9	7.7	12.3	28.2	18.6	18.1	7.5	4.5	1.4	9.1
0-2 mi.	------	------	4.8	2.9	3.0	4.1	8.1	13.7	30.2	20.3	19.7	8.5	5.5	3.2	10.4
Point Reyes, Calif.	260	5													
0-¼ mi.	------	------	2.1	1.0	2.0	3.3	6.5	4.7	14.4	10.1	14.8	9.9	7.3	8.5	7.1
0-½ mi.	------	------	3.6	3.4	3.6	6.4	8.6	6.4	18.6	15.2	17.7	13.5	11.2	11.1	10.0
0-2 mi.	------	------	13.4	8.2	6.5	10.9	14.7	12.4	32.3	29.6	26.4	20.7	19.9	21.6	18.2
San Diego, Calif.	28	10													
0-¼ mi.	------	------	0.8	1.1	1.7	0.6	0.2	0.5	0.1	0.4	0.4	3.0	1.5	1.3	1.0
0-½ mi.	------	------	1.0	1.6	2.1	0.7	0.3	0.7	0.3	0.6	0.6	3.7	1.8	1.6	1.3
0-2 mi.	------	------	2.6	6.2	5.3	2.1	1.4	2.8	1.9	2.2	4.4	9.0	5.0	3.4	3.9
Sand Point, Wash.	540	2													
0-¼ mi.	------	------	0.6	1.0	1.9	0.4	0.0	0.0	0.0	0.1	2.1	3.2	4.4	1.2	1.3
0-½ mi.	------	------	0.8	1.2	2.1	0.7	0.0	0.0	0.2	0.2	4.0	4.7	5.0	1.6	1.8
0-2 mi.	------	------	4.3	5.5	4.2	2.4	0.2	0.4	2.0	3.7	10.5	10.5	12.2	4.8	5.2
San Francisco, Calif.	18	5													
0-¼ mi.	------	------	2.7	0.9	1.1	0.3	*	0.0	0.1	0.2	0.6	0.8	3.0	4.7	1.1
0-½ mi.	------	------	3.3	1.3	1.2	0.4	*	0.0	0.1	0.3	0.7	1.1	3.7	5.5	1.4
0-2 mi.	------	------	10.2	5.9	3.2	1.3	0.2	0.4	0.3	1.3	2.9	7.3	13.3	16.7	5.2

*Indicates less than .05%

Stations	Elevation, Feet	Years of Record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
San Miguel I., Calif.	550	2													
0-¼ mi.			11.7	10.4	8.6	7.0	11.6	21.2	42.5	28.7	12.1	5.3	6.7	11.1	14.8
0-½ mi.			13.8	10.7	9.4	9.2	11.6	22.9	44.5	28.7	12.1	5.3	7.1	12.9	15.7
0-2 mi.			13.8	11.0	9.4	9.5	12.1	23.2	46.1	29.1	12.1	6.1	7.1	13.4	16.2
San Nicolas I., Calif.	137	5													
0-¼ mi.			4.4	1.1	1.1	0.8	1.7	1.0	2.4	1.8	1.0	1.3	1.3	2.3	1.7
0-½ mi.			6.1	1.4	1.7	1.4	2.7	1.8	3.0	2.9	2.4	3.0	2.0	2.9	2.6
0-2 mi.			9.7	2.3	4.7	6.1	5.7	6.1	10.3	4.8	3.9	7.3	6.1	4.8	6.0
Seattle, Wash.	30	8													
0-¼ mi.			4.2	3.4	1.2	0.5	0.1	0.1	*	0.7	4.0	10.6	8.9	5.5	3.3
0-½ mi.			5.5	4.4	1.5	0.6	0.1	0.2	0.1	1.2	5.7	12.6	11.1	7.4	4.2
0-2 mi.			18.1	14.3	4.6	2.7	1.0	1.2	1.9	8.1	18.6	29.2	25.1	18.4	11.9
Tatoosh I., Wash.	86	4													
0-¼ mi.			0.2	0.0	1.5	0.5	1.1	3.0	9.9	17.7	11.8	4.0	*	1.2	4.3
0-½ mi.			0.4	0.1	1.7	0.9	1.6	3.4	11.6	20.5	13.3	4.8	*	1.6	5.1
0-2 mi.			1.9	0.9	3.1	1.5	2.7	6.2	16.6	25.5	20.6	9.2	1.8	5.3	8.0

*Indicates less than .05%

Table 2.—Average Occurrence of Dense Fog

[PERCENT OF HOURS]

Stations	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Bellingham, Wash.	0.8	0.1	0.7	0.0	0.0	0.0	0.2	0.3	1.7	3.0	1.8	0.7	0.8
Brookings, Oreg.	3.0	3.6	3.2	2.5	4.6	11.4	14.5	13.7	10.3	0.0	3.0	5.0	6.2
Buffalo Springs, Calif.	16.6	14.3	17.1	10.4	10.1	34.0	13.7	17.5	14.0	4.1	6.6	8.6	13.9
Estero, Calif.	0.8	2.8	4.8	5.9	8.4	8.8	17.0	15.6	15.9	11.1	5.3	1.9	8.2
Eureka, Calif.	1.9	0.4	0.9	0.6	0.1	1.9	3.1	4.8	6.1	11.8	6.8	5.9	3.7
Everett, Wash.	1.0	1.0	1.9	0.1	0.2	0.1	1.0	2.0	3.5	4.5	4.1	1.7	1.7
Fort Bragg, Calif.	0.6	0.0	0.0	0.9	1.7	2.0	5.3	5.0	7.9	3.0	2.2	3.2	2.7
Goleta, Calif.	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	0.0	0.2
Laguna Beach, Calif.	1.8	1.7	3.2	2.1	0.6	0.4	0.5	1.5	1.9	3.5	1.9	1.1	1.7
Moclips, Wash.	0.5	0.2	0.5	0.0	1.0	1.2	7.7	8.4	7.1	3.5	0.5	1.7	2.7
Monterey, Calif.	0.0	0.0	0.0	1.8	0.0	0.9	1.3	0.0	1.2	1.3	0.0	0.4	0.6
Newport, Oreg.	0.9	0.4	1.9	1.0	1.0	1.5	6.0	9.5	8.5	5.4	1.0	1.6	3.3
North Bend, Oreg.	1.3	1.0	1.8	1.8	2.4	2.0	2.9	6.1	6.3	7.9	5.3	2.9	3.5
North Head, Wash.	2.2	1.3	1.8	0.5	0.4	1.9	1.5	8.7	7.7	8.4	3.0	1.2	3.2
Point Arena, Calif.	1.5	0.3	1.1	3.1	2.9	8.9	14.5	17.5	6.4	7.9	3.3	4.6	6.0
Point Arguello, Calif.	1.4	0.1	2.4	3.1	3.6	7.6	12.1	11.0	7.7	4.7	0.7	0.8	4.6
Point Fermin, Calif.	2.8	0.7	1.9	2.6	2.3	1.3	3.4	2.2	2.7	3.4	3.3	3.8	2.5
Point Hueneme, Calif.	1.5	0.2	1.3	1.4	2.1	1.2	2.0	1.5	2.4	2.2	1.0	1.0	1.5
Point Montara, Calif.	0.9	0.7	0.3	1.2	3.7	2.7	6.3	4.9	7.0	7.7	4.4	3.6	3.6
Point Piedras, Calif.	2.8	0.7	1.7	3.0	8.7	12.5	28.0	14.9	9.1	4.6	2.9	1.0	7.5
Point Reyes, Calif.	1.6	1.4	1.3	2.5	6.2	5.5	13.6	10.5	6.9	8.5	7.0	7.8	6.1
San Diego, Calif.	0.7	0.9	1.4	0.5	0.1	0.4	*	0.2	0.3	2.4	1.2	1.2	0.8
Sand Point, Wash.	0.6	1.0	2.0	0.4	0.0	0.0	0.0	0.0	2.2	3.2	4.4	1.3	1.3
San Francisco, Calif.	2.4	0.9	0.9	0.3	*	0.0	*	0.1	0.5	0.6	2.7	4.3	1.1
San Miguel I., Calif.	8.1	10.7	2.7	8.8	18.9	31.4	43.3	40.6	13.3	6.9	5.7	7.5	16.5
San Nicolas I., Calif.	3.8	0.7	0.8	1.1	2.1	0.8	1.5	2.0	0.7	0.3	1.3	2.2	1.4
Seattle, Wash.	3.5	3.0	1.0	0.3	*	0.1	*	0.4	3.3	9.0	7.4	4.6	2.7
Tatoosh Island, Wash.	0.6	0.3	0.1	1.4	1.4	3.8	8.4	16.0	9.6	3.4	0.9	0.0	3.8

*Less than ½ of 0.1 percent.

Table 3.—Duration of Fog

[IN HOURS]

Station	Period of record	January	February	March	April	May	June	July	August	September	October	November	December
San Diego:													
Average	1934–39	2.7	2.8	2.8	2.3	1.6	1.6	2.0	1.2	2.2	2.2	2.2	2.8
Maximum		7	10	9	6	4	4	7	2	5	5	12	10
San Francisco:													
Average	1934–38	3.5	2.2	3.0	3.3	1.0	0.0	1.3	1.3	2.8	1.7	3.0	3.4
Maximum		14	10	11	5	1	0	2	2	8	6	14	32
Seattle:													
Average	1934–41	3.9	5.1	3.5	2.5	1.6	2.7	1.0	2.2	3.4	4.8	5.5	4.7
Maximum		20	20	10	6	3	5	1	6	12	17	42	29

Meteorological Tables

COMPILED BY THE UNITED STATES WEATHER BUREAU

San Diego, Calif.—Position: Latitude 32°44′ N., longitude 117°10′ W.—Altitude: 28 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage)[1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog[2]	Thunderstorms	Heavy fog[2]	Thunderstorms	Poor visibility[3]	Gales[4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.08	30.48	29.48	54.7	62.9	46.5	85	25	68	4.5	68	1.83	2.65	0	7	0	2	1	0.7	0	1.5	----	10.2	13.8	15.6	10.0	8.1	8.1	10.2	23.0	1.0	5.2	29.5
February	30.06	30.53	29.48	55.6	63.2	47.9	89	34	72	4.8	66	2.04	2.90	0	7	0	2	x	0.9	0	3.1	----	8.9	10.3	12.7	8.9	9.5	7.9	13.6	27.0	1.2	6.0	28.7
March	30.02	30.45	29.46	57.2	64.4	50.0	99	36	71	4.6	68	1.51	2.40	0	7	0	2	x	1.4	0	3.1	----	7.9	7.4	10.0	7.8	11.6	11.6	21.5	22.2	0	6.1	40.0
April	29.99	30.36	29.61	59.3	65.8	52.8	96	39	72	4.6	67	0.68	3.23	0	5	0	1	x	0.5	0	1.0	----	5.7	4.8	7.0	5.6	12.4	17.2	25.9	21.4	0	6.1	28.7
May	29.95	30.26	29.67	61.5	67.0	56.0	98	45	74	4.8	60	0.30	1.45	0	3	0	1	x	0.1	0	0.7	----	4.7	2.7	3.5	3.5	15.8	23.3	26.8	19.7	0	6.1	23.5
June	29.91	30.12	29.66	64.2	69.5	59.0	96	50	77	4.3	61	0.05	0.25	0	1	0	1	x	0.4	x	1.3	----	5.8	2.0	2.0	2.1	14.3	23.7	28.1	22.0	0	6.1	22.6
July	29.91	30.12	29.66	67.8	73.0	62.5	100	54	78	3.6	68	0.04	0.83	0	x	0	1	1	x	0.1	0.7	----	5.5	1.5	0	1.1	11.8	22.4	31.5	26.2	0	6.1	15.6
August	29.91	30.16	29.64	69.1	74.4	63.8	94	54	78	3.3	70	0.09	1.80	0	1	0	1	1	0.2	x	1.1	----	5.6	1.0	0	1.4	9.6	19.6	32.4	30.4	0	6.1	20.0
September	29.89	30.14	29.53	67.6	73.6	61.6	110	50	77	3.2	71	0.11	1.50	0	1	0	2	x	0.3	x	1.8	----	6.7	2.6	2.1	3.2	9.7	13.8	23.5	37.4	1.0	5.2	15.6
October	29.95	30.24	29.57	64.0	70.9	57.0	96	44	72	3.5	70	0.45	3.24	0	3	0	3	x	2.4	0	5.2	----	10.0	6.5	6.5	4.8	11.0	11.0	18.9	30.2	1.1	5.2	17.4
November	30.02	30.39	29.52	60.2	68.8	51.6	93	36	66	3.3	77	0.89	2.75	0	4	0	3	x	1.2	x	3.1	----	10.1	12.2	13.4	7.5	6.6	6.3	11.9	31.0	1.0	4.3	44.3
December	30.07	30.45	29.56	56.6	64.9	48.3	84	32	68	4.3	70	2.00	3.62	0	7	0	2	x	1.2	0	2.0	----	10.2	12.6	17.1	11.3	8.8	8.2	9.3	21.5	1.0	5.2	27.8
Mean	29.88	----	----	61.5	68.2	54.8	----	----	73	4.1	68	----	----	----	----	----	----	----	0.8	x	2.1	----	----	----	----	----	----	----	----	----	----	6.1	----
Total	----	----	----	----	----	----	----	----	----	----	----	9.99	----	0	46	0	21	3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.53	29.46	----	----	----	110	25	----	----	----	----	3.62	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	44.3
Number Years Record	71	78	78	75	75	75	78	78	5	62	58	100	78	100	78	78	39	78	9	9	9	----	9	9	9	9	9	9	9	9	9	18	6

[1] Mean of 0430—1030—1630—2230 (P. S. T.).
[2] Visibility—Less than 1/8 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
[5] 0430 and 1630—62 yr. record; 1030 and 2230—10 yr. record.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
† Statute miles.
# Greater than.
x Less than 1 day.

Santa Catalina, Calif.—Position: Latitude 33°24′ N., longitude 118°25′ W.—Altitude: 1580 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [1]	Thunderstorms	Heavy fog	Thunderstorms	Poor visibility	Gales	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	----	30.45	29.56	53.2	59.8	46.6	78	29	----	----	----	0.51	0.73	0.6	3	1	8	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
February	----	30.39	29.63	53.6	60.4	46.8	75	32	----	----	----	1.59	1.25	0	6	0	9	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
March	----	30.35	29.71	51.8	57.8	45.8	79	38	----	----	----	2.32	1.38	0	6	0	12	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
April	----	30.35	29.66	56.0	62.3	49.7	88	40	----	----	----	0.55	1.04	0	3	0	12	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
May	----	30.17	29.65	57.6	64.3	50.9	91	45	----	----	----	0.17	0.12	0	3	0	15	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
June	----	30.07	29.66	62.0	69.5	54.4	89	47	----	----	----	0.08	0.24	0	2	0	13	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
July	----	30.10	29.72	68.2	77.3	59.1	94	50	----	----	----	T	T	0	0	0	14	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
August	----	30.07	29.70	69.4	78.0	60.8	96	51	----	----	----	T	T	0	0	0	9	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
September	----	30.09	29.64	71.1	79.9	62.3	102	50	----	----	----	0.02	0.03	0	1	0	6	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
October	----	30.22	29.58	62.1	70.8	53.3	92	41	----	----	----	0.19	0.13	0	3	0	12	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
November	----	30.27	29.57	59.5	66.0	53.0	88	43	----	----	----	1.11	1.15	0	2	0	7	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
December	----	30.36	29.46	53.5	59.2	47.7	77	37	----	----	----	3.00	1.70	0	5	0	11	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mean	----	----	----	59.8	67.1	52.5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total	----	----	----	----	----	----	----	----	----	----	----	9.54	----	0.6	34	1	128	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.45	29.46	----	----	----	102	29	----	----	----	----	1.70	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Number years record	----	5	5	5	5	5	5	5	----	----	----	5	5	5	5	5	5	5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

[1] Visibility—Less than 1/5 mile.
T Trace (less than 0.05 inches snow or 0.005 inches rain).

94926S—52——33

Los Angeles, Calif.—Position: Latitude 34°03′ N., longitude 118°14′ W.—Altitude: 512 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage)[1]	Mean cloud amount (0-10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog[2]	Thunderstorms	Heavy fog	Thunderstorms	Poor visibility	Gales	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.07	30.50	29.46	55.5	64.9	46.1	90	28	58	3.9	70	2.91	4.20	T	6	x	1	x	----	----	----	*	12.5	32.0	13.6	7.3	6.6	11.1	8.9	8.0	0	5	43
February	30.05	30.59	29.42	56.3	65.5	47.1	92	28	63	4.3	68	3.27	5.12	T	6	0	1	1	----	----	----	1	7.3	25.1	14.4	9.4	7.5	18.0	10.0	8.3	0	6	40
March	30.02	30.46	29.36	58.0	67.3	48.8	99	31	63	4.4	69	2.74	6.28	0.0	6	0	2	1	----	----	----	1	4.3	20.0	14.5	11.7	10.4	23.1	8.6	7.4	0	6	36
April	29.99	30.40	29.61	60.3	69.7	50.9	100	36	66	4.3	68	1.01	3.14	0.0	4	0	2	1	----	----	----	*	2.5	12.9	15.5	13.2	11.4	30.2	8.8	5.5	0	5	30
May	29.95	30.25	29.54	62.8	71.9	53.7	103	40	70	4.4	64	0.36	1.76	0.0	2	0	2	1	----	----	----	0	1.3	6.9	13.6	16.0	14.8	35.3	9.8	2.3	0	5	34
June	29.91	30.14	29.64	66.5	76.2	56.8	105	46	69	3.6	69	0.08	0.87	0.0	1	0	2	x	----	----	----	0	1.0	4.0	10.6	15.5	17.0	38.6	11.2	2.1	0	5	28
July	29.92	30.14	29.63	70.6	81.2	60.0	109	49	68	2.9	78	0.01	0.24	0.0	x	0	2	x	----	----	----	0	0	2.3	8.6	12.9	15.8	41.3	15.2	3.9	0	5	18
August	29.88	30.15	29.60	71.5	82.1	60.9	106	49	68	2.7	80	0.03	0.61	0.0	x	0	2	x	----	----	----	*	1.0	2.8	9.3	11.5	14.3	40.5	16.5	4.1	0	5	28
September	29.89	30.13	29.49	69.9	80.7	59.0	108	44	65	2.8	78	0.20	5.42	0.0	1	0	3	x	----	----	----	0	2.2	8.1	14.9	11.6	11.6	32.2	14.2	4.2	1.0	5	28
October	29.96	30.26	29.51	65.8	76.2	55.3	102	40	63	3.1	75	0.62	3.62	0.0	2	0	3	x	----	----	----	0	5.5	18.0	14.6	9.8	9.5	24.4	12.8	5.4	0	5	30
November	30.03	30.40	29.47	62.0	72.7	51.2	96	34	53	2.9	79	1.14	3.79	T	3	0	2	x	----	----	----	0	12.4	27.4	13.2	7.1	7.1	14.6	11.0	7.2	0	5	37
December	30.06	30.49	29.53	57.2	66.8	47.8	92	30	54	3.6	72	2.87	7.36	T	6	0	1	x	----	----	----	*	13.8	32.2	13.6	6.6	6.5	10.1	8.6	8.6	0	5	38
Mean	29.99	----	----	63.0	72.9	53.1	----	----	63	3.6	72	----	----	----	----	----	----	----	----	----	----	*	----	----	----	----	----	----	----	----	----	5	----
Total	----	----	----	----	----	----	----	----	----	----	----	15.24	----	----	39	x	23	5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.59	29.36	----	----	----	109	28	----	----	----	----	7.36	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	43
Number years record	70	70	70	72	72	72	72	72	33	72	53	72	72	72	72	72	72	66	----	----	----	5	12	12	12	12	12	12	12	12	12	72	72

[1] Mean of 0500—1200—1700 (P. S. T.).
[2] Visibility—Less than 1/8 mile.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
x Less than 1 day.

Santa Maria, Calif.—Position: Latitude 34°56′ N., longitude 120°25′ W.—Altitude: 238 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0-10)	Possible sunshine (percentage of hours)	Precipitation				Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)												Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [2]	Thunderstorms	Heavy fog	Thunderstorms	Poor visibility	Gales	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.14	30.51	29.72	49.8	63.3	36.4	82	22	69	3.8	----	1.41	2.55	T	5	0	3	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
February	30.07	30.38	29.55	51.0	62.6	39.5	87	28	74	5.1	----	2.00	2.07	0	8	0	4	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
March	30.05	30.44	29.72	53.1	64.1	42.1	85	31	74	5.2	----	2.34	2.52	0	11	0	4	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
April	30.04	30.40	29.82	55.7	67.3	44.1	97	32	75	4.8	----	0.67	1.32	0	4	0	6	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
May	30.00	30.22	29.82	57.5	67.8	47.2	90	37	76	4.7	----	0.28	0.69	0	2	0	7	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
June	29.97	30.18	29.73	60.6	71.2	50.1	95	42	75	3.6	----	0.02	0.11	0	1	0	6	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
July	29.98	30.15	29.78	61.8	71.4	52.2	86	43	79	3.4	----	T	T	0	0	0	7	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
August	29.95	30.11	29.81	61.7	71.7	51.6	92	43	79	3.5	----	0.02	0.11	0	0	0	10	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
September	29.92	30.16	29.69	62.6	74.5	50.8	102	36	76	3.2	----	0.01	0.02	0	1	0	12	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
October	29.99	30.28	29.68	59.6	72.2	47.0	94	30	74	3.6	----	0.42	0.55	T	3	0	12	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
November	30.05	30.30	29.66	55.5	69.4	41.6	92	30	67	3.8	----	0.99	1.30	0	6	0	7	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
December	30.08	30.41	29.50	51.6	63.6	39.6	86	26	72	5.1	----	2.22	1.66	0	8	0	3	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mean	30.02	----	----	56.7	68.3	45.2	----	----	74	4.2	----	----	----	0	----	----	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total	----	----	----	----	----	----	----	----	----	----	----	10.38	----	----	49	0	81	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.51	29.50	----	----	----	102	22	----	----	----	----	2.55	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Number years record	4	4	4	7	7	7	7	7	7	7	----	7	7	7	7	7	----	7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

[1] Mean of 0430—1030—1630—2230 (P. S. T.).
[2] Visibility—Less than 1/8 mile.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
x Less than 1 day.

949286—52——38

San Francisco, Calif.—Position: Latitude 37°37′ N., longitude 122°23′ W.—Altitude: 18 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [2]	Thunderstorms	Heavy fog [2]	Thunderstorms	Poor visibility [3]	Gales [4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.12	30.62	29.85	50.1	55.2	44.9	78	29	76	5.5	53	4.63	4.67	T	11	0	2	x	2.4	0	5.2	*	23.0	13.6	4.1	17.1	7.2	5.6	9.8	19.6	0	6	41
February	30.10	30.62	29.13	52.7	58.4	47.0	80	33	73	5.1	57	3.75	3.60	0.1	11	x	2	x	0.9	x	2.5	1	12.1	11.6	3.3	17.7	8.8	12.2	16.6	17.7	0	7	42
March	30.06	30.64	29.24	54.3	60.6	48.3	86	33	70	4.4	63	3.11	3.65	T	10	x	1	x	0.9	0	1.8	*	8.1	7.1	2.9	10.6	7.0	16.2	31.2	16.9	0	8	38
April	30.05	30.48	29.43	55.7	62.1	49.4	89	40	70	3.8	71	1.52	2.43	0.0	6	0	x	x	0.3	0	0.6	1	3.6	4.2	1.5	7.9	5.9	21.4	40.3	15.2	0	9	33
May	30.00	30.35	29.63	57.0	63.3	50.8	97	42	72	3.8	70	0.68	1.42	0.0	4	0	x	x	x	0	0.1	1	1.3	2.7	1.5	5.0	2.8	31.2	47.5	8.0	0	10	33
June	29.96	30.38	29.62	58.9	65.5	52.3	100	46	74	3.2	75	0.15	1.23	0.0	2	0	1	x	0	0	0.2	1	0	1.2	1.0	2.6	3.8	40.2	47.4	3.8	0	10	33
July	29.96	30.28	29.65	58.9	65.0	53.0	99	47	78	3.9	69	0.01	0.23	0.0	x	0	1	x	x	0	0.1	*	0	0	0	1.0	2.7	58.4	36.4	1.5	0	10	33
August	29.95	30.29	29.50	59.4	65.2	53.5	92	46	80	4.2	63	0.02	0.25	0.0	x	0	1	x	0.1	0	0.8	1	0	0	0	1.9	2.4	48.5	45.0	1.2	1.0	10	30
September	29.95	30.26	29.50	61.6	68.5	54.8	101	47	74	3.5	70	0.28	3.58	0.0	2	0	1	x	0.5	0	1.1	*	1.9	1.9	1.0	5.2	3.5	35.0	46.4	4.1	1.0	8	33
October	30.02	30.39	29.54	60.7	67.8	53.8	96	43	70	3.7	70	0.96	2.03	T	4	0	2	x	0.6	0.1	2.6	*	8.4	5.6	2.0	10.1	6.1	20.0	35.6	11.2	1.0	7	35
November	30.10	30.51	29.44	56.8	62.9	50.7	83	38	70	4.1	63	2.42	3.98	0.0	7	0	2	x	2.7	0	6.2	*	18.4	11.5	2.9	15.2	6.8	9.0	18.2	16.9	1.0	6	44
December	30.13	30.61	29.33	51.5	56.4	46.5	74	27	74	5.0	54	4.36	3.44	0.1	10	0	2	x	4.3	0	9.0	1	23.8	14.5	3.9	18.3	7.2	5.2	7.8	19.3	0	6	44
Mean	30.03	----	----	56.5	62.6	50.4	----	----	73	4.2	66	----	----	----	----	----	----	----	1.1	x	2.5	1	----	----	----	----	----	----	----	----	----	8	----
Total	----	----	----	----	----	----	----	----	----	----	----	21.89	----	0.2	67	x	15	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.64	28.85	----	----	----	101	27	----	----	----	----	4.67	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	44
Number years record	58	58	58	79	75	75	79	79	30	60	59	101	79	79	79	79	59	59	5	5	5	5	32	32	32	32	32	32	32	32	32	60	38

[1] Mean of 0500—1200—1700 (P. S. T.).
[2] Visibility—Less than 1/5 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
x Less than 1 day.

Eureka, Calif.—Position: Latitude 40°48′ N., longitude 124°10′ W.—Altitude: 60 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)										Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [2]	Thunderstorms	Heavy fog [2]	Thunderstorms	Poor visibility [3]	Gales [4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.12	30.66	29.02	46.9	52.9	40.9	77	20	82	6.8	39	7.11	5.10	0.2	17	0	4	1	3.1	0.2	5.5	*	11.6	9.0	10.2	30.1	15.1	12.2	4.3	4.4	3.1	6.1	57
February	30.10	30.65	28.93	47.2	53.4	41.1	85	24	81	6.8	42	6.48	4.91	0.1	15	0	3	1	2.3	0	4.5	0	16.4	7.0	8.7	27.2	12.7	12.5	6.2	6.8	2.5	6.9	47
March	30.10	30.55	29.05	48.3	54.0	42.6	78	29	80	6.3	48	5.23	3.94	0.1	16	0	2	0	1.9	0	3.4	0	27.3	7.6	5.2	20.2	9.7	10.8	6.9	9.9	2.4	6.9	49
April	30.11	30.56	29.29	49.9	55.5	44.3	79	31	81	6.3	52	3.33	2.87	T	12	0	1	0	1.6	0	3.5	0	29.0	5.8	4.2	16.3	9.6	13.2	7.4	13.0	1.5	7.8	54
May	30.08	30.49	29.38	52.0	56.9	47.2	84	35	82	6.3	54	1.80	2.24	0.0	9	0	1	0	0.3	0	1.0	0	35.1	4.1	3.1	8.5	6.2	12.5	8.2	20.3	2.0	7.8	42
June	30.06	30.36	29.65	54.3	58.7	49.9	85	40	83	5.9	55	0.72	1.99	0.0	5	0	2	0	1.2	0	3.6	0	26.8	2.8	1.8	5.0	5.5	11.9	9.0	25.2	2.0	6.9	38
July	30.06	30.32	29.68	55.5	59.6	51.4	76	43	85	6.0	50	0.11	1.18	0.0	2	0	5	0	1.5	0	3.7	0	30.0	2.4	0	2.4	7.3	17.2	11.3	27.8	1.6	5.2	41
August	30.04	30.26	29.72	56.0	60.2	51.9	79	44	85	6.3	44	0.18	2.63	0.0	2	0	6	0	4.0	0	9.8	0	23.7	3.9	2.2	5.5	6.8	14.5	12.5	28.4	2.5	5.2	37
September	30.02	30.35	29.56	55.9	61.2	50.6	85	36	84	5.6	49	1.01	2.77	0.0	5	0	8	0	6.2	0	12.4	0	23.2	6.2	5.0	11.4	8.3	13.5	10.1	18.7	3.6	5.2	43
October	30.07	30.46	29.40	53.6	59.5	47.8	84	34	83	5.9	48	2.33	3.61	0.0	9	0	9	0	10.4	0	2.05	0	21.0	7.6	7.6	19.6	9.2	12.6	7.6	11.6	3.2	5.2	43
November	30.12	30.57	29.33	51.1	57.4	44.8	81	27	82	6.6	42	5.18	4.55	0.0	12	0	6	1	13.6	0	2.05	0	12.2	8.1	10.8	28.2	12.6	12.3	5.8	7.1	2.9	5.2	43
December	30.12	30.71	29.11	48.2	54.4	42.0	70	22	82	6.4	41	6.28	4.17	T	16	0	4	1	2.1	0.1	5.2	0	12.4	9.4	11.6	31.5	11.6	10.7	4.5	5.8	2.5	6.1	52
Mean	30.08	----	----	51.6	57.0	46.2	----	----	82	6.3	47	----	----	T	----	0	----	----	4.0	x	7.9	*	----	----	----	----	----	----	----	----	----	6.1	----
Total	----	----	----	----	----	----	----	----	----	----	----	39.76	----	----	120	----	51	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.71	28.93	----	----	----	85	20	----	----	----	----	5.10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	57
Number years record	59	59	59	63	63	63	63	63	41	63	54	63	63	63	63	63	63	63	6	6	6	3	9	9	9	9	9	9	9	9	9	62	62

[1] Mean of 0500—1200—1700 (P. S. T.).
[2] Visibility—Less than 1/5 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
T Trace (less than 0.05 inches snow or 0.005 inches rain)
* Less than 0.5.
x Less than 1 day.

North Head, Wash.—Position: Latitude 46°18′ N., longitude 124°05′ W.—Altitude: 211 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0-10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [2]	Thunderstorms	Heavy fog [2]	Thunderstorms	Poor visibility [3]	Gales [4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.03	30.70	28.72	42.1	46.1	38.0	67	11	83	7.8	28	8.29	4.29	2.4	22	----	3	x	1.3	0	5.7	8	7.8	3.9	30.8	21.3	15.7	7.5	6.5	6.5	0	14	63
February	30.04	30.79	29.01	43.4	47.7	39.1	71	14	85	7.3	37	7.15	3.69	1.6	19	----	3	x	1.1	0	3.3	7	13.6	3.7	18.4	19.5	20.0	8.7	8.7	7.4	0	17	63
March	30.04	30.62	28.78	45.3	49.8	40.8	79	22	84	7.1	42	5.73	2.98	0.4	19	----	2	x	2.0	0	5.3	7	19.4	2.8	8.4	12.7	18.5	10.2	11.7	16.3	0	17	63
April	30.07	30.69	29.24	48.2	52.7	43.8	88	33	83	6.9	48	3.95	2.74	T	17	----	1	x	0.3	0	1.9	4	23.8	2.3	6.1	8.2	20.7	10.8	10.3	17.8	0	17	52
May	30.07	30.62	29.26	51.7	55.8	47.5	86	35	84	6.9	48	2.84	2.63	T	15	----	2	x	0.4	0	2.2	3	33.2	1.3	1.9	4.6	18.5	10.6	12.3	17.6	0	17	50
June	30.07	30.54	29.29	55.0	58.9	51.1	97	44	86	6.8	48	2.23	2.00	0.0	13	----	2	x	1.7	0.1	3.8	1	35.2	1.0	1.4	3.5	17.7	7.8	10.4	23.2	0	16	50
July	30.09	30.43	29.64	57.5	61.3	53.7	97	46	89	6.4	50	0.97	1.74	0.0	9	----	4	x	2.5	x	7.1	1	56.0	0	0	1.0	10.8	4.7	5.4	22.1	0	16	42
August	30.07	30.36	29.49	58.2	62.2	54.2	94	46	90	6.5	46	1.11	1.78	0.0	9	----	8	x	7.7	0.1	13.3	*	49.3	1.5	0	3.6	19.0	6.7	5.9	14.0	0	14	33
September	30.03	30.50	29.20	56.9	61.4	52.5	93	42	91	6.2	48	2.88	2.89	0.0	12	----	7	1	8.1	x	13.7	1	39.6	3.4	4.3	7.9	22.2	5.3	5.8	11.5	0	14	49
October	30.05	30.62	28.98	53.5	57.8	49.2	87	27	87	6.8	41	5.08	2.94	T	16	----	6	x	7.0	x	12.6	6	21.9	4.0	10.2	16.8	28.3	4.8	5.4	8.6	0	16	63
November	30.05	30.74	28.95	48.4	52.4	44.3	74	20	85	7.6	31	8.09	3.27	0.1	20	----	2	1	2.6	0	6.3	8	15.8	3.3	20.3	24.0	18.9	7.2	5.8	4.7	0	18	63
December	30.04	30.76	28.75	44.1	48.0	40.3	66	16	85	7.8	27	9.35	3.59	0.4	22	----	2	x	1.0	x	4.9	10	8.7	2.8	25.8	25.6	17.8	5.8	6.7	6.8	0	20	63
Mean	30.06	----	----	50.4	54.5	46.2	----	----	86	7.0	41	----	----	----	----	----	----	----	3.0	x	6.8	5	----	----	----	----	----	----	----	----	----	17	----
Total	----	----	----	----	----	----	----	----	----	----	----	57.67	----	4.9	193	----	42	2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.79	28.72	----	----	----	97	11	----	----	----	----	4.29	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	63
Number years record	53	53	53	62	62	62	62	62	37	56	44	72	63	60	62	----	63	62	12	12	12	3	9	9	9	9	9	9	9	9	9	47	6

[1] Mean of—0430—1030—1630—2230 (P. S. T.).
[2] Visibility—Less than 1/5 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
x Less than 1 day.

Tatoosh Island, Wash.—Position: Latitude 48°23′ N., longitude 124°44′ W.—Altitude 86 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow 0.1 inch or more	Heavy fog [2]	Thunderstorms	Heavy fog [2]	Thunderstorms	Poor visibility [3]	Gales [4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.00	30.77	28.62	41.7	44.8	38.6	64	7	83	7.8	27	11.24	4.56	3.3	22	3	1	x	0.2	0	1.1	17	1.0	5.6	49.6	6.4	17.8	7.5	8.6	3.5	0	17	76
February	30.00	30.75	28.94	42.5	45.9	39.1	64	13	83	7.2	37	9.02	4.57	2.2	18	3	1	x	0.0	0	0.2	6	1.0	6.6	43.9	6.4	21.1	9.4	9.6	2.0	0	15	73
March	30.00	30.58	28.76	44.2	48.0	40.4	69	24	82	7.2	40	7.96	4.76	0.6	20	2	1	x	1.5	x	2.3	4	1.0	10.2	24.3	4.2	20.4	14.3	17.8	7.8	0	14	67
April	30.05	30.62	29.19	47.0	51.1	43.0	75	33	83	7.1	44	5.54	3.77	T	17	0	1	x	0.4	0	1.3	2	3.0	8.3	21.5	4.1	20.7	16.9	20.0	5.5	0	11	56
May	30.05	30.60	29.16	50.6	54.5	46.6	81	35	85	7.0	47	3.75	2.22	T	14	0	3	x	1.2	0	2.1	3	1.0	5.4	11.8	3.9	23.3	24.7	26.5	3.4	0	10	50
June	30.06	30.52	29.35	53.6	57.4	49.7	84	43	88	6.9	48	3.09	2.75	0.0	13	0	4	x	3.0	0	5.0	1	3.0	4.7	8.7	1.0	24.4	25.9	27.1	4.2	1.0	9	50
July	30.08	30.47	29.58	55.4	59.4	51.5	88	44	91	6.7	48	1.79	3.72	0.0	10	0	9	x	9.9	0.2	13.6	*	2.0	3.7	4.2	1.0	37.6	32.1	16.4	2.0	1.0	9	46
August	30.06	30.42	29.55	55.6	59.6	51.5	80	43	93	6.9	45	1.93	2.78	0.0	10	0	13	x	17.8	0	23.2	*	1.0	4.3	8.2	1.0	41.3	30.3	11.9	1.0	1.0	9	38
September	30.02	30.51	29.20	54.1	58.3	49.9	80	40	90	6.4	47	4.28	3.79	0.0	12	0	9	x	11.8	0.1	16.3	*	3.0	14.7	19.5	3.0	32.1	16.6	8.3	2.8	0	10	56
October	30.03	30.66	28.85	51.4	55.0	47.7	77	33	89	6.9	38	8.21	5.91	0.0	17	0	6	1	4.0	x	6.3	*	1.0	11.7	38.4	4.5	22.2	10.1	8.6	3.5	0	12	59
November	30.00	30.75	28.72	46.9	50.2	43.6	68	25	86	7.9	25	11.23	4.49	0.3	21	.4	1	1	x	0	0.7	11	1.0	5.6	52.4	6.1	16.9	7.4	6.8	3.8	0	16	82
December	29.98	30.80	28.66	43.7	46.8	40.6	60	19	85	7.8	24	12.73	4.28	0.7	23	1	1	1	1.2	0.2	2.7	14	1.0	3.4	45.3	7.6	21.8	8.1	8.5	4.3	0	17	74
Mean	30.02	----	----	48.9	52.6	45.2	----	----	86	7.2	42	----	----	----	----	----	----	----	4.3	0.1	6.3	5	1.6	7.0	27.3	4.1	25.0	16.9	14.2	3.7	0	12.2	----
Total	----	----	----	----	----	----	----	----	----	----	----	80.77	----	7.1	197	9.4	50	3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.80	28.62	----	----	----	88	7	----	----	----	----	5.91	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	82
Number years record	62	62	62	61	61	61	61	61	38	43	39	72	62	59	62	40	64	64	5	5	5	5	7	7	7	7	7	7	7	7	7	18	59

[1] Mean of 0430—1030—1630—2230 hr. (P. S. T.).
[2] Visibility—Less than 1/8 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
x Less than 1 day.

Seattle, Wash.—Position: Latitude 47°26′ N., longitude 122°20′ W.—Altitude 388 feet

Month	Pressure reduced to sea level (inches)			Air Temperature (° F.)					Mean humidity (percentage) [1]	Mean cloud amount (0–10)	Possible sunshine (percentage of hours)	Precipitation			Mean number of days with—				Percentage of observations with—				Wind										
		Extremes		Mean			Extremes					Amount (inches)											Direction (percentage of observations)									Speed (knots)	
	Mean	Highest	Lowest	Daily	Maximum	Minimum	Maximum	Minimum				Mean	Maximum in 24 hours	Snowfall	Precip. .01 in. or more	Snow	Heavy fog [2]	Thunderstorms	Heavy fog [2]	Thunderstorms	Poor visibility [3]	Gales [4]	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Mean	Maximum
January	30.05	30.75	28.80	40.4	44.8	36.0	67	3	80	7.9	26	4.73	2.47	4.7	18	3	2	x	3.5	0	10.9	*	1.0	5.7	48.9	6.8	18.0	7.7	8.8	3.1	0	9	39
February	30.05	30.75	28.99	42.4	47.7	37.0	70	4	76	7.4	35	3.81	2.69	3.4	16	2	3	x	3.0	0	8.0	*	11.4	13.5	9.3	25.2	24.7	8.2	2.8	4.9	0	9	43
March	30.03	30.59	28.96	45.7	52.2	39.3	81	20	73	7.0	44	3.10	2.92	0.8	16	1	2	x	1.0	x	2.3	*	2.0	10.2	24.0	4.1	19.6	14.5	17.9	7.7	0	9	36
April	30.06	30.63	29.24	50.4	58.1	42.8	87	30	71	6.5	50	2.26	1.74	0.1	13	0	1	x	0.3	0	1.1	*	15.8	10.5	5.7	15.9	22.5	12.8	7.5	9.3	0	8	39
May	30.05	30.54	29.30	55.7	63.8	47.6	92	36	69	6.3	52	1.82	1.35	T	12	0	x	1	x	0.1	0.4	0	1.0	5.4	11.7	3.3	23.4	24.6	26.9	3.7	0	8	34
June	30.04	30.48	29.43	60.2	68.6	51.9	98	40	70	6.0	53	1.38	1.42	0.0	9	0	x	1	0.1	x	0.4	*	18.3	14.5	3.1	7.5	18.7	13.8	10.2	13.8	0	7	32
July	30.06	30.43	29.57	64.4	72.4	54.1	100	46	68	4.5	64	0.64	1.00	0.0	5	0	x	1	x	0.1	0.5	*	1.9	3.4	4.1	1.3	27.7	31.6	28.0	1.0	1.0	7	26
August	30.04	30.44	29.52	64.1	73.0	55.2	96	46	74	4.8	59	0.70	1.43	0.0	5	0	2	1	0.4	x	3.6	0	1.0	4.2	7.9	1.9	40.9	30.4	10.9	1.8	1.0	6	27
September	30.03	30.51	29.27	59.5	67.1	51.9	92	36	76	5.7	50	1.71	1.64	0.0	8	0	4	1	3.3	0.1	10.5	*	21.5	10.9	3.8	13.1	21.3	8.2	6.0	12.4	2.8	7	33
October	30.06	30.69	29.07	52.9	58.9	47.0	82	29	83	7.0	34	2.90	2.22	T	13	0	6	1	9.0	x	19.5	*	1.0	11.0	38.9	4.6	22.5	9.8	9.3	2.9	0	7	45
November	30.06	30.76	28.93	46.3	51.1	41.5	70	15	85	7.9	24	4.84	3.20	0.9	17	1	4	x	7.4	0	17.4	*	12.6	12.5	8.5	28.8	23.8	6.1	2.9	4.8	0	8	45
December	30.06	30.83	28.91	42.3	46.5	38.0	65	12	84	7.9	22	5.55	3.52	1.5	19	2	3	x	4.6	0	11.8	*	1.0	3.1	45.3	7.7	21.9	8.1	8.8	4.1	0	9	51
Mean	30.05	----	----	52.0	58.7	45.2	----	----	76	6.6	43	----	----	----	----	----	----	----	2.7	x	7.2	*	----	----	----	----	----	----	----	----	----	8	----
Total	----	----	----	----	----	----	----	----	----	----	----	33.44	----	11.4	151	9	27	6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	30.83	28.80	----	----	----	100	3	----	----	----	----	3.52	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Number years record	54	54	54	59	59	59	59	59	10	56	54	72	59	57	59	37	50	56	9	9	9	9	32	32	32	32	32	32	32	32	32	17	6

[1] Mean of 0430—1030—1630—2230 hr.
[2] Visibility—Less than 1/5 mile.
[3] Visibility—1 mile or less.
[4] Winds—Force 7 or greater.
T Trace (less than 0.05 inches snow or 0.005 inches rain).
* Less than 0.5.
x Less than 1 day.

Ocean Area No. 1.—Position: Latitude 30°-35° N., longitude 115°-120° W., Greenwich Noon Observations—Years covered 1885-1934

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentages of observations from— N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Weather: Percentages of observations recording Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (percentage)	Average air temperature	Average sea surface temperature
January	1,142	6.0	11	8	7	6	5	7	14	33	9	8	2	3	1	3	0	3	0	3	0	1	11	42	57.2	58.6
February	1,084	6.5	9	6	5	7	5	5	13	41	9	8	3	3	1	2	0	2	0	1	0	0	10	48	57.4	57.8
March	1,089	6.5	8	4	5	4	5	6	19	41	8	10	4	2	1	2	0	2	0	2	0	0	9	50	57.4	58.3
April	1,151	7.2	5	3	4	4	4	7	21	46	6	11	4	2	1	1	0	1	0	1	0	0	8	35	58.3	58.8
May	1,154	6.8	3	2	2	4	4	6	22	48	9	13	4	3	1	0	0	0	0	1	0	0	7	66	59.2	59.7
June	1,085	6.5	2	2	3	5	5	9	21	45	8	14	6	5	1	0	0	1	0	0	0	0	7	70	60.9	61.3
July	1,122	5.7	3	1	3	4	6	6	19	48	10	19	5	5	1	1	0	0	0	0	0	0	5	75	63.4	64.1
August	1,136	6.0	2	1	1	5	5	7	21	50	8	15	3	4	0	0	0	0	0	0	0	0	7	72	64.6	65.5
September	1,142	6.5	4	1	2	3	4	8	18	52	8	16	3	4	0	0	0	1	0	0	0	0	9	60	64.6	65.2
October	1,208	5.7	5	4	3	6	3	5	18	44	12	13	4	5	0	1	0	1	0	1	0	0	9	54	62.9	63.8
November	1,161	5.7	10	5	5	6	3	5	14	41	11	10	4	5	1	1	0	1	0	0	0	0	5	36	61.2	62.2
December	1,183	6.0	13	9	7	6	5	5	12	33	10	6	3	2	1	3	0	1	0	1	0	1	13	36	58.4	60.0
Means		6.3	6	4	4	5	4	6	18	44	9	12	4	4	1	1	0	1	0	1	0	*	8	54	60.4	61.3
Totals	13,657																									

*Less than 0.5 percent.

Ocean Area No. 2.—Position: Latitude 35°-40° N., longitude 120°-125° W., Greenwich Noon Observations—Years covered 1879-1934

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentages of observations from— N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Weather: Percentages of observations recording Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (percentage)	Average air temperature	Average sea surface temperature
January	1,345	9.3	12	8	7	16	8	6	9	29	5	5	5	5	2	8	0	4	1	4	0	2	8	53	52.7	53.8
February	1,306	8.9	11	5	4	12	8	8	10	36	6	5	8	9	2	5	0	3	1	4	0	2	10	52	52.9	53.8
March	1,641	9.7	9	2	3	11	7	6	11	44	7	6	5	6	2	5	0	3	0	6	0	3	8	50	52.8	53.3
April	1,596	9.7	7	2	3	8	6	7	12	49	6	8	5	5	2	3	0	2	0	2	0	2	8	48	53.2	53.4
May	1,076	11.6	6	1	1	4	4	5	11	64	4	9	4	3	1	1	0	1	0	1	0	2	8	51	53.9	53.5
June	1,414	11.6	6	1	1	3	3	6	11	64	5	13	8	13	1	1	0	1	1	1	0	2	7	52	55.2	54.5
July	1,494	10.6	9	1	1	3	4	7	10	61	4	13	10	12	1	0	0	0	0	1	0	2	5	67	56.6	56.1
August	1,465	9.3	8	1	1	4	4	4	13	60	5	15	11	16	1	0	0	1	0	0	0	1	5	64	57.9	57.4
September	1,546	8.0	8	2	2	7	4	5	12	52	8	17	9	17	0	1	0	0	0	1	0	1	6	54	58.5	58.0
October	1,550	8.0	11	3	2	10	7	5	10	45	7	11	6	14	2	3	0	1	1	1	0	1	8	49	57.5	57.4
November	1,496	8.0	14	4	3	13	6	5	9	39	7	9	5	14	1	3	0	1	1	2	0	2	7	44	56.1	56.5
December	1,610	8.4	14	8	9	12	7	5	9	27	8	6	6	7	2	7	0	3	0	3	0	2	8	49	53.0	54.4
Means	------	9.3	9	4	4	9	7	6	11	43	6	8	6	9	2	4	0	2	*	3	0	2	8	52	56.1	56.4
Totals	16,135	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

*Less than 0.5 percent.

Ocean Area No. 3.—Position: Latitude 40°-45° N., longitude 120°-125° W., Greenwich Noon Observations—Years covered 1882-1934

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentages of observations from— N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Weather: Percentages of observations recording Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (percentage)	Average air temperature	Average sea surface temperature
January	501	10.2	13	7	6	29	14	9	7	11	4	4	6	5	2	15	0	4	0	5	0	3	9	64	48.0	50.5
February	593	9.3	14	7	8	22	19	8	5	12	5	5	6	3	3	15	1	3	1	6	0	3	8	64	48.8	50.0
March	633	9.3	17	4	6	20	13	11	6	19	4	7	3	3	3	10	0	4	1	7	1	2	9	59	48.5	49.6
April	601	9.3	16	4	4	15	12	9	10	26	4	5	2	2	3	10	0	4	0	6	0	2	9	55	49.7	50.2
May	681	7.6	21	2	3	10	10	8	8	31	7	10	5	5	5	5	0	4	1	3	1	1	9	62	52.1	51.5
June	803	7.6	21	3	3	9	7	5	4	39	9	9	6	8	3	3	0	1	0	1	0	2	9	59	54.3	53.2
July	612	8.4	30	1	2	8	5	4	4	39	7	13	8	11	1	1	0	1	1	0	0	1	7	59	55.4	53.7
August	761	7.2	23	3	2	8	5	4	4	41	10	12	9	22	2	1	0	1	0	0	0	1	7	63	55.9	53.9
September	554	7.6	28	3	1	12	12	2	3	29	10	13	4	18	1	2	0	1	0	1	0	1	10	47	55.8	55.0
October	690	6.8	21	5	6	19	16	4	2	19	8	7	5	19	2	4	1	2	0	2	0	1	7	54	54.4	53.9
November	504	10.2	15	5	5	23	21	8	5	12	6	4	6	8	2	16	0	3	0	6	0	5	9	58	52.2	52.6
December	637	10.6	9	7	12	29	15	8	6	10	4	5	3	2	2	12	1	5	1	7	1	5	9	66	49.8	51.4
Means	------	8.7	19	4	5	17	12	7	5	24	6	8	5	9	2	8	*	3	*	4	*	2	8	59	52.1	52.1
Totals	7,570	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

*Less than 0.5 percent.

Ocean Area No. 4.—Position: Latitude 45°-50° N., longitude 125°-130° W., Greenwich Noon Observations—Years covered 1885-1934

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentages of observations from— N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Weather: Percentages of observations recording Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (percentage)	Average air temperature	Average sea surface temperature
January	1,317	15.0	6	7	10	21	19	14	11	11	1	2	5	4	4	15	2	5	1	8	0	9	2	66	45.4	47.1
February	1,324	14.5	7	6	12	20	18	13	11	11	2	3	6	5	5	15	1	3	0	7	1	7	3	65	45.5	46.3
March	1,398	12.5	7	7	7	17	14	13	16	16	3	2	5	3	4	10	1	4	1	8	2	5	4	64	45.5	46.4
April	1,294	12.0	6	3	8	18	14	13	17	19	2	3	4	4	4	10	1	3	0	7	2	3	4	58	46.7	47.2
May	1,300	9.7	6	3	4	15	12	13	20	24	3	3	6	4	3	8	0	4	0	4	0	2	3	64	50.1	50.2
June	1,327	9.7	5	2	3	12	9	12	23	30	4	4	6	5	3	6	0	4	0	2	0	1	4	64	53.3	53.4
July	1,220	8.9	7	2	2	7	8	10	25	35	4	5	7	7	3	4	0	3	0	2	0	1	4	66	56.8	56.3
August	1,380	8.9	10	2	4	7	7	8	22	34	6	4	9	10	3	4	0	2	0	2	0	1	4	63	58.9	58.3
September	1,368	9.3	11	5	6	9	10	9	15	30	5	4	5	10	3	5	0	7	1	5	1	2	3	58	57.4	57.2
October	1,552	11.1	7	5	10	22	13	12	14	13	4	3	7	10	4	10	0	4	0	7	1	4	4	63	54.7	54.7
November	1,585	15.0	6	5	10	22	18	13	13	16	3	1	7	3	4	17	----	4	1	11	0	9	2	68	50.9	51.6
December	1,470	16.0	4	5	11	22	19	15	13	9	2	2	4	3	4	17	1	4	1	12	1	10	3	69	47.8	49.2
Means	----	11.8	7	4	7	16	13	12	17	20	3	3	6	6	4	10	1	4	*	6	1	4	3	64	51.1	51.5
Totals	16,535	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

*Less than 0.5 percent.

Conversion Table, Degrees to Points and Vice Versa

° ′	Points	° ′	Points	° ′	Points	° ′	Points
0 00	N	90 00	E	180 00	S	270 00	W
1 24		91 24		181 24		271 24	
2 49	N ¼ E	92 49	E ¼ S	182 49	S ¼ W	272 49	W ¼ N
4 13		94 13		184 13		274 13	
5 38	N ½ E	95 38	E ½ S	185 38	S ½ W	275 38	W ½ N
7 02		97 02		187 02		277 02	
8 26	N ¾ E	98 26	E ¾ S	188 26	S ¾ W	278 26	W ¾ N
9 51		99 51		189 51		279 51	
11 15	N x E	101 15	E x S	191 15	S x W	281 15	W x N
12 39		102 39		192 39		282 39	
14 04	N x E ¼ E	104 04	ESE ¾ E	194 04	S x W ¼ W	284 04	WNW ¾ W
15 28		105 28		195 28		285 28	
16 53	N x E ½ E	106 53	ESE ½ E	196 53	S x W ½ W	286 53	WNW ½ W
18 17		108 17		198 17		288 17	
19 41	N x E ¾ E	109 41	ESE ¼ E	199 41	S x W ¾ W	289 41	WNW ¼ W
21 06		111 06		201 06		291 06	
22 30	NNE	112 30	ESE	202 30	SSW	292 30	WNW
23 54		113 54		203 54		293 54	
25 19	NNE ¼ E	115 19	SE x E ¾ E	205 19	SSW ¼ W	295 19	NW x W ¾ W
26 43		116 43		206 43		296 43	
28 08	NNE ½ E	118 08	SE x E ½ E	208 08	SSW ½ W	298 08	NW x W ½ W
29 32		119 32		209 32		299 32	
30 56	NNE ¾ E	120 56	SE x E ¼ E	210 56	SSW ¾ W	300 56	NW x W ¼ W
32 21		122 21		212 21		302 21	
33 45	NE x N	123 45	SE x E	213 45	SW x S	303 45	NW x W
35 09		125 09		215 09		305 09	
36 34	NE ¾ N	126 34	SE ¾ E	216 34	SW ¾ S	306 34	NW ¾ W
37 58		127 58		217 58		307 58	
39 23	NE ½ N	129 23	SE ½ E	219 23	SW ½ S	309 23	NW ½ W
40 47		130 47		220 47		310 47	
42 11	NE ¼ N	132 11	SE ¼ E	222 11	SW ¼ S	312 11	NW ¼ W
43 36		133 36		223 36		313 36	
45 00	NE	135 00	SE	225 00	SW	315 00	NW
46 24		136 24		226 24		316 24	
47 49	NE ¼ E	137 49	SE ¼ S	227 49	SW ¼ W	317 49	NW ¼ N
49 13		139 13		229 13		319 13	
50 38	NE ½ E	140 38	SE ½ S	230 38	SW ½ W	320 38	NW ½ N
52 02		142 02		232 02		322 02	
53 26	NE ¾ E	143 26	SE ¾ S	233 26	SW ¾ W	323 26	NW ¾ N
54 51		144 51		234 51		324 51	
56 15	NE x E	146 15	SE x S	236 15	SW x W	326 15	NW x N
57 39		147 39		237 39		327 39	
59 04	NE x E ¼ E	149 04	SSE ¾ E	239 04	SW x W ¼ W	329 04	NNW ¾ W
60 28		150 28		240 28		330 28	
61 53	NE x E ½ E	151 53	SSE ½ E	241 53	SW x W ½ W	331 53	NNW ½ W
63 17		153 17		243 17		333 17	
64 41	NE x E ¾ E	154 41	SSE ¼ E	244 41	SW x W ¾ W	334 41	NNW ¼ W
66 06		156 06		246 06		336 06	
67 30	ENE	157 30	SSE	247 30	WSW	337 30	NNW
68 54		158 54		248 54		338 54	
70 19	ENE ¼ E	160 19	S x E ¾ E	250 19	WSW ¼ W	340 19	N x W ¾ W
71 43		161 43		251 43		341 43	
73 08	ENE ½ E	163 08	S x E ½ E	253 08	WSW ½ W	343 08	N x W ½ W
74 32		164 32		254 32		344 32	
75 56	ENE ¾ E	165 56	S x E ¼ E	255 56	WSW ¾ W	345 56	N x W ¼ W
77 21		167 21		257 21		347 21	
78 45	E x N	168 45	S x E	258 45	W x S	348 45	N x W
80 09		170 09		260 09		350 09	
81 34	E ¾ N	171 34	S ¾ E	261 34	W ¾ S	351 34	N ¾ W
82 58		172 58		262 58		352 58	
84 23	E ½ N	174 23	S ½ E	264 23	W ½ S	354 23	N ½ W
85 47		175 47		265 47		355 47	
87 11	E ¼ N	177 11	S ¼ E	267 11	W ¼ S	357 11	N ¼ W
88 36		178 36		268 36		358 36	

Index

Number in parentheses immediately following any item in this Index is the number of the largest-scale United States Coast and Geodetic Survey Chart on which that feature appears.

A

	Page
Abalone Point (5602)	287
Abbey Islet (6102)	385
Abbotts Lagoon (5603)	275
Aberdeen (6195)	377
Aberdeen Gardens (6195)	380
Abernethy Point (6152)	350
Accidents, reports	23
Active Pass (6380)	422
Active Pass Light (6380)	424
Adams Cove (5116)	207
Adams, Point (6151)	342
Admiralty Bay (6450)	460
Admiralty Head (6450)	412
Admiralty Inlet (6450)	460
Agate Bay (6382)	407
Agate Passage (6445)	486
Agate Passage Bridge (6445)	487
Agate Point (6445)	486
Aids, navigation	42
Aircraft Homing Beacons	530
Aircraft warnings	176
Ala Spit (6380)	438
Alameda (5535)	250
Alameda Creek (5531)	250
Alamitos Bay (5142)	182
Alava, Cape (6265)	388
Albany (6171)	360
Albert Head (6382)	401
Albert Head Light (6382)	402
Albion (5711)	283
Albion (Bay) Cove (5711)	282
Albion River (5711)	282
Alcatraz Island (5535)	244
Alden Bank (6380)	437
Alden Point (6380)	417
Alder Creek (5302)	222
Aleck Bay (6380)	433
Alexander Island (6102)	386
Alki Point (6449)	468
Allan Island (6376)	435
Allyn (6460)	511
Alsea Bay (5802)	325
Alviso (5531)	250
Alviso Slough (5531)	249
Amelia Island (6300)	456
American River (5528)	273
Amphitrite Point (6102)	392
Amsterdam Bay (6460)	503
Anacapa Island (5114)	201
Anacapa Passage (5114)	202
Anacortes (6376)	440
Anaheim Bay (5142)	182
Anchorage areas	11
Anchorage regulations	61
Anchorages. *See also* name of place	42
Andersen Canyon (5302)	223
Anderson Cliff (5602)	288
Anderson Cove, Hood Canal (6460)	485
Anderson Cove, Port Washington Narrows (6446)	493
Anderson Island (6460)	503
Andrews Bay (6380)	415
Angel Island (5532)	254
Angeles Point (6382)	408
Angora Peak (5902)	336
Anita Rock (5535)	245
Annapolis (6440)	492
Annas Bay (6460)	486
Ano Nuevo, Point (5402)	231
Antioch (5527)	261
Appendix	515
Apple Cove Point (6445)	464
Appletree Cove (6445)	464
Aptos Creek (5403)	229
Aquatic Park (5535)	244
Arachne Reef (6380)	420
Arago, Cape (5802)	317
Arcadia (6460)	513
Arcata (5832)	296
Arcata Bay (5832)	295
Arcata Channel (5832)	295
Arch Cape (5902)	336
Arch Island (6002)	384
Arch Rock, Anacapa Island (5114)	201
Arch Rock, Orford Reef (5952)	313
Arch Rock, San Francisco Bay (5535)	245
Arena Cove (5502)	279
Arena, Point (5502)	279
Arena Rock (5502)	280
Arguello, Point (5202)	212
Arguello Point Loran Station (5202)	212
Argyle (6380)	425
Argyle Shoal (6380)	426
Ariel (6153)	353
Arletta (6460)	508
Arlington (6157)	366
Army Point (5534)	259
Arroyo San Carpoforo (5302)	221
Ashe Head (6380)	402
Asotin	368
Astoria (6151)	347

	Page
Astoria Range (6151)	345
Atkinson, Point (6300)	450
Atlas Rock (5386)	216
Attalia	367
Austin (6450)	461
Austin Point (6153)	353
Avalon (5128)	197
Avalon Bay (5128)	197
Avila (5386)	217
Avisadero, Point (5531)	248
Avon (5534)	260

B

Baada Point (6266)	405
Bachelor Island (6154)	354
Bachelor Island Slough (6154)	354
Bacon Island (5527)	267
Bainbridge Reef (6446)	489
Baker Bay (6151)	345
Balboa (5108)	181
Balboa Island (5108)	181
Balch Passage (6460)	503
Bald Hill (5703)	286
Bald Islets (6102)	388
Bald Mountain (5951)	311
Ballard (6449)	469
Ballast Point, Catalina Harbor (5128)	198
Ballast Point, San Diego (5105)	175
Ballenas Channel (6300)	456
Ballenas Islands (6300)	456
Ballona Lagoon (5144)	190
Ballow (6460)	510
Baltimore Rock (5984)	318
Bandon (5971)	316
Bangor (6422)	483
Bare Island (6380)	417
Barkley Sound (6102)	392
Barlow Bay (6380)	425
Barlow Point Channel (6153)	351
Barnes Island (6380)	437
Barren Island (6381)	415
Basalt Point (6421)	462
Bat Rock (5116)	206
Batchelor Point (6300)	455
Bathhouse Point (5128)	197
Battery Point (5895)	304
Battle Point (6445)	488
Battle Rock (5952)	311
Battleship Island (6381)	415
Bay Center (6185)	375
Bay City, Grays Harbor (6195)	377
Bay City, Tillamook Bay (6112)	334
Bay City Channel (6112)	333
Bay Farm Island (5531)	250
Bay Island (5108)	181
Baynes Channel (6380)	418
Beacon Reef (5115)	204
Beale, Cape (6102)	392
Beals, Point (6460)	495
Beans Point (6446)	489
Bear River, California (5795)	292
Bear River, Washington (6185)	376
Bear Harbor Ridge (5602)	288
Beaufort wind scale	49
Beaver Point (6380)	422
Beaver Slough, Columbia River (6152)	351
Beaver Slough, Mokelumne River (5527)	266
Becher Bay (6382)	400
Bechers Bay (5115)	204
Bedwell Harbor (6380)	420
Bee (6460)	503
Bee Rock (5116)	204
Beechey Head (6382)	400
Begg Rock (5113)	192
Bell Island (6380)	428
Bell Rock (5896)	307
Belle Chain Islets (6380)	452
Belle Rock (6380)	435
Bells Mountain (5602)	286
Bells Point (5602)	286
Bellingham (6378)	443
Bellingham Bay (6378)	442
Bellingham Channel (6378)	441
Belmont Shore (5142)	182
Belvedere (5532)	254
Ben Ure Island (6376)	434
Benicia (5534)	259
Bennett, Point (5116)	206
Bentinck Island (6382)	401
Berkeley (5535)	251
Berkeley Yacht Harbor (5532)	251
Berry Point (6300)	453
Best Rock (5952)	313
Bethel Tract (5527)	265
Big Eddy (6157)	363
Big Flat (5602)	289
Big Lagoon (5702)	302
Big Quilcene River (6450)	484
Big River (5711)	284
Big White Rock (5602)	288
Biggs	366
Biloxi (6460)	497
Bingham Landing Light (6171)	359
Birch Bay (6300)	446
Birch Point (6300)	446
Bird Rock, Cape San Martin (5302)	222
Bird Rock, Isthmus Cove (5128)	197
Bird Rock, San Juan Channel (6380)	428
Bird Rock, Tomales Point (5603)	275
Bird Rocks (6380)	435
Bishop (ship) (5101)	174
Bishop Cut (5527)	269
Bishop Rock (5101)	174
Bit Rock (5144)	189
Bixby Landing (5476)	225
Black Point, San Francisco Bay (5535)	244
Black Point, southward of Gualala River (5502)	278
Black Point Landing (5502)	278
Black Rock, Blanco Reef (5952)	313
Black Rock, Rosario Strait (6380)	436
Blacklock Point (5952)	315
Blaine (6399)	447
Blake Island (6460)	494
Blakely Harbor (6446)	467
Blakely Island (6380)	432
Blakely Rock (6446)	467
Blalock (6157)	366
Blanco, Cape (5952)	314
Blanco Reef (5952)	313
Blank Rock (5846)	299
Blind Bay (6380)	430

	Page
Blind Island (6380)	430
Blind Point (5527)	262
Blind Slough (6152)	350
Blossom Rock (5535)	245
Blowers Bluff (6450)	478
Bluff Cove (5144)	189
Blunden Island (6380)	420
Blunden Point (6300)	455
Blunt, Point (5532)	254
Blunts Reef (5795)	292
Blunts Reef Lightship (5795)	292
Blyn (6403)	411
Bodega Bay (5603)	275
Bodega Harbor (5603)	275
Bodega Head (5603)	275
Bodega Rock (5603)	275
Bodelteh Islets (6265)	388
Boiling Reef (6380)	420
Bold Point (6380)	403
Bolin, Point (6445)	487
Bolinas (5532)	240
Bolinas Bay (5532)	240
Bolinas Lagoon (5532)	240
Bolinas Point (5599)	274
Bolon Island (6004)	323
Bolton Peninsula (6450)	484
Bone River (6185)	375
Bonilla Point (6300)	399
Bonita Cove (5532)	239
Bonita Channel (5532)	238
Bonita, Point (5532)	237
Bonneville (6156)	363
Bonneville Dam (6156)	363
Bosley Butte (5896)	308
Boulder Reef (6380)	437
Boundary Bay (6300)	448
Boundary Bluff (6300)	448
Boundary Pass(6380)	418
Bournes (Bowen) Landing (5502)	278
Bowen (Bournes) Landing (5502)	278
Brace Point (6460)	494
Brackenridge Bluff (6195)	377
Bradbury Slough (6152)	351
Bradford Island, San Joaquin River (5527)	262
Bradford Island, Columbia River (6156)	362
Bradwood (6152)	350
Branch Hydrographic Offices	521
Breaker	7
Breaker Point (5302)	221
Breakwater Island (6300)	453
Bremerton (6440)	492
Bridge of the Gods (6157)	364
Bridge regulations	79
Brighton (6122)	335
Brinnon (6450)	484
Brisco Point (6462)	506
Brockway Point (5116)	204
Broken Group Islands (6102)	392
Broken Point (6380)	431
Brookings (5896)	307
Brooks Island (5532)	252
Brooks Slough (6152)	350
Brotchie Ledge (6380)	403
Brothers, The, northward of Punta Gorda (5795)	291
Brothers, The, San Francisco Bay (5532)	253
Brown Island (6380)	426
Brown, Point, Grays Harbor (6195)	377
Brown, Point, Puget Sound (6407)	498
Brown Rock (5895)	305
Brownsville (6445)	488
Bruhel Point (5602)	286
Brushy Bald Mountain (5951)	310
Bryan Tract (5527)	267
Buchmans Landing (6171)	359
Buchon, Point (5387)	218
Buck Bay (6380)	431
Buckeye Shoal (6380)	436
Budd Inlet (Olympia Harbor) (6460)	505
Buhne Point (5832)	294
Bull Rock (5711)	282
Bulls Head Point (5534)	259
Bulls Head (Ribbon Rock) (5112)	196
Buoys	15
Burke Bay (6445)	488
Burke Island (6153)	351
Burke Slough (6153)	353
Burrows Bay (6376)	435
Burrows Island (6376)	435
Burbank	368
Burley (6460)	509
Burley Lagoon (6460)	509
Burns Cutoff (5527)	269
Burns Point (6460)	512
Burns Reach (5527)	262
Burrard Inlet (6300)	450
Burrill Point (6380)	424
Burton (6460)	496
Burton Peninula (6460)	496
Bush Point (6450)	461
Butler Cove (6462)	506
Bywater Bay (6421)	482

C

Cabrillo National Monument (5105)	175
Cabrillo, Point (5711)	284
Cactus Islands (6380)	417
Cache Slough (5527)	273
Cadboro Bay (6380)	418
Cadboro Point (6380)	418
Cahto Mountain (5602)	287
Cake Rock (6102)	387
Calaveras Point (5531)	249
Calibration of direction finders	16
Caledonia (6407)	498
California Creek (6399)	447
California Point (5532)	254
California State Maritime Academy (5534)	259
Camano (6450)	478
Camano Head (6448)	476
Camano Island (6450)	477
Camas (6156)	362
Camas Slough (6156)	362
Cambria (5302)	220
Cambria Rock (5302)	220
Camp Pendleton (5101)	180
Camp Sealth (6460)	497
Campanile (5535)	251
Campbell Bay (6380)	452
Campbell Point (6380)	452

	Page
Can Rock (5116)	205
Canada Honda (5302)	215
Cannery Hill (6023)	324
Cannon Beach (5902)	337
Canoe Island (6380)	430
Canoe Pass, Fraser River (6300)	449
Canoe Pass, Rosario Strait (6376)	434
Canoe Rock (6380)	421
Cape. *See* proper name	
Capilano River (6300)	451
Capitan (5202)	211
Capitola (5403)	229
Capsante Waterway (6376)	440
Cardiff-by-the-Sea (5101)	180
Cardwell Point (5116)	205
Carillon, The (5128)	197
Carlsbad (5101)	180
Carlyon Beach (6460)	512
Carmanah Point (6102)	391
Carmel (5476)	226
Carmel Bay (5476)	226
Carmel Canyon (5476)	226
Carmel Cove (5476)	226
Carmel Point (5476)	226
Carmel River (5476)	226
Carpinteria (5202)	209
Carpinteria Lagoon (5202)	209
Carquinez Strait (5534)	258
Carquinez Strait Light (5525)	257
Carr Inlet (6460)	508
Carr Point (6403)	411
Carrington Point (5115)	204
Carroll Islet (6102)	388
Carroll (Charlton) Channel (6153)	353
Carter Point (6378)	442
Cascade Bay (6380)	431
Cascade Head (5902)	331
Cascade Locks (6157)	363
Cascade Range	362
Case Inlet (North Bay) (6460)	509
Case Shoal (6421)	482
Casino Point (5128)	197
Casket Rock (5703)	282
Caspar (5711)	284
Caspar Anchorage (5711)	284
Caspar Creek (5711)	284
Castle Rock, Arch Cape (5902)	336
Castle Rock, Cape Blanco (5952)	315
Castle Rock, Cowlitz River (6153)	352
Castle Rock, Point St. George (5895)	305
Castle Rock, San Miguel Island (5116)	206
Castillo, Point (5261)	210
Castro Point (5532)	253
Castro Rocks (5532)	253
Cat Rock (5114)	201
Catalina Harbor (5128)	198
Catching Slough (5984)	321
Cathlamet (6152)	350
Cathlamet Bay (6151)	349
Cathlamet Channel (6152)	350
Cattle Point (6380)	424
Caulfield Cove	451
Caution, Point (6380)	427
Cavallo, Point (5535)	244
Cayucos (5387)	219
Cayucos Point (5387)	220
Cedar Island (6171)	359
Cedar River (6185)	373
Celilo Falls (6157)	366
Center Island (6380)	432
Center Reef (6381)	416
Centerville (5602)	293
Centissima Reef (5532)	238
Central Ferry	368
Cerantes (Observatory) Rock (6300)	400
Cerritos Channel (5147)	184
Chads Island (6380)	422
Chambers Creek (6460)	504
Channel Islands (5202)	199
Channel Street (5535)	245
Charlton (Carroll) Channel (6153)	353
Chart agencies	515
Charts, nautical	2
Charts, tidal current	6
Chase Ledge (5895)	305
Chatham Islands (6380)	418
Chauncey, Point (5532)	254
Chehalis, Point (6195)	376
Chehalis River (6195)	379
Chesil Bank (6380)	422
Chetco Cove (5896)	307
Chetco Point (5896)	307
Chetco River (5896)	307
Cherry Point (6380)	446
Chico (6446)	493
Chico Landing (5528)	272
Chimacum Creek (6405)	460
Chimney Rock (5599)	274
China Basin (5535)	245
China Point (5117)	195
Chinese Harbor (5114)	202
Chinook (6151)	346
Chipps Island (5534)	260
Christopher Point (6382)	401
Christie (6171)	359
Christmas Rock (5795)	291
Chuckanut Bay (6378)	443
Chuckanut Island (6378)	443
Chuckanut Rock (6378)	443
Chula Vista (5107)	174
Church Point (6460)	513
City of Seattle Rock (6376)	440
City Waterway (6407)	498
Clackamas Rapids (6171)	359
Clackamas River (6171)	359
Clallam Bay (6300)	406
Clallam Point (Diamond Point) (6403)	411
Clark Island (6380)	437
Clark Point (6378)	442
Clarke Point (6300)	454
Clarksburg (5528)	271
Clatskanie (6152)	351
Clatskanie (Creek) River (6152)	351
Clatsop Spit (6151)	342
Claymore Cove	451
Cleawox Lake (5802)	323
Clements Reef (6380)	418
Cleone (Laguna Landing) (5703)	286
Cliff House (5532)	237
Cliff Island (6380)	428
Clifton Channel (6152)	350
Climate	44
Clo-oose (6102)	391
Clover Point (6380)	403
Cluster Cone Rock (5602)	288
Coal Creek Slough (6153)	351

Page
Coal Oil Point (5202) 211
Coalbank Slough (5984) 321
Coast and Geodetic Survey..... 1, 515
Coast Eddy Current 241
Coast Guard 14, 521
Coast Highway 60
Coast Pilots 1, 515
Coastwise courses 158
Coastwise navigation 59
Coit Tower (5535) 244
Colby (6460) 494
Colby Reef (5711) 283
Cole Island (6380) 402
Cole Point (6460) 504
Colebrooke Butte (5951) 310
Collins Island (5108) 181
Collinson Point (6380) 423
Columbia Beach (6448) 476
Columbia City (6153) 353
Columbia City Range (6153) 351
Columbia River 339
Columbia River Bar (6151) 344
Columbia River Datum 340
Columbia River Entrance (6151)..... 342
Columbia River Gorge (6156)..... 362
Columbia River Lightship (6151)..... 343
Columbia Slough (6155) 355
Colusa (5528) 272
Colville Island (6380) 433
Colville, Point (6380) 433
Colvos (6460) 497
Colvos Passage (6460) 496
Colvos Rocks (6421) 462
Commencement Bay (Tacoma Harbor) (6407) 497
Commercial broadcasting stations 528
Communications 178, 188, 248
Conception, Point (5202) 212
Cone Islands (6378) 441
Cone Peak (5302) 223
Cone Rock, Pyramid Point (5896) 307
Cone Rock, Trinidad Head (5702) 301
Connection Slough (5527) 267
Conical Rock (5795) 290
Conical White Rock (5952) 313
Constance Bank (6382) 402
Constance Cove (6380) 402
Constantine Rock (5387) 220
Conway (Fir Station) (6450) 480
Cook (6157) 365
Coon Island (6380) 428
Cooper Point, Budd Inlet (6462) 507
Cooper Point, north of Pfeiffer Point (5476) 224
Cooper Reef (6380) 419
Coos Bay (5984) 318
Coos Bay (city) (5984) 321
Coos Head (5984) 318
Coos River (5984) 321
Cooskie Creek (5602) 290
Copalis Head (6002) 382
Copalis River (6002) 382
Copalis Rocks (6002) 382
Copleys Rock (6171) 359
Coquille (5802) 317
Coquille Point (5971) 316
Coquille River (5971) 316
Coquille Rock (5971) 316

Page
Coquitlan River (6300) 448
Corbett (6156) 362
Cordell Bank (5502) 236
Cormorant Passage (6460) 504
Corona Del Mar (5108) 181
Coronado (5107) 174
Coronado Islands (Los Coronados) (5101) 173
Corps of Engineers, U. S. Army ... 188, 521
Corte Madera Creek (5532) 255
Cortes Bank (5101) 174
Corvallis (6171) 360
Cosmopolis (6195) 377
Cottaneva (Rockport) Cove (5602)... 287
Cottaneva Needle (5602) 287
Cottaneva Rock (5602) 287
Cottonwood Island (6153) 351
Cottonwood Island Lower Range (6153) 351
Cottonwood Island Turn (6153) 351
Cottonwood Island Upper Range (6153) 351
County Wharf (5386) 217
Coupeville (6450) 479
Courses, coastwise 158
Courtland (5528) 271
Cove (6460) 497
Coveland (6450) 479
Covill Creek (6382) 408
Cowlitz Bay (6380) 417
Cowlitz River (6153) 352
Cox Rock (5802) 325
Coxcomb Hill (6151) 346
Coxo Anchorage (5202) 212
Coxo Valley (5202) 212
Coyle (6450) 484
Crane Island (6380) 428
Coyote Creek (5531) 249
Coyote Hill Slough (5531) 250
Creosote (6446) 467
Crescent Bay (6382) 407
Crescent City (5895) 304
Crescent Harbor (6404) 479
Crescent Rock (6382) 407
Crims Island (6152) 349
Crockett (5534) 259
Crockett Lake (6450) 461
Cromwell (6460) 508
Crook Point, southward of Cape Sebastian (5896) 309
Crook Point, San Miguel Island (5116) 207
Crows Landing (5527) 264
Crystal Springs (6446) 491
Cuffey Cove (5703) 282
Current Tables 6
Currents. *See also* name of place..... 44
Curtis Peak (6380) 420
Cushman (6023) 324
Customs. *See also* name of place..... 23
Customs Districts 524
Cutts Island (6460) 509
Cuyler Harbor (5116) 205
Cypress Island (6380) 436
Cypress Island Light (6378) 441
Cypress, Point (5476) 227
Cypress Reef (6380) 436
Cypress Rock, Point (5476) 227

D

	Page
Dabob Bay (6450)	484
Daby Island (5832)	295
Dakota Creek (6399)	447
Dalco, Point (6460)	497
Dallas Bank (6403)	411
Dalles, The (6157)	365
Dalles-Celilo Canal (6157)	366
Dalles (Fivemile) Rapids (6157)	366
Dallesport (6157)	364
Dana Passage (6462)	506
Dana Point (5101)	180
Danger Rock (6380)	429
Danger Shoal (6381)	415
Danger signal information	22
Danger zone regulations	106
D'Arcy Island (6380)	419
D'Arcy Shoals (6380)	419
Dash Point (6407)	498
Days Island (6460)	502
Days Island Lagoon (6460)	502
Daylight saving time	61
Davenport (5402)	231
Davidson Inshore Current	44
Davidson Rock (6380)	433
Davis Point, San Juan Channel (6380)	425
Davis Point, San Pablo Bay (5533)	256
Dayton (6171)	360
Deadman Islet (6380)	425
Deans Point (6122)	335
Decatur (6380)	433
Decatur Head (6380)	436
Decatur Island (6380)	432
Decatur Reef (6446)	468
Deception Island (6376)	434
Deception Pass (6376)	434
Decker Island (5527)	273
Deep River (6151)	349
Deep River (town) (6151)	349
Deepwater Bay (6378)	441
Deer Harbor, San Juan Channel (6380)	427
Deer Harbor, Skookum Inlet (6460)	512
Deer Islands (6102)	392
Deer Lagoon (6450)	463
Deer Point (6380)	432
Defiance, Point (6407)	498
Defiance Park, Point (6407)	498
Delake (5902)	330
Delgada, Point (5773)	288
Delano Beach (6460)	509
Delgada Canyon (5602)	289
Del Mar, northward of La Jolla (5101)	179
Del Mar, suburb of Santa Cruz (5403)	230
Del Mar Landing (5502)	278
Demock Point (6404)	480
Dennis Shoal (6376)	435
Depoe Bay (5902)	329
Depth curves	4
Descanso Bay (5128)	197
Deschutes Basin (6462)	507
Deschutes River (6462)	507
Desdemona Channel (6151)	345
Desdemona Sands (6151)	345
Des Moines (6460)	495
Destruction Island (6002)	384
Detroit (6460)	511
Devils Head (6460)	504
Devils Gate Rock (5795)	291
Devils Lake (5902)	330
Devils Slide (5402)	233
Dewatto (6460)	485
Dewatto Bay (6460)	485
Diamond Point (Clallam Point) (6403)	411
Diablo, Point (5532)	239
Dibblee Point (6153)	352
Dickey River (6102)	387
Dillon Point (5534)	259
Dilworth (6460)	495
Dinner Island (6380)	425
Disappointment, Cape (6151)	342
Disappointment Slough (5527)	269
Discovery Island (6380)	403
Disney, Point (6380)	417
Distance table	518
District Offices, Coast and Geodetic Survey	1, 515
Dockton (6460)	496
Dodson (6156)	362
Doe Bay (6380)	437
Doebay (village) (6380)	437
Dofflemyer Point (6460)	505
Dogfish Bay (6445)	487
Dolan Canyon (5302)	223
Dolan Cone (5302)	223
Dolphin Point (6460)	495
Dorcas Point (6300)	455
Dosewallips River (6450)	484
Dot Island (6380)	441
Dot Rock (6380)	436
Double Bluff (6450)	461
Double Cone Rock (5602)	287
Double Island (6380)	431
Double Peak (5902)	336
Double Point (5599)	274
Double Rock (5951)	310
Doughty, Point (6380)	429
Douglas Island (6300)	456
Dragon Channel (5895)	306
Drakes Bay (5599)	274
Drano Lake (6157)	365
Drayton Harbor (6399)	446
Drayton Passage (6460)	503
Drexler Tract (5527)	268
Driscol Range (6152)	349
Dtokoah Point (6266)	405
Duckabush (6450)	484
Duck Club Light (6154)	354
Dumas Bay (6460)	496
Dumbarton Bridge (5531)	249
Dumbarton Point (5531)	249
Dume Canyon (5101)	191
Dume Cove (5101)	191
Dume, Point (5101)	191
Duncan Rock (6265)	390
Duncans Landing (5502)	277
Dungeness (6382)	410
Dungeness Bay (6382)	410
Dungeness Spit (6382)	410
Duntze Rock (6265)	391
Dutch Slough (5527)	265
Dutchers Cove (6460)	510
Dutton Island (5534)	260
Dutton Landing (5533)	258
Duwamish Head (6449)	468

Page
Duwamish River (6449) 469
Duxbury Point (5532) 240
Duxbury Reef (5532) 240
Dyes Inlet (6446) 493

E

Eagle Creek (6157) 364
Eagle Harbor, Bellingham Bay (6378). 441
Eagle Harbor, Puget Sound (6446) 466
Eagle Island (6460) 503
Eagle Island Reef (6460) 503
Eagle Point (6380) 414
Eagle Reef (5128) 197
Eagledale (6446) 467
East Basin Channel (5147) 184
East Bremerton (Manette P. O.) (6440) 492
East Cromwell (6460) 508
East Fish Camp (5114) 201
East Fork, Hoquiam River (6195)..... 379
East Passage (6460) 493
East Point, Haro Strait (6380) 420
East Point, Santa Rosa Island (5115) . 204
East Point, Whidbey Island (6450) ... 477
East Rock (5895) 306
East Sound (6380) 431
East Waterway (6449) 469
Eastern Bank (6450) 413
Eastsound (6380) 431
Eaton's Ranch (6185) 373
Eberhardt Cove (6460) 511
Ebey Slough (6448) 476
Echo Bay (6380) 418
Echo boards 16
Echo soundings 4
Echoes 16
Eckley (5534) 259
Edgell Banks (6300) 455
Edith Point (6380) 452
Ediz Hook (6303) 408
Edmonds (6445) 464
Edwards Point (6445) 464
Edye Point (6382) 401
Eel Canyon (5602) 293
Eel River (5602) 293
Eglon (6450) 463
Eighteen Mile Island (6157) 364
Eld Inlet (Mud Bay) (6462) 507
Eldon (6460) 485
Eleventh Coast Guard District 187
Elger Bay (6450) 478
Elgin (6460) 509
Eliza Island (6378) 443
Eliza Rock (6378) 443
Elizabeth, Cape (6002) 383
Elk (5703) 282
Elk Creek (5902) 337
Elk River, southward of Cape Blanco (5952) 312
Elk River, Grays Harbor (6195) 378
Elk Rock (5602) 281
Elk Rock Island (6171) 359
Elkhorn Slough, Monterey Bay (5403) 229
Elkhorn Slough, Sacramento River (5528) 273

Page
Ellice, Point (6151) 348
Elliot Bluff (6380) 421
Elliot Point (6448) 474
Elliott Bay (6449) 468
Ellis Slough (6185) 373
Ellisport (6460) 495
Ellwood (5202) 211
Elma (6195) 379
Elokomin River (6152) 350
Elokomin Slough (6152) 350
El Segundo (5144) 190
Elwha River (6382) 408
Embarcadero (5107) 176
Emeryville (5535) 251
Empire (5984) 320
Empire Cut (5527) 268
Encinitas (5101) 180
Enetai (6446) 491
Engineers, Corps of..... 10, 521
English Bay (6300) 450
English Bluff (6300) 448
Ennis Creek (6303) 409
Enterprise Reef (6380) 423
Entomology and Plant Quarantine, Bureau of 26, 526
Entrance Island (6300) 453
Erland (6446) 493
Espada Bluff (5202) 212
Estero Bay (5387) 218
Estero, Point (5387) 218
Esquimalt Harbor (6380) 402
Ettershank 451
Eureka (5832) 295
Eureka Channel, Columbia River (6152) 349
Eureka Channel, Humboldt Bay (5832) 295
Eureka Slough (5832) 295
Evans, Point (6460) 502
Everett (6448) 474
Ewing Island (6380) 418

F

Fabian-Bell Canal (5527) 267
Fabian Tract (5527) 267
Fairfax Point (6380) 420
Fair Harbor (6460) 511
Fairhaven (5832) 295
Fairview (6446) 493
Fairway Bank (6380) 424
Fairway Channel (6300) 454
Falcon, Cape (5902) 335
Falcon Rock (5902) 335
Fallbrook Junction (5101) 180
False Bay (6380) 414
False Cape (5795) 293
False Cape Rock (5795) 293
False Klamath Rock (5702) 303
False Point (5101) 179
False River (5527) 265
False Sur (5476) 224
False Creek (6300) 450
Fanny Shoal (5502) 236
Farallon Islands (5502) 235
Farnsworth Bank (5112) 196
Father and Son (6265) 389

Page
Fauntleroy (6460) 494
Fauntleroy Cove (6460) 494
Fauntleroy Point (6380) 432
Fauntleroy Rock, Crescent City (5895) 304
Fauntleroy Rock, Cape Mendocino (5795) 292
Fawn Island (6380) 427
Feather River 273
Federal Communications Commission 26, 527
Felida (6154) 354
Fermin, Point (5147) 183
Ferncliff (6446) 466
Ferrelo, Cape (5896) 307
Ferry Building (5535) 245
Fidalgo Bay (6376) 441
Fidalgo Head (6376) 435
Fidalgo Island (6376) 434
Fields Landing (5832) 296
Filucy Bay (6460) 503
Fir Station (Conway) (6450) 480
First Beach (6266) 406
First Narrows (6300) 451
Fishboat Harbor (Inner Harbor Basin) (5895) 304
Fisgard Island (6380) 402
Fish and Wildlife Service 530
Fish Eddy (6171) 359
Fish Camp Landing (5527) 268
Fish Harbor (5147) 184
Fish Rocks (5502) 279
Fisher Island Channel (6153) 351
Fisher Island Slough (6153) 352
Fisherman Bay (6380) 426
Fisherman Cove (5128) 198
Fishermans Cut (5527) 265
Fisherman Harbor (6450) 484
Fisherman Point (5105) 176
Fishing regulations 111
Fishweirs 60
Fisk Mill Cove (5502) 278
Five Finger Island (6300) 454
Fivemile Point (5802) 317
Fivemile (The Dalles) Rapids (6157) .. 366
Flat Point (6380) 430
Flat Rock, Flat Rock Point (5144) 189
Flat Rock, Grays Harbor (6002) 383
Flat Rock, St. George Reef (5895) ... 306
Flat Rock, Trinidad Harbor (5846) ... 299
Flat Rock Point (5144) 189
Flat Top Islands (6300) 453
Flattery, Cape (6265) 390
Flattery Rocks (6265) 388
Flattop Island (6380) 429
Flavel Range (6151) 345
Fletcher Bay (6446) 492
Flint Rock Head (5702) 303
Florence (6023) 324
Flounder Bay (6376) 435
Fog. *See also* name of place 51
Fog, advection 52
Fog, radiation 52
Fog signals, hours of operation 534
Fog, *tule* 54
Forbes Point (6404) 479
Foreign consuls 526
Forks (6102) 387
Forney Cove (5115) 203
Fort Bragg (5703) 285
Fort Canby (6151) 342
Fort Columbia (6151) 346
Fort Flagler (6405) 460
Fort Point (5532) 239
Fort Ross (5502) 277
Fort Ross Cove (5502) 277
Fort Ross Reef (5502) 277
Fort Stevens (6151) 345
Fort Ward (6446) 491
Fosdick, Point (6460) 502
Foster Point (6380) 431
Fossil Bay (6380) 418
Foulweather Bluff (6421) 461
Foulweather, Cape (5902) 329
Fourmile Rock (6449) 468
Fourteenmile Slough (5527) 269
Forwood Channel (6300) 454
Fox Island (6460) 508
Fox Rock (5952) 313
Fragaria (6460) 497
Frances, Point (6378) 442
Franklin D. Roosevelt Lake 368
Frankport (5951) 310
Fraser Point (5115) 203
Fraser River (6300) 448
Freeland (6450) 478
Freeman Island, Suisun Bay (5534) . 260
Freeman Island, San Juan Channel (6380) 429
Freeport (5528) 271
Freshwater Bay (6382) 408
Friday Harbor (6380) 426
Friday Harbor (town) (6380) 426
Fuca Pillar (6265) 390
Fuller (6195) 379
Fulton Creek (6450) 485

G

Gabriola Pass (6300) 453
Gabriola Reefs (6300) 453
Gales 55
Galiano Island (6300) 453
Gallows Point (6300) 455
Garcia River (5602) 281
Gardiner, Port Discovery (6403) 411
Gardiner, Umpqua River (6004) 323
Garibaldi (6112) 334
Garrison Bay (6381) 415
Garrison Rapids (6156) 363
Garry Point (6300) 449
Gaviota (5202) 212
Gaviota Canyon (5202) 211
Gedney (Hat) Island (6448) 476
George, Cape (6403) 412
George Point (6382) 401
Georgia Strait (6300) 445
Georgiana Slough (5527) 266
Georgina Point (6380) 424
Georgina Shoals (6380) 424
Gerald Island (6300) 456
Gerstle Cove (5502) 277
Gertrude (6460) 508
Gertrude Island (6460) 508
Gettysburg (6382) 407

Page
Giants Graveyard (6102) 386
Gibson (6446) 491
Gibson Point (6460) 502
Gig Harbor (6460) 497
Gig Harbor (town) (6460) 497
Gilbertson (6446) 492
Glen Acres (6460) 495
Glen Cove (6405) 459
Glenada (6023) 324
Glencove (6460) 509
Glendale (6450) 474
Glorietta Bay (5105) 176
Glover, Point (6446) 489
Goat Island, Chetco Point (5896) 307
Goat Island, Skagit Bay (6376)..... 439
Goat Islet (6382) 401
Gold Beach (5951) 309
Gold Bluffs (5702) 302
Golden Gate (5532) 238
Golden Gate Bridge (5532) 239
Goleta Point (5202) 211
Gonzales Point (6380) 403
Gooch Island (6380) 419
Goose Island (6380) 425
Goose Point (6185) 375
Gooseberry Point (6378) 442
Gorda, Point (5202) 209
Gorda Rock (5795) 290
Gordon Head (6380) 419
Gordon Hill (5602) 287
Gordon Rock (6380) 419
Gosnell Creek (6460) 513
Gossip Island (6380) 424
Gossip Shoals (6380) 424
Government Cove (6157) 364
Government Island (6156) 362
Gowlland Point (6380) 420
Grand Coulee Dam 368
Grand Island (5527) 273
Grant Line Canal (5527) 267
Grapeview (6460) 510
Grave Island (6460) 508
Graveyard Point (5952) 311
Gray Rock (6300) 456
Grays Bay (6151) 349
Grays Harbor (6195) 376
Grays Point (6151) 349
Grays River (6151) 349
Grays River (town) (6151) 349
Grayson (5527) 264
Great Bend, The (6460) 485
Great Break, Blunts Reef (5795)..... 292
Great Break, St. George Reef (5895)... 306
Green Hill (6112) 333
Green Point, Carr Inlet (6460)..... 509
Green Point, Port Angeles (6382)..... 410
Green Point, Spieden Island (6380) ... 429
Green Rock (5702) 301
Greenbank (6450) 478
Grenville Arch (6002) 382
Grenville, Point (6002) 382
Grey, Point (6300) 450
Griffin Bay (6380) 425
Grizzly Bay (5534) 260
Grizzly Slough (6152) 350
Ground swell 7
Guadalupe River (5531) 249
Gualala (5502) 278

949285—52——34

Page
Gualala Mountain (5502) 279
Gualala Point Island (5502) 278
Gualala River (5502) 278
Guano Rock (5984) 318
Guemes Channel (6376) 439
Gulf of the Farallones (5502) 235
Gull Island, Columbia River (6152) .. 350
Gull Island, Punta Arena (5115) 203
Gull Island Channel (6152) 349
Gull Rock, Bodega Head (5502) 276
Gull Rock, Cape Blanco (5952) 315
Gull Rock, San Juan Channel (6380) . 429
Gull Rock, Yaquina Head (5902) 329
Gunther (Indian) Island (5832) 295

H

Hackney Island (6450) 478
Hadlock (6405) 460
Hale Passage, Bellingham Channel (6378) 442
Hale Passage, Puget Sound (6460).... 508
Halfmoon Bay (5520) 232
Halfmoon Bay (town) (5520) 233
Halibut Bank (6300) 456
Halibut Island (6380) 419
Hamilton Beach (5128) 197
Hamilton Field (5533) 258
Hamma Hamma River (6460) 485
Hammersley Inlet (6460) 512
Hammond Bay (6300) 455
Hammond, Point (6380) 417
Hanbury Point (6381) 415
Hand Rock (6102) 388
Hannon, Point (Whiskey Spit) (6421) 482
Hansville (6450) 463
Happy Hollow (6460) 486
Harbor (5896) 307
Harbor Heights (6460) 496
Harbor Island, Newport Bay (5108) .. 181
Harbor Island, Seattle (6449) 469
Harbor Reefs (5128) 198
Harbor Rock (6380) 431
Harding Rock (5535) 245
Hardy Creek (5602) 287
Hardy Creek Landing (5602) 287
Hardy Rock (5602) 287
Harlan Rock (5302) 223
Harlech Castle Rock (5302) 221
Harney Channel (6380) 430
Haro Strait (6380) 413
Harper (6460) 494
Harrington Point (6151) 349
Harrington Point Range (6151) 345
Harris Point (5116) 206
Harrisburg (6171) 360
Harrison River (6300) 448
Hartstene Island (6460) 510
Hat Island, Padilla Bay (6380) 441
Hat (Gedney) Island, Snohomish River (6448) 476
Haven Island (6151) 346
Havens Anchorage (5502) 278
Havens Neck (5502) 279
Hawley (6446) 467

Page
Hayden Island (6155) 360
Haynes Inlet (5984) 321
Haynes Point (5527) 262
Haystack Rock, southward of Cape Kiwanda (5902) 337
Haystack Rock, northward of Double Peak (5902) 331
Hazel Point (6450) 484
Heads, The (5952) 311
Hecate Passage (6380) 418
Heceta Bank (5802) 324
Heceta Head (5802) 325
Hein Bank (6380) 404
Helen Point (6380) 423
Henderson Inlet (South Bay) (6460) 505
Henrici Range (6154) 354
Henry Island (6381) 415
Hermosa Beach (5144) 190
Herron (6460) 510
Herron Island (6460) 510
Heyer, Point (6460) 495
Hicks Bay (6380) 427
High Bluff (5702) 302
Hills Ferry (5527) 264
Hobsonville (6112) 334
Hoevet (6122) 335
Hog Island Cut (5527) 262
Hoh Head (6102) 385
Hoh River (6102) 385
Hoko River (6300) 406
Hole in the Wall (6376) 439
Holidays, legal 61
Holland Point (6380) 403
Hollister Peak (5387) 219
Holly (6460) 485
Holmes Harbor (6450) 478
Home (6460) 509
Home Valley (6157) 365
Honker Bay (5534) 260
Honker Cut (5527) 269
Hood (5528) 271
Hood Canal (6401) 481
Hood Head (6421) 482
Hood River (6157) 365
Hoodsport (6460) 485
Hookton (5832) 296
Hookton Channel (5832) 296
Hookton Slough (5832) 296
Hope (6300) 449
Hope Island, Puget Sound (6460) 511
Hope Island, Skagit Bay (6380) 438
Hoquarten Slough (6112) 333
Hoquiam (6195) 377
Hoquiam River (6195) 379
Horn, Cape, Bonneville (6156) 362
Horn, Cape, Wallace Island (6152) ... 350
Horn of the Pacific, Cape (5202) 212
Horsehead Bay (6460) 509
Horseshoe Bay (5535) 244
Horseshoe Bend (5533) 257
Horseshoe Point (5502) 278
Horswell Bluff (6300) 454
Horswell Channel (6300) 454
Hospital Cove (5532) 254
Houghton (6449) 471
Howell Rock (5386) 216
Huckleberry Island (6380) 441
Hudson, Point (6405) 458
Hudson Rocks (6300) 454
Hueneme Canyon (5202) 199
Hueneme, Point (5007) 207
Hug Point (5902) 336
Huge Creek (6460) 509
Hughes Bay (6380) 433
Hughes Passage (6380) 419
Humboldt Bar (5832) 294
Humboldt Bay (5832) 293
Humbug Mountain (5951) 311
Hump Rock (5895) 306
Humptulips River (6195) 378
Hunot Point (6380) 438
Hunter Cove (5896) 309
Hunter Creek (5951) 309
Hunter Island (5896) 309
Hunter Rock (5896) 306
Hunters Point (5531) 248
Hunting Islands (6152) 350
Hunting regulations 111
Huntington Beach (5101) 182
Huntington Beach State Park (5101) .. 182
Huntington Rock (6102) 386
Hupa Mountain (5702) 301
Hurst Shoal (5502) 236
Hyde Point (6460) 503
Hydrographic Office 12
Hylebos Creek (6407) 499
Hylebos Waterway (6407) 499
Hyperion (5144) 190

I

Icarus Point (6300) 455
Iceberg Point (6380) 425
Ida Island (5527) 270
Ika Island (6376) 439
Illahee (6446) 492
Ilwaco (6151) 345
Immigration and Naturalization Service 23, 525
Imola (5533) 258
Imperial Eagle Channel (6102) 392
Indian Cove (6380) 430
Indian Island, Port Townsend (6405) 460
Indian (Gunther) Island, Humboldt Bay (5832) 295
Indian Point (6460) 496
Indian Village (6421) 483
Indianola (Kitsap P. O.) (6445)..... 465
Inner Harbor Basin (Fishboat Harbor) (5895) 304
Inskip Island (6380) 402
Inspection, sanitary 25
International Boundary (6300) 446
Invincible Rock (5532) 253
Iona Island (6300) 450
Ione Reef (6156) 362
Iron Mountain (5902) 329
Irondale (6405) 460
Islais Creek (5535) 245
Island Knob (5602) 287
Island Rock (5952) 311
Isleton (5527) 271
Isthmus Cove (5128) 197

Page
Isthmus Slough (5984) 321
Itsami Ledge (6460) 505

J

Jack Island (6380) 441
Jack Point (6300) 455
Jackson Cove (6450) 484
Jackson Pinnacle (5602) 288
Jagel Slough (5531) 249
Jagged Islet (6102) 388
James Bay (6380) 403
James Island, off Decatur Head (6380) 436
James Island, Quillayute River (6102) 386
James Island, Sidney Channel (6380) .. 419
James Point (6380) 422
Java Islets (6380) 420
Jefferson, Point (6445) 465
Jennings Lodge (6171) 359
Jersey Island (5527) 265
Jersey Point (5527) 262
Joe Creek (6002) 382
Joe, Point (5403) 227
Joes Bay (6460) 509
John Day Channel (6151) 349
John Day Point (6151) 349
John Day River (6151) 349
Johns Island (6380) 417
Johns Pass (6380) 417
Johns River (6195) 379
Johnson, Cape (6102) 387
Johnson Point, Haro Strait (6380).... 418
Johnson Point, Puget Sound (6460)... 504
Johnsons Bar 368
Johnsons Lee (5115) 203
Johnstone Reef (6380) 418
Jonathan Rock (5895) 306
Jones Island (6380) 428
Juan Creek (5602) 287
Judge Rock (5116) 206
Judith Rock (5116) 207
Junipero Serra Peak (5302) 223

K

Kala Point (6405) 460
Kalaloch Rocks (6002) 384
Kalama (6153) 353
Kalama River (6153) 353
Kalama Lower Range (6153) 351
Kalama Upper Range (6153) 351
Kaluna Cliff (5602) 289
Kanaka Bay (6380) 415
Kanem Point (6403) 411
Kellers Shelter (5101) 191
Kellett Bluff (6381) 415
Kellett Ledge (6380) 436
Kelley Point (6155) 355
Kelp 41
Kelp Reefs (6380) 419
Kelso (6153) 353
Kennewick 367
Kerry (6152) 351
Kettle River 368
Ketron Island (6460) 504
Keyport (6445) 487
Keyport Torpedo Station (6445) 487
Kiapot Point (6403) 411
Kibesillah Rock (5602) 286
Kiket Island (6380) 438
Kilisut Harbor (6405) 460
Kincheloe Point (6112) 333
King Island (5527) 269
King Peak (5602) 289
King Spit (6422) 483
Kingston (6445) 464
Kiwanda, Cape (5902) 331
Klachopis Point (6266) 406
Klamath (5702) 303
Klamath River (5702) 303
Klas Rock (6421) 462
Klooqueh Rock (5952) 312
Knappton (6151) 348
Knox, Point (5532) 254
Knox Shoal, Point (5532) 254
Koitlah Point (6265) 404
Kwomais Point (6300) 448
Kydaka Point (6300) 406

L

La Center (6153) 353
La Conner (6376) 439
La Cruz Rock (5302) 221
La Jolla (5101) 179
La Jolla, Point (5101) 179
Lady Island (6156) 362
Lafayette (6171) 360
Laguna Beach (5101) 181
Laguna Landing (Cleone) (5703) 286
Laguna Point, northward of Point Cabrillo (5703) 286
Laguna Point, westward of Point Mugo (5007) 207
Lake Earl (5702) 306
Lake River (6154) 354
Lake Talawa (5702) 306
Lake Union (6447) 470
Lake Washington (6449) 470
Lake Washington Ship Canal (6447) .. 470
Lakebay (6460) 509
Lakota (6460) 496
Landsend (5532) 238
Langley (6450) 477
Langley Point (6376) 435
Lansing Rock (5386) 216
Lapush (6102) 387
Large Brown Rock (5952) 313
Las Pitas, Point (5202) 209
Latham Slough (5527) 268
Laura Point (6380) 423
Lavigia Hill (5261) 210
Lawrence Point (6380) 435
Lawson Reef (6376) 434
Lawson Rock (6380) 432
Leadbetter Point (6185) 371
Leaning Rock (5896) 308

	Page
Leiser Point (6156)	362
Lemolo (6445)	487
Leo Reef (6380)	432
Leucadia (5101)	180
Lewis River (6153)	353
Lewis and Clark River (6151)	346
Lewiston	368
Libby Point (6460)	513
Liberty Bay (6445)	487
Liddell Point (6380)	422
Lido Isle (5108)	181
Lifeboat Stations, Pacific Coast	523
Light Lists	15
Lighthouse Point (6376)	434
Lights	15
Lilliwaup (6460)	485
Lilliwaup Bay (6460)	485
Lime Kiln Light (6380)	415
Lime Point (5532)	239
Limestone Point (6380)	429
Lindsey Slough (5528)	273
Lion Rock (5387)	218
Lisabeula (6460)	497
Little Connection Slough (5527)	267
Little (Old) Coxo (5202)	212
Little D'Arcy Island (6380)	419
Little Head (5846)	298
Little Island (6380)	425
Little Potato Slough (5527)	267
Little River, near Navarro Head (5711)	283
Little River, near Trinidad Head (5602)	298
Little River Rock (5846)	298
Little Slate Rock (5302)	223
Little Sur River (5476)	225
Little White Salmon River (6157)	365
Lobos, Point, near Carmel (5476)	226
Lobos, Point, San Francisco (5532)	237
Lobos Rocks (5476)	226
Local attraction	5
Local services	60
Lofall (6421)	483
Loma, Point (5105)	175
Loma Prieta (5402)	231
Lone Black Rock (5386)	218
Lonetree Point (5533)	256
Long Beach (5147)	183
Long Brown Rock (5952)	313
Long Island, Columbia River (6152)	350
Long Island, San Juan Channel (6380)	425
Long Island, Willapa Bay (6185)	376
Long Island Shoal (6185)	376
Long Point, Puget Sound (6450)	478
Long Point, Santa Catalina Island (5112)	196
Long Rock (5895)	306
Longbranch (6460)	503
Longview (6153)	352
Longview Bridge (6153)	352
Lookout, Cape (5902)	332
Lookout Rock (5951)	311
Lopez (6380)	426
Lopez Hill (6380)	425
Lopez Island (6380)	425
Lopez Pass (6380)	433
Lopez Point (5302)	222
Lopez Rock (5302)	222
Lopez Sound (6380)	432
Loran	34
Los Angeles (5147)	183
Los Coronados (Coronado Islands) (5101)	173
Loudoun Channel (6102)	392
Low Island (6380)	428
Low Point (6382)	407
Lowell Point (6450)	478
Lulu Island (6300)	449
Lummi (6378)	443
Lummi Bay (6378)	442
Lummi Indian Reservation (6378)	442
Lummi Island (6380)	437
Lummi Island Beach (6378)	442
Lummi Peak (6380)	437
Lummi Point (6378)	442
Lummi Rocks (6380)	437
Lunada Bay (5144)	189
Lydia Shoal (6380)	436
Lyle (6157)	364
Lyle Point (6460)	504
Lynch Cove (6460)	486
Lyre River (6382)	407

M

Mabana (6450)	477
McArdle Bay (6380)	433
McArthur Bank (6380)	424
Macaulay (Sailor) Point (6380)	403
McConnell Island (6380)	428
McCracken Point (6381)	415
McDermott Point (6460)	503
McGlinn Island (6376)	439
Mack Arch (4896)	308
Mack Arch Cove (5896)	308
Mack Reef (5896)	308
Mackaye Harbor (6380)	425
McKenzie Head (6151)	343
McMicken Island (6460)	510
McMinnville (6171)	360
McNary Lock and Dam	367
McNeil Bay (6380)	403
McNeil Island (6460)	503
McNutt Gulch (5795)	291
Mad River (5602)	298
Mad River Slough (5832)	295
Mad River Slough Channel (5832)	295
Madrona (6450)	478
Madrona Beach (6450)	478
Magnolia Beach (6460)	496
Magnolia Bluff (6449)	468
Mailboat Slough (6185)	373
Main Channel (6112)	333
Main Ship Channel (5532)	238
Maintop (5502)	236
Malaga Cove (5144)	190
Mal Pass (5602)	281
Manchester (6460)	494
Mandarte Island (6380)	419
Mandeville Cut (5527)	262
Mandeville Island (5527)	267
Manhattan Beach (5144)	190
Manzanita, Port Orchard (6445)	487
Manzanita, Quartermaster Harbor (6460)	496

	Page
Manzanita Bay (6445)	487
Mansfield Break (5895)	306
Maplewood (6460)	497
March Point (6380)	441
Mare Island (5525)	256
Mare Island Strait (5525)	256
Marietta (6378)	443
Marin Islands (5532)	255
Markham (6195)	377
Marrowstone Island (6405)	460
Marrowstone Point (6405)	458
Marsh (Redwood) Point (5531)	249
Marshfield Channel (5984)	321
Martin Island (6153)	351
Martin Island Channel (6153)	351
Martin Slough (6153)	353
Martinez (5534)	259
Mary Anne Point (6380)	423
Marys Peak (5802)	326
Maryhill (6157)	366
Marysville (5528)	273
Mathews Point (6380)	423
Matia Island (6380)	437
Mats Mats (6421)	462
Mattole Canyon (5795)	290
Mattole Point (5795)	291
Mattole River (5795)	291
Mayfield Slough (5531)	249
Maude Island (6300)	455
Maury Island (6460)	494
Maylor Point (6404)	479
Mayne (6380)	423
Mayne Island (6380)	423
Mayo Cove (6460)	509
Mayor Channel (6380)	418
Meadow Point (6445)	466
Meadowdale (6450)	474
Meares, Cape (6112)	332
Measured nautical mile	179
Megler (6151)	348
Mendocino (5711)	284
Mendocino Bay (5711)	283
Mendocino Canyon (5795)	290
Mendocino, Cape (5795)	291
Mercer Island (6449)	471
Meridian (6460)	509
Merwin Dam (6153)	353
Meteorological Tables	539
Miami Cove (6112)	334
Midchannel Bank (6405)	459
Middle Arm, Fraser River (6300)	450
Middle Bank (6380)	414
Middle Breakwater (5147)	183
Middle Channel (6380)	425
Middle Corondao (5101)	173
Middle Farallon (5502)	236
Middle Harbor (5535)	251
Middle Point, westward of Point Mugu (5007)	207
Middle Point, eastward of Port Discovery (6403)	412
Middle River (5527)	268
Middle Rock, off San Miguel Island (5116)	205
Middle Rock, mouth of Hoh River (6102)	385
Middle Waterway (6407)	498
Midway Point (5702)	303
Migley, Point (6380)	437
Mile Rocks (5532)	238
Miller Bay (6445)	465
Miller Sands Channel (6151)	345
Miller Sands Channel (6152)	349
Milwaukee Waterway (6407)	499
Milwaukie (6171)	358
Milwaukie Heights (6171)	359
Miner Slough (5527, 5528)	273
Miners Bay (6380)	423
Minor Island (6380)	404
Miramar (5520)	233
Miramontes Point (5520)	232
Misery Point (6450)	484
Mission (6448)	476
Mission Bay (5101)	179
Mission Beach, Mission Bay (5101)	179
Mission Beach, Washington (6448)	477
Mission Rock (5535)	245
Mitchell Bay (6381)	415
Mitchell Point Range (6157)	364
Moclips (6002)	382
Moclips River (6002)	382
Modesto (5527)	264
Mokelumne River (5527)	265
Molate Point (5532)	253
Monarch Head (6380)	420
Monroe Landing (5602)	287
Monroe, Point (6445)	465
Montara Mountain (5402)	233
Montara, Point (5402)	233
Monterey (5403)	227
Monterey Bay (5403)	227
Monterey Canyon (5403)	227
Monterey Harbor (5403)	227
Monterey Wind Gap (5403)	229
Montesano (6195)	377
Montezuma Slough (5534)	260
Moore Hill (5795)	291
Mooring Rock (5711)	283
Mora (6102)	387
Moresby Island (6380)	420
Moresby Passage (6380)	422
Morgan Lower Range (6154)	354
Morgan Rock (5602)	288
Morgan Upper Range (6154)	354
Mormon Slough (5527)	269
Morrison Island (5527)	269
Morro Beach (5387)	219
Morro Bay (5387)	219
Morro Bay (town) (5387)	219
Morro Rock (5387)	218
Morrow Cove (5534)	259
Mosquito Pass (6381)	415
Mouat Point (6380)	422
Mouatt Reef (6380)	417
Mount Adams, Washington	342
Mount Bruce (6380)	422
Mount Buchon (5302)	218
Mount Carmel (5476)	226
Mount Coffin (6153)	352
Mount Constitution (6380)	429
Mount Dallas (6380)	414
Mount Diablo (5502)	235
Mount Eden Slough (5531)	250
Mount Hood, Oregon	342
Mount Norman (6280)	420
Mount Parke (6380)	423
Mount St. Helens, Washington	342

Page
Mount Tamalpais (5502) 235
Mount Turep (Red Mountain) (5702) 303
Mount Vernon (6450) 480
Mouse Rock (5387) 219
Moss Landing (5403) 229
Moss Landing Harbor (5403) 229
Mud Bay (6446) 493
Mud Bay (Eld Inlet) (6462) 507
Mugu Canyon (5202) 207
Mugu Lagoon (5007) 207
Mugu, Point (5202) 207
Mukilteo (6448) 474
Mukkaw Bay (6265) 389
Multnomah Channel (6154) 354
Murden Cove (6446) 466
Mussel Point (5702) 302
Mussel Rock, north of False Cape (5795) 293
Mussel Rock, north of The Brothers (5795) 291
Mussel Rock, Crescent City (5895) 304
Mussel Rock, St. George Reef (5895) .. 306
Mutiny Bay (6450) 461

N

Naglee (5527) 267
Nahcotta (6185) 376
Nahcotta Channel (6185) 376
Nanaimo (6300) 455
Nanaimo Harbor (6300) 455
Nanoose Harbor (6300) 455
Napa (5533) 257
Napa River (5533) 257
Narrows, The (6460) 501
Narvaez Bay (6380) 421
Naselle (6185) 376
Naselle River (6185) 376
National Bureau of Standards standard frequency broadcast service 30
National City (5107) 174
National Wildlife Refuges 530
Naval Air Station (5535) 250
Naval Supply Depot (5535) 251
Navarro Head (5703) 282
Navarro Landing (5703) 282
Navarro River (5703) 282
Navigation, coastwise 59
Navigation regulations 114
Neah Bay (6266) 404
Neah Bay (village) (6266) 405
Neahkahnie Mountain (5902) 336
Necanicum River (5902) 337
Neck Point, San Juan Channel (6380) 427
Neck Point, Hammond Bay (6300) ... 455
Ned Point (6382) 401
Neds Rock (6195) 378
Needle Rock, southward of Point Delgada (5602) 288
Needle Rock, Rogue River Reef (5951) 310
Needle Rock Landing (5602) 288
Needle Rock Point (5402) 231
Nehalem (6122) 335
Nehalem Beach (6122) 335
Nehalem River (6122) 335
Neill Point (6460) 496
Nelly Cove (5952) 312
Nelson Bay (6381) 416
Neskowin (5902) 331
Neskowin Rock (5902) 331
Netarts (5902) 332
Netarts Bays (5902) 332
Nestucca Bay (5902) 331
Nestucca River (5902) 331
New Dungeness Light (6382) 410
New Era Bar Island (6171) 359
New Hope Landing (5527) 265
New Westminster (6300) 449
Newberg (6171) 360
Newcastle Island (6300) 454
Newport, Newport Bay (5108) 181
Newport, Quartermaster Harbor (6460) 496
Newport, Yaquina River (6058) 327
Newport Bay (5108) 181
Newport Beach (5108) 181
Niawiakum River (6185) 375
Nicomekl River (6300) 448
Nisqually Flats (6460) 504
Nisqually Head (6460) 504
Nisqually Reach (6460) 504
Nisqually River (6460) 504
Nitinat Lake (6102) 391
Nob Island (6380) 428
Nooksack River (6378) 443
Noonday Rock (5502) 236
North Arm, Fraser River (6300) 450
North Bay, Grays Harbor (6195) 378
North Bay, San Juan Channel (6380) 425
North Bay (Case Inlet) (6460) 509
North Beach (6380) 430
North Bend (5984) 321
North Bend (town) (5984) 321
North Coronado (5101) 173
North Farallon Islands (5502) 236
North Fork, Skagit River (6450) 480
North Fork, Mokelumne River (5527).. 265
North Fraser Harbor (6300) 450
North Head (6151) 343
North Island (5105) 175
North Nemah River (6185) 375
North Pass (6380) 427
North Pender Island (6380) 420
North Point (5984) 319
North Portland Harbor (Oregon Slough) (6155) 361
North River (6185) 373
North Rock, northward of Rogue River (5951) 310
North Rock, southward of Hoh Head (6102) 385
North Slough (5984) 321
North Spit (5832) 294
North Victoria Canal (5527) 267
Northwest Anchorage (5115) 204
Northwest Harbor (5118) 195
Northwest Island (6376) 435
Northwest Rock, Rogue River Reef (5951) 310
Northwest Rock, Orford Reef (5952) .. 313
Northwest Seal Rock (5895) 305
Nose Rock (5703) 282
Notice to Mariners 12
Norwegian Point (6450) 463
Noyo (5703) 285

Page
Noyo Anchorage (5703) 284
Noyo River (5703) 285

O

Oak Bay, Admirality Inlet (6450) 461
Oak Bay, Haro Strait (6380) 418
Oak Harbor (6404) 479
Oak Head (6450) 484
Oak Island (Reach Island) (6460) 511
Oakland (5535) 250
Oakland Bay (6460) 512
Oakland Inner Harbor (5535) 250
Oakland Municipal Airport (5531) 250
Observatory Point (6382) 408
Observatory (Cerantes) Rock (6300) .. 400
Obstruction Island (6380) 432
Obstruction Pass (6380) 431
Oceano (5302) 216
Oceanside (5101) 180
Ocosta (6195) 377
Off-Trinidad Rock (5846) 299
Ogden Point (6380) 403
Ogden Point Breakwater Light (6380) 403
Oil, use in breaking sea..... 10
Olalla (6460) 497
Old (Little) Coxo (5202) 212
Old River (5527) 267
Oleum (5533) 256
Olga (6380) 431
Olney (6151) 346
Olympia (6462) 506
Olympia Harbor (Budd Inlet) (6460) .. 505
Olympia Shoal (6462) 506
O'Neal Islet (6380) 429
Orcas (6380) 430
Orcas Island (6380) 429
Orcas Knob (6380) 429
Orchard Point (6446) 489
Orchard Rocks (6446) 489
Oregon City (6171) 359
Oregon Slough (North Portland Harbor) (6155) 361
Orella (5202) 212
Orford Reef (5952) 312
Orient, Point (5532) 253
Oro Bay (6460) 504
Ortega Hill (5202) 209
Ork Reef (6004) 323
Orwood (5527) 267
Obsorn Bank (5101) 194
Ostrander (6153) 352
Ostrich Bay (6446) 493
Oswego (6171) 359
Oswego Creek (6171) 359
Oswego Rock (6171) 359
Otter Bay (6380) 422
Otter Rock (5902) 329
Oulton Point (5527) 262
Outer Break (5795) 291
Outer Harbor (5535) 251
Outer Islet (5302) 221
Outer Santa Barbara Passage (5101) .. 192
Owen Point (6300) 399
Oxnard (5007) 208
Oyster Bay, Dyes Inlet (6446) 493
Oyster Bay, Totten Inlet (6460) 512
Ozette Indian Village (6265) 388
Ozette Island (6265) 388

P

Pachena Bay (6102) 392
Pachena Point (6102) 391
Pacific Beach (5101) 179
Pacific Coast 41
Pacific City (5902) 331
Pacific Grove (5403) 227
Padilla Bay (6376) 441
Padre Serra's Cross (5007) 208
Painted Cave (5115) 203
Paintsville (5528) 271
Palisades (5112) 196
Palix River (6185) 375
Palm Beach (5403) 229
Palo Alto Municipal Airport (5531) .. 249
Palos Verdes Point (5144) 189
Pancake Point (6152) 351
Pandora Hill (6380) 403
Paradise Dam (5527) 264
Parker Reef (6380) 429
Parkin Point (6380) 421
Parks Bay (6380) 427
Parry Bay (6382) 401
Partridge Bank (6450) 413
Partridge, Point (6450) 412
Pasco 367
Pass Island (6376) 434
Paterson-Irrigon 366
Patos Island (6380) 417
Patterson (5527) 264
Patterson Cove 451
Peace Monument (6300) 446
Peale Passage (6460) 511
Peapod Rocks (6380) 436
Pear Point (6380) 425
Pearl Island (6381) 415
Pearson (6445) 487
Peavine Pass (6380) 432
Pebble Beach (5476) 226
Pecho Rock (5386) 218
Pedder Bay (6382) 401
Pedernales, Point (5302) 215
Pelican Bay, north of Point St. George (5702) 306
Pelican Bay, Santa Cruz Island (5115) 202
Pelly Point (6300) 449
Pelorus Point (6380) 420
Penawawa 368
Peninsula Drainage Canal (6155) 355
Penn Cove (6450) 478
Perkins Reef (6102) 385
Perpetua, Cape (5802) 325
Pescadero Creek (5402) 232
Pescadero Point (5402) 232
Petaluma (5533) 258
Petaluma Creek (5533) 258
Pfeiffer Point (5476) 223
Phinney Bay (6446) 493
Pico Blanco (5476) 226

	Page
Pico Blanco (Sur Peak) (5476)	224
Pico Rock (5302)	220
Pickering Passage (6460)	510
Piedras Blancas (5302)	221
Piedras Blancas, Point (5302)	221
Pierpont Bay (5007)	209
Pigeon Point (5402)	231
Pile Point (6380)	415
Pillar Point, northward of Pigeon Point (5520)	232
Pillar Point, eastward of Slip Point (6300)	407
Pillar Rock (5387)	218
Pillar Rock Lower Range (6152)	349
Pillar Rock Upper Range (6152)	349
Pilots. *See also* name of place	60
Pilot Point (6450)	463
Pilot Rock (5846)	298
Pin Rock (5128)	198
Piner, Point, Quartermaster Harbor (6460)	496
Pinole Point (5533)	256
Pinole Shoal Channel (5533)	256
Pinos, Point (5403)	227
Piper Slough (5527)	265
Pismo Beach (5302)	216
Pistol River (5896)	309
Pitt Island (6460)	508
Pitt Passage (6460)	508
Pitt River (6300)	448
Pittsburg (5534)	261
Pitship Point (6403)	411
Plaskett Rock (5302)	222
Playa del Rey (5144)	190
Pleasant Beach (6446)	491
Pleasant Harbor (6450)	484
Plumper Bay (6380)	402
Plumper Passage (6380)	418
Plumper Sound (6380)	421
Plymouth (6157)	366
Point. *See* name of place	
Point Arena (village) (5502)	279
Point George (6380)	427
Point No Point (6450)	463
Point of the Arches (6265)	389
Point Reyes Station (5603)	276
Pointer Island (6380)	436
Pole Pass (6380)	428
Polnell, Point (6404)	479
Pony Point (5984)	321
Porlier Pass (6300)	453
Port of Anacortes (6376)	440
Port Angeles (6303)	408
Port Blakely (6446)	467
Port Browning (6380)	421
Port Chicago (5534)	260
Port Costa (5534)	259
Port Crescent (6382)	407
Port Discovery (6403)	411
Ports of Entry	524
Port Gamble (6421)	482
Port Gamble (town) (6421)	482
Port Gardner (6448)	474
Port of Grays Harbor (6195)	381
Port Herron (6440)	492
Port Hueneme (5007)	208
Port-Industrial (Wapato) Waterway (6407)	499
Port Kelly	367
Port Ludlow (6421)	462
Port Ludlow, directions (6421)	463
Port Madison (6445)	465
Port Mann (6300)	448
Port Moody (6300)	451
Port of Oakland (5535)	250
Port Orchard, west of Bainbridge Island (6445)	486
Port Orchard, Sinclair Inlet (6440)	492
Port Orchard, directions (6446)	490
Port Orford (5952)	311
Port Orford (town) (5952)	312
Port Orford Coast Guard Station (5952)	312
Port of Peninsula (6185)	376
Port of Portland (6155)	356
Port Quelland (6449)	471
Port Renfrew (6300)	400
Port San Juan (6300)	399
Port San Luis (5386)	217
Port San Luis Wharf (5386)	217
Port of Seattle (6449)	469
Port Series	11
Port Stanley (6380)	432
Port Susan (6450)	477
Port and Terminal Charges. *See also* name of place	11
Port Townsend (6405)	458
Port Townsend Canal (6405)	460
Port Townsend (town) (6405)	459
Port of Vancouver (6155)	361
Port Washington (6380)	422
Port Washington Narrows (6446)	493
Portage (6460)	495
Portage Bay (6447)	470
Portage Head (6265)	389
Portage Inlet (6380)	403
Portland (6155)	356
Portland Island (6380)	422
Portlock Point (6380)	422
Portuguese Bend (5142)	189
Portuguese Point (6151)	349
Post Office Bar (6155)	355
Post Point (6378)	444
Possession Point (6450)	463
Possession Sound (6450)	474
Potato Point (5527)	262
Potato Slough (5527)	267
Potatopatch Shoal (5532)	237
Potlatch (6460)	485
Potrero Point (5532)	252
Poulsbo (6445)	487
Poverty Bay (6460)	495
Prairie Channel (6152)	350
Pratt Cliff (6002)	383
Precipitation	51
Preface	v
President Channel (6380)	429
President Point (6445)	464
Presidio, The (5535)	243
Presidio Monument (5403)	227
Presidio Shoal (5535)	244
Pressure pattern	44
Preston Point (6448)	475
Prevost (6380)	417
Prevost Harbor (6380)	417
Prevost Island (6380)	422
Price Island (6152)	350

Page
Priest Point (6448) 476
Priest Rapids Dam 367
Prince Island, off Pyramid Point (5896) 306
Prince Island, off San Miguel Island (5116) 205
Princeton (5520) 233
Prisoner Rock (5846) 299
Prisoners Harbor (5114) 202
Prisoners Point (5527) 262
Prospect Point (6300) 451
Prospect Slough (5528) 273
Prosper (5802) 317
Protection Island, Admiralty Bay (6403) 411
Protection Island, Georgia Strait (6300) 455
Protection, navigable waters 11
Public Health Service 24, 524
Publications 37
Puffin Island (6380) 437
Puffin Island Shoal Light (6380) 437
Puget Island (6152) 350
Puget Island Range (6152) 349
Puget Sound (6401) 457
Puget Sound Navy Yard (6440) 492
Pulali Point (6450) 484
Pully, Point (6460) 495
Punta Arena (5115) 203
Punta Gorda (5795) 290
Purdy (6460) 509
Purisima Point (5302) 215
Puyallup River (6407) 499
Puyallup Waterway (6407) 499
Pylades Channel (6300) 453
Pyramid (Smuggler) Cove (5117) 194
Pyramid Head (5117) 195
Pyramid Point (5896) 306
Pyramid Rock, off Cape Meares (6112) 332
Pyramid Rock, Blanco Reef (5952) 313
Pyramid Rock, Rogue River Reef (5951) 310
Pysht (6300) 407
Pysht River (6300) 407

Q

Quarantine. *See also* name of place .. 24
Quarry Point (5532) 254
Quartermaster (6460) 496
Quartermaster Harbor (6460) 496
Quatsap Point (6450) 484
Queets River (6002) 384
Quilcene (6450) 484
Quilcene Bay (6450) 484
Quillayute Needle (6102) 386
Quillayute River (6102) 387
Quinault Indian Reservation (6002) 383
Quinault River (6002) 383

R

Race Passage (6382) 401
Race Point (6300) 453
Race Rocks (6382) 400
Raccoon Shoal (5532) 254
Raccoon Strait (5532) 254
Races Cove (6421) 482
Radar 35
Radio 26
Radio bearings 17
Radio ranges 529
Radiobeacons 16
Radiobeacons, special operation of 16
Radiotelephone broadcast, U. S. Coast Guard 533
Raft Island (6460) 509
Raft River (6002) 384
Ragged Point (5302) 221
Rainbow Channel (6300) 454
Rainier (6153) 352
Randall Point (6448) 476
Ravenswood Point (5531) 249
Raymond (6185) 373
Razor Point (6380) 421
Reach Island (Oak Island) (6460) 511
Reardon Point 451
Red Bluff, north of Point Arena (5602) 281
Red Bluff, Sacramento River (5528) 273
Red Mountain (Mount Turep) (5702) 303
Red Rock (5532) 252
Redding Rock (5702) 302
Redfish Rocks (5952) 311
Redondo (6460) 495
Redondo Beach (5144) 190
Redondo Canyon (5144) 189
Redwood City (5531) 249
Redwood City Yacht Harbor (5531) 249
Redwood Creek (5531) 249
Redwood (Marsh) Point (5531) 249
Reedsport (6004) 323
Reef Island (6380) 427
Reef Point (6380) 436
Refugio Beach (5202) 212
Regulations, anchorage 61
§ 202. 61
§ 202.1 61
§ 202.90 61
§ 202.95 62
§ 202.100 64
§ 202.105 65
§ 202.110 65
§ 202.115 65
§ 202.120 65
§ 202.125 65
§ 202.126 66
§ 202.210 66
§ 202.212 67
§ 202.214 67
§ 202.216 70
§ 202.218 71
§ 202.220 71
§ 202.222 71
§ 202.224 71
§ 202.228 77
§ 202.230 77
Regulations, bridge 79
§ 203. 79
§ 203.710 79
§ 203.711 81
§ 203.712 81
§ 203.713 82
§ 203.714 82

	Page
§ 203.715	85
§ 203.716	85
§ 203.718	87
§ 203.720	87
§ 203.725	87
§ 203.730	88
§ 203.735	88
§ 203.740	88
§ 203.745	89
§ 203.750	89
§ 203.755	91
§ 203.759	92
§ 203.760	92
§ 203.762	93
§ 203.765	93
§ 203.770	94
§ 203.775	95
§ 203.785	96
§ 203.790	98
§ 203.795	100
§ 203.800	102
§ 203.805	103
§ 203.810	105
§ 203.815	105
Regulations, danger zone	106
§ 204.	106
§ 204.190	106
§ 204.195	106
§ 204.197	107
§ 204.200	108
§ 204.205	108
§ 204.210	109
§ 204.215	109
§ 204.218	110
§ 204.220	110
§ 204.221	110
§ 204.222	110
Regulations, fishing and hunting	111
§ 206.	111
§ 206.85	111
§ 206.90	113
§ 206.93	114
Regulations, navigation	114
§ 207.	114
§ 207.612	114
§ 207.613	115
§ 207.617	115
§ 207.620	116
§ 207.640	116
§ 207.645	119
§ 207.660	120
§ 207.663	120
§ 207.670	121
§ 207.680	121
§ 207.690	123
§ 207.700	124
§ 207.710	126
§ 207.720	130
§ 207.730	130
§ 207.750	131
§ 207.770	137
§ 207.780	137
§ 207.900	137
Reid Harbor (6380)	416
Reid Rock (6380)	426
Repairs. *See also* name of place	60
Rescue operations	21
Reservation Bay (6376)	435
Reservation Head (6376)	435
Reservation Point (5147)	187
Reserve Point (6380)	423
Resort Point (5144)	189
Restoration Point (6446)	467
Restricted areas. *See also* name of place	11
Retsil (6440)	492
Requa (5702)	303
Reyes, Point (5599)	274
Reynard Point (6380)	421
Reynolds Rock (5602)	290
Ribbon Rock (Bulls Head) (5112)	196
Rich Passage (6446)	489
Richardson (6380)	425
Richardson Bay (5532)	253
Richardson Rock (5116)	206
Richmond Beach (6445)	465
Richmond, Point (Richmond Harbor) (5532)	252
Ridgefield (6154)	354
Rincon Mountain (5202)	209
Rincon Point (5202)	209
Rio Vista (5527)	271
Riparia	368
Rip Point (6380)	424
Ripple Island (6380)	417
Ripple Point (6380)	403
Riverton (5802)	317
Roberts Bank (6300)	448
Roberts Island (5527)	268
Roberts, Point (6300)	446
Robinson, Point (6460)	495
Robinson Reef (5502)	278
Roche Harbor (6381)	415
Rock Creek (6157)	364
Rock Island (6171)	359
Rock Island Dam	367
Rockport (Cottaneva) Cove (5602)	287
Rocky Bay, San Juan Channel (6380)	429
Rocky Bay, Vaughn Bay (6460)	511
Rocky Island (6171)	359
Rocky Peak (5951)	311
Rocky Point, Columbia River (6151)	349
Rocky Point, east of Duxbury Point (5532)	239
Rocky Point, south of Point Arguello (5202)	213
Rocky Point, Point Orford (5952)	312
Rocky Point, Saratoga Passage (6450)	478
Rocky Point, north of Trinidad Head (5702)	302
Rocky Point, Washington Narrows (6446)	493
Rocky Prairie (5896)	308
Rodes Reef (5116)	204
Rodgers Break (5602)	290
Rodgers Mountain (5702)	301
Roe Island (5534)	260
Rogue River (5951)	309
Rogue River Reef (5951)	310
Rollingbay (6446)	466
Roosevelt	366
Rosario (6380)	431
Rosario Head (6376)	434
Rosario Strait (6380)	433
Rosburg (6151)	349
Rosedale (6460)	509
Rosedale Rock (6382)	401

Page
Rosehilla (6460) 496
Rosenfelt Rock (6380) 421
Roseville (5105) 174
Ross Mountain (5502) 277
Rough and Ready Island (5527) 269
Round Rock, Crescent City (5895).... 304
Round Rock, Orford Reef (5952) 313
Rounded Islet (6102) 386
Routes 139
Routes, trans-Pacific 139
Rowena (6157) 364
Royal Roads (6382) 401
Rudder Rock (6300) 456
Rules of the Road 42
Russell Point (5984) 319
Russian Gulch (5711) 284
Russian River (5502) 277
Ruthton (6157) 365
Ryde (5527) 271
Ryer Island (5534) 260

S

Sacramento (5528) 271
Sacramento River (5527) 269
Saddle Hill (6195) 377
Saddle Mountain (5902) 337
Saddle Peak (5302) 218
Saddlebag Island (6380) 441
Sail River (6300) 406
Sail Rock, off Pillar Point (5520) 232
Sail Rock, off Point Arena (5502) 279
Sail Rock, east of Neah Bay (6300) ... 406
Sailing directions 139
Sailor (Macaulay) Point (6380) 403
Saint, San, Santa are all indexed under Saint.
Santa Ana (5142) 182
Santa Ana (wind) 57, 181
Santa Ana River (5142) 182
San Andreas Shoal (5527) 262
Santa Barbara (5261) 210
Santa Barbara Channel (5202) 199
Santa Barbara Island (5110) 193
Santa Barbara Point (5261) 210
San Bruno, Point (5531) 248
Santa Catalina Island (5112) 196
Santa Clara Shoal (5527) 262
San Clemente (5101) 180
San Clemente Island (5111) 194
San Clemente Island Light (5118) 195
Santa Cruz (5403) 230
Santa Cruz Channel (5115) 203
Santa Cruz, Point (5403) 230
Santa Cruz Harbor (5403) 230
Santa Cruz Island (5114, 5115) 202
San de Fuca (6450) 479
San Diego (5107) 174
San Diego Bay (5105) 174
San Francisco (5535) 243
San Francisco Bay (5532) 242
San Francisco International Airport (5531) 248
San Francisco Lightship (5532) 237
San Francisco-Oakland Bridge (5535) . 246
St. George Channel (5895) 305
St. George, Point (5895) 305
St. George Reef (5895) 305
Saint Helens (6153) 353
St. Helens Range (6153) 351
San Joaquin River (5527) 261
San Juan Archipelago (6380) 413
San Juan Archipelago, Minor Passages (6380) 430
San Juan Capistrano (5101) 180
San Juan Capistrano Anchorage (5101) 180
San Juan Capistrano Valley (5101) .. 180
San Juan Channel (6380) 424
San Juan Creek (5101) 180
San Juan Island (6380) 414
San Juan Point (6300) 399
San Juan Rock (5101) 180
San Leandro Bay (5535) 250
San Luis Obispo (5386) 217
San Luis Obispo Bay (5386) 216
San Luis Obispo Creek (5386) 216
San Luis Obispo Light (5386) 216
San Luis Hill (5386) 216
San Luis, Point (5386) 216
San Martin, Cape (5302) 222
San Martin Rocks (5302) 222
San Mateo (5531) 249
San Mateo Bridge (5531) 249
San Mateo Creek (5101) 180
San Mateo Point, south of San Clemente (5101) 180
San Mateo, Point, San Francisco Bay (5531) 248
Santa Margarita River (5101) 180
St. Mary, Cape (6380) 436
San Miguel Island (5116) 205
San Miguel Passage (5116) 205
Santa Monica (5144) 191
Santa Monica Bay (5144) 189
San Nicolas Island (5113) 192
San Onofre Mountain (5101) 180
San Pablo Bay (5533) 255
San Pablo, Point (5532) 253
St. Paul Waterway (6407) 499
San Pedro (5147) 183
San Pedro Bay (5147) 183
San Pedro Breakwater (5147) 183
San Pedro Channel (5101) 192
San Pedro Hill, San Pablo Bay (5532) 255
San Pedro Hill, San Pedro Bay (5147) 183
San Pedro Point, Santa Cruz Island (5114) 202
San Pedro, Point, Montara Mountain (5402) 233
San Pedro, Point, San Pablo Bay (5532) 255
San Pedro Rock (5502) 237
San Quentin, Point (5532) 255
San Rafael (5532) 255
San Rafael Bay (5532) 255
San Rafael Creek (5532) 255
Santa Rosa Island (5115, 5116) 203
Santa Rosa Reef (5386) 218
Sal, Point (5302) 215
San Simeon (5302) 220
San Simeon Bay (5302) 220
San Simeon Point (5302) 220
Santa Ynez Mountains (5202) 209

	Page
Salamanca Point (6300)	453
Salem (6171)	360
Sales agents	1, 187
Sallas Rocks (6380)	419
Salmon Bank (6380)	425
Salmon Bay (6447)	470
Salmon Cove (5302)	222
Salmon Creek (Whitesboro) Cove (5711)	282
Salmon Point (5711)	282
Salmon River (5902)	331
Salsbury Point (6421)	483
Salt Point (5502)	277
Salt Point Landing (5502)	277
Saltspring Island (6380)	422
Samish Bay (6378)	442
Samish Island (6380)	441
Samoa (5832)	296
Samuel Island (6380)	452
Sand Heads Lightship (6300)	449
Sand Island (6151)	345
Sand Island Range (6151)	345
Sand Island Shoal (6195)	380
Sand Lake (5902)	332
Sand Mound Slough (5527)	265
Sand Point, Lake Washington (6449)	471
Sand Point, near Santa Barbara (5202)	209
Sand Point, Tomales Bay (5603)	276
Sandhill Bluff (5402)	231
Sandy Hook (6445)	487
Sandy Island (6153)	351
Sandy Point, Lummi Bay (6378)	442
Sandy Point, Santa Rosa Island (5116)	204
Sandy Point, Saratoga Passage (6448)	476
Sandy Point, Waldron Island (6380)	417
Sandy Point Anchorage (5116)	204
Sandy River (6156)	362
Sanpoil River	368
Santiago Peak (5101)	181
Saratoga (6450)	477
Saratoga Passage (6450)	477
Sares Head (6376)	435
Sargison Bank (6102)	392
Satellite Island (6380)	417
Saturna Island (6380)	420
Saunders Reef (5502)	279
Sausalito (5532)	253
Sauvie Island (6154)	354
Scandia (6445)	487
Scarboro Hill (6151)	346
Scatchet Head (6450)	463
Scholfield Creek (6004)	323
Scottsburg (6004)	322
Scorpion Anchorage (5114)	202
Scott Creek (5402)	231
Scripps Institute of Oceanography (5101)	179
Scroggs Rocks (6382)	402
Sea Island (6300)	450
Sea Lion Rock, Cape Vizcaino (5602)	287
Sea Lion Rock, Punta Gorda (5795)	291
Seabeck (6450)	483
Seabeck Bay (6450)	483
Seabird Point (6380)	403
Seabird Rocks (6102)	392
Seabold (6445)	487
Seabold Wharf (6445)	487
Seabright (5403)	230
Seacliff Beach (5403)	229
Seal Beach (5142)	182
Seal Cove (5111)	194
Seal Rock, east of Neah Bay (6300)	406
Seal Rock, Orford Reef (5952)	313
Seal Rock, Point Sal (5302)	215
Seal Rocks, off Point Lobos (5532)	237
Seal Rocks, Skagit Bay (6380)	438
Seal Rocks, south of Yaquina River (5802)	326
Sealbluff Landing (5534)	260
Sealion Rock (6002)	384
Search operations	21
Sears Point (5525)	257
Sears Rock (5532)	238
Seaside, near Monterey (5403)	228
Seaside, near Tillamook Head (5902)	337
Seattle (6449)	468
Second Beach (6266)	406
Seiche	7
Sekiu (6300)	406
Sekiu River (6300)	406
Selby (5533)	256
Selkirk Water (6380)	403
Semiahmoo (6399)	447
Semiahmoo Bay (6399)	446
Semiahmoo Harbor Light (6399)	447
Semiahmoo Spit (6399)	446
Semple Point (5534)	259
Sentinel Island (6381)	416
Sentinel Rock (6381)	416
Sequalitchew Creek (6460)	504
Sequim Bay State Park (6403)	411
Sequim Bay (Washington Harbor) (6403)	411
Serena (5202)	209
Serpentine River (6300)	448
Settler Point (6151)	349
Sevcik Pond (6171)	359
Seven Devils (5802)	317
Sevenmile Slough (5527)	265
Shag Rock (6380)	431
Shag Rocks (5535)	245
Shag Slough (5528)	273
Shanks Landing (6171)	359
Shannon Point (6376)	439
Shark Island (5108)	181
Shark Reef (6380)	425
Sharp Point (5702)	302
Shaw Island (6380)	430
Shaw Island (village) (6380)	430
Shawnee (6460)	496
Sheep Island (6380)	431
Shelter Cove, near Point Delgada (5773)	289
Shelter Cove, San Francisco Bay (5502)	236
Shelter Island (5105)	176
Shelton (6460)	513
Sheridan (6446)	493
Sheringham Point (6382)	400
Sherman Island (5527)	261
Sherwood Creek (6460)	511
Shilshole Bay (6449)	468
Shine (6421)	482
Ship fire signal	23
Ship Harbor (6376)	439
Ship Rock (5128)	197
Shoal Bay (6380)	432
Shoal Point (6380)	403

Page
Shoalwater (Willapa) Bay (6185) 371
Shoalwater, Cape (6185) 371
Shubrick Rock (5602) 289
Signal Hill (5147) 183
Signals, aircraft distress 22
Signals, distress 22
Signals, fog 15
Signals, ship fire 23
Signals, storm 14
Signals, submarine emergency identification 22
Signals, surveying vessels 1
Signals, time 30
Sidney Channel (6380) 419
Sidney Island (6380) 419
Sierra Point (5531) 248
Sierra Nevada, Point (5302) 221
Siletz Bay (5902) 330
Siletz River (5902) 330
Siltcoos River (5802) 323
Silverdale (6446) 493
Similk Bay (6380) 438
Simmons Island (5534) 260
Simonton Cove (5116) 206
Simpton, Point (5532) 254
Sinclair Inlet (6440) 492
Sinclair Island (6380) 437
Sister Rocks (5702) 303
Sisters (6421) 482
Sisters Rocks (5951) 310
Sitcum Waterway (6407) 499
Siuslaw River (6023) 324
Sixes River (5952) 315
Sixth Avenue Ferry Landing (Titlows Wharf) (6460) 502
Sixtymile Bank (5101) 174
Skagit Bay, northern part (6380) 438
Skagit Bay, southern part (6450) 479
Skagit City Bar (6450) 480
Skagit Island (6380) 438
Skagit River (6450) 480
Skamokawa (6152) 350
Skamokawa Channel (6152) 349
Skamokawa Creek (6152) 350
Skamokawa (Steamboat) Slough (6152) 350
Skiff Point (6446) 466
Skipanon River (6151) 346
Skipjack Island (6380) 417
Skookum Inlet (6460) 512
Skokomish River (6460) 486
Skunk Bay (6450) 463
Skunk Point (5115) 204
Slate Rock (5302) 223
Slaughters Channel (6153) 351
Slip Point (6300) 406
Small White Rock (5602) 288
Smith Island, San Luis Obispo Bay (5386) 217
Smith Island, Strait of Juan de Fuca (6380) 404
Smith Point (6151) 346
Smith River, near Point St. George (5702) 306
Smith River, Umpqua River (6004) ... 322
Smoke 53
Smuggler (Pyramid) Cove (5117) 194
Smugglers Cove, Cape Falcon (5902) .. 336

Page
Smugglers Cove, Santa Cruz Island (5114) 202
Snag Island (5534) 260
Snake Island (6300) 454
Snake River 367
Snake Rock (6421) 462
Snatelum Point (6450) 478
Snodgrass Slough (5527) 266
Snohomish River (6448) 475
Snow 51
Soberanes Point (5476) 226
Solana Beach (5101) 180
Soldiers Harbor (5703) 285
Soledad Mountain (5101) 179
Sonora Reef (6002) 383
Sooes River (6265) 390
Sooke Bay (6382) 400
Sooke Inlet (6382) 400
Soquel Cove (5403) 229
Soquel Creek (5403) 229
Soquel Point (5403) 230
South Arbor (6195) 379
South Bay, Grays Harbor (6195) 378
South Bay, San Francisco Bay (5532) .. 239
South Bay (Henderson Inlet) (6460) .. 505
South Beach (6446) 489
South Bend (6185) 373
South Channel, Columbia River (6151) 349
South Channel, Grays Harbor (6195) 378
South Channel, San Francisco (5532) 238
South Channel, Tillamook Bay (6112) 333
South Colby (6460) 494
South Coronado (5101) 173
South Cove (5802) 317
South Fork, Skagit River (6450) 480
South Fork, Mokelumne River (5527) .. 265
South Head (6460) 509
South Montesano (6195) 379
South Nemah River (6185) 375
South Pass (6450) 477
South Pender Island (6380) 420
South Point (5115) 203
South Reef (6058) 327
South Rock (6102) 385
South Shore Port (5531) 249
South Slough (5984) 320
South Spit (5832) 294
South Vallejo (5525) 257
Southampton Shoal (5532) 251
Southeast Anchorage (5115) 204
Southeast Black Rock (5952) 313
Southeast Farallon (5502) 235
Southeast Reef (5520) 232
Southport Channel (5832) 296
Southport Landing (5832) 296
Southwest Seal Rock (5895) 306
Southworth (6460) 494
Southworth, Point (6460) 497
Souza Rock (5386) 216
Sow and Pigs (6112) 333
Spanish Bank (6300) 450
Spanish Canyon (5602) 289
Special signals, San Francisco Bay ... 248
Spieden Bluff (6381) 416
Spieden Channel (6381) 416
Spieden Island (6381) 416
Spike Rock (6265) 389
Split Rock, near Cape Elizabeth (6002) 383

	Page
Split Rock, near Trinidad Head (5702)	302
Spokane River	368
Spoonbill Creek (5534)	260
Spring Beach (6460)	497
Spring Passage (6380)	428
Square Black Rock (5302)	223
Square White Rock (5952)	313
Squalicum Creek (6378)	443
Squalicum Creek Waterway (6378)	443
Squamish Harbor (6421)	482
Squaxin Island (6460)	511
Squaxin Passage (6460)	511
Standard time	61
Stanley Channel (6185)	376
Stanley Park Peninsula (6300)	451
Stanley Peninsula (6185)	376
Stanley Point (6380)	422
Stanwood (6450)	477
Star Rock (5895)	306
Starkweather Landing (6171)	359
Starr Rock (6378)	444
Steamboat Creek (6102)	385
Steamboat Island (6460)	512
Steamboat Rock, near Cape Mendocino (5795)	291
Steamboat Rock, Orford Reef (5952)	313
Steamboat (Skamokawa) Slough, Columbia River (6152)	350
Steamboat Slough, Everett Harbor (6448)	476
Steamboat Slough, Sacramento River (5527)	273
Stearns Wharf (5261)	210
Steilacoom (6460)	503
Stella (6153)	351
Stella Range (6153)	351
Steep Point (6380)	427
Stevenson (6157)	364
Steveston (6300)	449
Steveston Jetty (6300)	449
Stewarts Point (5502)	278
Still Harbor (6460)	508
Stillaguamish River (6450)	477
Stillwater Cove (5476)	226
Stillwell Point (5711)	283
Stockton (5527)	262
Stone Lagoon (5702)	302
Stonewall Bank (5802)	326
Storm warnings. *See also* name of place	177
Storm warning display stations	532
Storms, tropical	58
Straights Point Light (6157)	364
Strait of Juan de Fuca (6300)	397
Strait of Juan de Fuca, Northern Shore (6300)	399
Strait of Juan de Fuca, Southern Shore (6265)	404
Stretch Island (6460)	510
Striped Peak (6382)	408
Stuart Island (6380)	416
Stuart, Point (5532)	254
Strawberry Bay (6380)	436
Strawberry Island, near Ben Ure Island (6376)	434
Strawberry Island, Strawberry Bay (6380)	436
Strawberry Point (6450)	480
Sturgeon Bank (6300)	448
Submarine oil seepage	190
Sucia Islands (6380)	418
Sugar Loaf (5795)	292
Sugarloaf (5502)	236
Suisun Bay (5534)	260
Suisun City (5534)	260
Suisun Cutoff (5534)	260
Suisun Point (5534)	259
Suisun Slough (5534)	260
Sullivan Slough (6376)	439
Sulphur Springs (6004)	322
Summerland (5202)	209
Sunken Reef (5502)	277
Sunny Bay (6460)	508
Sunset (6171)	359
Sunset Beach (5142)	182
Supplies. *See also* name of place	60
Suquamish (6445)	465
Surf	7
Surf (station) (5302)	215
Surge	7
Sur Peak (Pico Blanco) (5476)	224
Sur, Point (5476)	224
Sur River (5476)	224
Sur Rock (5476)	224
Surface water temperatures	50
Svensen (6151)	349
Sycamore Canyon (5476)	223
Sylopash Point (6450)	484
Sylvan, Colvos Passage (6460)	497
Sylvan, Hale Passage (6460)	508
Sutil Island (5110)	193
Sutter Slough (5528)	273
Swanson Channel (6380)	421
Swell	7
Swifts Bay (6380)	432
Swiftsure Bank (6102)	391
Swiftsure Bank Lightship (6102)	391
Swinomish Slough (6376)	438
Switzer Rock (5602)	286

T

Table Bluff (5832)	293
Table Bluff Light (5832)	293
Table Mountain, near Alsea Bay (5802)	325
Table Mountain, near San Diego (5101)	173
Table Rock (5971)	316
Tacoma (6407)	497
Tacoma Harbor (Commencement Bay) (6407)	497
Tacoma Waterway Light (6407)	498
Taft (5902)	330
Tahkenitch Creek (5802)	323
Tahlequah (6460)	497
Taholah (6002)	383
Tala Point (6421)	462
Talcott Shoal (5116)	204
Tanner Bank (5101)	174
Tansy Point Range (6151)	345
Tatoosh Island (6265)	390
Taylor Point (6380)	420
Taylor Slough (5527)	265
Teahwhit Head (6102)	386
Telegraph Hill (5535)	244

	Page
Temperatures	50
Tenasillahe Island (6152)	350
Ten Mile River (5602)	286
Ten Mile River Beach (5602)	281
Tenmile Creek (5802)	325
Terminal facilities. *See also* name of place	178
Terminal Island (5147)	183
Termination Point (6421)	482
Terminous (5527)	267
Thatcher (6380)	432
Thatcher Pass (6380)	432
Thetis Cove (6380)	402
Thompson, Point (6380)	430
Thornton (5527, 5528)	266
Thrasher Rock (6300)	453
Three Arch Rocks (6112)	332
Three Peaks (5602)	289
Three Tree Point, Columbia River (6152)	349
Three-tree Point, Puget Sound (6460)	495
Threemile Creek (5802)	323
Threemile Rapids (6157)	366
Threemile Slough (5527)	265
Thunderstorms	51
Tiburon (5532)	254
Tiburon, Point (5532)	254
Tichenor Rock (5952)	311
Tidal Canal (5535)	250
Tide Point (6380)	435
Tide rips	399
Tide Rock (5302)	222
Tide Tables	6
Tides. *See also* name of place	42
Tides, extreme	9
Tides, tropic	42
Tillamook (6112)	334
Tillamook Bay (6112)	333
Tillamook Head (5902)	337
Tillamook Rock (5902)	337
Time, daylight saving	61
Time, standard	61
Tilly Point (6380)	420
Tinson Point (6300)	454
Titlows Wharf (Sixth Avenue Ferry Landing) (6460)	502
Toandos Peninsula (6450)	484
Toke Point (6185)	375
Tokeland (6185)	375
Toleak Point (6102)	386
Toledo, Columbia River (6153)	352
Toledo, Yakina Bay (6058)	328
Toliva Shoal (6460)	502
Tolo (6445)	486
Tolo Bank (5602)	288
Tom Paine Slough (5527)	267
Tom Point (6380)	419
Tomahawk Island (6155)	360
Tomales Bay (5603)	276
Tomales Bluff (5603)	276
Tomales Point (5603)	275
Tongue Point, Columbia River (6151)	348
Tongue Point, Crescent Bay (6382)	408
Tongue Point Channel (6151)	345
Totten Inlet (6460)	512
Toro Creek (5387)	219
Towboats. *See also* name of place	60
Tower Rock (5952)	315
Towhead Island (6380)	436
Tracyton (6446)	493
Tranquillon Mountain (5202)	213
Treasure Island (5535)	245
Treble Point (6460)	503
Trevor Channel (6102)	392
Trial Islands (6380)	403
Trincomali Channel (6300)	453
Trinidad (5846)	299
Trinidad Harbor (5846)	299
Trinidad Head (5846)	298
Triton Cove (6450)	484
Triton Head (6450)	485
Troutdale (6156)	362
Trump Island (6380)	433
Tryon Creek (6171)	359
Tskutsko Point (6450)	484
Tsusiat Lake (6102)	391
Tualatin River (6171)	359
Tulalip (6448)	476
Tulalip Bay (6448)	476
Tumbo Channel (6380)	421
Tumbo Island (6380)	421
Tumbo Point (6380)	421
Tumbo Reef (6380)	421
Tumwater (6462)	507
Turn Island (6380)	426
Turn Point (6380)	416
Turn Rock (6380)	426
Turner Cut (5527)	268
Turner, Point (6440)	492
Turtle Back Range (6380)	429
Turtle Rocks (5702)	302
Twin (6382)	407
Twin Lakes (5403)	230
Twin Peak (5302)	223
Twin Peaks (5302)	223
Twin Rivers (6382)	407
Twin Rocks, Mackaye Harbor (6380)	425
Twin Rocks, Tillamook Bay (6112)	334
Twin Spits (6421)	482
Twins, The (6421)	462
Twitchell Island (5527)	262
Two Arches Rock (5902)	331
Tyee Shoal (6446)	466
Tyler Bight (5116)	207

U

Umatilla	366
Umatilla Harbor	366
Umatilla Reef (6265)	389
Umatilla Reef Lightship (6265)	389
Umatilla River (6157)	367
Umpqua River (6004)	322
Underwood (6157)	365
Union (6460)	486
Union Bay (6447)	470
Union Island (5527)	267
Union Landing (5602)	287
Union River (6460)	486
Union Slough (6448)	476
Unit Rocks (6380)	419
United States Military Reservations	244

Page

University of Washington, near Friday Harbor (6380) 426
University of Washington, Lake Washington (6447) 470
Upright Channel (6380) 430
Upright Head (6380) 430
Urban (6380) 437
Usal (5602) 287
Usal Rock (5602) 287
Usal Valley (5602) 287
Useless Bay (6450) 463
Utsaladdy (6404) 480

V

Valdes Island (6300) 453
Vallejo (5525) 257
Vancouver, British Columbia (6300) .. 451
Vancouver, Washington (6155) 361
Vancouver Harbor (6300) 451
Vancouver Lake (6154) 354
Vancouver Lower Range (6154) 354
Vancouver Upper Range (6154) 354
Van Sickle Island (5534) 260
Vashon (6460) 495
Vashon Heights Landing (6460) 495
Vashon Island (6460) 494
Vashon Point (6460) 495
Vaughn (6460) 511
Vaughn Bay (6460) 511
Veale Tract (5527) 265
Vega (6460) 504
Vendovi Island (6378) 442
Venice (5144) 190
Venice Cut (5527) 262
Ventura (5007) 208
Ventura River (5007) 208
Ventura Rocks (5476) 225
Verona (5528) 273
Vessels, undocumented, numbering 20
Vessels, undocumented, recording 20
Vessels, surveying, special signals 1
Veterans Home (6440) 492
Vicente, Point (5142) 189
Victim Island (6380) 431
Victor (6460) 511
Victoria Canal (5527) 267
Victoria Harbor (6380) 402
Victoria Island (5527) 267
Villa Canyon (5302) 222
Village Point (6380) 437
Virago Point (6300) 453
Viti Rocks (6378) 442
Vizcaino, Cape (5602) 287
Von Geldern Cove (6460) 509
Von Helm Rock (5302) 220

W

WWV 30
WWVH 32
Waada Island (6266) 405

Page

Waatch Point (6265) 390
Waatch River (6265) 390
Waddell Creek (5402) 231
Waldron (6380) 417
Waldron Island (6380) 417
Waldport (5802) 325
Walker Creek (5603) 276
Walker Island (6153) 351
Walker Island Channel (6153) 351
Wallace Island (6152) 351
Wallace Point (6380) 420
Wallace Slough (6152) 351
Wallis Point (6300) 455
Walnut Eddy (6171) 360
Walnut Grove (5528) 271
Wapato (Port-Industrial) Waterway (6407) 499
Wards Cut (5527) 262
Wards Island (5527) 267
Warnings, aircraft 176
Warnings, navigational 33
Warnings, storm 177
Warren (6460) 508
Warrendale (6156) 362
Warrenton (6151) 346
Warrior Rock Light (6154) 354
Warrior Rock Range (6154) 354
Wasco Light (6157) 364
Washington Harbor (Sequim Bay) (6403) 411
Washougal (6156) 362
Wasp Islands (6380) 427
Wasp Passage (6380) 428
Waterman (6446) 491
Waterman Point (6446) 490
Water densities, monthly mean sea.... 520
Water temperatures, monthly mean surface 520
Wauna (6460) 509
Wauna Range (6152) 349
Waves, destructive 8
Waves, seismic sea 8
Waves, wind 7
Wawa Point (6450) 484
Weather. *See also* name of place 44
Weather broadcasts 27
Weather broadcasts, commercial radio stations 533
Weather Bureau 13, 532
Webb Point (5527) 262
Wedderburn (5951) 309
Wells, Point (6445) 464
West Bank (6380) 418
West Conical Rock (5952) 313
West Cove (5118) 196
West Linn (6171) 359
West Pass (6450) 480
West Point, near Deception Island (6376) 434
West Point, Elliott Bay (6449) 468
West Point, Santa Cruz Island (5115) 203
West Seattle (6449) 469
West Sound (6380) 431
West Waterway (6449) 469
Westcott Bay (6381) 415
Westcott Shoal (5116) 206
Westdahl Rock (5386) 218
Westhaven (6195) 377

Page
Westpoint Slough (5531) 249
Westport, Columbia River (6152) 351
Westport, near Fort Bragg (5602) 286
Westport, Grays Harbor (6195) 377
Westport Channel (6152) 349
Westport Landing (5602) 286
Westport Slough (6152) 351
Westsound (6380) 431
Westwood (6446) 491
Whale (5895) 306
Whale Rocks (6380) 425
Whaleboat Rock (5302) 222
Whalehead Island (5896) 307
Whaler Island, Crescent City (5895) .. 304
Whaler Island, San Luis Obispo Bay (5386) 216
Whalers Knoll (5476) 226
Whalers Rock (5476) 226
Whatcom Creek (6378) 443
Whatcom Creek Waterway (6378) 443
Wheeler (6122) 335
Wheeler Island (5534) 260
Whidbey Island (6380) 404
Whiskey Slough (5527) 268
Whiskey Spit (Point Hannon) (6421) 482
Whitcomb Flats (6195) 377
White Cove (5112) 196
White Point, Coos Bay (5984) 321
White, Point, Rich Passage (6446) ... 490
White Rock, southward of Cape Alava (6102) 388
White Rock, southward of Klamath River (5702) 303
White Rock, northward of Point Estero (5302) 220
White Rock, off Point St. George (5895) 305
White Rock, Pointer Island (6380) ... 436
White Rock, San Juan Channel (6380) 429
White Rock, northward of Trinidad Head (5702) 301
White Rock No. 1 (5302) 222
White Rock No. 2 (5302) 222
White Salmon River (6157) 365
White Slough (5527) 269
Whitehorn, Point (6380) 446
Whites Point (5142) 189
Whitesboro (Salmon Creek) Cove (5711) 282
Whiting Rock (5532) 253
Wildcat Harbor (6460) 512
Willamette (6171) 359
Willamette Falls Canal (6171) 359
Willamette River (6155) 354
Willamette River Light (6155) 355
Willapa (6185) 372
Willapa Bar (6185) 372
Willapa (Shoalwater) Bay (6185) 371
Willapa Bay entrance (6185) 371
Willapa Bay Light (6185) 371
Willapa River (6185) 372
William Head (6382) 401
William Point (6380) 441
Williams, Point (6460) 494
Williamson Rocks (6376) 435
Willoughby Rock (6002) 383
Willow Creek (5302) 222
Willow Island (6171) 359
Willow Range (6154) 354

Page
Willows Anchorage (5115) 203
Wilmington (5147) 183
Wishkah River (6195) 379
Wilson Cove (5118) 195
Wilson Creek, near Klamath River (5702) 303
Wilson Creek, Willapa River (6185) .. 373
Wilson Point, Case Inlet (6460) 510
Wilson, Point, Admiralty Inlet (6450) . 412
Wilson Rock, near False Klamath Rocks (5702) 303
Wilson Rock, San Miguel Island (5116) 206
Wilsonville (6171) 360
Winchelsea Islands (6300) 456
Winchester Bay (6004) 323
Winchuck River (5896) 307
Wind, Beaufort scale 49
Wind River (6157) 365
Winds, local 56
Windy Bluff (6460) 511
Windy Point (6446) 493
Winehaven (5532) 253
Wing Point, Eagle Harbor (6446) 466
Wing Point (town) (6446) 467
Wing Point Reef (6446) 466
Winslow (6446) 467
Winter Point (6380) 452
Wire drags 2
Wollochet (6460) 508
Wollochet Bay (6460) 508
Woodland (6153) 353
Woodley Island (5832) 295
Woody Island (6152) 350
Woody Island Channel (6152) 350
Wyckoff Ledge (5116) 207
Wyckoff Shoal (6460) 508

Y

Yacht Clubs 248, 530
Yachats River (5802) 325
Yakima River 367
Yamhill Lock (6171) 360
Yamhill River (6171) 360
Yankee Point (5476) 226
Yankee Point Rock (5476) 226
Yaquina (6058) 328
Yaquina Bay (6058) 326
Yaquina Head (6058) 326
Yaquina Head Light (6058) 326
Yaquina Reef (6058) 327
Yaquina River (6058) 326
Yellow Bluff (5535) 244
Yellow Island (6380) 428
Yellow Rock (5896) 308
Yeo Island (6300) 456
Yeomalt (6446) 466
Yeomalt Point (6446) 466
Yerba Buena Island (5535) 244
Yokeko Point (6376) 435
Yoman (6460) 503
Young Island (6376) 435
Youngs Bay (6151) 346
Youngs River (6151) 346
Yukon Harbor (6460) 494

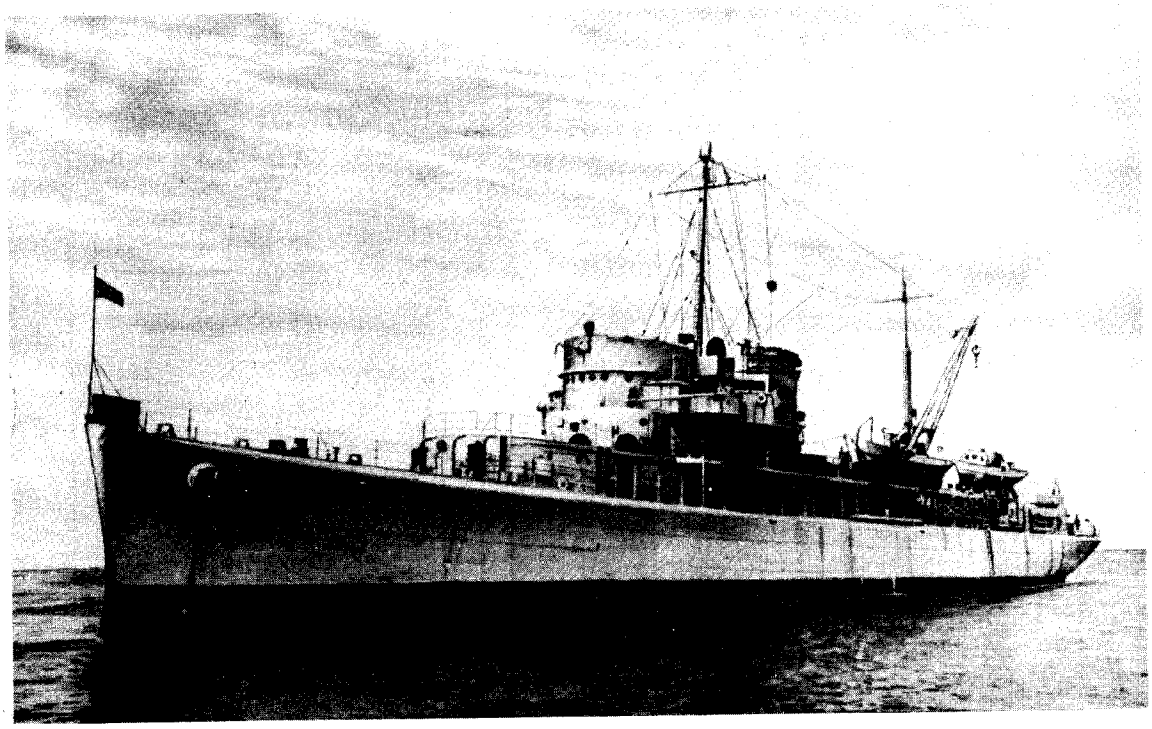
Z

	Page
Zenith (6460)	495
Zero Rock (6380)	419
Zuniga Point (5105)	175
Zuniga Shoal (5105)	175

☆ U. S. GOVERNMENT PRINTING OFFICE: 1952—949285

U. S. Coast and Geodetic Survey

NAUTICAL CHART
SYMBOLS AND ABBREVIATIONS



COAST AND GEODETIC SURVEY SHIP *PIONEER*

Chart No. 1

SYMBOLS AND ABBREVIATIONS FOR NAUTICAL CHARTS

The standard symbols and abbreviations which have been approved for use on nautical charts published by the United States of America are reproduced on the following pages.

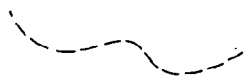
Symbols and abbreviations are numbered in accordance with a standard form proposed by the International Hydrographic Bureau of 1939.

Vertical figures indicate that the symbol or abbreviation is in accordance with the I. H. B. standard.

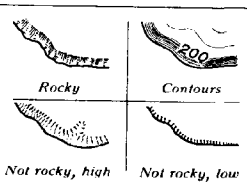
Symbols or abbreviations which differ from those of the I. H. B., or which do not appear on the standard are indicated by slant figures.

Figures in parentheses indicate that the symbol or abbreviation is in addition to those shown on the standard.

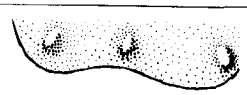
A. The Coastline



1 *Shoreline unsurveyed*



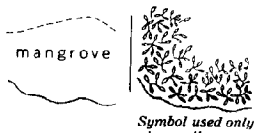
3 *Cliffy coastline (Bluffs)*



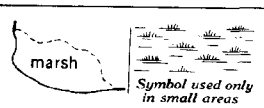
4 *Sandhills or dunes*

5 *Stony or shingly shore*

6 *Sandy shore*

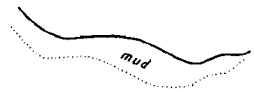


7 *Mangrove*



8 *Swamp or marsh*

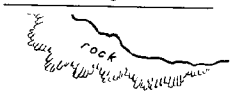
11 Foreshores



a *Mud flats*

b *Sand*

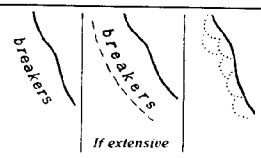
c *Stones or gravel*



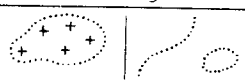
d *Rock, uncovers at datum of soundings*

f *Sand and gravel*

g *Coral, uncovers at datum of soundings* (See O-10)



12 *Breakers along a shore*

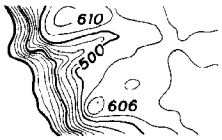


13 *Limiting danger line*

B. Coast Features

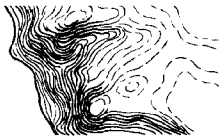
1	*G.*	*Gulf*
2	*B.*	*Bay*
(2a)	*B.*	*Bayou*
3	*Fd.*	*Fjord*
4	*L.*	*Loch,Lough,Lake*
5	*Cr.*	*Creek*
(5a)	*C.*	*Cove*
6	*In.*	*Inlet*
7	*Str.*	*Strait*
8	*Sd.*	*Sound*
9	*Pass.*	*Passage, Pass*
10	*Chan.*	*Channel*
11	*Entr.*	*Entrance*
13	*Mth.*	*Mouth*
14	*Rds.*	*Roads, Roadsted*
15	*Anch.*	*Anchorage*
16	*Hbr.*	*Harbor*
17	*P.*	*Port*
(17a)	*P.*	*Pond*
18	I.	*Island*
19	It.	*Islet*
20	Arch.	*Archipelago*
21	Pen.	*Peninsula*
22	C.	*Cape*
23	Prom.	*Promontory*
24	Hd.	*Head*
25	Pt.	*Point*
26	Mt.	*Mountain Mount*
27	Rge.	*Range*
29	Pk.	*Peak*
30	Vol.	*Volcano*
32	*Bld.*	*Boulder*
(33)	*Str.*	*Stream*
(34)	*R.*	*River*
(35)	*Slu.*	*Slough*
(36)	*Lag.*	*Lagoon*
(37)	*Thoro.*	*Thorofare*

C. The Land

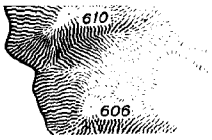


1 *Contours*

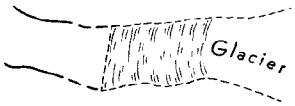
(a) Contours, approximate



(b) Form lines, no definite interval



2 *Hachures*



3 *Glacier*

TREE

A conspicuous clump or single tree of any kind useful as a landmark.

5 *Isolated trees*

wooded

9 *Deciduous woodland*

wooded

10 *Coniferous woodland*

·2560 T.T.

(11) Elevation of top of trees

D. Control Points

1	△		*Triangulation point(station)*
2	⊙		*Fixed point*
3	·256		*Summit of height (Peak) (when not a landmark)*
(a)	255		*Peak, accentuated by contours*
(b)	256		*Peak, accentuated by hachures*
(c)			*Peak, when elevation has not been determined*
(d)	256		*Peak, when a landmark*
4	⊕	Obs. Spot	*Observation spot*
5		B.M.	*Bench mark*
6	∘	See View	*View point*
(9)		Astro.	*Astronomical*
(10)		Tri.	*Triangulation*
(11)		C. of E.	*Corps of Engineers*
(12)			
(13)			

E. Units

1	hr.	*hour*
2	m.; min.	*minute*
3	sec.	*second*
4	m.	*meter*
5	km.	*kilometer*
6	in.	*inch*
7	ft.	*foot*
8	yd.	*yard*
9	fm.	*fathom*
11	M.	*nautical mile*
12	kn.	*knot*
13	lat.	*latitude*
14	long.	*longitude*
17	cor.	*correction*
(18)	alt.	*altitude*
(19)	ht.	*height*
(20)		
(21)		
(22)		

F. Adjectives

and other abbreviations

1	gt.	great
3	lrg.	large
4	sml.	small
7	mid.	middle
9	anc.	ancient
12	conspic.	conspicuous
16	dist.	distant
17	abt.	about
(19)	aband.	abandoned
(20)	extr.	extreme
(21)	concr.	concrete
(22)	bet.	between
(23)	estab.	established
(24)	exper.	experimental
(25)	discontd.	discontinued
(26)	fl.	flood
(27)	mod.	moderate
(28)	maintd.	maintained
(29)	elec.	electric
(30)	priv.	private, privately
(31)	prom.	prominent
(32)	std.	standard
(33)	subm.	submerged
(34)	approx.	approximate
(35)	cor.	corner
(36)	CL.	clearance
(37)	No.	number
(38)	Ave.	avenue
(39)	Hy.	highway
(40)	explos.	explosive
(41)	Blvd.	boulevard
(42)		
(43)		
(44)		
(45)		
(46)		

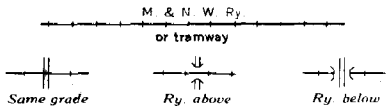
G. Harbors

1		Anch.	Anchorage, large vessels (see No. P-12)
2		Anch.	Anchorage, small vessels
3		Hbr.	Harbor
6		Bkw.	breakwater
8			jetty (partly below M H W)
(8a)			jetty (small scale)
9		Pier	pier
11			groin (partly below M H W)
12	Anchorage prohibited	Anch. prohib.	Anchorage prohibited
13	spoil area		spoil ground
14	Trap		fish traps (actual shape charted)
(14a)		Fsh. stk.	fishing stakes when dangerous
16		Ldg.	landing place
18		Whf.	wharf
21		Dol.	dolphin
26		Quar.	Quarantine
29		Cus. Ho.	Customhouse
33		B. Hbr.	Boat Harbor
35			dock
36			dry dock (actual shape shown on large scale charts)
37			floating dock (actual shape shown on large scale charts)
39			patent slip (marine railway)
(39a)		Ramp	ramp
40	Lock		lock (point upstream)
45		Obsy.	Observatory
(46)			
(47)			

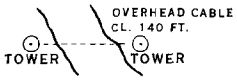
H. Topography

1 Roads (Rds.)

2 Track, footpath, or trail



3 Railway (single or double track)
Railway (Ry.) Railroad (R.R.)



4 Overhead cable (OVHD. CAB.)

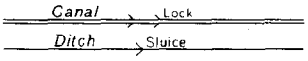
5 Power transmission line

8 River or Stream

9 Intermittent stream

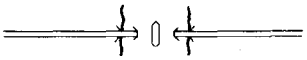
10 Lake (L.)

12 Marsh (See No. A-8)

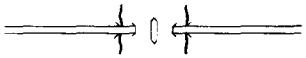


13 Canal or ditch (point upstream)

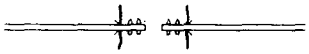
14 Bridge (fixed) (BR.)



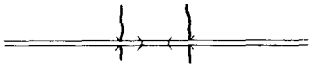
15 Drawbridge, in general



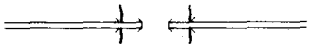
16 Swing bridge, that can be opened



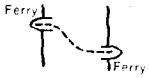
17 Pontoon bridge, that can be opened



(17a) Lift bridge



(b) Bascule bridge, that can be opened



19 Ferry (Fy.)

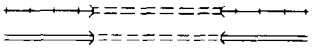
21 Dam

(25) Levee

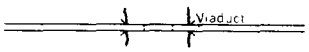
(26) Lava flow

(27) Log boom

(28) Submerged piling, piling, stumps, and snags



(29) Tunnel (railroad or road)



(30) Viaduct

I. Buildings

When the buildings are prominent, they may be shown by landmark symbol with descriptive note. (see L-63)
The landmark symbol is used to indicate positions of objects when accurately determined.

1			City or town (large scale)
(1a)			City or town (small scale)
3		Vil.	Village
4		Cas.	Castle
5		Ho.	House
8		Ch.	Church
10			Temple
12			Mosque
13			Minaret
14		Pag.	Pagoda
16		Mony.	Monastery
18	Cem.	Cem.	Cemetery
19		Ft.	Fort (actual shape charted)
23	Airport		Airplane landing field
24			Airport (large scale)
			Small scale
(24a)			Airport (military)
(24b)			Airport (civil)
26	First St.		Street
27		Tel.	Telegraph
29		P. O.	Post Office
30		Govt.	Government
32		Hosp.	Hospital
34		Magz.	Magazine
35	MON.		Monument
36	CUP.		Cupola
37		elev.	elevation elevator elevated
40	Ruins		Ruins
41	TR.		Tower
42			Windmill
44	CHY.		Chimney
46			Oil tank
47		Facty.	Factory
(56)	GAB		Gable
(57)		Sch.	School
(58)		H. S.	High School
(59)		Univ.	University
(60)		Inst.	Institute
(61)		Co.	Company
(62)		Corp.	Corporation
(63)		Cap.	Capitol
(64)			Courthouse
(65)		Cath.	Cathedral
(66)		Bldg.	Building
(67)		Pav.	Pavilion
(68)		Ltd.	Limited
(69)		Apt.	Apartment
(70)		T.	Telephone
(71)			
(72)			

J. Miscellaneous Stations

2	Sta.	Station
3	C. G.	Coast Guard (similar to LS.S.)
(3a)	C. G. WALLIS SANDS	When the building is a landmark
6	LS.S.	Lifesaving station (See J-3)
7	Rkt. Sta.	Rocket station
8	PIL. STA.	Pilot station
9	Sig. Sta.	Signal station
10	Sem.	Semaphore
19	FS.	Flagstaff
(20)	W. B. SIG. STA.	Weather Bureau signal station
(21)	FP.	Flagpole
(22)	F. TR.	Flag tower
(23)	LOOK. TR.	Lookout tower
(24)	S'PIPE	Standpipe
(25)	BELL	On land
(26)		
(27)		

K. Lights

1		Position of light
2	Lt.	Light
3	LH.	Lighthouse
4	AERO	Aeronautical light
5		Lighted beacon
6		Lightship
7		Lighted buoy
10	REF	Reflector
(17)	Priv maintd	Private light (maintained by private interests; to be used with caution)
21	F	Fixed
22	Occ	Occulting
23	Fl	Flashing
24	Qk Fl	Quick flashing
(24a)	I Qk	Interrupted quick
26	Alt	Alternating
27	Gp Occ	Group occulting
28	Gp Fl	Group flashing
(28a)	S L	Short-long
29	F Fl	Fixed and flashing
30	F Gp Fl	Fixed and group flashing
31	Rot.	Rotating
(39)	m.; min.	minutes
(40)	sec.	seconds
44		visible
44a	M.	nautical mile
47	Gp.	group
49	SEC	sector
61	Vi.	violet
63	Bu.	blue
64	G.	green
65	Or.	orange
66	R.	red
67	W.	white
(67a)	Am.	amber
68	OBSC	obscured
69	(U)	unwatched
70	Occas	occasional
71	Irreg.	irregular
73	Temp	temporary
80	Vert.	vertical
81	Hor.	horizontal
(82)	D.	destroyed
(82a)	Exting.	extinguished
(83)	V. B.	vertical beam
(84)	Exper.	experimental
(85)	RGE	range
(86)	AERO	aeronautical

L. Buoys and Beacons

On entering a channel from seaward, buoys on starboard side are red with even numbers, on port side black with odd numbers. Lights on buoys on starboard side of channel are red or white, on port side white or green. Mid-channel buoys have black and white vertical stripes. Obstruction buoys are green, or have red and black horizontal bands. This system does not always apply to foreign waters. The dot of the buoy symbol, and the small circle of the light vessel and mooring buoy symbols and the center of the beacon symbol indicate their positions.

1	•	Position of buoy
2		Lighted buoy
3	BELL	Bell buoy
(3a)	GONG	Gong buoy
4	WHIS	Whistle buoy
5	C	Can buoy
6	N	Nun buoy
7	SP	Spherical buoy
8	S	Spar buoy
(8a)		Checkered buoy
12		Lightship
14	BW	Fairway buoy (B. & W. V. S.) (Mid-Channel)
18	RB RB	Junction buoy (R. & B. H. B.)
19	RB RB	Isolated danger buoy (R. & B. H. B.)
20	RB G	Wreck or obstruction buoy (R. & B. H. B.) or (G.)
22		Mooring buoy
24	Y Quar.	Quarantine buoy
(27)	BW	Fish trap buoy (W. & B. H. B.)
(28)		Anchorage buoy
(29)	Priv. maintd.	Maintained by private interests: to be used with caution
31	H. B.	Horizontal bands
32	V. S.	Vertical stripes
33	Chec.	checkered
41	W.	white
42	B.	black
43	R.	red
44	Y.	yellow
45	G.	green
(46)	Br.	brown
(47)	Gy.	gray
(48)	T. B.	temporary buoy
52	△RW Bn △W Bn ▲R Bn ▲ Bn	Unlighted beacon (Daybeacon)
(52a)	MARKER	Private aid to navigation
53	Bn	Beacon (See L-52)
63	⊙	Landmark
(63a)	∘	Landmark, position approx
(64)	REF	Reflector
(65)	WOr WOr	Special purpose buoy

Note: Buoy and beacon symbols with topmarks may be shown on charts of foreign waters.

M. Radio and Radar Stations

1	R. Sta.	Radio station
2	R.T.	Radio telephone
3	R. Bn.	Radiobeacon
7	R. D. F.	Radio direction finder station
9	R. TR.	Radio tower
(9a)	R. MAST	Radio mast
(10)	R. TR. (WEAF)	Commercial broadcast
11	Ra.	Coast radar station
12	Racon	Radar responder beacon
(13)	Ra. Ref.	Radar reflector
(14)	Ra. (conspic.)	Radar conspicuous object
(15)	Ramk.	Ramark

N. Fog Signals

1	Fog Sig.	Fog signal station
6	SUB-BELL	Submarine fog bell (mechanical)
7	SUB-OSC	Submarine oscillator
8	NAUTO.	Nautophone
9	DIA.	Diaphone
11	SIREN	Fog siren
12	HORN	Fog trumpet
13	HORN	Fog horn
14	BELL	Fog bell
15	WHIS.	Fog whistle
16	REED	Reed horn
17	GONG	Gong
(18)	D. F. S.	Distance finding station
(19)	GUN	Fog gun
(20)		

O. Dangers

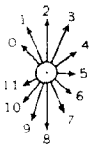
(25)	
1	Rocks which do not cover; with their elevations above M.H.W.
* uncovers 2 ft | *(2)	
2	Rocks that cover and uncover, with heights in feet above datum of soundings
*	
(3a)	When rock of 2 is considered a danger to navigation
+	
(4a)	Sunken rock
+	
(4b)	When rock of 4a is considered a danger to navigation
2 Rk	
(4c)	Shoal sounding on isolated rock replaces symbol
[21] Rk [21] Wk [21] Obstr	
6a	Sunken danger with depth cleared by wire drag (Feet or fathoms)
reef line	
10	Coral or rocky reef (below datum of soundings) See A-11g
11	Stranded wreck (any portion of hull above datum of soundings)
masts	
12	Sunken wreck with only masts visible
14	Dangerous sunken wreck with less than 10 fathoms of water over it (See 6a)
wreckage	
(14a)	A number of sunken wrecks
21 Obstr	
(14b)	Obstruction of any kind

5½ wreck		
15	Wreck of known depth	
16	Sunken wreck, not dangerous to surface navigation or over which the depth exceeds 10 fathoms	
foul		
17	Foul ground	
tide rips | Symbol used only in small areas		
18	Overfalls or tide rips	
eddies		
19	Eddies	
kelp | Symbol used only in small areas		
20	Kelp, any kind	
(20a)		
21	Bk.	bank
22	Shl.	shoal
23	Rf.	reef
24	Le.	ledge
25		breakers (see A-12)
27	Obstr.	obstruction
28	Wk.	wreck
(28a)	Wks.	wreckage
33	cov.	covers
34	uncov.	uncovers
35	Rep.	reported
(35a)	Shoal (rep. 1945)	shoal reported
36	Discol.	discolored
41	P. A.	position approximate
42	P. D.	position doubtful
43	E. D.	existence doubtful
44	Pos.	position
(46)		
(47)		

P. Various Limits

1		Leading line (Range line)
4		Limit of sector
5		Channel or course recommended
(5a)		Alternate course
7	Cable area	Submarine cable
8	Pipeline Pipeline area	Submarine pipe line
9		Maritime limits in general
10		Limit of fishing zone (fish trap areas bounded by broken lines)
11		Limit of dumping ground (see Nos. P-9 & G-13)
12		Anchorage limit
13	Airport	Limit of airport
16		International boundary (also State boundary)
18		Ice limits
(21)	Bdy.	Boundary
(22)	Bdy. Mon.	Boundary monument
(23)		Reservation line

T. Tides and Currents

1	H.W.	high water
(1a)	H.H.W.	higher high water
2	L.W.	low water
(2a)	L.L.W.	lower low water
3	M.T.L.	mean tide level
4	M.S.L.	mean sea level
6	Sp.	spring tide
7	Np.	neap tide
(8a)	M.H.W.	mean high water
(8b)	M.H.H.W.	mean higher high water
(9a)	M.L.W.	mean low water
(9b)	M.L.L.W.	mean lower low water
10	I.S.L.W.	Indian spring low water
17	Str.	stream
18		current, general
19	2 kn	flood stream
20	2 kn	ebb stream
23	vel.	velocity
24	kn.	knots
(25)		Current Diagram, with explanatory note
(26)		

Q. Soundings

2	27	No bottom sounding
5	30 FEET MAY 1939	Dredged channels (controlling depth may be shown in separate note)
9	17 119	Swept areas (shown by green tint) (not yet covered by sufficient hydrographic surveys to show adequate soundings)
(9a)		Areas swept by wire drag to depth indicated
(12)	19	Soundings taken from older surveys or smaller scale charts
(16)	6 5	Stream
(17)	5	Soundings on reefs that uncover
(18)		

R. Depth Contours & Tints

Feet	Fathoms
0	0
6	1
12	2
18	3
24	4
30	5
36	6
60	10
120	20
180	30
240	40
300	50
600	100
1,200	200
1,800	300
2,400	400
3,000	500
6,000	1,000
12,000	2,000
18,000	3,000
Or 10 fathoms and greater	

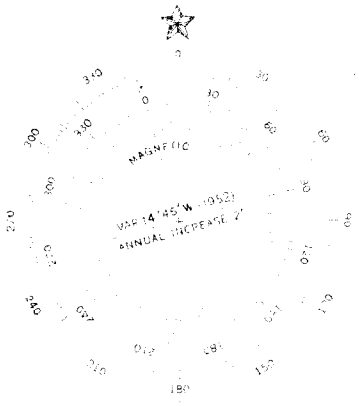
Or 10

Or 100 (blue)

S. Quality of the Bottom

1	Grd.	ground
2	S.	sand
3	M.	mud
4	Oz.	ooze
5	Ml.	marl
6	Cl.	clay
7	G.	gravel
8	Sn.	shingle
9	P.	pebbles
10	St.	stones
(10a)	Sp.	specks
11	Rk.	rock
(11a)	Bld. (s)	boulder (s)
12	Ck.	chalk
13	Qz.	quartz
14	Co.	coral
(14a)	Co. Hd.	coral head
15	Md.	madrepore
(16a)	Vol. Ash.	volcanic ash
17	La.	lava
18	Pm.	pumice
19	T.	tufa
20	Sc.	scoriae
21	Cn.	cinders
22	Mn.	manganese
23	Sh.	shells
24	Oys.	oysters
25	Ms.	mussels
26	Spg.	sponge
27	Grs.	grass
28	Wd.	weeds
32	Fr.	foraminifera
33	Gl.	globigerina
34	Di.	diatom
35	Rd.	radiolaria
36	Pt.	pteropod
37	Po.	polyzoa
39	fne.	fine
40	crs.	coarse
41	sft.	soft
42	hrd.	hard
43	stf.	stiff
44	sml.	small
45	lrg.	large
46	stk.	sticky
47	brk.	broken
(47a)	rky.	rocky
50	spk.	speckled
51	gty.	gritty
53	fly.	flinty
54	glac.	glacial
56	wh.	white
57	bk.	black
59	bu.	blue
60	gn.	green
61	yl.	yellow
63	rd.	red
64	br.	brown
66	gy.	gray
67	lt.	light
68	dk.	dark
(69)	Ca.	calcareous
(70)		

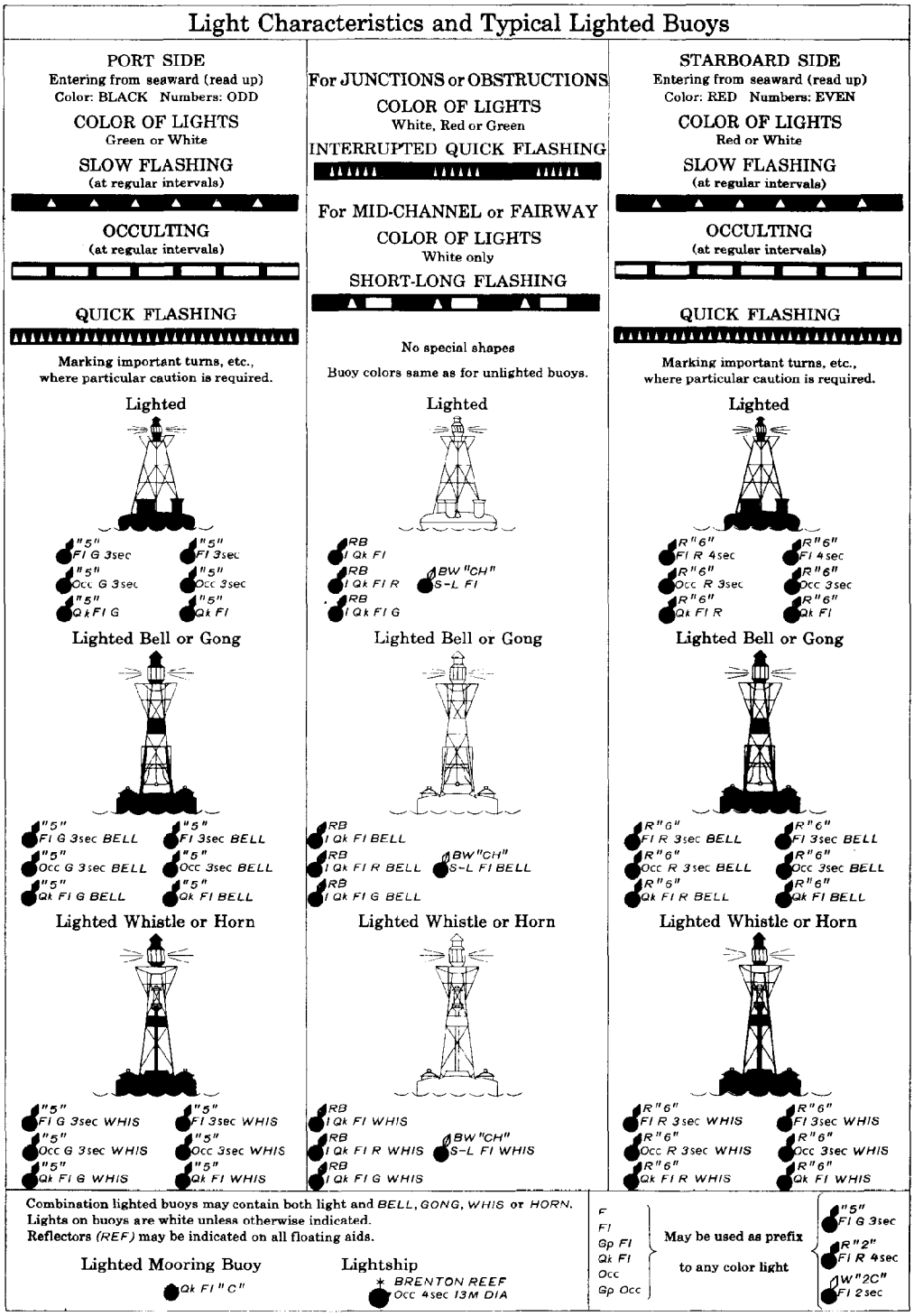
U. Compass



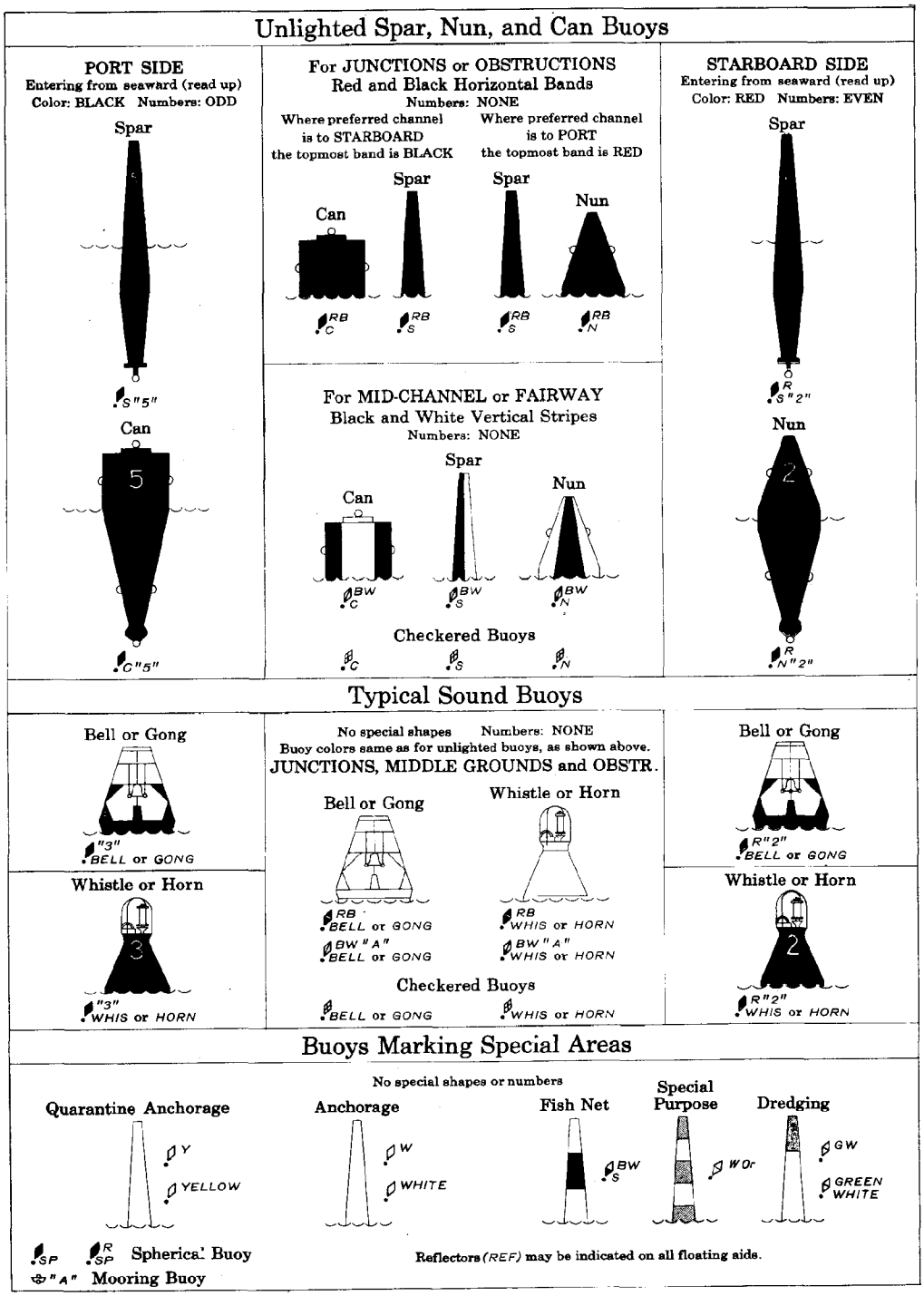
Compass Rose

The outer circle is in degrees with zero at true north. The inner circles are in points and degrees with the arrow indicating magnetic north.

1	N.	north
2	E.	east
3	S.	south
4	W.	west
5	NE.	northeast
6	SE.	southeast
7	SW.	southwest
8	NW.	northwest
21	brg.	bearing
23	mag.	magnetic
24	var.	variation
(27)	deg.	degrees
(28)	dev.	deviation

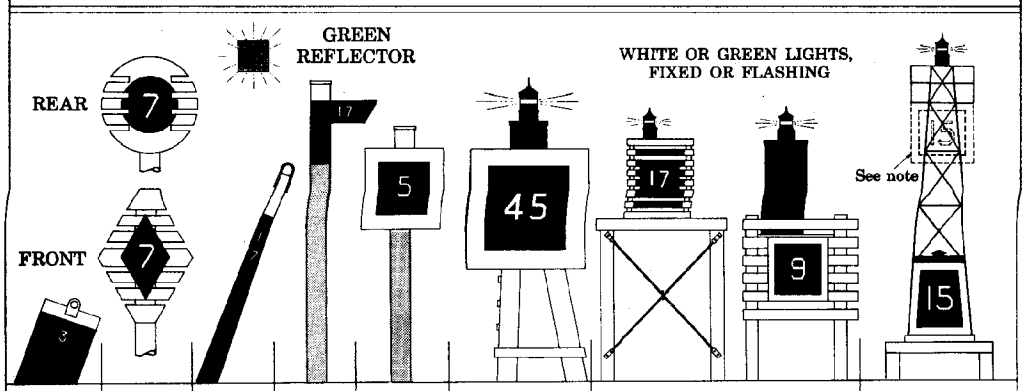


Lighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.



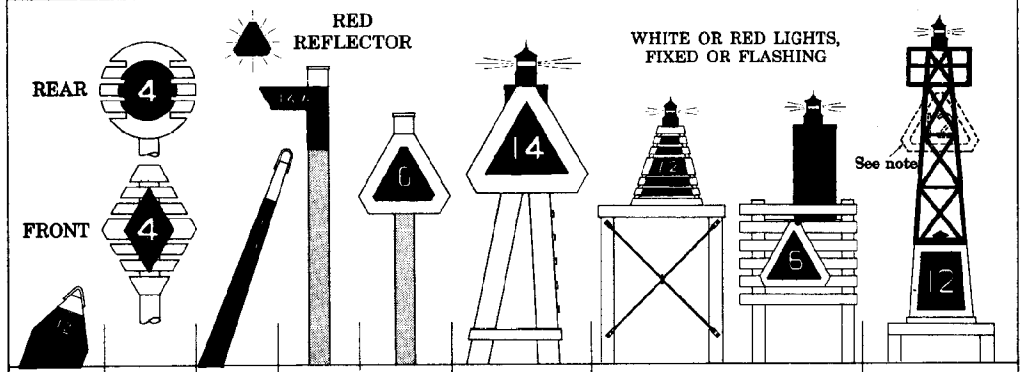
Unlighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.

TYPES OF AIDS TO NAVIGATION
INTRACOASTAL WATERWAY



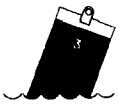
SPECIAL (S) CAN BUOY	RANGES ROUND, OVAL OR DIAMOND	SPAR BUOY 2nd.-4th. Class	DAYBEACONS Pointer	DAYBEACONS Daymark	3 PILE DOLPHIN	SLATTED, PILE STRUCTURES		SKELETON STRUCTURES Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used.
Supporting Structure may be painted White or Aluminum.								
C "3"	"7" "7"	S "7"	"17"	"5"	Fl 2sec "45"	Fl G 5sec "17"	F "9"	F G "15"

PORT Side of channel (Black with Odd Numbers) entering from north and east and traversed to south and west respectively.



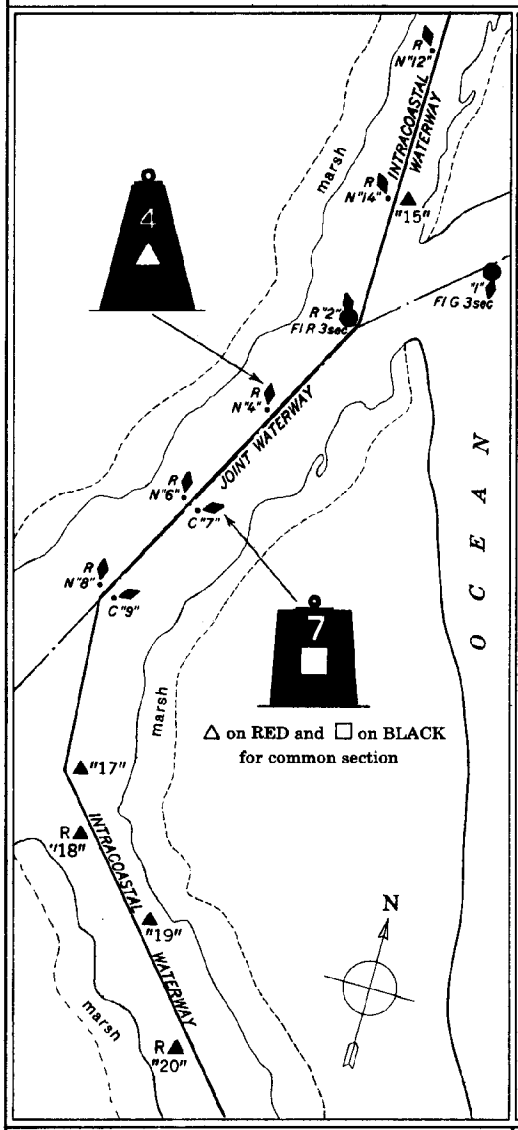
SPECIAL (S) NUN BUOY	RANGES ROUND, OVAL OR DIAMOND	SPAR BUOY 2nd.-4th. Class	DAYBEACONS Pointer	DAYBEACONS Daymark	3 PILE DOLPHIN	SLATTED, PILE STRUCTURES		SKELETON STRUCTURES Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used.
Supporting Structure may be painted White or Aluminum.								
R N "12"	R "4" R "4"	R S "4"	R "14 A"	R "6"	Fl 2sec "14"	Fl R 5sec "12"	F "6"	F R "12"

STARBOARD Side of channel (Red with Even Numbers) entering from north and east and traversed to south and west respectively.



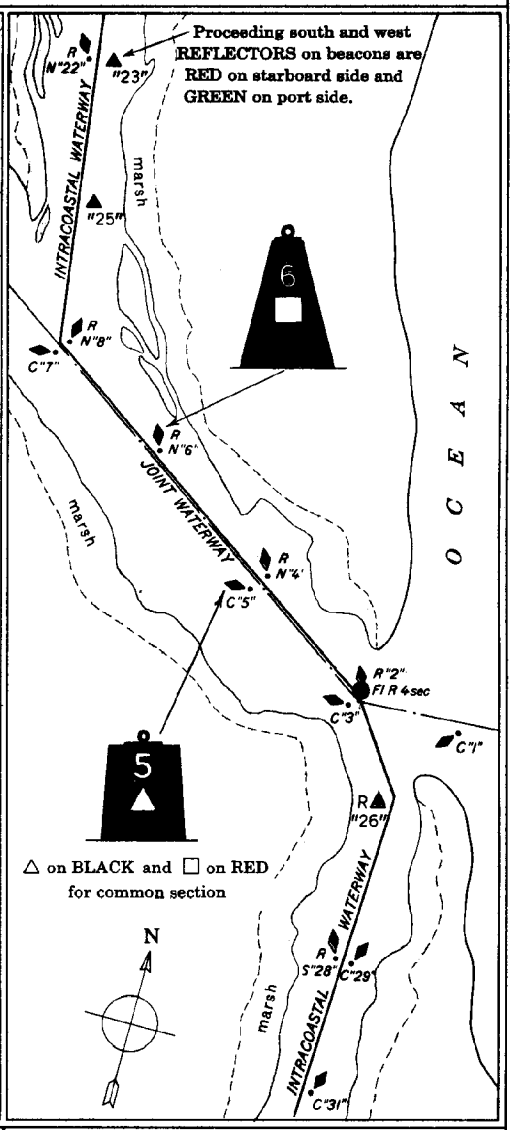
THE ICW AIDS ARE CHARACTERIZED BY THE YELLOW BORDER

ILLUSTRATING THE SYSTEM OF DUAL PURPOSE MARKING WHERE THE ICW AND OTHER WATERWAYS COINCIDE



SKETCH A:

ICW joins another waterway, which is numbered from seaward, at buoy No. 2 and is common with it to buoy No. 9. ICW numbers and yellow borders are omitted in this section but the △ or □ is used on the regular aids to designate the ICW.



SKETCH B:

ICW joins another waterway at buoy No. 8 and is common with it to buoy No. 3. This section is numbered in the opposite direction to that of the ICW. The ICW numbers and yellow borders are omitted from the regular aids but a △ or □ is shown to designate the ICW.